

SPECIFICATIONS

PERMIT SET VOLUME 2 of 4 Divisions 01 - 22

for

The City of Key West City Hall at Glynn Archer School



August 8, 2014

Submitted by:

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Bender & Associates ARCHITECTS p.a.

410 Angela Street □ Key West, FL 33040 305/296-1347



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SECTION 011000

SUMMARY

PART 1 - GENERAL

1.01 PROJECT INFORMATION

- A. Project Title: Key West City Hall at Glynn Archer, Phase 2 - New Construction and Major Renovation.
- B. Owner: City of Key West, Florida.
- C. Design Team:
 - 1. General:
 - a. Consultant shall serve as the Owner's Representative for the Project, with authority to act on behalf of the Owner to the extent provided in the Contract and as outlined in the Special Conditions.
 - 2. Prime Consultant (Architect): Bender & Associates Architects, P.A.
 - 3. Sub-consultants:
 - a. Associate Architect: M.C. Harry & Associates, Inc.
 - b. Civil Engineer: Perez Engineering & Development, Inc.
 - c. Structural Engineer: Atlantic Engineering Services.
 - d. Landscape Architect: Little John, Inc.
 - e. Geotechnical Engineer: AMEC Environment & Infrastructure, Inc.
 - f. M/E/P Engineer: Hufsey-Nicolaides-Garcia-Suarez Associates, Inc.
 - g. Acoustics and Communications: Kinsella + Marsh Group, Inc.
 - h. Network Systems and Security: Unified Network Consulting, LLC.
 - i. Art Conservation Services: Viviana Dominquez (Murals Conservator)
 - j. Environmental Assessment: EE&G Environmental
 - k. Historic Preservation: Bender & Associates Architects, P.A.
- D. Project Description: Repairs, alterations and additions to the existing historic Glynn-Archer School facilities as required to accommodate new use as municipal city hall, including but not limited to selective demolition, repairs, renovations, alterations, additions, sitework, and related work indicated in the drawings and specifications.

1.02 DEFINITIONS

- A. Architect: Where any of the terms "Architect", "Architect/Engineer", or "A/E" is used in the drawings or specifications, it shall be deemed to mean "Consultant".
- B. Owner: Where the term "Owner" is used in the drawings or specifications, it shall be deemed to mean "City of Key West".

1.03 DESCRIPTION OF DEMOLITION AND ALTERATIONS WORK

- A. Scope of demolition and removal work is shown on drawings.
 - 1. Asbestos and lead abatement prior to other demolition activities.
 - 2. Selective Demolition for Remodeling: The historic Glynn Archer School building is a locally significant historic resource, dating to 1923. Care shall be taken to protect the exterior historic walls designated to remain. The extent of selective

demolition is indicated on the drawings, and includes but is not limited to removal of floors, roofs, windows, interior partition framing, designated portions of exterior walls, stairways, windows and doors, etc.

- B. Scope of additions and alterations work is indicated on the drawings.
- C. Contractor shall remove and deliver the following to Owner prior to start of work:
 - 1. All items identified on the drawings.
- D. Salvage:
 - 1. Phase 1 - Selective Demolition: Building elements that have been removed by Phase 1 contractor and stored for reuse as part of the Phase 2 contract work include:
 - a. Wood tongue & groove flooring at auditorium stage.
 - b. One hundred (100) auditorium seats.
 - 2. Phase 2 - New Construction and Major Renovation: Building elements that are to be removed and stored by Phase 2 contractor for reuse as part of the Phase 2 contract work include:
 - a. Wood plank/strip floor and roof deck lumber.
 - b. Wood framing (floors, walls, ceilings) and truss lumber.

1.04 OWNER OCCUPANCY

- A. Cooperate with Owner to minimize conflict and to facilitate Owner's operations on site.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on drawings.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Use of designated portions of the site by the public.
- C. Construction Safeguards: Comply with construction safety requirements of the authorities having jurisdiction and the governing building code, including but not limited to FBC-B Chapter 33 and FBC-EB Chapter 14. .
- D. Provide access to and from site as required by law:
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions (e.g., allowable work hours; time restrictions related to noise control):
 - 1. On-site construction, demolition, drilling, and other similar activities shall be limited to the hours of 8:00 AM and 7:00 PM on Monday through Friday, and 9:00 AM to 5:00 PM on Saturday, except as otherwise authorized or directed by Owner's Construction Manager.
 - 2. On-site construction, demolition, drilling, and other similar activities shall not generate unreasonable or disturbing noise, except as allowed under City of Key West noise ordinance (Key West Code of Ordinances, Sec. 26-193).
- F. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire

sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.

3. Prevent accidental disruption of utility services to other facilities.
4. Disruption of Utilities: Refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Description of alternates.
- B. Procedures for pricing alternates.
- C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Section 001100 - Proposal Requirements:
 - 1. Proposal Requirements:
 - a. Instructions to Proposers: Instructions for preparation of pricing for alternatives.
 - b. Proposal Form: List of alternatives as supplement to Proposal Form
 - 2. Contract Forms:
 - a. Contract: Incorporating monetary value of accepted alternatives.

1.03 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.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 – The base bid includes one of the three solar array structures (e.g. Photovoltaic (PV) Systems) identified in the plans. State the amount of addition to the base bid to add the second solar array structure, including PV modules, PV arrays, inverters, and interconnecting circuits, steel structure including foundations, and miscellaneous equipment required for a fully operational system.
 - 1. Base Bid Item: Division 26 Sections including 263100 – Photovoltaic Systems; and 051213 – Architecturally Exposed Structural Steel; 099610 – High Performance Coatings For Steel; including Drawing numbers A17.1, A17.2 and S1.4.
 - 2. Alternative Item: Division 26 Sections including 263100 – Photovoltaic Systems; and 051213 – Architecturally Exposed Structural Steel; 099610 – High Performance Coatings For Steel; including Drawing numbers A17.1, A17.2 and S1.4.
- B. Alternate No. 2 – The base bid includes one of the three solar array structures. State the amount of addition to the base bid to add the third solar array structure, including solar

panels, steel structure including foundations, and miscellaneous equipment required for a fully operational system:

1. Base Bid Item: Division 26 Sections including 263100 – Photovoltaic Systems; and 051213 – Architecturally Exposed Structural Steel; 099610 – High Performance Coatings for Steel; including Drawing Sheets A17.1, A17.2 and S1.4.
 2. Alternative Item: Division 26 Sections including 263100 – Photovoltaic Systems; and 051213 – Architecturally Exposed Structural Steel; 099610 – High Performance Coatings for Steel; including Drawing Sheets A17.1, A17.2 and S1.4.
- C. Alternate No. 3 – The base bid includes asphalt pavement at the parking lot. State the amount of addition to the base bid to substitute concrete for asphalt:
1. Base Bid Item: Sections 321216 – Asphalt Paving and 321313 – Concrete Paving; and Drawing numbers C5 and C6 including Detail 8/C6.
 2. Alternative Item: Sections 321216 – Asphalt Paving and 321313 – Concrete Paving; and Drawing number C5 and C6 including 10/C6.
- D. Alternate No. 4 – The base bid includes the Commission Chamber roof framing as shown on Sheet S1.3. State the amount of change to the base bid price (add, deduct or no change) to substitute the alternate bid framing.
1. Base bid item: Sheet S1.3.
 2. Alternative item: Sheets S1.3A and S2.11.
- E. Alternate No. 5 – The base bid includes the concrete slab and site furnishings at the pavilion in the Butterfly Garden at Grinnell Street. State the amount of addition to the base bid to furnish, install, including foundations, and finish the pavilion structures.
1. Base bid item: Sheets L-11, L-13, and L-21.
 2. Alternative item: Sheets L-11, L-13, L-21, and S2.9 for foundation.
- F. Alternate No. 6 – The base bid includes the drip irrigation system with one Hunter I-Core Station with a baseline Watertec S.100 Smart Watering Device with one soil moisture sensor. State the amount of addition to the base bid to add the baseline 3200 pedestal mount controller, installed with 6 soil moisture sensors and hydrometer. Substitute a Hoover pump station for the base bid 5 HP centrifugal pump.
1. Base Bid Item: Spec Section 328400, Drawings Sheets L-80, and L-81.
 2. Alternate Bid Item: Spec Section 328400, Drawings Sheets L-80, and L-81.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Contractor's construction schedules.
- D. Progress photographs.
- E. Submittals:
 - 1. Submittals for review, information, and project closeout.
 - 2. Number of copies of submittals.
 - 3. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions.
- B. Section 007300 - Supplementary Conditions.
- C. Section 011100 - Summary.
- D. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
- E. Section 017800 - Closeout Submittals: Project record documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after award of the Contract.
- B. Attendance Required:
 - 1. Owner (Owner's Representative).
 - 2. Architect (Project Manager).
 - 3. Contractor (Project Manager, LEED AP Coordinator, and Superintendent).
 - 4. Major construction trade subcontractors.
 - 5. Others, per Owner's approval.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of Products, schedule of values, and construction schedule.

5. Designation of personnel representing the parties to Contract and Architect.
 6. Procedures and processing of field decisions, submittals, and substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. LEED-related items which require action prior to commencement of construction activities for conformance with LEED v2009 NC Sustainable Sites Pre-Requisite 1 - Construction Activity Pollution Prevention.
 8. 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.

3.02 PROGRESS MEETINGS

- A. Schedule and make arrangements for meetings throughout progress of the Work at weekly intervals.
- B. Architect will prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, LEED AP Coordinator, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- 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 construction 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 construction schedule and coordination.
 11. LEED Activities Progress Report.
 12. Other business relating to Work.
- E. Contractor will 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 CONTRACTOR'S SCHEDULES

- A. General:
 1. Before commencing any work, prepare and submit to the Architect/Engineer the initial Progress Schedule and Schedule of Values in triplicate. After review by Architect/Engineer, revise and resubmit as required for approval by the Architect/Engineer and the Owner. Submit revised Progress Schedule with each application for partial payment, reflecting changes since previous submittal.

2. Comply with progress schedule for submittals related to Work progress.
Coordinate submittal of related items.

B. Construction Progress Schedules:

1. Within 7 days after being awarded the Contract, the Contractor shall prepare and submit for Owner's and Architect's information the construction schedule
2. The construction schedule shall provide for expeditious and practicable execution of the Work, and shall be revised at least monthly to reflect physical progress in the Work and to provide additional information related to plans for upcoming work activities.
3. Microsoft Project Professional 2010 project management software or equivalent shall be used for preparation and periodic revisions of a construction schedule and format for construction schedule submittals shall include CPM Gantt chart(s).
4. Construction Progress Reports: As part of the periodic revisions of the construction schedule, the Contractor shall prepare and submit for Owner's and Architect's information a monthly construction progress report describing the physical progress during the report period, plans for the forthcoming report period, actions to correct any negative float predictions, and potential delays and problems and their estimated impact on performance and the overall project completion date.
5. Submit latest updated construction schedule with each Application for Payment.

C. Submittal Schedule:

1. Within 7 days after being awarded the Contract, the Contractor shall prepare and submit for Architect's approval a submittal schedule.
2. Submittal schedule shall be coordinated with the construction schedule, and data from submittal schedule shall be incorporated into required construction schedule submittals.
3. Submittal schedule shall allow the Architect reasonable time to review submittals.
 - a. In no instance shall the scheduled review time for any submittal be less than 14 days.
 - b. For submittals requiring review by multiple design disciplines (e.g., MEP submittals), additional time for review shall be allocated.

- D. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit new photographs each week, within 3 days after exposure.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
- D. Views:
 1. Consult with Architect for instructions on views required.
 2. Provide factual presentation.
 3. Provide correct exposure and focus, high resolution and sharpness, maximum depth

of field, and minimum distortion.

- E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.05 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 conformance with information given and the design concept expressed in the contract documents.
 - C. Samples will be reviewed only 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.
- D. For additional requirements, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 007300 - Supplementary Conditions.
- ### 3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Engineering calculations.
 - 3. Certificates.
 - 4. Test reports.
 - 5. Inspection reports.
 - 6. Manufacturer's instructions.
 - 7. Manufacturer's field reports.
 - 8. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.
- C. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.

3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.
- C. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
1. Small Size Sheets, Not Larger than 8-1/2 x 11 inches (215 x 280 mm): Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
 2. Larger Sheets, Not Larger than 36 x 48 inches (910 x 1220 mm): Submit one reproducible transparency and two opaque reproduction copies.
- B. Documents for Information: Submit two copies.
- C. Extra Copies at Project Closeout: See Section 017800 - Closeout Submittals.
- D. Samples: Submit three samples, two 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.
- E. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.09 SUBMITTAL PROCEDURES

- A. Transmit each submittal with appropriate transmittal form (e.g., AIA Form G810 or other form approved by Architect and Owner).
- B. Sequentially number each submittal on the transmittal form.
1. Revise submittals with original number and a sequential alphabetic suffix.
- C. Include the following submittal identification information on each copy:
1. Project (name and number), Contractor (name and address), and applicable subcontractor or supplier.
 2. Pertinent drawing and detail number, and specification section number.
 3. Submittal date and dates of previous submittals.
 4. Deviations from Contract Documents.
- D. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed Work.
- E. When revised for resubmission, identify all changes made since previous submission.
- F. Provide space for Contractor and Architect/Engineer review stamps on each copy.
1. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work

and Contract Documents.

- G. Deliver submittals to Architect at business address.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.
- I. For each submittal for review, allow a minimum of 14 calendar days for review and approval/disapproval by the A/E in all cases.
 - 1. The time allowed for review and approval/disapproval by the A/E shall be measured from first full business day following receipt by the A/E until A/E's notification to Contractor that the review and approval/disapproval by the A/E has been completed. Time required for delivery of submittal materials from Contractor to A/E and for delivery of reviewed submittal materials from A/E to Contractor shall be in addition to the time allowed for review and approval/disapproval by the A/E.
- J. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.
- L. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.10 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. The Contractor shall be responsible for the preparation of detailed shop drawings necessary for the fabrication, erection, and construction of all parts of the work in conformity with the requirements of the Contract Documents.
 - 1. Contract drawings prepared by the A/E shall not be used as shop drawings, nor shall such contract drawings be enhanced for use as shop drawings except as specifically authorized by the A/E.
- B. Each submission of shop drawings, product data or samples shall be accompanied by a transmittal letter listing the drawings submitted by number and title.
- C. When professional engineering calculations and/or certifications of performance criteria of materials, systems, and/or equipment are required, the Architect/Engineer is entitled to rely upon the accuracy and completeness of calculations and certifications submitted by Contractor. When required by the contract documents, such calculations and/or certifications shall be submitted in a neat, clear and in an easy to follow format, and signed and sealed by a Professional Engineer registered in the State of Florida.
- D. Failure to comply with any of the above may result in the rejection of shop drawings.
- E. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.11 MANUFACTURER'S INSTRUCTIONS

- A. When required in individual Specification Section, submit manufacturer's published instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for Product Data.

3.12 FIELD SAMPLES

- A. Provide field samples of finishes at project as required by individual Specifications section. Install sample complete and finished. Acceptable samples in place may be retained in completed work, unless otherwise indicated.

END OF SECTION

SECTION 013514
LEED-NC 2009 CREDIT SUMMARY

PART 1 - GENERAL

1.01 DEFINITIONS

- A. LEED Rating System: LEED-NC (New Construction and Major Renovations) 2009 edition.
- B. Required: Achievement of this credit is essential for certification of this project.
- C. Preferred: Achievement of this credit would be desirable but is not mandatory.
- D. Not Required: Achievement of this credit is not expected or not possible for this project.

PART 2 - CREDIT SUMMARY

2.01 CERTIFICATION LEVEL TO BE ACHIEVED: SILVER, REQUIRING MINIMUM OF 50 POINTS.

2.02 SUSTAINABLE SITES (SS): 23 POINTS TO BE ACHIEVED.

- A. SS Prerequisite 1 - Required - No points - Construction Activity Pollution Prevention.
 - 1. Prior to and During Demolition and Construction:
 - a. Preventive measures and remediation are specified in Section 015713 - Temporary Erosion and Sediment Control.
 - b. Dust control and basic surface drainage are specified in Section 312500 - Erosion and Sedimentation Controls
 - c. Preventive measures prescribed by state laws and local regulations will be followed.
 - 2. Permanent erosion and sedimentation prevention features are to be provided:
 - a. Sod and sodding materials are specified in Section 329200 - Sodding.
 - b. Landscape plants and non-plant materials are specified in Section 329300 - Landscape.
- B. SS Credit 1 - Required - 1 point - Site Selection.
 - 1. The project is not located on any of the inappropriate or environmentally sensitive lands defined for this credit.
- C. SS Credit 2 - Required - 5 points - Development Density & Community Connectivity.
 - 1. The project is on a site that meets the criteria for Option 1, Development Density.
 - 2. The project is on a site that meets the criteria for Option 2, Community Connectivity.
- D. SS Credit 3 - Required - 1 point - Brownfield Redevelopment.
 - 1. The project is located on a site documented as contaminated.
 - 2. Remediation procedures tailored to the specific situation (asbestos abatement, lead-based paint removal, and mold remediation) are specified in Section 024100 - Demolition.
- E. SS Credit 4.1 - Required - 6 points - Alternative Transportation: Public Transportation Access.

1. The project is located on a site that meets the criteria for Option 2, Bus Stop Proximity.
- F. SS Credit 4.2 - Required - 1 point - Alternative Transportation: Bicycle Storage & Changing Rooms.
1. Bicycle racks are specified in Section 129313 - Bicycle Racks.
 2. Shower and changing facilities are indicated on the drawings and specified as follows:
 - a. Tile for shower floor and walls is specified in Section 093013 - Tiling.
 - b. Shower curtains and rods are specified in Section 102813 - Toilet Accessories.
 - c. Lockers are specified in Section 105100 - Lockers.
 - d. Plumbing fixtures for showers are specified in Section 224223 - Commercial Showers.
- G. SS Credit 4.3 - Required - 3 points - Alternative Transportation: Low-Emitting & Fuel-Efficient Vehicles.
1. Preferred parking spaces for Low-Emitting & Fuel-Efficient Vehicles have been provided, in the quantity required.
- H. SS Credit 4.4 - Required - 2 points - Alternative Transportation: Parking Capacity.
1. Parking capacity does not exceed local zoning requirements.
 2. Preferred parking spaces for car or vanpools have been provided, in the quantity required.
- I. SS Credit 5.1 - Not Required - 1 point - Site Development: Protect or Restore Habitat.
- J. SS Credit 5.2 - Not Required - 1 point - Site Development: Maximize Open Space.
- K. SS Credit 6.1 - Required - 1 point - Stormwater Design: Quantity Control.
1. Existing site imperviousness is greater than 50 percent.
 2. The site design does not increase existing runoff rate and quantity.
 3. Methods used are:
 - a. Using pervious surfacing:
 - (1) Demolition of existing impervious surfacing is specified in Section 024100 - Demolition.
 - (2) Grading is specified in Section 312200 – Finish Grading.
 - (3) Porous Pavement System (Geopave) is specified and detailed on Sheets A1.1 and A.1A.
 - b. Storing rainwater for use in non-potable water systems:
 - (1) Collection surfaces are specified in Section 075200 - Modified Bituminous Membrane Roofing.
 - (2) Existing underground storage tanks are being reused; new lining system is specified in Section 099610 - High Performance Coatings for Cisterns.
 - (3) Storm drainage piping and manholes are specified in Section 33400 – Storm Drainage Utilities.
 - (4) Plumbing pumps are specified on the Irrigation drawings.
- L. SS Credit 6.2 - Required - 1 point - Stormwater Design: Quality Control.
1. Natural on-site stormwater treatment to remove sediment is provided.
 - a. Grading is specified in Section 312200 – Finish Grading.

- b. Plants are specified in Section 329300 - Landscape.
 - 2. Underground exfiltration drainage structures are specified in Section 33400 – Storm Drainage Utilities.
 - 3. A mechanical treatment system to remove sediment is provided on-site, shown on Sheet P2.1B.
 - M. SS Credit 7.1 - Required - 1 point - Heat Island Effect: Non-Roof.
 - 1. The site design reduces thermal gradient differences by a combination of:
 - a. Placing some parking spaces covered by a structure.
 - (1) Pre-engineered carport structures are shown on drawings.
 - b. Using shade trees to cover paving.
 - (1) Trees are specified in Section 329300 - Landscape.
 - c. Using Porous Pavement System for a portion of the parking spaces.
 - (1) Porous Pavement System (Geopave) is specified and detailed on Sheets A1.1 and A.1A.
 - d. Using paving with reflectance of at least 0.3:
 - (1) Portland cement concrete paving, which typically has a reflectance of 0.3 to 0.4, is specified in Section 321313 - Concrete Paving.
 - N. SS Credit 7.2 - Required - 1 point - Heat Island Effect: Roof.
 - 1. The roofing design reduces thermal gradient differences by using high reflectance and high emissivity roofing for at least 75 percent of roof area
 - a. High SRI roofing meeting the requirements is specified in Section 075200 - Modified Bituminous Membrane Roofing and 075600 – PMMA Liquid-Applied Roofing.
 - O. SS Credit 8 - Not Required - 1 point - Light Pollution Reduction.
- 2.03 WATER EFFICIENCY (WE): 8 POINTS TO BE ACHIEVED.
- A. WE Prerequisite 1 - Required - No points - Water Use Reduction: Minimum 20% Reduction.
 - 1. Appropriate high efficiency and/or waterless fixtures are specified in Section 224213.13 - Commercial Water Closets, Section 224213.16 - Commercial Urinals, Section 224216.13 - Commercial Lavatories, Section 224216.16 - Commercial Sinks, Section 224223 - Commercial Showers, and Section 224713 – Drinking Fountains.
 - B. WE Credit 1.1 and WE Credit 1.2 - Required - 4 points - Water Efficient Landscaping: No Potable Water Use for Irrigation.
 - 1. Landscaping that requires irrigation is included in this project, but:
 - a. A high-efficiency underground irrigation system is specified in Section 328400 - Irrigation.
 - b. Plants that do not require much irrigation are specified in Section 329300 - Landscape.
 - c. Only Non-potable water (rainwater) will be used for irrigation:
 - (1) Collection surfaces are specified in Section 075200 - Modified Bituminous Membrane Roofing.
 - (2) Existing underground storage tanks (aka historic cisterns) are being reused; new lining system is specified in Section 099610 - High

Performance Coatings for Cisterns.

- (3) Storm drainage piping and manholes are specified in Section 33400 – Storm Drainage Utilities.
- (4) Plumbing pumps are specified on the Irrigation drawings.

- C. WE Credit 2 - Not Required - 2 points - Innovative Wastewater Technologies.
- D. WE Credit 3.1 - Required - 2 points - Water Use Reduction: Minimum 35% Reduction
 - 1. Appropriate high efficiency and/or waterless fixtures are specified in the following sections:
 - a. Section 224213.13 - Commercial Water Closets.
 - b. Section 224213.16 - Commercial Urinals.
 - c. Section 224216.13 - Commercial Lavatories.
 - d. Section 224216.16 - Commercial Sinks.
 - e. Section 224223 - Commercial Showers.
 - f. Section 224713 - Drinking Fountains.
- E. WE Credit 3.2 - Required - 2 points - Water Use Reduction: Minimum 40% Reduction.
 - 1. Same solutions as for WE Credit 3.1, but greater reduction.

2.04 ENERGY & ATMOSPHERE (EA): 17 POINTS TO BE ACHIEVED.

- A. EA Prerequisite 1 - Required - No points - Fundamental Commissioning of Building Energy Systems.
 - 1. General commissioning requirements are specified in Section 019113. The following systems will be commissioned:
 - a. Mechanical Systems: HVAC equipment, Testing, adjusting and balancing and BAS (controlled devices, control loops and systems integration)
 - b. Plumbing Systems: Domestic hot water heating systems
 - c. Electrical Systems: Lighting control systems (i.e. occupancy sensors, daylighting controls, dimmers, and time scheduling)
 - d. Renewable energy systems (photovoltaic array system)
 - e. Rainwater Capture and Reuse
 - 2. Commissioning of HVAC is specified in Section 230800 - Commissioning of HVAC.
- B. EA Prerequisite 2 - Required - No points - Minimum Energy Performance.
 - 1. The building envelope, HVAC, lighting, etc., have been designed to meet the criteria.
 - 2. The overall design solution is implemented in the drawings and many sections of the specifications.
- C. EA Prerequisite 3 - Required - No points - Fundamental Refrigerant Management.
 - 1. New equipment: No CFC-based refrigerants are used in any equipment. Non-CFC refrigerants are specified in the following sections:
 - a. Chillers: Section 236423 - Scroll Water Chillers.
 - b. Computer Room Air Conditioners: Section 238123.11 - Computer-Room Air-Conditioners, Floor-Mounted Units (6 Tons (21 KW) and Smaller).
 - c. Fan Coil Units: Section 238219 - Fan Coil Units
- D. EA Credit 1 - Required - 4 points - Optimize Energy Performance: Minimum 15.7%

Energy Savings for Existing Building Renovation.

1. The building envelope, HVAC, lighting, etc., have been designed to meet the criteria for the number of points indicated.
 2. The overall design solution is implemented in the drawings and many sections of the specifications.
- E. EA Credit 2 - Required - 7 points - On-Site Renewable Energy: Min. 13% offset.
1. Renewable energy systems provide the percentage of the project's total energy cost required for the number of points indicated.
 2. The following on-site systems, along with utility net metering, are provided:
 - a. Photovoltaic power generation specified in Section 263100 – Photovoltaic Systems
 - b. Solar Arrays and Support Structures are shown on Sheets A17.1, A17.2 and S1.4.
- F. EA Credit 3 - Required - 2 points - Enhanced Commissioning.
1. Contractor's responsibilities for post-occupancy commissioning are specified in Section 019113 - General Commissioning Requirements.
 2. Responsibilities for preparation of operation and maintenance manuals for commissioned systems are specified in Section 017800 - Closeout Submittals.
- G. EA Credit 4 - Required - 2 points - Enhanced Refrigerant Management.
1. No Halon is used in any equipment or extinguishing system.
 2. HVAC:
 - a. New Equipment: No HCFC-based refrigerants are used in any equipment. Non-HCFC refrigerants are specified in the following sections:
 - (1) Chillers: Section 236423 - Scroll Water Chillers.
 - (2) Computer Room Air Conditioners: Section 238123.11 - Computer-Room Air-Conditioners, Floor-Mounted Units (6 Tons (21 KW) and Smaller).
 - (3) Fan Coil Units: Section 238219 - Fan Coil Units
 2. Fire Suppression:
 - a. Fire extinguishers specified in Section 104400 - Fire Protection Specialties use agents other than Halon.
 - b. Fire extinguishing system using NFPA 2001 agents is specified in Section 212200 - Clean Agent Fire Extinguishing System.
- H. EA Credit 5 - Not Required - 3 points - Measurement & Verification.
- I. EA Credit 6 - Required - 2 points - Green Power.
1. The Owner intends to or has already entered into a contract for electricity from renewable sources, but that is not part of the construction contract.

2.05 MATERIALS & RESOURCES: 6 POINTS TO BE ACHIEVED.

- A. MR Prerequisite 1 - Required - No points - Storage & Collection of Recyclables.
1. Small recycling containers have been provided throughout facility to collect recyclables. Service crews will collect and empty contents of small containers into large outdoor recycling dumpster for pick up by recycling service.
 2. The outside area designated for collection and storage of recyclables is indicated on the drawings as 'Painted Stucco Enclosure, 6ft High' on Sheet A.1.1, fronting

Seminary Street.

- B. MR Credit 1.1 - Not Required - 1 point - Building Reuse: Maintain Minimum 55% of Existing Walls, Floors & Roof.
- C. MR Credit 1.2 - Not Required - 1 point - Building Reuse: Maintain Minimum 50% of Interior Non-Structural Elements.
- D. MR Credit 2.1 - Required - 1 point - Construction Waste Management: Divert Minimum 50% from Disposal.
 - 1. Construction procedures and measurement of diverted waste are specified in Section 017419 - Construction Waste Management. This section requires the Contractor to perform the measurement and computation.
 - 2. Waste prevention and disposal procedures specific to certain types of work are specified in many sections.
- E. MR Credit 2.2 - Required - 1 point - Construction Waste Management: Divert Minimum 75% from Disposal.
 - 1. Same as for MR Credit 2.1, but increased quantity.
- F. MR Credit 3.1 - Not Required - 1 point - Materials Reuse: Minimum 5%.
- G. MR Credit 3.2 - Not Required - 1 point - Materials Reuse: Minimum 10%.
- H. MR Credit 4.1 - Required - 1 point - Recycled Content: Minimum 10% (post-consumer plus 1/2 pre-consumer).
 - 1. The definition of recycled content for the purposes of the contract documents is included in Section 016000 - Product Requirements; qualifying products do not include plumbing, HVAC, electrical, or communications equipment, piping, conduit, ductwork, or wiring.
 - 2. This project contains steel framing and many other steel-containing products; submission of a complete list of all metal-containing products will be required, with documentation showing steel mill source and mill process, allowing computation by using industry-averages for recycled content; the forms are specified in Section 013516 - LEED Submittal Forms.
 - 3. Concrete using recycled materials such as fly ash to replace Portland cement as much as possible while retaining strength and design requirements is specified in:
 - a. Section 033000 - Cast-in-Place Concrete.
 - b. Section 034113 - Precast Concrete Hollow Core Planks.
 - 4. Other specific products that must contain recycled content are specified in the appropriate section(s).
 - 5. Contractor's reporting and measurement requirements are specified in Section 013515 - LEED Certification Procedures and Section 016000 - Product Requirements; calculation of project totals is the responsibility of Contractor.
- I. MR Credit 4.2 - Required - 1 point - Recycled Content: Minimum 20% (post-consumer plus 1/2 pre-consumer).
 - 1. Same as for MR Credit 4.1, but increased quantity.
- J. MR Credit 5.1 - Required - 1 point - Regional Materials: Minimum 10% Extracted, Processed & Manufactured Regionally.

1. For the purposes of the contract documents, the term "regionally-sourced" is used instead of "regional materials" and is defined in Section 016000 in the same way as for this credit.
2. We don't know which products might qualify for this credit but want to pursue it anyway, so we will require the submittal of the Regionally-Sourced Products Form for each product used; this will be done by requiring the submittal of the form along with the first application for payment for the product; the form is specified in Section 013516 - LEED Submittal Forms.
- 3 Major products that are specified to be regionally-sourced include, but are not limited to the following:
 - a. Section 329200 - Sodding
 - b. Section 329300 - Landscape
 - c. Section 312200 - Finish Grading
 - d. Section 312300 - Excavation and Backfill
 - e. Section 033000 - Cast-in-Place Concrete
 - f. Section 034113 - Precast Concrete Hollow Core Planks
 - g. Section 042000 - Unit Masonry Assemblies
 - h. Section 052100 - Steel Joist Framing
 - i. Section 053100 - Steel Decking
 - j. Section 054000 - Cold-Formed Metal Framing
 - k. Section 055000 - Metal Fabrications
 - l. Section 055110 - Metal Stairs
 - m. Section 055120 - Historic Replica Fire Escapes
 - n. Section 055213 - Decorative Metal Railings
 - o. Section 057270 - Cable Railing Systems
 - p. Section 061643 - Gypsum Sheathing
 - q. Section 092400 - Portland Cement Plaster
 - r. Section 092410 -Portland Cement Plaster Repairing
4. Other specific products that must be regionally-sourced are specified in the appropriate section(s).
5. Contractor's reporting and measurement requirements are specified in Section 013515 - LEED Certification Procedures and Section 016000 - Product Requirements; calculation of project totals is the responsibility of Contractor.

K. MR Credit 5.2 - Required - 1 point - Regional Materials: Minimum 20% Extracted, Processed & Manufactured Regionally.

1. Same as for MR Credit 5.1, but for an additional 10 percent.

L. MR Credit 6 - Not Required - 1 point - Rapidly Renewable Materials.

M. MR Credit 7 - Not Required - 1 point - Certified Wood.

2.06 INDOOR ENVIRONMENTAL QUALITY: 12 POINTS TO BE ACHIEVED.

A. EQ Prerequisite 1 - Required - No points - Minimum IAQ Performance.

1. The building ventilation has been designed to meet the minimum requirements of ASHRAE 62.1-2010.
2. The overall design solution is implemented in the drawings and many sections of the specifications.

- B. EQ Prerequisite 2 - Required - No points - Environmental Tobacco Smoke (ETS) Control.
 - 1. Smoking in the building is prohibited.
 - 2. Exterior smoking areas are located at least 25 feet (8 meters) away from entries, outdoor air intakes, and operable windows. Signage is included.
- C. EQ Credit 1 - Required - 1 point - Outdoor Air Delivery Monitoring.
 - 1. Direct-digital HVAC control system is specified in Section 230923.
- D. EQ Credit 2 - Not Required - 1 point - Increased Ventilation.
- E. EQ Credit 3.1 - Required - 1 point - Construction IAQ Management Plan, During Construction.
 - 1. Good construction procedures and submittal requirements intended to prevent future Indoor Air Quality problems are specified in Section 015721 - Indoor Air Quality Controls.
 - 2. Contractor is required to develop and implement an Indoor Air Quality Management Plan (IAQ) for use during demolition and construction.
 - 3. Contractor is required to maintain and upload to LEED On-line a detailed photo log of the IAQ Plan.
- F. EQ Credit 3.2 - Required - 1 point - Construction IAQ Management Plan, Before Occupancy.
 - 1. Contractor is required to perform either a full building flush-out or air quality testing prior to occupancy, both of which are specified in Section 015721 - Indoor Air Quality Controls.
- G. EQ Credit 4.1 - Required - 1 point - Low-Emitting Materials, Adhesives & Sealants.
 - 1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- H. EQ Credit 4.2 - Required - 1 point - Low-Emitting Materials, Paints & Coatings.
 - 1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
 - 2. Paints, coatings and stains are specified in Section 099000 - Painting and Coating.
- I. EQ Credit 4.3 - Required - 1 point - Low-Emitting Materials, Flooring Systems.
 - 1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
 - a. Carpet tile; specified in Section 096813 - Tile Carpeting.
 - b. Adhesives used in connection with carpet systems.
- J. EQ Credit 4.4 - Required - 1 point - Low-Emitting Materials, Composite Wood & Agrifiber Products.
 - 1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

2. The products covered by this credit include ONLY particleboard, plywood, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores, and laminating adhesives used on-site or in the shop.
 3. A project-wide prohibition on use of these products if they contain added urea-formaldehyde is specified.
- K. EQ Credit 5 - Not Required - 1 point - Indoor Chemical & Pollutant Source Control.
- L. EQ Credit 6.1 - Required - 1 point - Controllability of Systems: Lighting.
1. Lighting controls meeting the criteria are to be provided.
 - a. Lighting control devices are specified in Section 260923 - Lighting Control Devices.
- M. EQ Credit 6.2 - Required - 1 point - Controllability of Systems: Thermal Comfort.
1. HVAC Controls: Individual controls are to be provided for at least 50 percent of occupants in regularly occupied areas.
 - a. Locally controlled HVAC terminal units are specified in Section 233600 - Air Terminal Units.
 - b. Direct-digital HVAC control system is specified in Section 230923 - Direct Digital Control (DDC) System for HVAC.
- N. EQ Credit 7.1 - Required - 1 point - Thermal Comfort: Design.
1. Thermal comfort meeting the credit criteria is to be provided, with ventilation by mechanical means only.
 2. The overall design solution is implemented in the drawings and many sections of the specifications.
- O. EQ Credit 7.2 - Required - 1 point - Thermal Comfort: Verification.
1. Owner's O&M program will address procedures for identifying and implementing corrective actions.
 2. A survey of building occupants will be conducted by Owner within 6 to 18 months after building occupancy to determine level of comfort; Owner will develop a plan for corrective action if more than 20 percent of occupants report dissatisfaction with thermal comfort in building.
 3. Direct-digital HVAC control system is specified in Section 230923 - Direct Digital Control (DDC) System for HVAC.
 4. Commissioning of these controls is specified in the sections referenced for EA Prerequisite 1, Fundamental Building Systems Commissioning.
- P. EQ Credit 8.1 - Not Required - 1 point - Daylight & Views: Daylighting.
- Q. EQ Credit 8.2 - Required - 1 point - Daylight & Views: Views for Minimum 90% of Spaces.
1. Views meeting the credit criteria are to be provided.
 2. The overall design solution is implemented in the drawings with vision glazing specified in many sections of the specifications, including:
 - a. Steel windows specified in Section 085123 - Steel Windows and Doors.
 - b. Fixed glazing specified in Section 088000 - Glazing.

2.07 INNOVATION & DESIGN PROCESS (ID): 5 POINTS TO BE ACHIEVED.

- A. ID Credit 1.1 - Required - 1 point - Innovation in Design: Exceeding 40% Water Savings in WEc3.
- B. ID Credit 1.2 - Required - 1 point - Innovation in Design: Exceeding 200 trips under SSc4.1 Alternative Transportation.
- C. ID Credit 1.3 - Required - 1 point - Green Housekeeping Program.
- D. ID Credit 1.4 - Required - 1 point – Meet or exceed 95% Construction Waste Diversion Rate
- E. ID Credit 2 - Required - 1 point - LEED(tm) Accredited Professional.
 - 1. At least one principal participant of the project team has successfully completed the LEED Accredited Professional exam and holds current LEED AP accreditation.

2.08 REGIONAL PRIORITY (RP): 1 POINT TO BE ACHIEVED.

- A. Region (Zip Code): 33040.
- B. RP Credit 1.1 - Required - 1 point - Region Specific Environmental Priority: SSc3 - Brownfield Redevelopment.
- C. RP Credit 1.2 - Not Required - 1 point - Region Specific Environmental Priority: SSc5.1 - Site Development: Protect or Restore Habitat.
- D. RP Credit 1.3 - Not Required - 1 point - Region Specific Environmental Priority: WEc1 - Water Efficient Landscaping; No Potable/Irrigation.
- E. RP Credit 1.4 - Not Required - 1 point - Region Specific Environmental Priority: WEc2 - Innovative Wastewater Technologies.

END OF SECTION

SECTION 013515

LEED CERTIFICATION PROCEDURES

PART 1 - GENERAL

1.01 PROJECT GOALS

- A. This project has been designed to achieve the LEED Silver (minimum 50 points rating as defined in the LEED(r) Green Building Rating System(tm) for New Construction and Major Renovations, 2009 Edition.
- B. Contractor is not responsible for the application for LEED certification, nor for determination of methods of achieving LEED credits unless specifically so indicated.
- C. Many of the LEED credits can be achieved only through intelligent design of the project and are beyond the control of the Contractor. However, certain credits relate to the products and procedures used for construction. Therefore, the full cooperation of the Contractor and subcontractors is essential to achieving final certification.
- D. Contractor shall familiarize himself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.
- E. Since Contractor and subcontractors may not be familiar with LEED requirements, this section includes a summary of the products and procedures intended to achieve LEED credits.
 - 1. Some credits are marked PREREQUISITE; these must be achieved regardless of the level of certification; many are dependent on proper performance by Contractor and subcontractors.
 - 2. Other credits involve quantifying percentages by weight and cost; these require careful recordkeeping and reporting by the Contractor.
 - 3. See www.usgbc.org for more information.

1.03 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Submit LEED submittals and reports to Architect, unless otherwise indicated.
- C. LEED Submittal/Report: For each product with the notation "show quantity on LEED submittal or report," submit a report with the following information:
 - 1. Submit with each Application for Payment; update the Report each period with latest period shown separately.
 - 2. Identify each product with:
 - a. Name and manufacturer.
 - b. Specification section number.
 - c. Applicable Credit(s).
 - d. Net weight per unit.
 - e. Quantity installed.
 - f. Material cost per unit.

SECTION 013516
LEED SUBMITTAL FORMS

1.01 PURPOSE

- A. These forms are for the Contractor's use in submitting documentation to be used to determine whether particular credits have been achieved. The cooperation of subcontractors, suppliers, and manufacturers is required.
- B. These forms apply to the following LEED Credits:
 - 1. MR Credits 4.1 and 4.2 - Recycled Content.
 - 2. MR Credits 5.1 and 5.2 - Regional Materials.
 - 3. IEQ Credit 4 - Low-Emitting Materials.

1.02 FORMS

- A. Section 013516.01 - LEED Material Cost Summary Form: Certification by Contractor.
- B. Section 013516.03 - LEED Metal-Containing Product List: Certification by Contractor.
- D. Section 013516.04 - LEED New Product Content Form: Including separate reporting of wood, steel, rapidly renewable, and recycled content; data certification by manufacturer of product; cost and quantity certification by Contractor.
- E. Section 013516.05 - LEED New Product Source Form: Data certification by manufacturer of product; cost and quantity certification by Contractor.
- F. Section 016116.07 - LEED Prohibited Content Installer Certification: Certification by each installer working on project regardless of product type.

1.03 PROCEDURES

- A. All LEED submittal forms are to be submitted by Contractor; certifications are to be made by indicated party.
- B. Where a LEED Submittal is called for, fill out and submit the appropriate form.
 - 1. Fill out one form for each different brand name product and each different manufacturer of a lot of commodity products.
 - 2. Where required attachments are specified, attach the documentation to the back of the form.
- C. Each form must be signed by the entity capable of certifying the information.
 - 1. Certification signatures must be made by an officer of the company.
 - 2. For products, certification must be made by the manufacturer not the supplier.
 - 3. For custom fabricated products, certification by the fabricator is acceptable.
- D. Submit the completed forms in accordance with the requirements of Section 013000 - Administrative Requirements, as information submittals.
 - 1. Give each form a unique submittal number.
 - 2. Do not combine LEED forms with product data or shop drawing submittals.

- E. Submit forms applicable to work for which application for payment is being made, either prior to or concurrent with application for payment; payment will not be made until relevant forms have been submitted.
- F. For work covered by multiple applications for payment, the initial submittal of a LEED form is sufficient for subsequent applications unless the nature of the product has changed.

END OF SECTION

SECTION 013516.01

LEED MATERIAL COST SUMMARY FORM

1.01 LEED SUBMITTAL FORM

A. Identification:

1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
2. Architect's Project No.: 1305
3. Architect: Bender & Associates Architects, P.A.
4. Associate Architect: M.C. Harry & Associates, Inc.

B. This form applies to the following LEED Credits:

1. MR Credits 3 - Materials Reuse.
2. MR Credits 4.1 and 4.2 - Recycled Content.
3. MR Credits 5.1 and 5.2 - Regional Materials.

C. Procedure:

1. Because the above listed credits require computations based on the material costs for the project, the Contractor is required to submit the following cost breakdown, in addition to any cost breakdown specified elsewhere.
2. The Material Cost Certification must include all shipping and handling expenses to deliver the material to the project site, and the actual cost of the material including all taxes, but shall exclude any costs for labor, equipment and Contractor's overhead and profit. Revise cost summary whenever materials actually installed change due to contract modifications or Contractor preference.

1.02 CERTIFICATION

1.03 \$ _____ TOTAL COST OF ALL MATERIALS

1.04 \$ _____ TOTAL COST OF PLUMBING, HVAC, ELECTRICAL, AND COMMUNICATIONS

1.05 \$ _____ TOTAL COST OF ARCHITECTURAL EQUIPMENT IN DIVISIONS 11 THROUGH 14

1.06 CERTIFIED BY: (CONTRACTOR)

A. Print Name: _____

B. Signature: _____

C. Title: _____ (officer of company), Date: _____

END OF SECTION

SECTION 013516.03

LEED METAL-CONTAINING PRODUCT LIST

1.01 LEED SUBMITTAL FORM

A. Identification:

1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
2. Architect's Project No.: 1305
3. Architect: Bender & Associates Architects, P.A.
4. Associate Architect: M.C. Harry & Associates, Inc.

B. This form applies to LEED Credits MR 4.1 and 4.2 (recycled content).

1.02 STEEL-CONTAINING PRODUCTS

A. Rationale: Although all steel contains reused steel, steel products often cannot be traced to a certain mill lot and, even when they can, the mill's certificate usually does not indicate the proportion of new to reused steel.

B. Procedure: Determine recycled steel content by estimating the proportion of reused steel based on trade association surveys of mill practices multiplied by the quantity of steel by weight in the product.

1. Referenced Mill Practices Survey: See the current edition of Steel Recycling Institute "Steel Takes LEED with Recycled Content," at http://www.recycle-steel.org/en/~media/Files/SRI/Media%20Center/LEED_Sept2011.ashx.
2. If the mill source cannot be identified, the product will be considered to have the lowest reused steel content reported in referenced mill practices survey.
3. For each steel-containing product provided for this project, submit "LEED New Product Content Form". At minimum, submit for the following products. Initial those for which the material content form is attached.

C. Steel-Containing Product List:

1. ___ Concrete reinforcement (bars, mats, wire, mesh), anchor plates.
2. ___ Structural steel framing members, plates.
3. ___ Steel structural components of pre-engineered products.
4. ___ Miscellaneous steel fabrications made from rolled shapes, including equipment supports.
5. ___ Bar joists and girders.
6. ___ Steel decking.
7. ___ Steel bar grating (raised Chiller platform)
8. ___ Light gauge steel framing, joists and trusses.
9. ___ Steel stairs and components.
10. ___ Stainless Steel Cable Railing system and handrails.
10. ___ Miscellaneous formed steel fabrications.
12. ___ Stainless Steel sheet metal flashing and trim.
13. ___ Steel doors and frames.
14. ___ Steel windows.
15. ___ Overhead Coiling Doors

16. ___ Door Hardware
17. ___ Non-load-bearing steel framing (studs, ceiling framing, shaft wall)
18. ___ Steel lath for plaster, and trim.
19. ___ Suspended ceiling grid.
20. ___ Steel lockers.
21. ___ Stainless Steel Bicycle Racks

1.03 CAST IRON-CONTAINING PRODUCTS

- A. Rationale: Cast iron is considered 100 percent recycled.
- B. For each homogeneous cast iron product, report total cost on "LEED New Product Content Form".
- C. Cast Iron Product List:
 1. Cast iron pipe.
 2. Cast iron castings.

1.04 ALUMINUM-CONTAINING PRODUCTS

- A. For each aluminum product, report total cost on "LEED New Product Content Form".
- B. Aluminum Product List:
 1. Decorative Railing Systems
 2. Stair Nosings
 3. Vertical Ladders
 4. Interior Storefront Frames
 5. Interior Service and Teller Window Units

1.05 COPPER-CONTAINING PRODUCTS

- A. For each copper product, report total cost on "LEED New Product Content Form".
- B. Copper Product List:
 1. Gutters, Downspouts and brackets.
 2. Roofing Drip Edge

1.04 CERTIFICATION

- A. ___ All other steel, cast iron, aluminum or copper-containing products used on this project are shown on the attached list.
- B. ___ I certify that there are no other steel-containing products used on this project that exceed 1 percent of total material cost less material cost attributed to mechanical and electrical.
- C. ___ I certify that there are no other cast iron-containing products used on this project that exceed 1 percent of total material cost less material cost attributed to mechanical and electrical.
- D. CERTIFIED BY: (Contractor)
 1. Print Name: _____
 2. Signature: _____

3. Title: _____ (officer of company),
Date: _____

END OF SECTION

SECTION 013516.04

LEED NEW PRODUCT CONTENT FORM

1.01 LEED SUBMITTAL FORM

A. Identification:

1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
2. Architect's Project No.: 1305
3. Architect: Bender & Associates Architects, P.A.
4. Associate Architect: M.C. Harry & Associates, Inc.

5. Product Name: _____ (brand name, model #, etc.)
6. Manufacturer: _____ www. _____
 - a. Contact: _____ tel: _____
7. Supplier/Sub: _____ www. _____
 - a. Contact: _____ tel: _____
8. Applicable Specification Section Number(s) _____

B. This form applies to LEED Credits MR 4.1 and 4.2 (recycled content) and MR 6 (certified wood).

1.02 PRODUCT CERTIFICATION

A. Steel Content: _____ percent by weight (mass).

1. _____ Steel Mill Source is:

2. _____ Mill letter describing mill process and typical re-used steel content is attached.

B. Other Content: (Percentages by weight (mass) may not add up to more than 100 percent.)

1. Pre-Consumer/Post-Industrial Recycled Content: _____ percent by weight (mass).
2. Post-Consumer Recycled Content: _____ percent by weight (mass).
3. Description of Recycled Content:

4. Definition: Recycled content is defined in accordance with FTC regulations, found in 16 CFR 260.7(e); see www.ftc.gov/bcp/grnrule/guides980427.htm.

C. Total Weight (Mass): _____ per _____ (unit).

D. CERTIFIED BY: (Manufacturer)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company),
Date: _____

1.03 COST CERTIFICATION

A. Total Material Cost of This Product: \$ _____

The Material Cost Certification must include all shipping and handling charges incurred to deliver the material to the project site, and the actual cost of the material including all taxes, but shall exclude any costs for labor, equipment and Contractor's overhead and profit.

B. CERTIFIED BY: (Contractor)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company), Date:

END OF SECTION

SECTION 013516.05

LEED NEW PRODUCT SOURCE FORM

1.01 LEED SUBMITTAL FORM

A. Identification:

1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
2. Architect's Project No.: 1305
3. Architect: Bender & Associates Architects, P.A.
4. Associate Architect: M.C. Harry & Associates, Inc.

5. Product Name: _____ (brand name, model #, etc.)
6. Manufacturer: _____
 www. _____
 a. Contact: _____ tel: _____
7. Supplier/Sub: _____
 www. _____
 a. Contact: _____ tel: _____
8. Applicable Specification Section Number(s) _____

B. This form applies to LEED MR Credits 5.1 and 5.2 for new products only; see separate form for reused products.

1.02 PRODUCT CERTIFICATION

A. The following percentages of this product were processed in the locations indicated. (Indicate N/A in first column if process is not applicable.)

Percent	Harvest, Extraction, Recovery, or Manufacturing Process	City/County, State, Country	Distance From Project
____ %	Raw Material _____:	_____	_____
____ %	Raw Material _____:	_____	_____
____ %	Raw Material _____:	_____	_____
____ %	Manufactured at: (primary)	_____	_____
____ %	Manufactured at: (primary)	_____	_____
____ %	Manufactured at: (secondary)	_____	_____

SECTION 013516.07

LEED PROHIBITED CONTENT INSTALLER CERTIFICATION

1.01 LEED SUBMITTAL FORM

- A. Identification:
1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
 2. Architect's Project No.: 1305
 3. Architect: Bender & Associates Architects, P.A.
 4. Associate Architect: M.C. Harry & Associates, Inc.
- B. This form applies to the following LEED credits:
1. Credit IEQ 4.1; VOC content of field-installed adhesives and sealants.
 2. Credit IEQ 4.4; added-urea-formaldehyde content of composite wood and agrifiber products, defined as particleboard, plywood, medium density fiberboard, wheatboard, strawboard, panel substrates, door cores, and laminating adhesives; applies to manufacturers/suppliers and installers.
- C. Procedure:
1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, each installer of work on this project is required to certify that his/their use of these particular materials complies with the contract documents and to provide documentation showing that the products used do not contain the prohibited content.
 2. Volatile organic compounds (VOCs) are defined by the U.S. EPA and state and local regulations applicable to this project. See Contract Documents for minimum criteria.

1.02 PRODUCT CERTIFICATION

- A. ___ Adhesives: I certify that the installation work of my firm on this project has not required the use of any adhesives.
- B. OR (certify either the above or the below, not both)
- C. ___ Adhesives: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Section 016000 on this project; product data and MSDS sheets for all adhesives used, whether specified or not, are attached.
- D. ___ Joint Sealants: I certify that the installation work of my firm on this project has not required the use of any gunnable or pourable joint sealants.
- E. OR (certify either the above or the below, not both)
- F. ___ Joint Sealants: I certify that my firm has NOT installed any joint sealant with VOC content exceeding that specified in Section 079005 on this project; product data and MSDS sheets for all joint sealants used, whether specified or not, are attached.

- G. ____ Composite Wood and Agrifiber Products: I certify that the work of my firm on this project has not required the use of any composite wood or agrifiber products, as defined above.
- H. OR (certify either the above or the below, not both)
- I. ____ Composite Wood and Agrifiber Products: I certify that the composite wood and agrifiber products, as defined above, furnished or installed by my firm DO NOT contain any ADDED urea-formaldehyde binder; product data and MSDS sheets for products used, whether specified or not, are attached.
- J. CERTIFIED BY: (Installer/Manufacturer/Supplier Firm)
1. Firm Name: _____
 2. Print Name: _____
 3. Signature: _____
 4. Title: _____ (officer of company), Date: _____

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Tolerances.
- C. Testing and inspection services.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions.
- B. Section 013000 - Administrative Requirements: Submittal procedures.
- C. Section 014219 - Reference Standards.
- D. Section 312300 - Excavation and Fill: Testing requirements for soil materials, backfilling, and compaction.

1.03 SUBMITTALS

- A. General:
 - 1. For submittal procedures and additional requirements, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12), Section 007300 - Supplementary Conditions, and Section 013000 - Administrative Requirements.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect/Engineer and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Architect/Engineer, provide interpretation of results.
 - 2. Test reports are submitted for Architect/Engineer's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.04 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.
 - 1. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 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/Engineer 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.

3.02 MOCK-UPS

- A. Tests will 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/Engineer and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 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/Engineer before proceeding.

- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Architect/Engineer 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/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
5. Perform additional tests and inspections required by Architect/Engineer.
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 which require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work.
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/Engineer and laboratory 48 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-conformance to specified requirements shall be performed by the same agency on instructions by Architect/Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.

- E. For additional requirements, refer to Section 007200 - General Conditions and Section 007300 - Supplementary Conditions.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect/Engineer, it is not practical to remove and replace the Work, Architect/Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 014100
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Regulatory requirements applicable to this project include but are not limited to the following:
1. Zoning Code: Key West, Florida, Code of Ordinances; current edition
 2. Building Code: The governing building code for this project is the 2010 edition of the Florida Building Code (FBC), which includes the following referenced codes:
 - a. FBC-B -- Florida Building Code, Building; 2010 edition (including 2012 Supplement).
 - b. FBC-EB -- Florida Building Code, Existing Building; 2010 edition.
 - c. FBC-A -- Florida Building Code, Accessibility; 2012 edition.
 - d. FBC-EC -- Florida Building Code, Energy Conservation; 2010 edition, with 2013 Supplement.
 - e. FBC-M -- Florida Building Code, Mechanical; 2010 edition.
 - f. FBC-P -- Florida Building Code, Plumbing; 2010 edition, with 2012 Supplement.
 - g. FBC-FG -- Florida Building Code, Fuel Gas; 2010 edition.
 - h. FBC-TP -- Florida Building Code, Test Protocols for HVHZ; 2010 edition.
 3. Fire Prevention Code: FBC-B CHAPTER 36 and the 2010 edition of the Florida Fire Prevention Code (FFPC), which includes the following codes by reference:
 - a. National Fire Protection Association (NFPA):
 - (1) NFPA 1(FL) -- Fire Code; 2009 edition, w/ State of Florida revisions; adopted per FFPC.
 - (2) NFPA 101(FL) -- Life Safety Code; 2009 edition, w/ State of Florida revisions; adopted per FFPC.
 - (3) NFPA 241 -- Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2004 edition; adopted per FAC Rule 69A-60.005.
 4. Electrical Code: FBC-B CHAPTER 27, which includes the following codes by reference:
 - a. National Fire Protection Association (NFPA):
 - (1) NFPA 70 -- National Electric Code; 2008.
 5. Elevator Code: FBC-B CHAPTER 30, which includes the following codes by reference:
 - a. American Society of Mechanical Engineers (ASME):
 - (1) ASME A17.1 -- Safety Code for Elevators and Escalators; 2007.
 - (2) ASME A17.3 -- Safety Code for Existing Elevators and Escalators; 1996.
 6. Florida Administrative Code (FAC):
 - a. FAC 61C-5 -- Rule 61C, Bureau of Elevator Safety Regulations.
 - b. FAC 62-4 -- Department of Environmental Protection, Permits.
 - c. FAC 64E -- Rule 64E, Sewage Disposal.
 - d. FAC 69A-60 -- Florida Fire Prevention Code.
 - (1) FAC Rule 69A-60.005 -- Publications Referenced in NFPA 1, the Florida

2009 Edition, and NFPA 101, the Florida 2009 Edition, Added to the Florida Fire Prevention Code.

7. Florida Department of Environmental Protection (FDEP).
 - a. FDEP (SESCIM) -- FDEP Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements.

1.03 QUALITY ASSURANCE

- A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract, provide the direct supervision of a qualified Professional Engineer experienced in design of this type of work and licensed in the State of Florida.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014219
REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions: Reference standards.
- B. Section 014100 - Regulatory Requirements: Regulatory requirements and codes.

1.03 QUALITY ASSURANCE

- A. Citation of Standards: Each citation listed in the specifications includes:
 - 1. Name of promulgating technical society, organization or agency of the standard.
 - 2. Standard identification, as used in the various sections of these specifications.
 - 3. Title of the standard.
- B. Edition Date of Standards: Reference to the standards of any technical society, organization or body shall be construed to mean the latest standard adopted and published (including all revisions, amendments, supplements, and updates) at the date the Solicitation for Bids was issued, except as follows:
 - 1. When a standard listed in the specifications is also listed in an applicable code, the effective date of that standard as listed in the applicable code shall apply.
 - 2. When the citation for a standard listed in the specifications includes a specific edition date, the effective date of such standard as listed in the citation shall apply.
- C. Where differences occur between provisions of these specifications and referenced codes and standards, the provisions the most stringent requirement shall apply.
 - 1. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- D. The codes and standards referenced in the specifications shall be considered part of the contract requirements to the prescribed extent of each such reference.
 - 1. Such reference is hereby made a part of the Contract Documents, the same as if herein repeated in full.
- E. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- F. When required by the Contract Documents, Contractor shall obtain copies of designated reference standard document(s) and maintain at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- G. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or

inference otherwise in any reference document.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary controls.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 015300 - Temporary Barriers and Enclosures.
- B. Section 015400 - Construction Aids.
- C. Section 015715 - Temporary Erosion and Sediment Control: Prevention of erosion and sedimentation due to construction and demolition activities.
- D. Section 017419 - Construction Waste Management.

1.03 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes, except as follows:
 - 1. City of Key West will pay for electrical power and water services.
- B. Existing facilities may be used.
- C. New permanent facilities may not be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; DSL modem or faster.
 - 4. Email: Account/address reserved for project use.

5. Facsimile Service: Fax-to-email software on personal computer.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain daily in clean and sanitary condition.

1.06 TEMPORARY BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- E. For additional requirements, refer to Section 015300 - Temporary Barriers and Enclosures.

1.07 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.
 - 1. Existing fence and gates may be reused, subject to approval by Owner. Where existing fence and gates are reused, Contractor shall be responsible for maintenance and repairs, and for alterations required for site access and security during work of this project.
 - 2. Coordinate with silt fence requirements indicated on the Storm Water Pollution Prevention Plan Site Map in contract drawings.
- C. For additional requirements, refer to Section 015300 - Temporary Barriers and Enclosures and Section 015713 - Temporary Erosion and Sediment Control.

1.08 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.

- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

- A. See Section 017419 - Construction Waste Management, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

1.12 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm).
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015300
TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary construction barriers, enclosures and passageways.
 - 1. Dust and debris barriers.
 - 2. Security barriers.
 - 3. Temporary chain link fencing.
 - 4. Covered passageways.
- B. Protection of completed Work.
- C. Removal of construction facilities and temporary controls.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions.
- B. Section 007300 - Supplementary Conditions.
- C. Section 011000 - Summary: Contractor's use of site and premises.
- D. Section 015000 - Temporary Facilities and Controls: Temporary utilities, temporary support facilities, and protection of existing facilities and occupants.
- E. Section 015400 - Construction Aids: Temporary lifts, hoists, stairs, scaffolding.
- F. Section 015713 - Temporary Erosion and Sediment Control: Prevention of erosion and sedimentation due to construction and demolition activities.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A392 -- Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 - 2. ASTM C94 -- Standard Specification for Ready-Mixed Concrete.
 - 3. ASTM D5034 -- Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
 - 4. ASTM F567 -- Standard Practice for Installation of Chain-Link Fence.
 - 5. ASTM F1083 -- Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-EB -- Florida Building Code, Existing Building.

1.04 DESIGN & PERFORMANCE REQUIREMENTS

- A. General:
 - 1. Contractor shall be responsible for detailed design, engineering, fabrication, supply and erection of temporary construction barriers, enclosures and passageways, and all related products and work necessary to provide complete systems for protection of persons and property, Contractor's access to Work, provision of site amenities, and
 - 2. Contractor shall be responsible for removal of temporary construction barriers, enclosures and passageways when no longer required, except as follows:
 - a. The chain link fence enclosure, gates and associated silt fence materials installed at site perimeter shall be left in place in its entirety.
- B. Design Requirements:
 - 1. Design and engineering of all temporary construction barriers, enclosures and passageways shall conform to all applicable codes and regulatory requirements, including but not limited to FBC-B SECTIONS 108 and 3103, and FBC-B CHAPTER 33.
 - 2. Prepare structural design drawings defining the complete systems, precise interface geometry determination, reaction loads imposed on existing structure, connection details, interfaces and layouts.
 - 3. Generally, temporary construction barriers, enclosures and passageways shall be designed to be self-supporting between the support construction.
 - 4. Where chain link fencing is to be used for support of silt fence fabric (e.g., perimeter chain link fence enclosure), refer to SWPPP in drawings and Section 015713 - Temporary Erosion and Sediment Control for additional requirements.
- C. Performance Requirements: Temporary construction barriers, enclosures and passageways shall be sufficient to withstand loads in accordance with requirements of the governing building code.
- D. Construction Documents for Temporary Structures: Contractor shall be responsible for preparing and submitting a permit application and construction documents for each installation of a temporary structure.
 - 1. The construction documents shall include a site plan indicating the location of the temporary structures and information delineating the means of egress and the occupant load.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures and additional requirements, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12), Section 007300 - Supplementary Conditions, and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Construction Site Plan: Refer to Section 015000 - Temporary Facilities and Controls.
- D. Shop Drawings:
 - 1. General:

- a. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - b. Shop drawings required herein shall include work specified in Related Requirements.
2. Temporary Protection Systems for Existing Work to Remain: Indicate materials and construction details, system dimensions, tolerances, affected related Work, weather protection details, expansion control details, and anchorage and attachment details.
 3. Temporary Exterior Construction Barriers, Enclosures and Passageways: Indicate materials and construction details, system dimensions, framed opening requirements and tolerances, affected related Work, weather protection details, expansion control details, and anchorage and attachment details.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Contractor shall comply with applicable requirements of federal, state and local rules and regulations.
 1. Contractor shall be solely responsible for jobsite safety.
- B. Temporary Construction Barriers, Enclosures and Passageways: As required by governing authorities having jurisdiction, provide substantial barriers, enclosures and passageways in and around Work areas and adjacent to embankments and excavations for protection of workers and the public.
- C. Field Measurements: Where work of this Section is indicated to fit other construction including but not limited to existing work, verify field dimensions by field measurements. Take field measurements prior to preparation of shop drawings and fabrication, and indicate measurements on shop drawings.
- D. Designer Qualifications: Design temporary construction barriers, enclosures and passageways under direct supervision of a professional structural engineer experienced in design of work of the type specified in this Section and licensed in the State of Florida.

1.07 PROTECTION OF EXISTING CONDITIONS

- A. Protection of Adjacent Facilities: Contractor shall restrict Work to limits indicated on the Drawings and as specified in Section 011000 - Summary. Protect existing, adjacent facilities from damage, including soiling and debris accumulation.
- B. Protection of Existing Building, Finishes, Furniture, Fixtures and Equipment: As applicable, provide temporary enclosures, barriers and covers to protect existing building, finishes, furniture, fixtures and equipment remaining in Project area during construction.

1.08 MAINTENANCE OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- A. Maintenance: Use all means necessary to maintain temporary barriers and enclosures in proper and safe condition throughout progress of the Work.
- B. Replacement: In the event of loss or damage, promptly restore temporary barriers and

enclosures by repair or replacement at no change in the Contract Sum or Contract Time.

1.09 TEMPORARY BARRIERS, ENCLOSURES AND PASSAGEWAYS

- A. General: Provide temporary fencing, barriers and guardrails as necessary to provide for public safety, to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
1. Refer to temporary construction plan in the Drawings. Comply with requirements indicated.
 2. Note requirements for continued occupancy and use of existing buildings and site areas during construction.
 3. Comply with applicable requirements of governing building code and authorities having jurisdiction, including industrial safety regulations. Review requirements with Owner's Representative.
 4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting.
 5. Paint temporary barriers and enclosures with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
 6. Where appropriate and necessary, provide warning lighting, including flashing red or amber lights.
- B. Temporary Chain-Link Fencing: Provide temporary chain-link fencing where indicated or as needed by the Contractor to provide for public safety, to prevent unauthorized entry to outdoor construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
1. General.
 - a. As a minimum, provide temporary fencing around site perimeter and other outdoor areas as indicated on drawings
 - b. Do not attach temporary fencing to the building or permanent site improvement.
 - c. Fence Height: 6-feet, except as otherwise approved by Owner's Representative.
 - d. Erection Tolerances:
 - (1) Maximum Variation from Plumb: 1/4 inch (6 mm).
 - (2) Maximum Offset from True Position: 1 inch (25 mm).
 2. Installation:
 - a. Install framework, chain link fabric, accessories and gates in accordance with most stringent requirements of ASTM F567 and FBC-B SECTION 2224.
 - b. Set line, gate and terminal posts plumb, in concrete footings with top of footing 2 inches above finish grade.
 - (1) Footing diameter and depth below finish grade shall comply with most stringent requirements of ASTM F567 and FBC-B SECTION 2224.
 - (2) Slope top of concrete for water runoff.
 - c. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.
 - d. Provide top rail through line post tops and splice with minimum 6 inch (150 mm) long rail sleeves.
 - e. Install center and bottom brace rail on corner gate leaves.

- f. Place chain link fabric on outside of posts and rails, and place wind screen fabric on outside of fence assembly.
 - (1) Stretch chain link fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.
 - (2) Position bottom of chain link fabric 2 inches (50 mm) above finished grade, except where SWPPP requires bottom to be closer to grade.
 - (3) Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
 - (4) Fasten chain link fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum spacings specified in FBC-B SECTION 2224.
 - g. Install bottom tension wire stretched taut between terminal posts.
 - h. Install gate with fabric to match fence. Install hardware.
 - i. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
 - j. Secure windscreen fabric to fence at all grommets, in accordance with manufacturer's installation instructions.
3. Chain link fencing is to be used for support of silt fence fabric at site perimeter.
- a. Existing fence and gates may be reused, subject to approval by Owner. Where existing fence and gates are reused, Contractor shall be responsible for maintenance and repairs and for alterations required for site access and security during work of this project.
 - b. For additional requirements, refer to Storm Water Pollution Prevention Plan (SWPPP) Site Map in contract drawings and Section 015713 - Temporary Erosion and Sediment Control.
- C. Temporary Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- D. Temporary Covered Passageways: Erect self-supporting, protective, covered walkways for passage of persons along adjacent passageways.
- 1. Coordinate installation details with Owner's requirements for continuing operations in adjoining facilities.
 - 2. Review design and details with Owner's Representative.
 - 3. Comply with applicable regulations of authorities having jurisdiction.
 - 4. Construct covered walkways using scaffold or shoring framing.
 - 5. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - 6. Extend back wall beyond the structure to complete enclosure fence.
 - 7. Paint and maintain in a manner as directed by Owner's Representative.
- E. Temporary Closures: Provide temporary closures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- F. Temporary Landscape Barriers: Provide barriers around trees and plants designated to remain.

1. Locate barriers as directed outside of drip lines of trees and plants.
 2. Protect entire area under trees against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.
 3. Contractor shall pay all costs to restore trees and plants within barriers that are damaged by construction activities. Restoration shall include replacement with plant materials of equal quality and size. Costs shall include all fines, if any, levied by authorities having jurisdiction.
- G. Temporary Barricades: Comply with standards and code requirements for erection of structurally adequate barricades.
1. Paint barricades with appropriate colors, graphics and warning signs to inform personnel and the public when protecting them against a hazard.
 2. Where appropriate, provide lighting, including flashing red or amber lights.
- H. Temporary Guard rails: Provide guardrails along tops of embankments and excavations. Along public walkways and areas accessible by the public, adjoining excavations, provide guardrails in addition to fencing.
1. Guardrails shall be substantially and durably constructed of lumber, firmly anchored by posts embedded in concrete, and complying with Code requirements for temporary barriers.
- I. Temporary Security Closures and Lockup: Provide substantial temporary closures of openings in exterior surfaces and interior areas as appropriate to prevent unauthorized entrance, vandalism, theft and similar violations of security. Provide doors with self-closing hardware and locks.
1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- J. Temporary Access, Passage and Exit Ways: Construct temporary stairs, ramps, and covered walkways, with related doors, gates, closures, guardrails, handrails, lighting and protective devices, to maintain access and exit ways to existing facilities to remain operational.
2. Design and location of temporary construction shall be by Contractor, subject to review by Owner's Representative and authorities having jurisdiction.
 3. Provide temporary lighting, illuminated interior exit signage, non-illuminated directional and instructional signage, and temporary security alarms for temporary exits and exit passageways.
 4. Temporary measures shall suit and connect to existing building systems, and shall be approved by Owner's Representative and authorities having jurisdiction.

1.10 PROTECTION OF INSTALLED WORK

- A. Protection of Installed Work, General: Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- B. Protective Coverings: Provide protective coverings at walls, projections, jambs, sills, and soffits of openings as necessary to prevent damage from construction activities, such as

coatings applications, and as necessary to prevent other than normal atmospheric soiling.

C. Traffic Protection:

1. Protect surfaces of existing construction designated to remain, from traffic, soiling, wear and marring.
2. Prohibit traffic and storage on landscaped areas.
3. Protect newly fine graded, seeded and planted areas with barriers and flags to designate such areas as closed to pedestrian and vehicular traffic.

1.11 REMOVAL OF TEMPORARY CONSTRUCTION BARRIERS, ENCLOSURES AND PASSAGEWAYS

- A. Removal of Temporary Barriers and Enclosures: Remove temporary materials, equipment, services, and construction prior to Contract Completion review.
- B. Cleaning and Repairs: Clean and repair damage, soiling and marring caused by installation or use of temporary barriers and enclosures.

PART 2 - PRODUCTS

2.01 CHAIN LINK FENCE MATERIALS

- A. Frame Components: ASTM F1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 50 ksi for sizes NPS 5 and larger (344 MPa for sizes NPS 125 and larger).
 1. Posts: Comply with requirements of FBC-B SECTION 2224.
 2. Top and Brace Rails: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.
 3. Gate Frames: 1.66 inch (42 mm) diameter for welded fabrication.
- B. Wire Fabric: ASTM A392 zinc coated steel chain link fabric; 2 inch (51 mm) diamond mesh interwoven wire, 12-1/2 gage thick; top selvage knuckle end closed, bottom selvage twisted tight.
- C. Windscreen Fabric (for screening of construction activities from view): Closed mesh weave of 30 warp by 16 fills per square inch.
 1. Fiber: 5.6 ounce per square yard polypropylene fiber.
 2. Shade Factor: 78 percent.
 3. Color: Green or blue, as selected by Architect.
 4. Performance Requirements:
 - a. Tensile Strength: 360 pounds for warp and 190 pounds for fill, when tested according to ASTM D5034.
 - b. Tear Strength: 110 pounds for warp and 70 pounds for fill.
 5. Fabrication:
 - a. Reinforce hems and seams with 2-3/4 inch black polypropylene folded binding tape, with tensile strength of 300 pounds.
 - b. Provide center reinforcing tape in addition to reinforced perimeter hems and panel seams.
 - c. Sew hems and seams with UV light resistant polyester thread.
 - d. Provide 9/32-inch brass grommets spaced at 12-inches on center in perimeter hems and center reinforcing tape.

- D. Silt Fence Fabric (for erosion and sediment control): For product specifications, refer to Storm Water Pollution Prevention Plan (SWPPP) Site Map in contract drawings and Section 015713 - Temporary Erosion and Sediment Control.
- E. Tension Bands: Comply with requirements of FBC-B SECTION 2224.
- F. Tension Wire: Steel, single strand.
- G. Fabric Ties: Same gage as fabric.
- H. Post Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- I. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
- J. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1525 mm) high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.
- K. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1525 mm) high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.
- L. Concrete for Chain Link Fence Post Footings: Ready-mixed, complying with ASTM C94; normal Portland cement; 2,500 psi (17 MPa) strength at 28 days, 3 inch (75 mm) slump.
 - 1. Footings (Foundations): Comply with requirements of governing building code, including but not limited to FBC-B SECTION 2224.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015400
CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction aids, including:
 - 1. Temporary lifts and hoists.
 - 2. Debris chutes.
 - 3. Temporary stairs and ramps.
 - 4. Scaffolding and work platforms.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Temporary utilities, temporary support facilities, and protection of existing facilities and occupants.
- C. Section 015300 - Temporary Barriers and Enclosures: Temporary construction barriers, enclosures and passageways.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American National Standards Institute (ANSI).
- C. American Society of Safety Engineers (ASSE):
 - 1. ASSE A10.8 -- Scaffolding Safety Requirements (ANSI/ASSE A10.8).
- D. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910 -- Labor - Occupational Health and Safety Standards.
 - a. 29 CFR 1910 Subpart D -- Walking Working Surfaces.
 - 1) 29 CFR 1910.28 -- Safety Requirements for Scaffolding.
 - 2. 29 CFR 1926 -- Labor - Safety and Health Regulations for Construction
 - a. 29 CFR 1926 Subpart L -- Scaffolds.
 - 1) 29 CFR 1926.451 -- General Requirements.

1.04 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Contractor shall comply with applicable requirements of federal, state and local rules and regulations.
 - 1. Contractor shall be solely responsible for jobsite safety.

1.06 TEMPORARY LIFTS AND HOISTS

- A. Temporary Lifts and Hoists: Contractor shall provide facilities for hoisting materials and personnel.
- B. For additional requirements, refer to Section 015000 - Temporary Facilities and Controls.

1.07 DEBRIS CHUTES

- B. Debris Chutes: Contractor shall provide chutes as necessary for debris removal.
 - 1. Construct debris chutes of substantial materials. Use cylindrical, laminated fiber forms (e.g., Sonotube, or equal) to minimize noise of debris removal.
 - 2. Provide controls at debris chutes to minimize spread of dust and debris.
 - 3. Limit use of debris chutes to times to minimize disruption of activities in adjacent spaces.

1.08 TEMPORARY STAIRS, RAMPS AND SCAFFOLDING

- A. Temporary Stairs and Ramps: Contractor shall provide temporary stairs and/or ramps where necessary for moving materials, equipment and workers to the work area within the building.
 - 1. Contractor shall cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of Contract Completion review.
- B. Scaffolding and Work Platforms: Contractor shall provide scaffolding as necessary for access and proper performance of the Work, and for protection of existing building features where appropriate.
 - 1. Design, engineering, installation, and supervision of scaffolding and platforms shall be solely Contractor's responsibility.
 - 2. Design, construction and use of scaffolding and platforms shall conform to all applicable federal, state and local regulatory requirements, including but not limited to 29 CFR 1910.28, 29 CFR 1926.451, and ANSI/ASSE A10.8.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 MAINTENANCE OF CONSTRUCTION AIDS

- A. Maintenance: Contractor shall use all means necessary to maintain construction aids in proper and safe condition throughout progress of the Work.
- B. Replacement: In the event of loss or damage, Contractor shall promptly restore construction aids by repair or replacement at no change in the Contract Sum or Contract Time.

3.02 REMOVAL OF CONSTRUCTION AIDS

- A. Removal of Construction Aids: Unless otherwise mutually agreed by Owner's Representative and Contractor, Contractor shall remove construction aids prior to Contract Completion review.

- B. Cleaning and Repairs: Contractor shall clean and repair damage caused by installation or use of construction aids.

END OF SECTION

SECTION 015713

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction and demolition activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation (to the Owner) for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls: Temporary facilities and controls required for compliance with regulatory requirements, including but not limited to:
 - 1. Pedestrian protection.
 - 2. Preventing the accumulation of water or damage to any foundations on the premises
 - 3. Disconnecting and capping utilities.
 - 4. Chain link fencing around site perimeter.
- B. Section 015300 - Temporary Barriers and Enclosures: Temporary construction barriers, enclosures and passageways; chain link fence.
- C. Section 015400 - Construction Aids: Temporary lifts and hoists; debris chutes; temporary stairs and ramps; and scaffolding and work platforms.
- D. Section 015713 - Temporary Erosion and Sediment Control:
 - 1. Prevention of erosion due to construction and demolition activities.
 - 2. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
 - 3. Restoration of areas eroded due to insufficient preventive measures.
- E. Section 017419 - Construction Waste Management: Limitations on disposal of removed materials; requirements for recycling.
- F. Section 024100 - Demolition: Selective demolition of built site elements and building elements for alterations purposes.

1.03 REFERENCE STANDARDS

- A. See Section 014219 - Reference Standards for additional information.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D3786 -- Standard Test Method for Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method.
 - 2. ASTM D4355 -- Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

3. ASTM D4491 -- Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 4. ASTM D4533 -- Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 5. ASTM D4632 -- Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 6. ASTM D4751 -- Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 7. ASTM D4873 -- Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- C. Florida Department of Agriculture and Consumer Services (FDACS).
- D. Florida Department of Environmental Protection (FDEP).
1. FDEP (SESCIM) -- FDEP Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual.
- E. Florida Department of Transportation (FDOT):
1. FDOT Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System.
 - a. FDOT Index No. 102 -- Temporary Erosion and Sediment Control.
 2. FDOT Standard Specifications for Road and Bridge Construction
 - a. FDOT Section 104 -- Prevention, Control, and Abatement of Erosion and Water Pollution.
 - b. FDOT Section 570 -- Performance Turf.
 - c. FDOT Section 901 -- Coarse Aggregate.
 - d. FDOT Section 981 -- Turf Materials.
 - e. FDOT Section 985 -- Geotextile Fabrics.
 - f. FDOT Section 987 -- Prepared Soil Layer Materials.
- F. U.S. Environmental Protection Agency (EPA):
1. EPA (NPDES) -- National Pollutant Discharge Elimination System.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with the following:
1. EPA (NPDES) Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
 2. FDEP (SESCIM): Florida's storm water regulatory program requires the use of Best Management Practices (BMPs) during and after construction to minimize erosion and sedimentation and to properly manage runoff for both storm water quantity and quality.
 - a. For statutory and regulatory requirements, refer to FDEP (SESCIM) Chapter 3.
 - b. For information on Best Management Practices (BMPs) for erosion and sedimentation control, dewatering operations, stormwater management, and vegetation for erosion control, refer to FDEP (SESCIM) Chapters 4 through 7.
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

- C. Do not begin clearing, grading, dewatering, or other work involving disturbance of ground surface cover or excavation until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- F. Erosion:
 - 1. On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - a. Control movement of sediment and soil from temporary stockpiles of soil.
 - b. Prevent development of ruts due to equipment and vehicular traffic.
 - c. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to the Owner.
 - 2. Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - a. Prevent windblown soil from leaving the project site.
 - b. Prevent tracking of mud onto public roads outside site.
 - c. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - d. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to the Owner.
- G. Sedimentation of Waterways:
 - 1. On Site: Prevent sedimentation of waterways on or off the project site, including open drainage ways, storm sewers, and sanitary sewers.
 - a. If sedimentation occurs, install or correct preventive measures immediately at no cost to the Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - b. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
 - 2. Off Site: Prevent sedimentation of waterways off the project site, including open drainage ways, storm sewers, and sanitary sewers.
 - a. If sedimentation occurs, install or correct preventive measures immediately at no cost to the Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- H. Open Water: Prevent standing water that could become stagnant.

- I. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- J. Dewatering Permit:
 - 1. Obtain permit, or permits, for erosion and sedimentation control for earthwork and dewatering.
 - a. Make application and arrangements and pay fees and charges for permit, or permits.
 - 2. Obtain permit, or permits, for erosion and sedimentation control prior to:
 - a. starting earthwork.
 - b. installing dewatering system, or systems.
 - 3. Comply with requirements of permits for erosion and sedimentation control.
- K. Stormwater Pollution Prevention Plan (SWPPP):
 - 1. Prepare "Notice of Intent to Use Generic Permit for Stormwater Discharge from Construction Activities that Disturb Five or More Acres of Land".
 - a. Submit application and pay fee for review and approval of Notice.
 - 2. Obtain response to Notice prior to starting construction.
 - 3. Comply with requirements of SWPPP and Generic Permit for Stormwater Discharge from Construction Activities that Disturb Five or More Acres, including modifications, addenda, and additions by Federal, State, and County regulatory authorities having jurisdiction.

1.05 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Erosion and Sedimentation Control Plan:
 - 1. Submit at least 10 days prior to effective date of Notice to Proceed.
 - 2. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 - 3. Obtain the approval of the Plan by authorities having jurisdiction and the Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- E. LEED Submittals:
 - 1. General:
 - a. Collect and submit data and documentation as required for completing the applicable LEED Credit Submittal Form(s).
 - 2. Project Data for SS Prerequisite 1: Provide the following:
 - a. Copies of the project drawings to document the erosion and sedimentation control measures implemented on the site.
 - b. Confirmation regarding the compliance path taken by the project (i.e., EPA (NPDES) Compliance or Local Erosion Control Standards).
 - c. Provide date-stamped photos showing the measures taken, including any corrective action, to effectively implement the ESC plan. Include at least 3 photos from at least 6 inspections equally spaced over the site work period. Inspections must occur monthly, at a minimum.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Mulch Materials: Conform to requirements of the Erosion Control Plan, and FDOT Sections 104 and 981:
 - 1. The mulch material shall be one of the following:
 - a. Compost meeting the requirements of FDOT Section 987, hardwood barks, shavings or chips.
 - b. Inorganic mulch materials as approved by the Architect.
 - c. Hydraulically applied wood fiber mulch or bonded fiber matrix (BFM).
 - 2. Source Requirements for Mulch: Contractor shall comply with all current restrictions in regard to movement of mulch material, as required by the FDACS Division of Plant Industry.
- B. Grassing/Sod Materials: Conform to requirements of the Erosion Control Plan, FDOT Sections 104, 570 and 981, and as follows:
 - 1. Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
 - 2. Source Requirements for Sod: Contractor shall comply with all current restrictions in regard to movement of sod material, as required by the FDACS Division of Plant Industry.
- C. Straw Bale Materials:
 - 1. Bales: Conform to requirements of the Erosion Control Plan, FDOT Section 104, and as follows:
 - a. Air dry, rectangular straw bales.
 - b. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
 - c. Bindings: Wire or string, around long dimension.
 - 2. Bale Stakes: Conform to requirements of the Erosion Control Plan, FDOT Section 104, and as follows:

- a. One of the following, minimum 3 feet (1 m) long:
 - (1) Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
 - (2) Wood, 2 by 2 inches (50 by 50 mm) in cross-section.
- D. Silt Fence Materials:
- 1. Silt Fence Fabric: Conform to requirements of the Erosion Control Plan, FDOT Sections 104 and 985, and as follows:
 - a. Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - (1) Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
 - (2) Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 - (3) Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
 - (4) Tensile Strength: 100 lb-f (450 N), minimum, in cross-machine direction; 124 lb-f (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632.
 - (5) Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
 - (6) Tear Strength: 55 lb-f (245 N), minimum, when tested in accordance with ASTM D4533.
 - (7) Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 - 2. Silt Fence Posts: Conform to requirements of the Erosion Control Plan, FDOT Section 104, and as follows:
 - 1. One of the following, minimum 5 feet (1500 mm) long:
 - (1) Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
 - (2) Softwood, 4 x 4 inches (100 by 100 mm) in cross section.
 - 3. Where indicated on drawings, chain link fencing may be used for support of silt fence fabric at site perimeter. For additional requirements, refer to Storm Water Pollution Prevention Plan (SWPPP) Site Map in contract drawings and Section 015713 - Temporary Erosion and Sediment Control.
 - a. Existing chain link fence and gates may be reused, subject to approval by Owner. Where existing fence and gates are reused, Contractor shall be responsible for maintenance and repairs and for alterations required for site access and security during work of this project. For additional requirements, refer to Section 015300 - Temporary Barriers and Enclosures.
- E. Aggregate Materials: Conform to requirements of the Erosion Control Plan, and as follows:
- 1. Coarse Aggregate:
 - a. FDOT No. 1 Coarse Aggregate, 1-1/2 to 3-1/2 inch washed stone, conforming to FDOT Sections 102 and 901.

- b. FDOT No. 67 Coarse Aggregate, 3/4 inch to No. 4 (3/4 to 1-1/2 inch) washed stone, conforming to FDOT Sections 102 and 901.
- G. Sand Bags: Conform to requirements of the Erosion Control Plan and regulatory requirements for use as temporary stormwater and erosion control barrier.
 - 1. Sandbag Material: Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 oz./sq.yd, Mullen burst strength exceeding 300 lbs./sq.in. in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70-percent in conformance with the requirements in ASTM D4355.
 - a. Use of burlap is not acceptable.
 - 2. Sandbag Size: Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs.
 - a. Bag dimensions are nominal, and may vary based on locally available materials.
 - 3. Fill Material: All sandbag fill material should be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Erosion Control Plan:
 - 1. Excavation method shall be selected by the Contractor, unless otherwise shown on the Drawings or required by local regulations.
 - 2. Contractor shall be responsible for erosion and sedimentation control.
 - 3. Prepare and submit an Erosion Control Plan based upon the proposed excavation method.
 - 4. Erosion Control Plan shall be reviewed and accepted by the A/E prior to commencement of any land disrupting activities. Erosion Control Plan shall be reviewed and accepted by State, local, or State and local authorities having jurisdiction over erosion and sedimentation control prior commencement of any land disrupting activities.
 - 5. Submit erosion and sedimentation control plan approved by State, local, or State and local authorities.
- B. Sedimentation and Erosion Control (SEC) Devices:
 - 1. The type of SEC devices to be employed on the project will depend on location and adjoining features of the land at that location.
 - 2. Construct SEC devices in accordance with approved Erosion Control Plan.
- E. Siltation and Bank Erosion: Take adequate precautions to minimize siltation and bank erosion in crossing canals or ditches, in discharging well point systems, or during other construction activities.

3.02 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.03 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.04 SCOPE OF PREVENTIVE MEASURES

A. General:

- 1. Conform to requirements of Erosion Control Plan.
- 2. Temporary preventive measures are not required if permanent erosion resistant measures have been installed, unless otherwise indicated.

B. Temporary Stabilized Construction Site Exits: To prevent tracking of mud onto right-of-way, provide a stabilized pad located at points where vehicles enter and leave a construction site.

- 1. Dimensions: As indicated on drawings, and as required to comply with FDEP (SESCIM).
- 2. Aggregate Layer: Traffic bearing layer conforming to FDOT Section 102, and as follows:
 - a. Material: Coarse Aggregate.
 - b. Layer Thickness: 6 inches, min.
- 3. Wheel Washing Areas: At each stabilized construction site exit, provide wheel washing area and water hose with spigot (min. 100-ft long).
 - a. Wash water must be carried away from the entrance to a settling area to remove sediment.
- 4. Signage: Provide and maintain signage at each exit requiring all vehicles leaving the site to wash their wheels, wheel wells and undercarriages to prevent tracking of mud onto right-of-way.
- 4. Location(s): Provide a Stabilized Construction Site Exit at each construction exit leading to public right-of-way.

C. Temporary Linear Sediment Barriers:

- 1. Provide linear sediment barriers where indicated on Erosion Control Plan, and as follows:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet (60 m) apart.
 - c. Across the entrances to culverts that receive runoff from disturbed areas.
- 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope less than 2 Percent: 100 feet (30 m).
 - b. Slope between 2 and 5 Percent: 75 feet (23 m).
 - c. Slope between 5 and 10 Percent: 50 feet (15 m).
 - d. Slope between 10 and 20 Percent: 25 feet (7.5 m).
 - e. Slope greater than 20 Percent: 15 feet (4.5 m).
- 3. Sediment Fence Construction:
 - a. Locate sediment fence down-slope from source of sediment.
 - b. Extend sediment fence around source of sediment so that all run-off from source of sediment flows through sediment fence.
 - c. Set posts down-slope of fabric.

- d. Bury toe of fence approximately eight inches deep.
 - e. When joints are necessary, securely fasten fabric at support post with overlap to next post.
- D. Temporary Sediment Trap Construction:
- 1. Clear, grub and strip area under embankment of vegetation and root mat.
 - 2. Clear retention area to elevation as approved by A/E.
 - 3. Use fill material free of roots, woody vegetation and organic matter.
 - a. Place fill in lifts not to exceed nine inches. Machine compact fill.
 - 4. Construct dam and stone spillway to dimensions, slopes and elevations shown on approved permit, or approved permit drawings.
 - 5. Construct spillway crest level (± 0.05 feet) and at least 18 inches below top of dam at all points.
 - 6. Extend stone outlet section to vegetated road ditch on zero grade with top elevation of stone level with bottom of drain.
 - 7. Construct top of dam six inches above natural surrounding ground, minimum.
 - 8. Stabilize embankment and disturbed area above sediment pools as shown in vegetation plan.
- E. Temporary Storm Drain Curb Inlet Sediment Trap: Protect each storm drain curb inlet using method indicated on Erosion Control Plan; if not indicated, use one of the following measures:
- 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Temporary Soil Stockpiles: Protect using one of the following measures:
- 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.
- H. Temporary Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- I. Temporary Grassing: Use where temporary vegetated cover is required.

3.05 INSTALLATION

- A. Traffic-Bearing Aggregate Surface: Provide traffic-bearing surface as indicated on civil engineering drawings.
- B. Silt Fences: Install in accordance with Erosion Control Plan, FDOT Sections 104 and 985, FDOT Index No. 102, and as follows:
 - 1. Store and handle fabric in accordance with ASTM D4873.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 8 inches

- (200 mm) in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 8 inches (200 mm) in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 8 inches (200 mm) in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
 7. Fasten fabric to wood posts using one of the following:
 - a. Four 3/4 inch (19 mm) diameter, 1 inch (25 mm) long, 14 gage nails.
 - b. Five 17-gage staples with 3/4 inch (19 mm) wide crown and 1/2 inch (12 mm) legs.
 8. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

C. Sand Bags:

1. When used as a linear control for sediment removal:
 - a. Install along a level contour.
 - b. Turn ends of sandbag row up slope to prevent flow around the ends.
 - c. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective control.
2. When used for concentrated flows:
 - a. Stack sandbags to required height using a pyramid approach as shown in attached figure.
 - b. Upper rows of sandbags should overlap joints in lower rows.
3. Construct sandbag barriers with a setback of at least 3 ft from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the sandbag barrier may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable

D. Straw Bale Rows: Install in accordance with Erosion Control Plan, FDOT Section 104, and as follows:

1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches (100 mm) in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row,

compacted.

- E. Mulching: Install in accordance with Erosion Control Plan, FDOT Sections 104 and 981, and as follows:
 - 1. Large Areas:
 - a. Dry Straw and Hay: Apply 2-1/2 tons per acre (6350 kg per hectare); anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
 - b. Erosion Control Matting: Comply with manufacturer's instructions.
 - 2. Small and Medium Areas:
 - a. Dry Straw and Hay: Apply 4 to 6 inches (100 to 150 mm) depth.
 - b. Erosion Control Matting: Comply with manufacturer's instructions.
- F. Temporary Grassing/Sod: Conform to requirements of the Erosion Control Plan, and FDOT Sections 104, 570 and 981.

3.06 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 - 2. Remove silt deposits that exceed one-third of the height of the fence.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 - 2. Remove silt deposits that exceed one-half of the height of the bales.
 - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.07 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 015721
INDOOR AIR QUALITY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality before commencement of construction; existing building areas only.
- D. Testing indoor air quality after completion of construction.
- E. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

- A. For overall project goals relating to environment and energy, see Section 013515 - LEED Certification Procedures.
- B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
 - 3. Establish condition of existing ducts and equipment prior to start of alterations.
- C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.
- D. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

1.03 RELATED REQUIREMENTS

- A. Section 013515 - LEED Certification Procedures: LEED credits relating to indoor air quality.
- B. Section 014000 - Quality Requirements: Testing and inspection services.
- C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- D. Section 234000 - HVAC Air Cleaning Devices: HVAC filters.
- E. Section 230593 - Testing, Adjusting, and Balancing for HVAC: Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

1.04 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 - 1. ASHRAE 62.1 -- Ventilation For Acceptable Indoor Air Quality.
 - 2. ASHRAE 129 -- Measuring Air-Change Effectiveness.
- C. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA):
 - 1. SMACNA (OCC) -- IAQ Guideline for Occupied Buildings Under Construction.

1.05 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Section 013515 - LEED Certification Procedures.
- C. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit within 60 days after Notice to Proceed.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
- D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- E. Duct and Terminal Unit Inspection Report.
- F. Air Contaminant Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Locations and scheduling of air sampling.

3. Test procedures, in detail.
 4. Test instruments and apparatus.
 5. Sampling methods.
- G. Air Contaminant Test Reports: Show:
1. Location where each sample was taken, and time.
 2. Test values for each air sample; average the values of each set of 3.
 3. HVAC operating conditions.
 4. Certification of test equipment calibration.
 5. Other conditions or discrepancies that might have influenced results.
- H. Ventilation Effectiveness Test Plan: Identify:
1. Testing agency qualifications.
 2. Description of test spaces, including locations of air sampling.
 3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
 4. Test instruments and apparatus; identify tracer gas to be used.
 5. Sampling methods.
- I. Ventilation Effectiveness Test Reports: Show:
1. Include preliminary tests of instruments and apparatus and of test spaces.
 2. Calculation of ventilation effectiveness, E.
 3. Location where each sample was taken, and time.
 4. Test values for each air sample.
 5. HVAC operating conditions.
 6. Other information specified in ASHRAE 129.
 7. Other conditions or discrepancies that might have influenced results.

1.07 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.

- C. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- D. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 3. Do not use return air ductwork for ventilation.
 4. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air; provide alternate return air pathways.
- E. Do not store construction materials or waste in mechanical or electrical rooms.
- F. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
- G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- H. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

- A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.
- B. Perform building flush-out before occupancy.
- C. Do not start flush-out until:
 1. All construction is complete.
 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 4. New HVAC filtration media have been installed.
- D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot (4500 cubic meters per square meter) of floor area has been supplied.
 1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.

2. Maintain interior temperature of at least 60 degrees F (15 degrees C) and interior relative humidity no higher than 60 percent.
 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
 4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot (0.0015 cu m/s/sq m) or design minimum outside air rate, whichever is greater.
- E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

- A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.
- B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.
- C. Perform air contaminant testing before occupancy.
- D. Do not start air contaminant testing until:
 1. All construction is complete, including interior finishes.
 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 3. New HVAC filtration media have been installed.
- E. Indoor Air Samples: Collect from spaces representative of occupied areas:
 1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
 2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet (2,300 square meters); take samples from areas having the least ventilation and those having the greatest presumed source strength.
 3. Collect samples from height from 36 inches (915 mm) to 72 inches (1830 mm) above floor.
 4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
 5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
 6. When retesting the same building areas, take samples from at least the same locations as in first test.
- F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.
- G. Analyze air samples and submit report.

- H. Air Contaminant Concentration Determination:
1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
 2. Airborne Mold and Mildew: Measure in relation to outside air.
 3. Formaldehyde: Not more than 50 parts per billion.
 4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air.
 5. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.
 6. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air.
 7. Particulates (PM10): Not more than 50 micrograms per cubic meter.
 8. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air.

3.04 VENTILATION EFFECTIVENESS TESTING

- A. Perform ventilation effectiveness testing during commissioning period.
- B. Do not begin ventilation effectiveness testing until:
 1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
 2. Building flush-out or air contaminant testing has been completed satisfactorily.
 3. New HVAC filtration media have been installed.
- C. Test each air handler zone in accordance with ASHRAE 129.
- D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Lists of products to be removed from existing building.
- B. Section 013515 - LEED Certification Procedures: Requirements for LEED reports.
- C. Section 013516 - LEED Submittal Forms.
- D. Section 014000 - Quality Requirements: Product quality monitoring.
- E. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- F. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.
- G. Section 061100 - Reclamation of Historic Lumber.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code; 2008.
- C. U.S. Code of Federal Regulations (CFR):
 - 1. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission.

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. LEED Submittals: Use forms provided in Section 013516 - LEED Submittal Forms.

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. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. 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.
- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
 - 1. Reclaimed lumber salvaged from Phase 1 selective demolition and Phase 2 Major Renovation and Construction. For additional information, refer to Section 061100 - Reclamation of Historic Lumber.
 - 2. Historic artwork and plaster medallions.
 - 3. Historic Auditorium Chairs.
- E. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
 - 1. For list of items required to be salvaged for reuse and relocation, see Section 011000 - Summary.
- F. LEED Submittals: State cost of each reused product, quantity installed, and total cost of reused products.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
- C. Regionally-Sourced Products:

1. Overall Project Requirement: Provide materials amounting to a minimum of 20 percent of the total value of all materials (excluding plumbing, HVAC, electrical, elevators, and other equipment) that have been extracted, harvested, or recovered, as well as manufactured, within a radius of 500 miles (805 km) from the project site.
 - a. This provision is applicable to LEED Credit MR 5.1; show quantity on LEED report.
 - b. This provision is applicable to LEED Credit MR 5.2; show quantity on LEED report
 2. Specific Product Categories: Provide regionally-sourced products as specified elsewhere.
 3. LEED Submittals: Indicate location of manufacture; in all cases indicate location of final assembly; for harvested products, indicate location of harvest; for extracted (i.e. mined) products, indicate location of extraction; for products involving multiple manufacturing steps, indicate all locations of manufacture or assembly; provide manufacturer or supplier certification of location information.
- D. Products with Recycled Content:
1. Overall Project Requirement: Provide products with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial recycled content constitutes at least 20 percent of the total value of all products installed, except mechanical and electrical components.
 - a. This provision is applicable to LEED Credit MR 4; show quantity and calculations on LEED report.
 2. Specific Product Categories: Provide recycled content as specified elsewhere.
 3. Calculations: Where information about recycled content is required to be submitted:
 - a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).
 - b. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 - c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 - d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
 - e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
 4. LEED Submittals: State unit cost, post-consumer and post-industrial content percentages, quantity installed, total material cost, and total recycled content value; attach evidence of contents from either manufacturer or an independent agency.
- E. Motors: NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
- F. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

- G. Cord and Plug: Provide minimum 6 foot (2 m) cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

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 PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution 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.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

- A. For identification of Owner-supplied products, see Section 011000 - Summary.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.

- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. 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

SECTION 016116

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. VOC restrictions for product categories listed below under "DEFINITIONS."
- B. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures.
- B. Section 013515 - LEED Certification Procedures.
- C. Section 014000 - Quality Requirements: Procedures for testing and certifications.
- D. Section 015721 - Indoor Air Quality Controls: Procedures and testing; LEED requirements.
- E. Section 016000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
 - 1. Adhesives, sealants, and sealer coatings.
 - 2. Carpet tile.
 - 3. Paints and coatings.
 - 4. Cabinet work.
 - 5. Other products when specifically stated in the specifications.
- 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. Carpet and Rug Institute (CRI):
 - 1. CRI (GLP) -- Green Label Plus Carpet Testing Program - Approved Products.
- B. Green Seal, Inc. (GreenSeal)
 - 1. GreenSeal GC-03 -- Anti-Corrosive Paints.
 - 2. GreenSeal GS-11 -- Paints.
 - 3. GreenSeal GS-36 -- Commercial Adhesives.

- C. South Coast Air Quality Management District (SCAQMD):
 - 1. SCAQMD 1113 -- South Coast Air Quality Management District Rule No.1113.
 - 2. SCAQMD 1168 -- South Coast Air Quality Management District Rule No.1168.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Evidence of Compliance: Submit for each different product in each applicable category.
 - 1. Identify evidence submittals with the words "LEED Report".
- C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- D. Installer Certifications for Accessory Materials: 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 his products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

- A. 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. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by SCAQMD 1168.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- B. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current GreenSeal Certification.
- C. Paints and Coatings:
 - 1. Provide coatings 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. USGBC LEED Rating System, edition as stated in Section 013515 - LEED Certification Procedures; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
 - (1) Architectural Paints and Coatings: Do not exceed VOC content limits established in GreenSeal GS-11.
 - (2) Anti-Corrosive and Anti-Rust Paints: Do not exceed VOC content limits established in GreenSeal GC-03.

- (3) Clear Wood Finishes, Floor Coatings, Stains, Primers and Shellacs: Do not exceed the VOC content limits established in SCAQMD 1113.
- 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.
- 3. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- D. Carpet Tile and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current Green Label Plus Certification.
 - b. Report of laboratory testing performed in accordance with requirements.
- E. Other Product Categories: Comply with limitations specified elsewhere.

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. All additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

Attachment 1: Accessory Material VOC Content Certification Form.

SECTION 016116 Attachment 1

ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

1.01 FORM

A. Identification:

1. Project Name: Key West City Hall at Glynn Archer - Phase 2 - New Construction and Major Renovation.
2. Architect's Project No.: 1305
3. Architect: Bender & Associates Architects, P.A.
4. Associate Architect: M.C. Harry & Associates, Inc.

B. Use of This Form:

1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
2. Contractor is required to obtain and submit this form from each installer of work on this project.
3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

C. VOC content restrictions are specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

2.01 PRODUCT CERTIFICATION

A. I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

3.01 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

- A. Firm Name: _____
- B. Print Name: _____
- C. Signature: _____
- D. Title: _____ (officer of company)
- E. Date: _____

END OF SECTION

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. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Closeout procedures, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures.
- B. Section 014000 - Quality Requirements: Testing and inspection procedures.
- C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 015715 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.
- E. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- F. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
- G. Section 024100 - Demolition: Selective demolition of designated portions of existing facilities.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 241 -- Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- C. U.S. Occupational Safety and Health Administration (OSHA).
- D. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910 - Occupational Safety and Health Standards.

1.04 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative

Requirements.

- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- D. 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.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of five years of documented experience.
- B. For survey work, employ a land surveyor registered in the State of Florida and acceptable to Architect.
 - 1. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- C. For design of temporary shoring and bracing, employ a Professional Structural Engineer experienced in design of this type of work and licensed in the State of Florida.
- D. Contractor shall employ the services of a qualified and experienced core drilling contractor for drilling of cores through existing structural concrete elements.
 - 1. Contractor shall employ the services of a qualified and experienced testing laboratory to locate and describe the reinforcement in the vicinity of the proposed cores.
 - a. Testing laboratory shall experience in non-destructive testing methods of the type required for this project, including but not limited to use of a pachometer to determine placement, depth, quantity and depth of embedded steel reinforcing in existing structural concrete members.

- b. Testing laboratory shall prepare Non-Destructive Testing Report for each proposed core-drilling location. Contractor shall submit report with other submittals.
- 2. Equipment Requirements:
 - a. Core drilling equipment shall have a ground fault interrupter (GFI) so that if there is contact between the drill blade and any other metal (i.e., steel reinforcing) while drilling is in progress the equipment will automatically stop working.
 - b. Pachometer equipment used for non-destructive testing of structural concrete elements shall be a microprocessor-controlled rebar locator, size detector, and cover depth recorder, and shall be capable of accurately detecting embedded reinforcing steel (e.g., rebar, pre-stressed tendons, etc.) cover to a maximum depth of 12 in (30cm) and bar size to an 8 in (20.3cm) depth.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- F. 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.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
 - 4. For additional requirements, refer to Section 015715 - Temporary Erosion and Sediment Control.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- I. Pest and Rodent Control:
 - 1. Provide methods, means, and facilities to prevent pests and insects from damaging

the work.

2. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

- J. Cutting and Patching: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio, except as specifically indicated on the drawings and as approved by Architect.

1.06 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 shown 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.

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.

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. Commencement 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 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that established by Owner provided survey.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, and ground floor elevations.
- K. Periodically verify layouts by same means.
- L. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct demolition and construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

- B. 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.
- C. Make vertical elements plumb and horizontal elements level, 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.

3.06 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 shown.
 - 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 (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
- 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. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- H. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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-conforming work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.
- D. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract

Documents.

G. 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.

3.08 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. Collect and remove waste materials, debris, and trash/rubbish from site daily and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.

3.10 FINAL CLEANING

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean debris from drainage systems.
- D. Clean site; sweep paved areas, rake clean landscaped surfaces.
- E. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 1. Provide copies to Architect and Owner.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Submit written certification 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 review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. The Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Site clearing debris, including brush, branches, logs, and stumps.
 - 2. Concrete masonry units.
 - 3. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, electrical conduit, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 4. Clean dimensional lumber, wood trim, and wood sheet materials.
 - 5. Roofing.
 - 6. Insulation.
 - 7. Glass.
 - 8. Carpet and pad.
 - 9. Gypsum board.
 - 10. Packaging materials, including paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates and pallets, and plastic pails.
 - 11. Aluminum, glass and plastic beverage containers.
- E. LEED Certification for this project is dependent on diversion of at least 75 percent, by weight, of potential landfill trash/waste by recycling and/or salvage (LEED MR Credit 2.1 and MR Credit 2.2).
- F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements, as provided by a qualified Recycler such as Southern Waste Systems / Sun Recycling, Waste Management (WMI) of the Florida Keys, or equal.
 - 1. Contractor must use Owner-mandated solid waste and/or recycling company specified by the Owner, if such specification exists. Otherwise, Contractor may utilize any qualified waste management and recycling company based on value and service.

- H. The following sources may be useful in developing the Waste Management Plan:
1. State of Florida:
 - a. Florida Department of Environmental Protection (FDEP) Recycling Program: FDEP; Division of Waste Management; 2600 Blair Stone Road; Tallahassee, FL 32399-2400; Tel. 850-245-8705.
 - b. Recycle Florida Today (RFT): Post Office Box 15889; Tallahassee, FL 32317; Tel. 850-907-1278.
 2. Monroe County Solid Waste Management: 1100 Simonton Street, Suite 2-284; Key West, FL 33040; Tel. 305-292-4432.
 3. Recyclers: Refer to "List of Construction and Demolition Facilities" at <http://www.dep.state.fl.us/waste/categories/recycling/cd/canddmain.htm> .
 - a. American Environmental Recycling: 10001 SW 240 Street; Miami, FL 33174; Tel. 305-232-2344.
 - b. Florida Wood Recycling: 9651 NW 89th Avenue; Medley, FL 33178; Tel. 305-805-0033.
 - c. Southern Waste Systems / Sun Recycling: 790 Hillbrath Drive; Lantana, FL 33462; Tel. 888-800-7732.
 - d. Waste Management (WMI) of the Florida Keys: 125 Toppino Industrial Drive; Rockland Key, MM8.5; Key West, FL 33040; Tel. 305-296-8297.
 4. Recycling Economics Information: The following sources contain information that may be useful in estimating the costs or savings or recycling options.
 - a. "Construction and Demolition Debris Recycling in Florida" provides a comprehensive perspective of the construction and demolition industry's debris management and recycling practices.
 - b. Construction and demolition debris recycling and disposal is tracked by the FDEP through annual reports from Counties and permitted construction and demolition facilities statewide in accordance with Florida Administrative Code rule 62-701.730(12).
- I. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
 2. Burying on the project site.
 3. Dumping or burying on other property, public or private.
 4. Other illegal dumping or burying.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls: Site access and temporary controls.
- B. Section 024100 - Demolition:
 1. Selective demolition for alterations purposes, including but is not limited to removal of floors, roofs, windows, interior partitions, designated portions of

- exterior walls, stairways, windows and doors, MEP systems, etc..
- 2. Abandonment and removal of existing utilities and utility structures.
- 3. Removal and salvage of identified items and materials, and removal of resulting rubbish and debris.
- 4. Identification and abatement of asbestos-containing-materials (ACM) and lead-based paint (LBP) materials located on or within structures or equipment designated for renovation or demolition, in accordance with applicable regulatory requirements.
- 5. Temporary facilities and controls required for compliance with regulatory requirements, including but not limited to:
 - a. Pedestrian protection.
 - b. Preventing the accumulation of water or damage to any foundations on the premises.
 - c. Disconnecting and capping utilities.
- C. Section 311100 - Site Clearing and Grubbing: Site clearing debris, including brush, branches, logs, and stumps.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances (e.g., ignitibility, corrosivity, toxicity or reactivity).
- D. Non-hazardous: Exhibiting none of the characteristics of hazardous substances (e.g., ignitibility, corrosivity, toxicity, or reactivity).
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well

production run-off water.

- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
- C. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled (i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler).
 - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Project Manager.

3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party stating that materials will not be disposed of in landfills or by incineration.
 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards (cubic meters).
 - c. Include weight tickets as evidence of quantity.
 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- E. LEED On-line Form: Fill out and upload Construction Waste Management Credit Form to LEED On-line, including Waste Disposal Reports at specified intervals
1. Submit updated Credit On-line Form and uploaded supporting documentation with each Application for Progress Payment; failure to submit Report will delay payment.
- F. Recycling Incentive Programs:
1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
 2. Where revenue accrues to Owner, submit any additional documentation required by Project Manager in addition to information provided in periodic Waste Disposal Report.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to the following:
 - a. U.S. Environmental Protection Agency (EPA).
 - b. Florida Department of Environmental Protection (FDEP).
 - c. Florida Department of Environmental Regulation (FDER).
 - d. Monroe County Fire Marshall (FM).
 - e. Monroe County Division of Growth Management (GM).
 - f. Monroe County Division of Environmental Management (DEM).
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Worker Certification: Maintain a worker signature Log on site at all times, listing all personnel who has read the approved Waste Management Plan.
- E. Meetings: Discuss trash/waste management goals and issues at project meetings, particularly at:
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.
- F. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. For temporary dust and dirt control, environmental protection, and noise control requirements, refer to with Section 015000 - Temporary Facilities and Controls.
- G. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:

- a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable, unless single-stream recycling is available
 - c. Recycling bins at worker lunch area.
2. Provide containers as required.
 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 4. Provide materials for barriers and enclosures that are non-hazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 5. Locate enclosures out of the way of construction traffic.
 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked with signage as indicated on Drawings, in order to avoid contamination of materials.
- H. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- I. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- J. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- K. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

1.03 SUBMITTALS

- A. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.

5. Details not on original Contract drawings.

END OF SECTION

SECTION 019113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 ABBREVIATIONS

- A. The following are common abbreviations used in the Specifications and the Commissioning Plan.
1. A/E - Architect and Design Engineers
 2. BoD - Basis of Design
 3. BAS - Building Automation System
 4. Cx - Commissioning
 5. CxA - Commissioning Authority
 6. CC - Controls Contractor (Building Automation System Contractor)
 7. CM - Construction Manager
 8. Cx Plan - Commissioning Plan document
 9. EC - Electrical Contractor
 10. FPT - Functional Performance Test
 11. GC - General Contractor (prime)
 12. MC - Mechanical Contractor
 13. O&M - Operation and Maintenance
 14. PR - Owner's Project Requirements
 15. PM - Project Manager (of the Owner)
 16. Subs - Subcontractors (CC, EC, MC, TAB)
 17. SVC -Systems Verification Check (aka pre-functional test)
 18. TAB - Test and Balance Contractor

1.02 DEFINITIONS

- A. Owner's Project Requirements (OPR) – also known as the design intent. A document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design phases.
- B. Basis of Design (BoD) – The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Owner's Project Requirements (OPR). The BoD describes the systems, components, conditions and methods chosen to meet the OPR. Some reiterating of the OPR may be included.
- C. Commissioning Authority (CxA) - The CxA coordinates the Cx activities.
- D. Commissioning Plan – an overall project specific plan developed by the CxA that helps provide direction for the Cx Process during construction.
- E. System Verification Checks (SVC) – tests of individual components of a system, including static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gauges in place, sensors

calibrated, etc.). Also includes simple testing of the function of a component, a piece of equipment or system SVC checklists augment and are combined with the manufacturer's start-up checklist. SVCs are performed by the contractor and sub-contractors. The CxA requires that the procedures be documented in writing, and does not witness much of the equipment start-up, except for larger or more critical pieces of equipment.

- F. Functional Performance Test (FPT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Performance testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The CxA develops the FPT procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed by the installing Contractor or vendor. FPTs are performed after the SVCs are complete.
- G. Seasonal Tests - tests that are deferred until the system(s) will experience outdoor weather conditions closer to their design conditions.

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. OPR and BoD documentation prepared by Owner and A/E contain requirements that apply to this Section.
- C. LEED Commissioning Plan prepared by TLC Engineering for Architecture, Inc, dated July 23, 2014 (attached at end of this section).

1.04 SCOPE

- A. Cx is a systematic process of ensuring that all building systems perform interactively according to the OPR and BoD. This is achieved by beginning in the design phase and documenting the OPR and continuing through construction, acceptance and the warranty period with actual verification of performance. The Cx process will encompass and coordinate the separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training.
- B. Cx during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors.
 - 2. Verify and document proper and energy efficient performance of equipment and systems.

3. Verify that O&M documentation left on site is complete.
 4. Verify that the Owner's operating personnel are adequately trained.
- C. The following systems will be commissioned. All general references to equipment in this document refer only to equipment that is to be commissioned.
1. Mechanical Systems
 - a. HVAC equipment
 - b. Testing, adjusting and balancing
 - c. BAS (controlled devices, control loops and systems integration)
 2. Plumbing Systems
 - a. Domestic hot water heating systems
 3. Electrical Systems
 - a. Lighting control systems (i.e. occupancy sensors, daylighting controls, dimmers, and time scheduling)
 - b. Renewable energy systems (i.e. photovoltaic arrays)
- D. The Cx process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning project. Cx is essentially the process of observing and documenting that the equipment and systems operate and perform as intended.
- E. The Cx testing will be based upon the following reference standards: American Commissioning Group (ACG) (www.commissioning.org); ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for the Commissioning Process.

1.05 COMMISSIONING AUTHORITY

- A. The CxA services will be provided by or sub-contracted by the Architect. The Contractor(s) are responsible to execute the Cx process according to this specification section.

1.06 ROLES AND RESPONSIBILITIES

- A. Cx Team: The members of the Cx team consist of the CxA, the PM, the designated representative of the owner's CM firm, the GC or Contractor, the A/E (particularly the mechanical engineer), the MC, the EC, the TAB representative, the CC, any other installing subcontractors or suppliers of equipment. The Owner's building or plant operator/engineer and users are also integral members of the Cx team.
- B. The responsibilities of various parties on the Cx team are provided in this section and will be clarified in the Cx Plan. Roles and responsibilities listed in this spec for the A/E, CxA and PM are for informational purposes only.
- C. All Parties
1. Follow the Cx Plan.
 2. Attend the Cx kick-off meeting and additional meetings, as necessary.
- D. Architect and Engineer (A/E)
1. Design Phase
 - a. Document the OPR and provide a copy to the CxA.
 - b. Provide any BoD narrative documentation requested by the CxA.

- c. Respond to CxA drawing review comments.
 - 2. Construction and Acceptance Phase
 - a. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
 - b. Coordinate resolution of system deficiencies identified during Cx, according to the Contract Documents.
 - c. Prepare and submit final as-built BoD documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
 - 3. Warranty Period
 - a. Coordinate resolution of design non-conformance and design deficiencies identified during warranty period Cx.
- E. Commissioning Authority (CxA)
 - 1. General: The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem solving, non-conformance or deficiencies, but ultimately that responsibility resides with the GC and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document that systems are functioning and performing in accordance with the Contract Documents. The Contractors shall provide all tools or the use of tools to start, checkout and test equipment and systems, including specified testing with portable data-loggers.
 - 2. Design Phase
 - a. Verify the A/E has documented the OPR.
 - b. Review the A/E BoD.
 - c. Review and comment on drawings prior to the Construction Document Phase.
 - d. Review and comment on drawings near the end of the Construction Document Phase.
 - 3. Construction and Acceptance Phase
 - a. Help coordinate the Cx activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 - b. Create and revise the project's Cx Plan document
 - c. Plan and conduct Cx meetings.
 - d. Request and review additional information required to perform Cx tasks, including O&M materials, Contractor start-up and checkout procedures.
 - e. Before start-up, gather and review the current control sequences and interlocks and work with Contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
 - f. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with Cx needs, concurrent with the A/E reviews.
 - g. The CxA makes periodic visits to the site, as necessary, to witness and observe equipment and system installations.
 - h. Review air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation. CxA will select, at random,

10% of TAB report for spot testing. CxA will schedule and observe spot testing. TAB shall provide personnel and equipment/instruments to perform tests. The TAB shall use the same equipment/instruments (by model and serial number) that were used when original data in report were collected. Any reading that deviates more than 10% from the design values shall result in rejection of the final TAB report.

- i. Write and distribute FPTs.
 - j. Compile and maintain a Cx Book that contains all Cx related activities:
 - k. Cx field visits
 - l. Cx deficiency lists
 - m. Equipment Startup Checklists
 - n. FT forms
 - o. Final Report
 - p. Review the training of the Owner's operating personnel.
 - q. Develop and deliver Systems Manual.
 - r. Provide a final Cx report.
4. Warranty Period
- a. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Cx. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the Systems Manual. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

F. Construction Manager or General Contractor

1. Design Phase
 - a. Attend the Cx kick-off meeting and additional meetings, as necessary Review and comment on drawings prior to the Construction Document Phase.
 - b. Review and comment on the Cx Plan
2. Construction and Acceptance Phase
 - a. Facilitate the coordination of the Cx work by the CxA, and ensure that Cx activities are being scheduled into the master project schedule.
 - b. Follow the Cx Plan.
 - c. Furnish a copy of all construction documents, addenda, change orders, approved submittals and shop drawings and O&M manuals related to commissioned equipment to the CxA.
 - d. Review the test procedures submitted by the CxA.
 - e. Provide completed construction checklists to the CxA for installation verification (SVCs and FPTs).
 - f. Sign off on completed SVCs and FPTs for all equipment and systems, prior to CxA witnessing testing.
 - g. Coordinate the resolution of non-compliance deficiencies identified in all phases of Cx with the various Contractors.

- h. Coordinate and provide for the training of Owner personnel.
 - i. In each purchase order or subcontract written, include requirements for submittal data, Cx tasks and training.
 - j. Ensure that all subcontractors execute their Cx responsibilities according to the Contract Documents and schedule.
 - k. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
3. Warranty Period
- a. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
- G. Mechanical and Electrical sub-contractors
- 1. Include scope to complete Cx requirements for mechanical and electrical systems in the contract price.
 - 2. Ensure cooperation and participation of specialty subcontractors. This includes ensuring TAB shall be available for spot testing with CxA.
 - 3. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
 - 4. Prepare schedule for mechanical and electrical system Cx related activities. Include time in the project schedule for equipment start-up, SVCs, and FPTs. Include time for resolution of deficiencies found during Functional and Performance tests.
 - 5. Sign off on completed SVCs and FPTs for all equipment and systems, prior to CxA witnessing testing.
 - 6. Executing the Functional and Performance tests while the CxA witnesses and documents.
- H. Owner's Project Manager (PM)
- 1. Provide OPR to commissioning team.
 - 2. Arrange for facility operating and maintenance personnel to attend various field Cx activities and field training sessions according to the Cx Plan.
- I. Controls Contractor (or mechanical contractor if there is not a separate CC)
- 1. Include scope for Cx requirements in the contract price. The CC shall execute most of the Division 23 Functional and Performance testing.
 - 2. Review the FPTs developed by the CxA to ensure that control system points are in place to execute the tests. Recommend test revisions to streamline or improve the test procedures
 - 3. Demonstrate building automation system performance to CxA during the Functional and Performance tests including all modes of system operation and explanation/definition of variable names for each piece of equipment and each system.
 - 4. Provide controls system technician, intimately familiar with the system, for use during execution of the Functional and Performance testing.

1.07 COMMISSIONING RESPONSIBILITY MATRIX

- A. General: The following responsibility matrix outlines the major tasks of the Cx process and the parties responsible to carry out the tasks. In general the CxA writes the tests and documents the test results. The Contractors are responsible to execute the tests. The CC is typically responsible for the majority of the mechanical test execution. If there is not a separate CC, the mechanical contractor shall be responsible for all scope designated to the CC in this specification.

Task / Action	Responsibility					
	CxA	Owner	CM/GC	EC & MC	CC	TAB
Cx Kickoff Meeting. (Early to mid construction phase.)	Lead	Attend	Attend	Attend	Attend	Attend
Write Functional Performance tests.	Write					
Review and refine tests.	Refine		Review	Review	Review	Review
CxA visit site to review progress.	Observe					
Equipment START-UP and checkout	Review			Perform		
Functional Performance Tests	Observe, Document	Observe	Schedule	Participate	Execute	Participate
Deficiency List	Write		Verify completion	Correct	Correct	Correct
Deferred Performance Tests (summer / winter sequences).	Observe, Document	Observe	Schedule	Participate	Execute	Participate
Final Cx Report	Write					
Test and Balance	Review					Execute

1.08 COMMISSIONING PROCESS

- A. The following narrative provides a brief overview of the typical Cx tasks during construction and the general order in which they occur.
1. Cx during construction begins with a kick-off meeting conducted by the CxA where the Cx process is reviewed with the Cx team members.
 2. Additional site visits and meetings shall be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities, resolve issues and verify installation.
 3. Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures.
 4. The subcontractors develop startup plans and startup documentation/checklists to be completed, during the startup process.
 5. The CxA uses submittals and shop drawings to develop specific equipment and system FPT procedures. The subcontractors review the procedures.

6. The subcontractors, under their own direction, perform startup and initial checkout. The subcontractors shall provide documentation/checklists from the start-up process to the CxA.
7. Testing, adjusting and balancing is performed by TAB and audited by the CxA.
8. The SVC procedures are executed by the Subs, under the observation of, and documented by the CxA. The Subs resolve SVC deficiencies prior to performance testing.
9. The FPT procedures are executed by the Subs, under the observation of, and documented by the CxA. The subs resolve any deficiencies.
10. Items of non-compliance in material, installation or setup are corrected at the subcontractor's expense and the system retested.
11. The CxA reviews the O&M documentation for completeness.
12. Cx is completed before Substantial Completion.
13. The CxA reviews the training provided by the subcontractors and verifies that it was completed.
14. Seasonal or deferred testing is conducted, as specified or required. The Subs resolve any deficiencies.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional and performance testing shall be provided by the contractor or subcontractor for the equipment being tested.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications*. If not otherwise noted, the following minimum requirements apply:
 1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F.
 2. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.
 3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged.
 4. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.01 SUBMITTALS

- A. The GC shall provide submittals for all equipment to be commissioned to the CxA. At a minimum, the submittals shall include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data and control drawings. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA shall be included by the subcontractors in their O&M manual contributions.

- B. The CxA will review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the Cx process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the CM, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.
- C. These submittals to the CxA do not constitute compliance for O&M manual documentation. The CxA may request additional design narratives from the A/E and from the Subs depending on the clarity of the bid document information. The O&M manuals are the responsibility of the Contractor, though the CxA will review and approve them

3.02 COMMISSIONING PLAN

- A. The purpose of the Cx Plan is to help provide direction for the Cx Process during construction. This includes providing resolution for issues and providing details that cannot or were not fully developed during design (such as scheduling, participation of various parties of this particular project, actual lines of reporting and approvals, coordination, etc.). The CxA will submit a preliminary Cx Plan to the Cx Team for review near 30% construction progress. The preliminary Cx Plan will include the following:
 - 1. Brief overview of the Cx process
 - 2. List of all systems to be commissioned
 - 3. Identification of the Cx Team and its responsibilities
 - 4. Overview of the Cx process
 - 5. Indicate expected work products
 - 6. Schedule indicating key commissioning process milestones

3.03 TEST METHODS

- A. Functional and performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. The CxA will determine which method is most appropriate.
- B. Simulated Conditions. Simulating conditions (not by an overwritten value) will be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
- C. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, will be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to

see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

- D. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
- E. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
- F. Indirect Indicators. Relying on indirect indicators for responses or performance will be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during equipment start-up.
- G. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The subcontractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the subcontractor shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
- H. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally and performance tested using a sampling strategy as determined by the CxA. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference.

3.04 NON-CONFORMANCE

- A. The CxA will record the results of the Prefunctional and Functional Tests. All deficiencies, non-conformance issues, or test failures will be noted and reported to the Contractors in a deficiency list or in a punch-list format.
- B. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
- C. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owners Representative.
- D. Re-testing.

1. If a Prefunctional or Functional Test fails, corrections shall be made to the deficient equipment or systems by the Contractors. The systems will be re-tested until they pass the Tests.
2. The time/cost for the CxA to perform any re-testing required because of improper set up of the systems by the contractors or failed prefunctional or functional tests will be back-charged to the General Contractor, who may choose to recover costs from the party responsible for executing faulty equipment start-up/checkout and associated checklists. This includes instances where a specific item was overlooked in the equipment start-up and checkout procedures, reported to have been successfully completed, but determined during Prefunctional or Functional testing to be faulty.
3. Any required re-testing by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Prime Contractor.

3.05 EQUIPMENT START-UP / SYSTEM VERIFICATION CHECKS

- A. After the equipment is installed and powered, the contractor shall perform a formal equipment start-up and system verification procedure. SVC checklists are completed by the Contractors to ensure equipment and systems are installed, tested, and fully operational prior to proceeding with Functional Performance Testing. Each piece of equipment is required to have a start-up form filled out by the Contractor. No sampling strategies are allowed. Proper equipment start-up must be successfully completed prior to Functional and Performance testing of that system.
- B. The contractor shall submit a plan and schedule for equipment start-up, and submit the project specific Equipment Start-up checklists. The CxA will review the Start-up checklists prior to the contractor performing equipment start-up.
- C. Objectives and Scope. The objective of systems verification checks is to demonstrate that each piece of equipment is operating properly according to the Contract Documents with respect to safety devices, thermostats, valves, control wiring, etc. During the testing process, areas of deficient operation or performance will be identified to be corrected.
- D. The Contractor shall submit completed SVC checklists to the CxA for record documentation.
- E. SVC checklists must be submitted for all scheduled mechanical and electrical equipment that are part of the “systems to be commissioned”.

3.06 FUNCTIONAL PERFORMANCE TESTING

- A. The CxA will observe the FPT’s near the end of the project. Before the overall system performance can be tested it is necessary to ensure that each “component” of the system be tested (SVC) and deficiencies resolved to prove that it is set-up and adjusted to work within intended ranges.
- B. Objectives and Scope. The objective of Performance Testing is to demonstrate that each system is operating according to the Contract Documents with respect to capacity and optimum energy efficiency. During the testing process, areas of deficient performance are identified to be corrected by the Contractors, improving the operation,

functioning, and efficiency of the systems. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc., shall also be tested.

- C. The purpose of any given specific FPT is to verify and document compliance with the stated criteria of acceptance given on the test form. The FPT procedures will be written in simple pass/fail format.
- D. Development of Test Procedures. Before test procedures are written, the CxA will obtain project contract documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CxA will develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CxA will provide a copy of the test procedures to the Contractors who shall review the tests for feasibility, safety, equipment and warranty protection.
- E. Specific Test forms will be developed by the CxA during the Construction Phase and will include (but not be limited to) the following information:
 - 1. System and equipment or component name(s)
 - 2. Instructions for setting up the test.
 - 3. Special cautions, alarm limits, etc.
 - 4. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 - 5. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 - 6. A section for comments
- F. The following is a summary of the systems that are intended to be Functional Performance Tested as part of this project. **Note that the contractor is responsible for testing 100% of all systems and components as part of their normal scope of work.** The table offers a descriptive listing of equipment and components which will be tested and witnessed by the CxA for each of the typical systems during the commissioning process.. An opinion of probable time required for Performance Testing is provided for typical systems for Contractor pricing. Deficiency correction time and follow-up tests shall be required when deficiencies are discovered.

System or Equipment	Equipment or Component Tested	General Description of Modes and Functions to Test	Minimum Cx Test Strategy	Opinion of Probable Testing Time	Seasonal Test
Chilled Water System	CHW pumps, associated VFD's and CHW distribution,	CHW pump control (startup, shutdown, resets lead-lag, alarms, lockouts), VFD control.	100%	0.5 days	Summer.

System or Equipment	Equipment or Component Tested	General Description of Modes and Functions to Test	Minimum Cx Test Strategy	Opinion of Probable Testing Time	Seasonal Test
	Control sequences.				
Heating System	Electric resistance heat.	All control sequences.	100%	1/2 day	Winter. Or summer if at least 50% loading is possible.
Air Handling System	AHU, supply, return, exhaust fans, coils, coil pumps, valves, dampers, VFDs, controls, reheat coils, humidifier.	All sequences of fans and related components (startup, shutdown, unoccupied mode, load changes, resets, alarms, lockouts), VFD control, operation of all dampers in all modes, emergency power, coil capacity, outside air control.	1-10: 100% 11-20: 50% >20: 25%.	½ day for small unit, 1 day for large unit.	Winter if economizer mode. Otherwise anytime.
Air Terminal Units	VAV or CV boxes, fan-coil unit, thru-wall unit, unit heaters.	Verify damper and fan sequences during heating, cooling, occupied, unoccupied modes. Check deadbands, verify flow.	Test min. 25% of identical units, and at least 1 of each type/size.	1 hour per unit.	Anytime.
Packaged and Split System HVAC Units	AHU, compressor, valves, dampers, heating elements, controls.	All sequences and related components (startup, shutdown, unoccupied mode, load changes, resets, alarms, lockouts) operation of all dampers in all modes, compressor and condenser staging, capacities.	1-10: 100% 11-20: 50% >20: 25%	4 hours per unit.	Anytime.
Computer Room AC Units	AC unit, humidifier, controls.	All sequences in all modes, humidity, reheat, interlocks with backup cooling, emergency power.	100%	2 hours per unit.	Anytime.
Fans	Supply, central exhaust, kitchen, stairwell pressurization, isolation room, etc.	All sequences, occupied, unoccupied, local control, overrides, schedules, control sequences.	25%.	1-2 hours per unit.	Anytime.
Building Automation System	Schedules, sequences, lockouts, alarms, interlocks, control strategies, trending, graphics	All sequences of controls for mechanical equipment and lighting controls.	10%	2 days	Anytime.
Test, Adjust, Balance	Airflows and water flows.	Validate diffuser airflows. Test reheat coil capacity by measuring air temperature rise.	10%.	1 hour per AHU zone	Anytime.

System or Equipment	Equipment or Component Tested	General Description of Modes and Functions to Test	Minimum Cx Test Strategy	Opinion of Probable Testing Time	Seasonal Test
Water Heating	Water heaters, storage tanks, mixing valves.	All sequences of control, temperatures, recirculation pumps, lockouts, safeties.	100%	4 hours.	Anytime
Lighting Controls	Occupancy sensors, daylighting	Occupied, unoccupied, overrides.	25%	0.25 hour per room.	Anytime.

1. Any secondary / tertiary chilled water pumps installed in the facility will be included in the scope.
2. Exhaust fans not associated with life safety / smoke control will be included with the Cx effort.
3. Controls system operation will be primarily verified through data trending using the existing controls front end system. If necessary, functional testing would occur during investigation phase to examine specific issues of concern.
4. Review of TAB activities will be done with spot checking of measured values in TAB Report. Spot checking to be performed by the TAB contractor, using the measurement devices used in the initial report, and witnessed by the CxA.
5. Electrical testing services for grounding or power quality are not currently included as part of the initial scope of work.
6. Electrical systems not included in scope of work include emergency generators, power quality, security systems, UPS, fire alarm.
7. Mechanical systems not included in commissioning activities include ductwork, fire and smoke dampers (except to the extent the FPTs check safety interfaces between these and the HVAC control system), and equipment sound & vibration measurements. Ductwork leakage testing to be performed by the contractor.
8. Kitchen hood equipment vendors will be required to provide start-up reports as part of the Cx effort.
9. CxA will have access to the site for activities necessary for performance of these services.

G. The contractor and sub-contractor will performs all tests and the CxA shall witness tests as indicated above. The contractor shall be responsible for any damages resulting from equipment start-up or testing.

3.07 DOCUMENTATION

- A. Equipment Start-up / System Verification Checklists (SVCs). The Contractor shall use a checklist type form during the start-up of each piece of equipment and submit to the CxA when complete. The Startup Checklists will be included in the Cx Book as a record that the equipment was started up and operating per the Contractors expectations.
- B. Functional Performance Tests (FPTs). The CxA will provide a performance test for each piece of equipment or system. The forms will be filled out by hand during the on-site tests. The pass/fail criteria will be included on the FPT forms. If the systems fail

the test, a deficiency list will be prepared for the Contractor outlining the failure. After the Contractors have addressed the deficiency, the CxA (or Contractors with Owners representative) will execute the FPT's again. There are sample forms at the end of this specification section.

- C. Deficiency List. The CxA will document any non-conformance deficiencies observed during site visits, or during tests. The deficiency list will be distributed by the A/E.
- D. Final Cx Report. The CxA will prepare a final report summarizing the Cx activities, the SVCs, the FPTs, and observed deficiencies. The final report will be submitted to the Owner.
- E. Cx Book. The CxA will manage the Cx Book. The Cx Book is a 3-ring binder containing all Cx related documents such as letters, memos, Equipment Start-up checklists, FT forms, PT forms, final Cx Report, etc. One copy of the Cx Book will be turned over to the Owner or the A/E at the conclusion of the Cx process.

3.08 NON-CONFORMANCE

- A. The CxA will record the results of the Functional Performance Tests. All deficiencies, non-conformance issues, or test failures will be noted and reported to the Contractors in a deficiency list or in a punch-list format.
- B. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
- C. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owners Representative.
- D. Re-testing.
 - 1. If a Functional Performance Test fails, corrections shall be made to the deficient equipment or systems by the Contractors. The systems will be re-tested until they pass the Tests.
 - 2. The time/cost for the CxA to perform any re-testing required because of improper set up of the systems by the contractors or failed functional or performance tests will be back-charged to the Contractor (who may choose to recover costs from the party responsible for executing faulty equipment start-up/checkout and associated checklists). This includes instances where a specific item was overlooked in the equipment start-up and checkout procedures, reported to have been successfully completed, but determined during Functional Performance testing to be faulty.
 - 3. Any required re-testing by any contractor, sub-contractor, or vendor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

3.09 DEFICIENCIES AND RETESTING

- A. The CxA documents the results of each test. (Corrections of minor installation or sequence of operation deficiencies are made during tests at the discretion of CxA.)
- B. Deficiencies/non-conformance issues not corrected during testing are reported to the Contractors for corrective action. Upon completion, a request is made by the Contractors to CxA for retest.

3.10 DEFERRED TESTING

- A. Unforeseen Deferred Tests. If any Test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of Testing may be delayed upon approval of the Owner. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties due to unforeseen deferred testing will be negotiated.
- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract at no additional cost. The Contractors shall coordinate this activity. Tests shall be executed, documented and deficiencies corrected by the Contractor, with facilities staff and the CxA witnessing.

3.11 MEETINGS

- A. Kick-off Meeting
 - 1. A Cx kick-off meeting is planned and conducted by the CxA near 30% construction progress. The CxA will distribute a preliminary Cx Plan. In attendance are the respective representatives of the GC, CxA, PM, A/E, MC, EC, CC and TAB. At the meeting, CX parties are introduced and the Cx process reviewed, management and reporting lines determined. The flow of documents, how much submittal data the CxA will receive, etc. are also being discussed. The Cx Plan is reviewed, process questions are addressed, lines of reporting and communications determined and the work products list discussed. Also covered are the general list of each party's responsibilities, who is responsible to develop the start-up checklist for each piece of equipment and the proposed Cx schedule. The outcome of the meeting is increased understanding by all parties of the Cx process and their respective responsibilities. The meeting provides the CxA additional information needed to finalize the Cx Plan.
 - 2. Prior to or during this meeting, the GC shall provide all drawings and specifications and the construction schedule by trade to the CxA. The CxA keeps notes from the meeting and distributes them to each team member.
- B. Progress Meetings. Meetings will be planned and conducted by the CxA at appropriate intervals as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with the Contractor(s). The CxA will plan these meetings in conjunction with regular project meetings to minimize unnecessary travel time.

3.12 PROJECT COMPLETION SCHEDULE

- A. The Cx Functional and Performance tests are executed at the end of the project after the Contractors have completed their work. It is possible to execute some tests, on

completed systems, prior to final project completion. In general, the Cx tests are scheduled for AFTER the TAB is complete and the controls contractor has completed the graphics in the building automation system. The Cx tests typically occur after the contractors request the substantial completion milestone.

- B. The FTs are typically executed during a few consecutive days. A deficiency list is prepared and given to the contractors for remediation. It typically takes a week or two to address the deficiencies. Follow-up Functional and Performance tests will be scheduled after the contractors report that the deficiency list is complete.
- C. The contractors should expect the Cx testing/deficiency identification/contractor remediation time period to span a month or two. The Owner/Contractor may agree to occupy the building during the Cx timeframe; however, this action may extend the Cx time frame due to scheduling difficulties encountered with shutting systems down or accessing equipment in an occupied building.
- D. Retainage will not be released until Cx is successfully completed.

3.13 O&M MANUALS

- A. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:
 - 1. The BoD narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.
 - 2. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These will include chillers, water system, condenser water system, heating system, supply air systems, and exhaust systems and . These will show major pieces of equipment such as pumps, chillers, boilers, control valves, expansion tanks, coils, service valves, etc.
- B. CxA Review and Approval. Prior to substantial completion, the CxA will review the O&M manuals, documentation and redline as-builts *for systems that were commissioned* to verify compliance with the *Specifications*. The CxA will communicate deficiencies in the manuals to the CM, PM or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the CM, PM or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

3.14 TRAINING AND ORIENTATION OF OWNER PERSONNEL

- A. The GC shall be responsible for training, including coordination and scheduling and ultimately for ensuring that training is completed.
- B. The CxA will be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
- C. The GC and CxA will interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner, GC and CxA shall decide how rigorous the training should be for each piece of commissioned

equipment. The GC shall communicate the results to the subcontractors and vendors who have training responsibilities.

- D. In addition to these general requirements, the specific training requirements of Owner personnel by subcontractors and vendors are specified in Division 22, 23, and 26.
- E. Each subcontractor and vendor responsible for training shall submit a written training plan to the GC and CxA for review and approval prior to training. The plan shall cover the following elements:
 - 1. Equipment (included in training)
 - 2. Intended audience
 - 3. Location of training
 - 4. Objectives
 - 5. Subjects covered (description, duration of discussion, special methods, etc.)
 - 6. Duration of training on each subject
 - 7. Instructor for each subject
 - 8. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - 9. Instructor and qualifications
- F. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
- G. The GC develops an overall training plan and coordinates and schedules, with the CM and CxA, the overall training for the commissioned systems. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the CM using a standard form. The CM also signs the approval form.
- H. Video taping of the training sessions shall be provided by the GC with tapes cataloged by the GC and added to the O&M manuals.
- I. The mechanical design engineer will at the first training session present the overall system design concept and the design concept of each equipment section. This presentation will be 2 to 4 hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, supply air systems, exhaust system and outside air strategies.

END OF SECTION

Attachment 1: LEED Commissioning Plan (25 pages).

Key West City Hall at Glynn Archer



Commissioning Plan

Prepared by:
TLC Engineering for Architecture

*May 8, 2013
Revised July 23, 2014*



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1. Overview

The purpose of the Cx plan is to help provide direction for the Cx process during construction. This includes providing resolution for issues and providing details that cannot be or were not fully developed during design (such as scheduling, participation of various parties of this particular project, actual lines of reporting and approvals, coordination, etc.).

1.1. Abbreviations

The following are common abbreviations used in the specification and in the commissioning plan:

A/E-	Architect and Design Engineers	FT-	Functional Test
BAS-	Building Automation System	GC-	General Contractor (prime)
BoD-	Basis of Design	MC-	Division 15 Mechanical Contractor
Cx-	Commissioning	O&M	Operation and Maintenance
CxA-	Commissioning Authority	OPR-	Owner's Project Requirements
Cx Plan-	Commissioning Plan document	PM-	Project Manager (of the Owner)
CC-	Controls Contractor (Building Automation System Contractor)	PT-	Performance Test
CM-	Construction Manager	Subs	Subcontractors (CC, EC, MC, TAB)
EC-	Division 16 Electrical Contractor	TAB-	Test and Balance Contractor

1.2. Scope

Cx is a systematic process of ensuring that all building systems perform interactively according to the OPR and BoD. This is achieved by beginning in the design phase and documenting the OPR and continuing through construction, acceptance and the warranty period with actual verification of performance. The Cx process will encompass and coordinate the separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training.

Cx during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:



- Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors.
- Verify and document proper and energy efficient performance of equipment and systems.
- Verify that O&M documentation left on site is complete.
- Verify that the Owner's operating personnel are adequately trained.

1.3. Commissioned Systems

The following systems will be commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned.

Mechanical Systems:

- Ductwork (review contractor leakage testing documentation). This will be a "hand" test. Contractor will check within 6" of duct in mechanical room for leakage prior to insulating the duct.
- Air-cooled chillers
- Hydronic pumps
- Fan-coil units
- AHU and associated condensing unit
- Zone Control Dampers
- Exhaust fans/air curtains
- Testing, adjusting and balancing
- BAS (controlled devices, control loops and systems integration)

Plumbing Systems

- Hot water heaters
- Water efficiency technologies (via visual observation during installation verification site visits, no FT's or PT's)

Electrical Systems

- Lighting controls
- Daylighting controls
- Photovoltaic Panels

2. General Building Information

Project: **Key West City Hall**

Location: **Key West, Florida**

Building Type: **Remodel of existing Glynn Archer School**

Square Footage: **38,000**



Number of stories: 2

3. Commissioning Team Data

<u>Team Member</u>	<u>Company and Contact Name</u>	<u>Phone</u>	<u>Email</u>
Owner	Mike Vieux Nicole Malo	305-809-3792 305-809-3778	mvieux@keywestcity.com nmalo@keywestcity.com
Architect	B&A Bert Bender	305-296-1347	blbender@bellsouth.net
Associate Architect and LEED Administrator	M.C. Harry & Assoc. Javier Torres	305-445-3765 x114	jtorres@mcharry.com
General Contractor			
Commissioning Authority	TLC Engineering Steve Samenski. PE	954-418-9096 O	Steve.samenski@tlc-eng.com
Commissioning Authority	TLC Engineering Jose Lara Gomez, PE	305-495-9753 C 305-266-6553 O	Jose.lara@tlc-eng.com
Mechanical/Electrical Designer/ Engineer	Mech. -Edwin Cerna Electrical – Tony Schulz	305-270-9935 305-270-9935	ecerna@hngsengineers.com AnthonySchulz@hngsengineers.com
Mechanical Contractor			
Electrical Contractor			
Plumbing Contractor			
Test and Balance Company			
Controls Contractor			

4. Roles and Responsibilities

4.1. Locations of Role Descriptions

4.2. Team Members

The members of Cx team consist of the CxA, the GC or Contractor, the A/E (particularly the mechanical engineer), the MC, the EC, the TAB representative, the CC, any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer and users are also members of the Cx team.

4.3. General Management Plan

The CxA was hired by the Architect. In general, the CxA coordinates commissioning activities and reports to the GC through the Architect. The CxA's responsibilities are detailed



in this Cx plan. All team members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

4.4. General Description of Roles

General Descriptions of the Cx roles are as listed below and as indicated in the table below.

All Parties: Follow the Cx plan and attend Cx kick-off meeting and additional meetings, as necessary.

- CxA: Helps coordinate the Cx process, writes functional and performance tests, reviews start-up, verifies TAB work, reviews and approves O&M manuals and owner training, and observes and documents functional and performance tests.
- CM/GC: Facilitates the Cx process, approves functional and performance test procedures submitted by the CxA and signs off on performance, ensures that subcontractors perform their responsibilities, integrates Cx into the construction process and schedule, and provides O&M manuals and owner training.
- Subs: Demonstrate proper system performance
- A/E: Provide OPR and BoD to the Cx team, perform construction observation, approve O&M manuals and assist in resolving issues.

Phase	Task / Action	CxA	Owner	A/E Design Team	Construction Team
Design	OPR	Review	Prepare	Review	Review
Design	BOD	Review	Review	Prepare	Review
Design	Cx Specs	Prepare	Review	Incorporate in CDs	Review
Design	Commissioning Plan	Write	Review & Comment	Review & Comment	Review, Comment, & Buy-in
Design	Review construction documents	Review of Docs & Write comments		Provide docs & Respond to comments	
Design	Cx Kickoff Meeting	Lead	Attend	Attend	Attend
Construction	Write Functional Performance Tests procedures	Write	Review & Comment	Review & Comment	Review, Comment, & Buy-in
Construction	Cx Meetings during construction phase.	Lead	Attend	Attend	Attend
Construction	CxA visit site to review progress.	Observe			
Construction	Deficiency Log	Write	Review	Review	Correct, & Verify completion
Construction	Review Submittals of Systems Being	Review	Review	Review	Provide Submittals



Phase	Task / Action	CxA	Owner	A/E Design Team	Construction Team
	Commissioned				
Construction	Equipment start-up and checkout	Review	Review	Review	Perform, & Verify Completion
Acceptance	Test and Balance	Verify	Review	Review	Perform, & Verify Completion
Acceptance	Perform Functional Performance Tests	Observe, Document	Observe	Participate	Schedule and Execute
Acceptance	Deficiency Log	Write	Review	Review	Correct, & Verify Completion
Acceptance	Preliminary Cx Report	Write			
Occupancy & Operation	O&M Manuals	Review & Comment			Prepare
Occupancy & Operation	Owner Training	Attend	Attend		Schedule and Conduct
Occupancy & Operation	Final Cx Report	Write			
Occupancy & Operation	Deferred Performance Tests - summer/winter tests for sequences.	Observe, Document	Observe		Schedule and Execute

5. COMPREHENSIVE COMMISSIONING

This section sequentially details the Cx process during construction by task or activity.

5.1 Overview

Comprehensive commissioning that starts at the pre-design phase of a project is the ideal approach to commissioning. Commissioning, with its quality management focus, should be part of the project from its inception because an early start provides maximum benefits.

For each phase, the required commissioning activities are listed. A detailed description of each activity and assignment of responsibility is given.

5.2 Pre-Design Phase



Commissioning activities during the pre-design phase are intended to establish commissioning as an integral part of the overall design, documentation and construction of the building.

5.2.1 Determine Commissioning Scope

After deciding to include commissioning on a project, the owner must determine the scope of commissioning – both in terms of what equipment and systems will be commissioned, and the general process to be used. These factors will determine the commissioning agency's scope of work. Owners with established in-house commissioning programs typically have a commissioning protocol and generic forms for equipment and systems to be commissioned. Owners without such a program may need prospective commissioning agencies or other advisors to present them with information on the commissioning process, its benefits and costs, and the extent to which systems on a particular project should be commissioned.

5.2.2 Owner's Project Requirements (OPR)

The designer is responsible for documenting the Owner's Project Requirements (OPR), which defines the technical design criteria required to satisfy the building's intended use and occupancy needs. The OPR continues to evolve throughout the design and construction phases to reflect changes and modifications arising from input by the owner, designers, suppliers and contractors as approved by the designer of record. Use and occupancy information comes from the owner.

The commissioning agency reviews the OPR and may provide information useful for establishing commissioning test criteria. Typical design intent information includes the following:

- Overall building and specific space usage and requirements
- Design indoor environmental conditions including:
 - Temperature,
 - Relative humidity
 - Maximum air velocity (drafts) within the occupied area
 - Outdoor ventilation air requirements
 - Air changes per hour
 - Space pressure – relative to adjacent spaces
 - Acceptable tolerances for all of the above
 - Barrier issues between adjacent spaces
 - Occupancy assumptions
- Applicable codes, standards and regulations. These must include legal requirements such as building codes, fire and life-safety regulations, and specialized equipment or system codes, but may also include owner-mandated requirements and other standards
- Energy considerations – consumption and cost goals
- Building envelope characteristics



- Service shaft and mechanical room leakage characteristics, if these are used as plenums or for airflow
- Criteria for LEED certification of green buildings
- Documentation requirements – identifies the owner’s expectations, and who will be responsible for the various types of documents.
- Facility management – information about how the building and its systems will be operated and maintained, and by whom.

5.2.3 Approve commissioning plan

The owner and his design consultants review the preliminary commissioning plan outline. Once approved, it is distributed to all members of the design team, and guides design phase commissioning activities, particularly commissioning specifications and the commissioning plan.

5.3 Design Phase

The design phase is a time to ensure that both the construction documents and the design phase commissioning plan include the information required to guide successful commissioning during subcontractor bidding and during the construction, acceptance, and post-acceptance phases. The following activities typically occur in the design phase.

5.3.1 Identify Building Energy Systems

The designer works from the concepts identified during the predesign phase to develop a schematic design. When the schematic design is approved, the owner, designer, and commissioning agency identify all building energy systems to be commissioned using the commissioning outline as a guide.

5.3.2 Design reviews

Although the designer is responsible for the entire design, projects often benefit from independent design reviews when they produce constructive suggestions for the designer’s consideration.

The commissioning agency carries out a review of design documents (drawings and specifications) as they are produced, particularly from the valuable and practical perspective of extensive field experience. Some of the review issues are:



- Balancing dampers, pressure ports, and access as needed for TAB or for observing physical responses of components during commissioning tests.
- Access for equipment maintenance and replacement.
- Barrier and inter-connection issues between buildings or spaces.
- Equipment locations and capabilities vs. occupancy needs.
- Description of each system, and its intended use.
- Flow and schematic diagrams to assist in describing more complex systems and how systems interact with one another.
- Building Automation Systems (BAS) layout; provide access to BAS data when and where required to support TAB and commissioning
- Complete and unambiguous control sequence descriptions.
- Equipment labeling requirements.
- Inclusion of design criteria and assumptions.

5.3.3 Commissioning Specifications

The designer has sole responsibility for the specifications. The commissioning agency should review the specifications to ensure inclusion of material describing the contractor's responsibilities related to commissioning. Comments and suggestions should be forwarded to the designer for his consideration.

5.3.4 Design-Phase Plan

Expanding on the pre-design outline, the commissioning agency prepares the commissioning plan based on the final design information. The commissioning plan, submitted to the owner and designer for their review, typically includes the following:

- The scope of commissioning – This section describes the overall commissioning process, and lists all equipment, systems, and interfaces to be commissioned.
- The Commissioning Team – The plan lists all members of the commissioning team, identified by individual name and corporate identity (if known) or by functional identity (e.g. general contractor, mechanical contractor, etc.) and describes their roles and responsibilities.
- Reference documents – These will include the drawings and specifications for the project. In addition, published standards or guidelines relevant to commissioning requirements will be referenced.
- Commissioning meetings – Describe the purpose and number of commissioning meetings.
- System-specific details – For each system to be commissioned, the commissioning plan will include the details listed below. The plan should also identify the required testing sequence, progressing logically from equipment, to sub-systems, to systems, to interactions between systems.



- Equipment readiness –Describe the system verification checks to be carried out prior to start-up, and include specific checklists.
- Equipment and system start-ups –Describe the step by-step start-up procedure for each system and piece of equipment. Often this information is contained in the same checklist as the system verification (or prestart) checks. If the specification requires that the manufacturer’s authorized technician perform the start-up, then the plan should require that a copy of the completed and signed manufacturer start-up form be included with the start-up checklist in the final documentation.
- Functional performance tests (FPTs) –Detail the tests needed to demonstrate correct operation under all modes of operation, and include the applicable pass/fail criteria. The commissioning agency must witness all FPTs to verify results.
- Acceptance –List the criteria for completion of the commissioning process. Typically these will include verification of functional performance for all systems, submission of TAB reports and O&M manuals, as well as other project-specific criteria. The designer bears responsibility for acceptance based on review of commissioning documentation and other relevant factors.
- O&M staff orientation and training – Describe the intended program for O&M staff orientation, training and demonstration. Training sessions should be videotaped.
- Documentation requirements – List all documentation required for the final commissioning report. The commissioning plan itself will form the basis of this documentation

5.4 Construction Phase

5.4.1 Cx Kick-off Meeting

A Cx kick-off meeting is planned and conducted by the CxA near 30% construction progress. The CxA will distribute a preliminary Cx Plan. In attendance are the respective representatives of the GC, CxA, PM, A/E, MC, EC, CC and TAB. At the meeting, Cx parties are introduced and the Cx process reviewed, management and reporting lines determined. The flow of documents, how much submittal data the CxA will receive, etc. are also being discussed. The Cx Plan is reviewed, process questions are addressed, lines of reporting and communications determined and the work products discussed. Also covered are the general list of each party’s responsibilities, who is responsible to develop the start-up checklist for each piece of equipment and the proposed Cx schedule. The outcome of the meeting is increased understanding by all parties of the Cx process and their respective responsibilities. The meeting provides the CxA additional information needed to finalize the Cx Plan.

Prior to or during this meeting, the GC shall provide all drawings and specifications and the construction schedule by trade to the CxA. The CxA keeps notes from the meeting and distributes them to each team member.

Any pertinent Cx tasks and documentation from the design phase (i.e. OPR, BoD, design reviews), will be reviewed at the Cx kick-off meeting.



5.4.2 Final Commissioning Plan

The CxA finalizes the Cx Plan using the information gathered from the kick-off meeting. The initial Cx schedule and timeline is also developed. The timeline is fine-tuned as construction progresses. In particular, prior to start-up of the primary equipment, the CxA meets with the GC and develops a detailed Cx schedule. The Cx plan is approved by the GC.

5.4.3 Site Observation

The CxA makes periodic visits to the site, as necessary, to witness and observe equipment and system installations. The GC shall provide the CxA with completed construction checklists for installation verification.

5.4.4 Meetings

The CxA attends selected planning and job site meetings in order to remain informed on construction progress and to update parties involved in Cx. The GC provides the CxA with information regarding substitutions, change orders and any Architect's Supplemental Instructions that may affect commissioned equipment, systems or the Cx schedule. The CxA may review construction meeting minutes, change orders and Architect's Supplemental Instructions for the same purpose.

Later during construction, necessary meetings between various Cx Team members will be scheduled by the CxA through the Owner and GC as required.

5.4.5 Progress and Reporting Logs

The CxA regularly communicates with all members of the Cx team, keeping them apprised of Cx progress and scheduling issues. The CxA will keep all Cx materials in an organized notebook referred to as the Cx Book.

5.4.6 Standard Submittals

The GC shall provide submittals for all equipment to be commissioned to the CxA. At a minimum, the submittals will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data and control drawings. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA shall be included by the subcontractors in their O&M manual contributions.

The CxA will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the Cx process, to the functional



performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the CM, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

5.4.7 Special Submittals, Notifications and Clarifications

The subs, GC or A/E notify the CxA of any new design intent or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems. The CC provides the CxA a full points list with details requested by the CxA. Prior to performing owner-contracted tests, the Subs provide the CxA full details of the procedures. As the phases of the test, adjust and balance are completed, the draft test, adjust and balance report is provided to the CxA with full explanations of approach, methods, results, data table legends, etc. The final test, adjust and balance report is provided to the CxA upon completion.

These submittals to the CxA do not constitute compliance for O&M manual documentation. The CxA may request additional design narratives from the A/E and from the Subs depending on the clarity of the bid document information. The O&M Manuals are the responsibility of the contractor, though the CxA will review and approve them.

5.4.8 Start-up Systems Verification Checklists “aka Pre-Functional Checklists” (SVCs)

5.4.8.1 Overview: Equipment Start-up Checklists are important to ensure the equipment and systems are hooked up and operational and that functional and performance testing may proceed without unnecessary delays. Each piece of equipment receives full Start-up checkout by the installing Contractor. In general, the start-up checklists for a given system must be successfully completed prior to formal functional and performance testing of that system.

Start-up checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some start-up checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The subs start-up checklists augment and are combined with the manufacturer’s start-up checklist.

Contractors typically already perform some, if not most or all, of the start-up checklist items the CxA will recommend. However, some contractors do not document in writing the execution of these checklist items. This project requires that the procedures be documented in writing by the installing technician. The CxA does not witness all of the start-up, except for testing of larger or more critical pieces of equipment and some spot-checking.

5.4.8.2 Execution of Checklists and Start-up



Prior to start-up, the Subs and vendors schedule start-up and initial checkout with the GC and CxA. The start-up and initial checkout are directed and executed by the Sub or vendor. If necessary, the GC and CxA observe start-up procedures for each piece of primary equipment (unless there are multiple units, and a sampling strategy is used). For components of equipment (e.g. VAV boxes), the CxA may observe a sampling of the start-up procedures.

To document the process of start-up and checkout, the site technician performing the line item task initials, dates, and checks off items/procedures on the equipment start-up checklists and manufacturer field checkout sheets, as they are completed. Only individuals having direct knowledge of a line item being completed shall check or initial the forms.

The Subs and vendors execute the checklists and tests and submit a signed copy of the completed start-up checklists to the CxA. The CxA may review start-up checklists in progress, as necessary. On smaller equipment or projects, the checklists (which all contain more than one trade's responsibility) may be passed around to the Subs to fill out. For larger projects, each trade may need a full form and the CxA will consolidate them later.



5.4.8.3 Sampling Strategy for CxA Observation of Start-up Checkout

The following table provides a tentative list of the equipment and how much of the start-up work will be witnessed by the CxA:

Systems and Major Equipment	Included in Cx Scope of Work?	Quantity to be Commissioned
Mechanical Equipment		
Air Handling Units, Fan Coil Units, Heat Pumps	Yes	1-10: 100% 11-20: 50% >20: 25%
Terminal Units (VAV)	Yes	25%
Central Plant Cooling Equipment (includes chillers, pumps, cooling tower)	Yes	100%
Exhaust Fans	Yes	25%
HVAC Controls	Yes	10%
TAB Services	Yes	10%
Chemical Treatment Systems	No	-
Electrical Equipment		
Lighting / Daylighting Controls	Yes	25%
Renewable Electrical Energy Systems	Yes	100%
Main Breakers & Distribution Panels	No	-
Emergency Power Systems	No	-
Grounding	No	-
Plumbing Systems		
Water Heaters	Yes	100%
Hot Water Pumps	Yes	50%
Domestic Water Booster Pumps	Yes	50%
Solar Thermal Hot Water Systems	Yes	
Rainwater Capture and Reuse	Yes	
Life Safety Systems		
Fire pump & jockey pump	No	-
Fire alarm system	No	-
Process Equipment, Refrigeration Equipment		
Building Envelope	No	-
Notes:		
1. Controls system operation will be primarily verified through data trending using the existing controls front-end system. If necessary, functional testing would occur during investigation phase to examine specific issues of concern.		



2. Review of TAB activities will be done with spot checking of measured values in TAB Report. Spot checking to be performed by the TAB contractor, using the measurement devices used in the initial report, and witnessed by the CxA.
3. Electrical testing services for grounding or power quality are not included as part of the base scope of work.
4. Electrical systems not included in scope of work include emergency generators, power quality, security systems, UPS, fire alarm.
5. Mechanical systems not included in commissioning activities include ductwork, fire and smoke dampers (except to the extent the FPTs check safety interfaces between these and the HVAC control system), and equipment sound & vibration measurements. Ductwork leakage testing to be performed by the contractor.
6. TLC will have access to the site for activities necessary for performance of these services.
7. The contractor and subcontractor will perform all tests and TLC shall witness tests as indicated above. The contractor shall be responsible for any damages resulting from equipment start-up or testing.

5.4.8.4 Deficiencies and Non-conformance

The Subs clearly list any outstanding items of the initial start-up checklists that were not completed successfully at the bottom of the form or on an attached sheet. The form and deficiencies are provided to the CxA within two days of test completion. The CxA works with the Subs and vendors to correct and retest deficiencies or uncompleted items, involving the GC and others as necessary. The installing Subs or vendors correct all areas that are deficient or incomplete according to the checklists and tests. The CxA recommends approval of the start-up and initial checkout of each system to the Owner and GC.

5.5 Acceptance Phase

The acceptance phase immediately follows the construction phase, and involves functional performance tests of specified systems after the completion and documentation of HVAC controls installation and TAB services.

During the acceptance phase, the owner's O&M staff receives the documentation and training necessary for effective operations and maintenance of the applicable mechanical and electrical systems. Upon completion of the events described below, the designer and the owner evaluate the systems relative to the DID and suitability for occupancy. Acceptance of systems by the owner initiates warranties required by project specifications.

Commissioning clarifies requirements by all parties for acceptance and initiation of the warranty period. These issues require careful consideration during composition of the commissioning specification and the commissioning plan.



5.5.1 Development of Functional Performance Test (FPT)

5.5.1.1 Overview: FPTs are the dynamic tests of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all of the control system's sequences of operation and components are verified to be responding as the sequences state.

The CxA develops the FPT procedures in a sequential written form, observes and documents the actual testing, which is performed by the contractor and sub-contractors.

5.5.1.2 The CxA will schedule FPTs through the GC and affected Subs. For any given system, prior to performing testing, the CxA waits until the start-up checklist has been submitted with the necessary signatures, confirming that the system is ready for functional testing. The CxA observes and documents the functional and performance testing of all equipment and systems according to the Specifications and the Cx Plan. The Subs execute the tests. The control system is tested before it is used to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional and performance testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems and finally to interlocks and connections between systems.

5.5.1.3 FPT Development Process

Before test procedures are written, the GC provides a current list of change orders affecting equipment or systems, including an updated points list, control sequences and setpoints to the CxA. The CxA develops specific FPT for each system.

FPTs and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers (provided by the CC). The CxA follows the Specifications when given and uses judgment where needed to determine which method is most appropriate. According to the Specifications, not all pieces of identical equipment receive in-depth testing. The CxA reviews owner-contracted, factory or required owner acceptance tests and determines what further testing may be required to comply with the Specifications. Redundancy is minimized. The CxA reviews and approves documentation format of these tests prior to execution, but does not develop the procedures or document their execution, unless so requested by the Owner.

5.5.2 Testing, Adjusting and Balancing



The TAB submits the outline of the test, adjust and balance plan and approach to the CxA and the CC prior to starting the test, adjust and balance. Included in the approach, is an explanation of the intended use of the building control system. The CxA reviews the plan and approach for understanding and coordination issues and may comment, but does not “approve.” The CC reviews the feasibility of using the building control system for assistance in test, adjust and balance work. The TAB submits written reports of discrepancies, contract interpretation requests and lists of completed tests to the CxA and GC. This facilitates quicker resolution of problems and will result in a more complete test, adjust and balance before functional testing begins.

Testing, adjusting, and balancing work will not begin until the controls checkout and selective functional tests have been performed and approved by the CxA.

After the testing, adjusting balancing report has been submitted, the CxA will approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation. CxA will select, at random, 10% of TAB report for spot testing. CxA will schedule and observe spot testing. TAB shall provide personnel and equipment/instruments to perform tests. The TAB shall use the same equipment/instruments (by model and serial number) that were used when original data in report were collected. Any reading that deviates more than 10% from the design values will result in rejection of the final TAB report.

5.5.3 Controls Checkout Plan

The controls contractor is responsible for documenting all aspects of the controls installation. At a minimum, the following as-built information should be included:

- Data on all components included with the controls installation, including general description, technical and applications data, and installation, calibration and maintenance information.
- Schematic diagrams of the entire controls system, in the form of laminated or framed drawings, computer graphics, or other specified formats.
- A complete points list, with records of point-to-point wiring and field device tests.
- Complete written sequences of controls for all systems, with details of final values for all parameters and set-points.
- Clearly labeled control panels and devices per specifications.
- For DDC systems, a complete set of system discs.

The CC develops and submits a written step-by-step plan to the CxA which describes the process they intend to follow in checking out the control system and the forms on which they will document the process. The CC shall also meet with the TAB prior to the start of test, adjust and balance plan to determine the capabilities of the control system for use in testing, adjusting and balancing. The CC shall provide the TAB with any necessary unique instruments for setting terminal unit boxes, etc. and instruct TAB in their use (handheld control system interface for use



around the building during testing, adjusting and balancing, etc.). The CC shall also provide a technician qualified to operate the controls to assist the TAB.

Controls checkout, calibrations, start-up and selected functional tests of the system shall be completed and approved by the CxA prior to testing, adjusting, and balancing. The controls contractor shall execute the tests and trend logs assigned to them and remain on site for executing mechanical system functional and performance tests.

5.5.4 Deficiencies and Retesting

The CxA documents the results of all FPTs test. Corrections of minor deficiencies identified are made during the tests at the discretion of the CxA. The CxA records the results of the test on the procedure or test form. Deficiencies or non-conformance issues are noted and reported to the Owner and GC. Subs correct deficiencies, and then notify the CxA of the correction. The CxA will schedule retesting through the GC and affected subs. Decisions regarding deficiencies and corrections are made at as low a level as possible, preferably between the CxA and the Sub. For areas in dispute, final authority, besides the Owner's, resides with the A/E. The CxA recommends acceptance of each test to the GC. The GC gives final approval on each test.

5.5.5 Facility Staff Participation

The Owner's facilities operating staff are encouraged to attend and participate in the testing process. The GC shall then notify the facility staff of when the Cx events will occur.

5.6 Miscellaneous Management Protocols

The following protocols will be used on this project.

<u>Issue</u>	<u>Protocol</u>
For notifying contractors of deficiencies:	The CxA documents deficiencies through the design-builder, but may discuss deficiency issues with contractors prior to notifying the design-builder.
For scheduling functional tests or training:	The CxA may provide input for training and testing, but does not do any scheduling.
For scheduling commissioning meetings:	The design-builder selects the date and schedules through the CxA
For making a request for	The CxA has no authority to issue change orders.



significant changes:

For making small changes in specified sequences of operations:

The CxA may not make changes to specified sequences without approval from the P/A AND the contractor.

Subcontractors disagreeing with requests or interpretations by the CA shall:

Try and resolve with the CxA first. Then work through the design-builder to resolve the situation. The design-builder has ultimate decision making authority.

5.6.1 Standard O&M Manuals

The CxA reviews the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the Specifications. The CxA recommends approval and acceptance of these sections of the O&M manuals to the Owner and GC. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated.

5.6.2 Commissioning Record

The CxA will compile, organize and index the following Cx data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the Owner and GC, to be included with the O&M manuals. The correspondence, meeting minutes and progress reports, miscellaneous notes, etc. kept in the Commissioning Record Book during construction will not be retained. The record manual will include a general section with the Cx plan, final Cx Report, Issues Log (record of deficiencies), and Progress Record. It will also include an equipment specific section that will be arranged by system type and include design narrative and criteria, sequences, start-up checklists and reports, and completed FT's and PT's.

5.6.3 Training and Orientation of Owner Personnel

The GC shall be responsible for training, including coordination and scheduling and ultimately for ensuring that training is completed. The CxA will be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. The GC and CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner, GC and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The GC shall communicate the results to the subcontractors and vendors who have training responsibilities.

Each subcontractor and vendor responsible for training shall submit a written training plan to the GC and CxA for review and approval prior to training. The plan will cover the following elements:



- Equipment (included in training)
- Intended audience
- Location of training
- Objectives
- Subjects covered (description, duration of discussion, special methods, etc.)
- Duration of training on each subject
- Instructor for each subject
- Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
- Instructor and qualifications

For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

The GC develops an overall training plan and coordinates and schedules, with the CM and CxA, the overall training for the commissioned systems. Video taping of the training sessions shall be provided by the GC with tapes cataloged by the GC and added to the O&M manuals.

The CxA will at the first training session present the overall system design concept and the design concept of each equipment section. This presentation will be 1 hour in length and include a review of all systems using as-built system schematics (one-line diagrams) provided by the controls contractor including hot water systems, supply air systems, exhaust systems and outside air strategies.

5.7 Post-Acceptance Phase

The commissioning process does not end until system issues are resolved to the satisfaction of the owner, and full documentation of the systems is provided. The following activities may occur after substantial completion.

5.7.1 “Off-season” FPTs

During the warranty period, seasonal testing and other deferred testing required is completed according to the Specifications. The CxA coordinates this activity through the Owner and GC. Tests are executed and deficiencies corrected by the appropriate Subs, witnessed by facilities staff and the CxA

Some commissioning tests check performance at maximum heating or cooling loads. If the project is being completed in summer, peak heating loads will be difficult to simulate; likewise for peak cooling loads in winter. Therefore, it may be necessary to defer some tests until outside



weather conditions are more suitable for achieving useful results. The commissioning agency works with the commissioning team to schedule tests when weather conditions are suitable.

System verification checks, start-ups of equipment and systems, O&M provisions, and most FPTs should occur prior to substantial completion, leaving the weather-dependent items to be performed later

5.7.2 Correct Problems and Re-test

As with earlier tests, the contractor is responsible for correcting problems, and carrying out follow-up checks necessary to confirm correct operation. The CxA is responsible for witnessing re-tests for satisfactory results. Contract documents should assign financial responsibilities for the costs associated with failed or aborted tests.

5.7.3 Near End of Warranty Walk-thru

In addition the CxA will return to the project approximately 10 months into the 12 month warranty period. During this visit(s) the CxA will review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Cx. The CxA will also interview facility staff and identify problems or concerns they have operating the building as originally intended.

The CxA will make suggestions for improvements and for recording these changes in the O&M manuals. The CxA will identify areas that may come under warranty or under the original construction contract. The CxA will also assist facility staff in developing reports and documents and requests for services to remedy outstanding problems.

6 **Final Commissioning Report**

The commissioning agency is responsible for preparing and submitting the final commissioning report to the owner and the design team. This report uses the final commissioning plan as its template. The report includes all system verification and start-up checklists, and all functional performance test checklists, completed with all test observations, problems encountered, corrective actions taken, and re-test results dated and signed by those carrying out and witnessing the tests. Where the checklists make reference to other test reports, copies of those reports must be appended. The final commissioning report should contain an executive summary addressing design intent conformance for all systems commissioned.

6.1 Summary Report

A final summary report by the CA will be provided to the PM. The report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the



commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:

- 1) Equipment meeting the equipment specifications,
- 2) Equipment installation
- 3) Functional performance and efficiency
- 4) Equipment documentation and design intent
- 5) Operator training.

All outstanding non-compliance items will be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. will also be listed. Recommendations outside the base project scope are not required to be implemented by the design-builder. Each non-compliance issue will be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment will include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

Appendices will contain acquired sequence documentation, logs, meeting minutes, progress reports, deficiency lists, site visit reports, findings, unresolved issues, communications, etc. Prefunctional checklists and functional tests (along with blanks for the operators) and monitoring data and analysis will be provided in a separate labeled binder.

The commissioning plan, the prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals, as described in the specifications.

7 Schedule

7.1 General Issues

The following sequential priorities are followed:

- Equipment is not “temporarily” started (for heating or cooling), until start-up checklist items and all manufacturer pre-start procedures are completed and moisture, dust and other environmental and building integrity issues have been addressed.
- The controls system and equipment it controls are not functionally tested until all points have been calibrated and controls checkout is completed.
- Testing, adjusting and balancing is not performed until the controls system has been sufficiently functionally tested.
- Testing, adjusting and balancing is not performed until the envelope is completely enclosed and ceiling complete, unless the return air is ducted.
- FPT’s are not begun until after start-up checklists and testing, adjusting, and balancing is completed, for a given system (this does not preclude a phased approach).



7.2 Project Schedule

The commissioning schedule for the project is listed in the table below.

Task / Activity	Estimated Start Date	Estimated End Date
Cx Kick-off Meeting	XXX	XXX
Cx Team Review and Comment of Draft CX Plan and FT's and PT's	XXX	XXX
Final Cx Plan	XXX	XXX
Submittals obtained and reviewed	XXX	XXX
Begin construction site visits/observations	XXX	XXX
Start-up checklists developed and distributed by Subs for review and comment by CxA	XXX	XXX
Finalize start-up and initial checkout plans	XXX	XXX
HVAC equipment start-up and initial checkout executed	XXX	XXX
BAS checkout	XXX	XXX
Testing, Adjusting and Balancing	XXX	XXX
TAB work verification	XXX	XXX
FPTs	XXX	XXX
O&M documentation review and verification	XXX	XXX
Training and training verification	XXX	XXX
Final Cx report	XXX	XXX
CxA Warranty period visit	XXX	XXX



SECTION 024100
DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of
 1. Designated built site elements and portions of paving.
 2. Designated building elements at existing Building A, Building B, and Auditorium, for alterations purposes.
- B. Removal/abandonment of existing utilities and utility structures.
- C. Removal and salvage of identified items and materials, and removal of resulting rubbish and debris.

1.02 RELATED REQUIREMENTS

- A. Section 003100 - Available Project Information: Information relating to existing surface and subsurface conditions and structures, including but not limited to the following:
 1. Geotechnical Report.
 2. Lead-Based Paint Report.
 3. Final Air Clearance Testing Results (Phase 1 Demolition)
 4. Structural Condition Review Report.
 5. Concrete Examination Report.
 6. Indoor Air Quality Report.
- B. Section 015000 - Temporary Facilities and Controls: Temporary facilities and controls required for compliance with regulatory requirements, including but not limited to:
 1. Pedestrian protection.
 2. Preventing the accumulation of water or damage to any foundations on the premises.
 3. Disconnecting and capping utilities.
- C. Section 015300 - Temporary Barriers and Enclosures: Temporary construction barriers, enclosures and passageways.
- D. Section 015400 - Construction Aids: Temporary lifts and hoists; debris chutes; temporary stairs and ramps; and scaffolding and work platforms.
- E. Section 015713 - Temporary Erosion and Sediment Control:
 1. Prevention of erosion due to construction and demolition activities.
 2. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
 3. Restoration of areas eroded due to insufficient preventive measures.
- F. Section 017419 - Construction Waste Management: Limitations on disposal of removed materials; requirements for recycling.
- G. Division 31 - Earthwork: Site clearing, grading, and fill.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. Florida Building Code, 2010 edition (FBC).
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-EB -- Florida Building Code, Existing Building.
- C. Florida Fire Prevention Code, 2010 edition (FFPC).
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 1(FL) -- Fire Code, Florida Edition (including State of Florida revisions adopted per FFPC).
 - 2. NFPA 101(FL) -- Life Safety Code, Florida Edition (including State of Florida revisions adopted per FFPC).
 - 3. NFPA 241 -- Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- E. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1926 -- U.S. Occupational Safety and Health Standards.
 - a. 29 CFR 1926.1101 -- Asbestos.
 - 2. 40 CFR 61 -- National Emission Standards for Hazardous Air Pollutants (NESHAP).
 - a. 40 CFR 61 Subpart M -- National Emission Standards for Asbestos.
- F. U.S. Environmental Protection Agency (EPA).

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Work Plan: Describe the demolition and salvage procedures proposed for the accomplishment of the work.
 - 1. Identify areas for temporary construction and field office, and for temporary and permanent placement of removed materials.
 - 2. Indicate extent of demolition, removal sequence, and location and construction of barricades and fences.
 - 3. Include a summary of safety procedures.
 - 4. Include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Building demolition, selective demolition, and salvage work shall comply with applicable federal, state and local regulatory requirements, including but not limited to FBC-B SECTION 3303, FBC-EB CHAPTERS 11 and 14, FBC-EB

APPENDIX B, and NFPA 1(FL) CHAPTER 16.

1. Demolition Documents: Demolition documents, asbestos removal documents, and a schedule for demolition must be submitted when required by the building official.
 - a. When such information is required, no work shall be done until the documents and schedule are approved.
2. Pedestrian Protection: The work of demolishing existing building shall not be commenced until pedestrian protection is in place as required by governing building code and authority having jurisdiction.
 - a. Pedestrian protection shall comply with requirements of FBC-B SECTION 3306 and FBC-EB SECTIONS 1402 and 1403.
 - b. For additional requirements, refer to Section 015000 - Temporary Facilities and Controls and Section 015300 - Temporary Barriers and Enclosures.
3. Water Accumulation: Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.
4. Utility Connections: Service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.
5. Identification and Abatement of Asbestos-Containing-Materials:
 - a. Contractor shall employ a qualified Florida-licensed Asbestos Consultant, who shall be responsible for conducting an asbestos survey, developing an operation and maintenance plan, monitoring and evaluating asbestos abatement, and preparing asbestos abatement specifications.
 - b. Contractor shall employ a qualified Florida-licensed Asbestos Contractor, who shall be responsible for conducting asbestos abatement work in accordance with the asbestos abatement specifications developed by the Asbestos Consultant.
 - c. Work performed under this contract shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding identification, handling, storing, transporting, and disposing of asbestos waste materials.
 - (1) Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work.
 - (2) Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.
 - d. Demolition activities shall be conducted in accordance with 40 CFR 61 (NESHAP).
 - e. Contractor personnel who perform demolition activities must comply with the OSHA construction standard for Occupational Exposure to Asbestos (29 CFR 1926.1101) and other applicable federal, state and local requirements; and a NESHAP competent person must be present on the project during demolition to note changes in the condition of ACM impacted during wet demolition.
 - f. Asbestos Contractor and Contractor shall comply with State of Florida and City of Key West Building/Licensing Department requirements for permitting and for notification of intent to renovate or demolish.
6. Identification and Abatement of Lead-Based Paint (LBP) Materials:

- a. Contractor shall employ a qualified Lead-Based Paint Risk Assessor, who shall be responsible for conducting a lead-based paint (LBP) survey, developing an operation and maintenance plan, monitoring and evaluating LBP abatement, and preparing LBP abatement specifications.
 - b. Contractor shall conduct Lead-Based Paint (LBP) abatement work in accordance with the LBP abatement specifications developed by the EPA LBP Risk Assessor.
 - c. Work performed under this contract shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding identification, handling, storing, transporting, and disposing of lead-based paint (LBP) waste materials.
 - (1) Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work.
 - (2) Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.
 - d. Contractor shall comply with State of Florida and City of Key West Building/Licensing Department requirements for permitting and for notification of intent to renovate or demolish.
7. Identification and Remediation of Mold Materials:
- a. Contractor shall employ a qualified Mold Assessor, who shall be responsible for conducting a mold survey, developing an operation and maintenance plan, monitoring and evaluating mold remediation, and preparing mold remediation specifications.
 - b. Contractor shall conduct mold remediation work in accordance with the mold remediation specifications developed by the Mold Assessor.
 - c. Work performed under this contract shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding identification, handling, storing, transporting, and disposing of mold waste materials.
 - (1) Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work.
 - (2) Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.
 - d. Contractor, Mold Assessor, and Mold Remediator shall comply with State of Florida and City of Key West Building/Licensing Department requirements for permitting and for notification of intent to renovate or demolish.
- B. Demolition Contractor Qualifications: Company specializing in the type of work required.
- 1. Minimum of 5 years of documented experience.
- C. Asbestos Consultant Qualifications: Person or business organization who holds a current, valid, active Asbestos Consultant license issued by the Florida Department of Business and Professional Regulation in accordance with Section 469 Florida Statutes.
- D. Asbestos Contractor Qualifications: Person or business organization who holds a

current, valid, active Asbestos Contractor license issued by the Florida Department of Business and Professional Regulation in accordance with Section 469 Florida Statutes; and who is approved by State of Florida and City of Key West Building/Licensing Department as qualified to perform the asbestos abatement work required for this project.

- E. Lead-Based Paint Assessor: Person who holds a current certificate as an EPA Lead-Based Paint Risk Assessor, and who is certified by the EPA to conduct LBP activities in the State of Florida.
- F. Mold Assessor: Person who holds a current, valid, active Florida license as a Mold Assessor and carries the minimum State-required Errors & Omissions and Liability insurance.
- G. Mold Remediator: Person who holds a current, valid, active Florida license as a Mold Remediator and carries the minimum State-required Errors & Omissions and Liability insurance.
- H. Demolition and salvage procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged or recycled, dust control, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials to be salvaged or recycled shall be stored daily in areas and manner specified by the Architect and Owner's Representative.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Erosion and Sedimentation Control: Refer to Section 015713 - Temporary Erosion and Sediment Control.
- B. Dust Control: The amount of dust resulting from removal, salvage and demolition operations shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area.
 - 1. Use of water to control dust will not be permitted when it will result in, or create, damage to existing building materials and hazardous or objectionable conditions such as flooding or pollution.

1.07 PROTECTION

- A. General:
 - 1. Before beginning any removal, salvage or demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work.
 - 2. The Contractor shall take necessary precautions to avoid damage to existing items that are to remain in place, to be reused, or to remain the property of the Owner.
 - 3. Items damaged by the Contractor shall be repaired and restored to original condition, or replaced, as approved by the Architect.
 - 4. The Contractor shall coordinate the work of this section with all other work, and shall construct and maintain shoring, bracing and supports, as required.

5. The Contractor shall ensure that structural elements are not overloaded and shall provide additional supports as may be required as a result of any cutting, removal, or demolition work performed under this Contract.
- B. Protection from Weather:
1. Salvageable materials shall be protected from the weather at all times.
 2. Salvaged materials shall be stored out of contact with the ground and under weather-tight covering.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Material: Refer to Division 31 - Earthwork.

PART 3 - EXECUTION

3.01 SCOPE

- A. Building Demolition: As indicated on drawings.
- B. Items designated to be removed for salvage:
- a. T&G Wood plank/strip floor and roof deck lumber.
 - b. Wood framing (floors, walls, ceilings) and truss lumber.
 - c. Five (5) historic steel windows
 - d. Any other item or building element which is uncovered and subsequently deemed to be a contributing feature to the existing Historic structure, as directed by Architect.
- B. Asbestos abatement, including but not limited to: asbestos survey, sampling and analysis of suspected asbestos-containing-materials; development of an operation and maintenance plan; preparation of asbestos abatement plans and specifications; notification and permitting related to asbestos abatement; monitoring and evaluation of asbestos abatement work; and removal of asbestos-containing-materials.
1. Upon receipt of Notification to Proceed, Contractor shall file all notices to applicable regulatory agencies and obtain all required permits to perform asbestos abatement work.
 - a. Contractor shall submit to Architect and Owner's Representative a notarized affidavit stating that notifications have been sent to the applicable regulatory agencies, as well as a copy of the notification of asbestos abatement.
 - b. Upon commencement of work, Contractor shall complete the asbestos abatement within the time specified in the contract and schedule of work of the project.
- C. Lead-based paint removal.
- D. Mold remediation.
- E. Remove paving and curbs as required to accomplish new work.
- F. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- G. Outside area of new construction, remove foundation walls and footings to a minimum

of 2 feet below finished grade.

- H. Remove concrete slabs on grade as indicated on drawings.
- I. Remove other items indicated, for salvage, relocation, and recycling.
- J. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Architect or Owner's Representative.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- E. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 017419 - Construction Waste Management.

2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 IDENTIFICATION AND REMOVAL OF ASBESTOS-CONTAINING-MATERIALS

- A. Asbestos Consultant shall develop an operation and maintenance plan, prepare asbestos abatement plans and specifications, and monitor and evaluate asbestos abatement.
 1. Based on the results of a limited asbestos inspection, the presence, extent, and condition of asbestos-containing-materials to be abated are described in the “Asbestos-Containing Materials Report” attached to Section 003100 - Available Project Information.
 2. For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, Contractor shall order Asbestos Consultant to perform additional survey, sampling and analysis services. When such additional analysis indicates the presence of asbestos containing materials, Contractor shall order the Asbestos Consultant to revise or develop additional asbestos abatement plans and specifications, and shall submit same to State of Florida and City of Key West Building/Licensing Department.
- B. Asbestos Contractor shall conduct asbestos abatement work in accordance with the asbestos abatement plans and specifications developed by the Asbestos Consultant.
- C. Identification and removal of asbestos-containing-materials shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations including but not limited to:
 1. Rule 62-257, Florida Administrative Code.
 2. Section 376.60, Florida Statutes.
 3. 40 CFR 61 Subpart M.
 4. Florida Department of Environmental Protection (DEP), Division of Air Resources Management.

3.04 IDENTIFICATION AND REMOVAL OF LEAD-BASED PAINT (LBP) MATERIALS

- A. Lead-Based Paint Assessor shall develop an operation and maintenance plan, prepare LBP abatement plans and specifications, and monitor and evaluate LBP abatement.
 1. Based on the results of a limited LBP survey, the presence, extent, and condition of LBP-materials to be abated are described in the “Lead-Based Paint Report” attached to Section 003100 - Available Project Information.
 2. For any previously untested building components suspected to contain LBP and located in areas impacted by the work, Contractor shall order Lead-Based Paint Assessor to perform additional survey, sampling and analysis services. When such additional analysis indicates the presence of LBP materials, Contractor shall order the Lead-Based Paint Assessor to revise or develop additional LBP abatement plans and specifications, and shall submit same to State of Florida and City of Key West Building/Licensing Department.
- B. Contractor shall conduct LBP abatement work in accordance with the LBP abatement plans and specifications developed by the Lead-Based Paint Assessor.

- C. Identification and removal of LBP materials shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations.

3.05 IDENTIFICATION AND REMOVAL OF MOLD

- A. Mold Assessor shall develop an operation and maintenance plan, prepare mold remediation plans and specifications, and monitor and evaluate mold remediation
 - 1. Based on the results of a limited mold survey, the presence, extent, and condition of mold materials to be remediated are described in the “Indoor Air Quality Report” attached to Section 003100 - Available Project Information.
 - 2. For any previously untested building components suspected to contain mold and located in areas impacted by the work, Contractor shall order Mold Assessor to perform additional survey, sampling and analysis services. When such additional analysis indicates the presence of mold materials, Contractor shall order the Mold Assessor to revise or develop additional mold remediation plans and specifications, and shall submit same to State of Florida and City of Key West Building/Licensing Department.
- B. Contractor shall conduct mold remediation work in accordance with the mold remediation plans and specifications developed by the Mold Assessor.
- C. Identification and removal of mold materials shall comply with applicable federal, state, and local laws, ordinances, criteria, rules and regulations.

3.06 SALVAGED ITEMS

- A. Salvage items shall include items designated for careful removal, and:
 - a. storage and reinstallation in the finished Work; or
 - b. transportation and delivery to storage location as directed by Owner’s Representative.
- B. Prior to any demolition work, designated salvage items shall be removed from the existing structure.
- C. Removal of salvageable items shall be accomplished by hand labor to the maximum extent possible. Care shall be taken to not damage portions of the existing structure to remain or items identified for salvage.
- D. Maintain a complete recording of all salvaged materials including the condition of such materials before, and after, salvage operations.

3.07 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Architect, Owner’s Representative and Authorities Having Jurisdiction.

- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Architect, Owner's Representative.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.08 SELECTIVE DEMOLITION FOR 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 shown.
 - 2. Report discrepancies to Consultant before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- C. 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.
 - 4. Patch as specified for patching new work.

3.09 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 017419 - Construction Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 030100
MAINTENANCE OF CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of existing concrete surfaces.
- B. Repair of exposed structural, shrinkage, and settlement cracks.
- C. Resurfacing of concrete surfaces having spalled areas and other damage.
- D. Repair of deteriorated concrete.
- E. Repair of internal concrete reinforcement.
- F. Scope of Work: As indicated on the drawings.

1.02 RELATED REQUIREMENTS

- A. Section 013515 - LEED Certification Procedures.
- C. Section 014000 - Quality Requirements: Procedures for testing and certifications.
- D. Section 015721 - Indoor Air Quality Controls: Procedures and testing; LEED requirements.
- E. Section 016116 - Volatile Organic Compound (VOC Content Restrictions).
- F. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.
- G. Section 039300 - Externally Bonded Carbon Fiber Reinforced Polymer Strengthening.
- H. Section 099620 - High Performance Coating For Cisterns.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI):
 - 1. ACI 201.1R -- Guide for Conducting a Visual Inspection of Concrete in Service.
 - 2. ACI 224.1R -- Causes, Evaluation, and Repair of Cracks in Concrete Structures.
 - 3. ACI 301 -- Specifications for Structural Concrete.
 - 4. ACI 304R -- Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 5. ACI 318 -- Building Code Requirements for Structural Concrete and Commentary.
 - 6. ACI 347 -- Guide to Formwork for Concrete.
 - 7. ACI 364.1R -- Guide for Evaluation of Concrete Structures Before Rehabilitation.
 - 8. ACI 437R -- Strength Evaluation of Existing Concrete Buildings.
 - 9. ACI C-10 -- Repair and Rehabilitation of Concrete Structures.
 - 10. ACI C-20 -- Repair and Rehabilitation II.
 - 11. ACI SP-66 -- ACI Detailing Manual.
- C. American Society for Testing and Materials (ASTM):

1. ASTM A82/A82M -- Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A615/A615M -- Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
3. ASTM C33/C33M -- Standard Specification for Concrete Aggregates.
4. ASTM C150/C150M -- Standard Specification for Portland Cement.
5. ASTM C404 -- Standard Specification for Aggregates for Masonry Grout.
6. ASTM C823/C823M -- Standard Practice for Examination and Sampling of Hardened Concrete in Constructions.
7. ASTM C882 -- Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
8. ASTM C928/C928M -- Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Material for Concrete Repairs.
9. ASTM C1059/C1059M -- Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
10. ASTM D638 -- Standard Test Method for Tensile Properties of Plastics.
11. ASTM D695 -- Standard Test Method for Compressive Properties of Rigid Plastics.

D. American Welding Society (AWS):

1. AWS D1.4/D1.4M -- Structural Welding Code - Reinforcing Steel.

1.04 SUBMITTALS

A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Shop Drawings: Submit detail drawings, conforming to ACI SP-66 and ACI 318, and showing location of architectural concrete elements in the work, building elevations, formwork fabrication details, reinforcements, embedments, dimensions, concrete strength, interface with adjacent materials, and special placing instructions, in sufficient detail to cover fabrication, placement, stripping, and finishing.

D. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

E. LEED Submittals: Collect and submit Product Data for each VOC-restricted product used in the project as required for completing the applicable LEED Credit Template.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design reinforcement splices under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State of Florida.

B. Contractor Qualifications: Company specializing in performing preparation, repair and

restoration of concrete in historic structures, with at least five years of experience.

C. Formwork Design: Formwork design shall conform to ACI 301 and ACI 347.

1.06 MOCK-UP(S)

- A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.
- B. Crack Injection: Prepare one sample of each type of injection.
- C. Vertical Surface Repair: Total of 10 foot (3 m) square area, demonstrating each type of repair.
- D. Where color or texture matching is required, first prepare a small size sample on cementitious board.
- E. Locate mock-up(s) where directed.
- F. Re-work mock-up(s) until satisfactory to Architect.
- G. Satisfactory mock-up(s) may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
- B. Dayton Superior Corporation: www.daytonsuperior.com.
- C. Prospec, an Oldcastle brand: www.prospec.com.
- D. Sika Corporation: www.sikaconstruction.com.
- E. SpecChem, LLC: www.specchemllc.com.
- F. W.R. Meadows, Inc.: www.wrmeadows.com.

2.02 CLEANING MATERIALS

- A. Degreaser:
 - 1. Products:
 - a. SpecChem "Citrus Cleaner".
 - b. W.R. Meadows "Ultrite Degreaser".
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Detergent: Non-ionic detergent.
- C. Blasting Medium: Use only abrasive media that have been proven not to damage concrete by testing on mock-up.

2.03 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

- A. Bonding Slurry: Water-based latex admixture complying with ASTM C1059/C1059M, combined with Portland cement and sand in accordance with admixture manufacturer's instructions.
 - 1. Admixture Products:
 - a. SpecChem “Acrylic Bonder”.
 - b. W.R. Meadows “Acry-lok”.
 - c. Substitutions: See Section 016000 - Product Requirements.

- B. Cementitious Resurfacing Mortar: One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.
 - 1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
 - 2. Integral corrosion inhibitor.
 - 3. Nominal Thickness: 1/8 inch (3 mm).
 - 4. Color: Light gray.
 - 5. Products:
 - a. Prospec “CR Concrete Resurfacer”.
 - b. SpecChem “Duo Patch”.
 - c. W.R. Meadows “Parge-All AF” or “Meadow-Patch T2”.
 - d. Substitutions: See Section 016000 - Product Requirements.

- C. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
 - 1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
 - 2. Dry Material: ASTM C928/C928M.
 - 3. Integral corrosion inhibitor.
 - 4. Products:
 - a. SpecChem “RepCon V/O.” or “Duo Patch”.
 - b. W.R. Meadows “Meadow-Crete GPS”.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.04 EPOXY PATCHING AND REPAIR MATERIALS

- A. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; conform to pot life and workability limits.
 - 1. Products:
 - a. SpecChem “SpecPoxy 1000”, “SpecPoxy 2000”, “SpecPoxy 3000”, or “SpecPoxy 3000 FS”.
 - b. W.R. Meadows “Rezi-Weld Gel Paste”, “Rezi-Weld Gel Paste State”, “Rezi-Weld 1000”, “Rezi-Weld 1000 State”, “Rezi-Weld LV”, or “Rezi-Weld LV State”.
 - c. Substitutions: See Section 016000 - Product Requirements.

- B. Epoxy Injection Adhesive:
 - 1. Products:
 - a. SpecChem “SpecPoxy 1000”.
 - b. W.R. Meadows “Rezi-Weld LV”, “Rezi-Weld LV State”, “Rezi-Weld (IP)”, or

“Rezi-Weld Gel Paste”.

- c. Substitutions: See Section 016000 - Product Requirements.
- C. Epoxy Bonding Adhesive: Non-sag, two-part, 100 percent solids.
 - 1. Bond Strength (ASTM C882): 2,000 psi (13.8 MPa), minimum.
 - 2. Tensile Strength (ASTM D638): 6,600 psi (45 MPa), minimum.
 - 3. Percent Elongation (ASTM D638): 2 percent at 7 days at 70 degrees F (21 degrees C).
 - 4. Compressive Strength (ASTM D695): 10,000 psi (69 MPa), minimum.
 - 5. Products:
 - a. SpecChem “SpecPoxy 2000”.
 - b. W.R. Meadows “Rezi-Weld Gel Paste State”, “Rezi-Weld 1000”, or “Rezi-Weld 1000 State”.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.05 ANCILLARY MATERIALS

- A. Anchoring Adhesive: Self-leveling or non-sag, as applicable.
 - 1. Products:
 - a. Self-Leveling Epoxy:
 - (1) SpecChem “SpecPoxy 2000”.
 - (2) W.R. Meadows “Rezi-Weld 1000”, “Rezi-Weld 1000 State”, “Rezi-Weld (IP)”, or “Rezi-Weld 3/2”.
 - (3) Substitutions: See Section 016000 - Product Requirements.
 - b. Non-Sag Epoxy:
 - (1) SpecChem “SpecPoxy 3000”, or “SpecPoxy 3000 FS”.
 - (2) W.R. Meadows “Rezi-Weld Gel Paste”, or “Rezi-Weld Gel Paste State”.
 - (3) Substitutions: See Section 016000 - Product Requirements.
- B. Primer/Bonding Agent: Type compatible with and specifically designed for use with applicable mortar, and recommended by mortar manufacturer.
- C. Portland Cement: ASTM C150/C150M, Type I, grey.
- D. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.
- E. Water: Clean and potable.
- F. Reinforcing:
 - 1. Steel: Refer to Section 033000 - Cast-In-Place Concrete.
 - 2. CFRP: Refer to Section 039300 - Externally Bonded Carbon Fiber Reinforced Polymer Strengthening
- G. Stirrup Steel: ASTM A82/A82M.

PART 3 - EXECUTION

3.01 GENERAL

- A. Concrete repair and renovation work shall be undertaken only after a complete evaluation and analysis of the areas to be repaired is completed, including sampling and testing of the existing concrete to determine its composition and qualities.

- B. Materials and procedures used for cleaning, repair, and renovation of historic character defining concrete elements and surfaces shall conform to recommendations of FBC-EB APPENDIX B.
 - 1. Historic character defining concrete elements and surfaces are defined as being a component part of the building's exterior envelope, except as otherwise indicated.
- C. Verify that surfaces are ready to receive work.
- D. Beginning of installation means acceptance of substrate.

3.02 EXAMINATION

- A. Evaluation and Analysis of Existing Concrete:
 - 1. A condition survey of the area to be repaired shall conform to ACI 201.1R and ACI 364.1R.
 - 2. Strength evaluation shall be in accordance with ACI 437R.
 - 3. Cracks shall be evaluated in accordance with ACI 224.1R.
 - 4. Examination and sampling procedures shall conform to ASTM C823/C823M.

3.03 PREPARATION OF CONCRETE SURFACES

- A. Cleaning - General:
 - 1. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
 - a. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
 - b. Clean out cracks and voids using same methods.
 - 2. The following are acceptable cleaning methods, in order from gentlest to less gentle:
 - a. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
 - b. Adding detergent to washing water; with final water rinse to remove residual detergent.
 - c. Steam-generated low-pressure hot-water washing.
 - d. Abrasive Blasting: Use only abrasive media that have been proven not to damage concrete by testing on mock-up.
 - 3. Do not use any of the following cleaning methods, unless otherwise indicated:
 - a. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
 - b. Soap or detergent that is not non-ionic.
 - c. Sandblasting using dry or wet abrasive media that permanently erodes the surface of the material and accelerates deterioration.
 - d. Cleaning with chemical products that will damage concrete, or leaving chemicals on masonry surfaces.
 - e. Applying high pressure water cleaning methods that will damage historic concrete surfaces, details, or joints.
- B. Initial Surface Cleaning:
 - 1. The cleaning materials, equipment, and methods shall not result in staining, erosion, marring, or other damage to the surfaces of the structure.

2. Demonstrate the materials, equipment, and methods proposed for use in cleaning in a 3 x 3 foot (1 x 1 m) square test section.
 3. The location of the test section, and the completed test section shall be subject to approval.
 4. The cleaning process shall be adjusted as required and the test section rerun until an acceptable process is obtained.
 5. Following an initial inspection and evaluation of the structure and surfaces, give the structure an initial surface cleaning to be completed prior to start of excavation, and sampling and testing for mixtures.
 6. The initial cleaning shall provide for the complete cleaning of all exterior concrete surfaces of the structures.
 7. The initial cleaning shall thoroughly clean the concrete surface to remove all traces of moss, dirt, and other contaminants.
 8. The cleaning shall provide a clean concrete surface to allow determination of the concrete's color and shades, finish and texture, and other properties.
 9. The "initial cleaning" shall consist of initial surface washing, followed by treatment with the cleaning solution, and then followed by a final water rinse.
 10. The initial surface washing shall consist of washing the surface with clean, low pressure water (pressure of less than 55 psi (0.38 MPa) and 2.5 to 3 gpm (9.5 to 11.4 L/minute) discharge) and manual surface scrubbing using handheld natural or plastic bristle brushes, followed by a clean water rinse.
 11. Following completion of the initial surface washing of the entire structure (or side of structure) dry the concrete prior to application of the cleaning solution.
 12. The concrete surfaces of the structure shall be coated with the cleaning solution at an application rate of 1 gal (3.8 L) of solution per 10 to 30 square feet (1 to 3 square meters) of treated surface using low pressure spraying equipment.
 13. Adjust the application rate of the solution as directed to ensure that the entire surface has been thoroughly wetted with the solution.
 14. Use a manual surface scrubbing with handheld natural or plastic bristle brushes on heavily soiled areas.
 15. Following treatment with the cleaning solution, rinse the treated surfaces with clean, low-pressure water.
 16. Water and all liquid materials used in the work shall be contained at the building perimeter and collected and disposed of in an approved manner.
- C. Areas to be Removed:
1. Remove unsound, weak, or damaged concrete. Loose particles, laitance, spalling, cracked, or debonded concrete and foreign materials shall be removed with hand tools unless otherwise noted.
 2. Protect surfaces of the structure, and surfaces adjacent to the excavation from damage which may result from excavation, cleaning, and patching operations.
- D. Exposed Reinforcement:
1. Remove concrete from around exposed or deteriorated reinforcing steel.
 2. Steel shall stand free of concrete at least 1 inch (25 mm) minimum to provide mechanical bond with patch material.
- E. Excavation in Concrete:

1. Excavate deteriorated areas indicated to be repaired to sound concrete.
2. The use of concrete and masonry saws for outlining the excavation shall not be allowed.
3. Accomplish the excavation by means of manual methods and low-energy, handheld equipment.
4. The sides of the excavation shall be approximately perpendicular to the exposed surface, dovetailed back 15 degrees from perpendicular to the exposed surface at the bottom in order to key in the patch.
5. The bottom (or back) of the excavation shall be approximately parallel with the exposed surface of the patch.
6. The surfaces of the excavation shall be finished to remove excessive variations and roughness and shall be shaped to provide a patch with uniform dimensions.
7. Feathering at edges is not permitted.
8. The excavation shall be accomplished to minimize the appearance of bond lines between the patch and the adjacent concrete and other abutting surfaces.
9. Protect surfaces of the structure and surfaces adjacent to the excavation from damage which may result from excavation operations.

F. Cleaning of Excavations:

1. Clean the surfaces of the excavation by water blasting and manual scrubbing methods. Sandblasting shall not be used to clean concrete surfaces.
2. The surfaces of excavations shall be cleaned of dust, dirt, laitance, corrosion, or other contamination.
3. Cracks and voids shall be flushed out with clean water and allowed to dry.
4. Concrete surfaces to be in contact with the freshly placed concrete shall be maintained in a continuously damp condition for at least 24 hours prior to concrete placement.
5. Immediately before placement, areas to be patched shall be cleaned and rinsed, followed by blowing dry with filtered, dry, compressed air to remove excess water, and to provide a surface in a saturated, surface-dry, damp condition.
6. Protect surfaces of the structure and surfaces adjacent to the excavation from damage which may result from cleaning operations.

G. Previously Repaired Cracks:

1. Remove old caulking or grout from previously repaired cracks where it is failing.
2. Remove loose particles from cracks.
3. Cracks shall be cleaned, rinsed with water followed by blowing with filtered, dry, compressed air.

3.04 CLEANING AND REPAIR OF REINFORCING STEEL

A. Cleaning:

1. Exposed reinforcing steel shall be mechanically cleaned to bare metal.
2. Paint exposed steel in areas to be patched with two coats of zinc-rich primer paint.

B. Repairing:

1. Notify the Architect of any reinforcing steel members which have significant loss in cross-sectional area due to corrosion, cutting, or other damage.
2. Damaged portions shall be mechanically cut away.

- a. Install reinforcing steel to match existing, where existing reinforcing is badly corroded or damaged.
- b. Lap splices shall be as required by code. If necessary, fasten bars with tie wires.

3.05 CONCRETE STRUCTURAL MEMBER REPAIR

- A. See the drawings for specific areas to be repaired.
- B. Remove broken and soft concrete at least 1/4 inch (6 mm) deep.
- C. Mechanically cut away damaged portions of reinforcement.
- D. Remove corrosion from steel and clean mechanically.
- E. Blast clean remaining exposed reinforcement surfaces.
- F. Repair by welding new bar reinforcement to existing reinforcement using sleeve splices.
 1. Perform welding work in accordance with AWS D1.4/D1.4M.
 2. Make welded sleeve splices to achieve strength to exceed strength of new reinforcement.
- G. Cover exposed steel reinforcement with epoxy mortar.
- H. Work epoxy mortar into broken surface and build up patch to match original.
- I. Feather edges of repairs flush to sound surface and trowel surface to match surrounding area.

3.06 CRACK REPAIR USING EPOXY ADHESIVE INJECTION

- A. Repair exposed cracks.
- B. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.
- C. Inject adhesive into ports under pressure using equipment appropriate for particular application.
- D. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.
- E. Remove temporary seal and excess adhesive.
- F. Clean surfaces adjacent to repair and blend finish.

3.07 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

- A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.
- B. Apply coating of bonding agent to entire concrete surface to be repaired.
- C. Fill voids with cementitious mortar flush with surface.
- D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch (6 mm) over

entire surface, terminating at a vertical change in plane on all sides.

- E. Trowel finish to match adjacent concrete surfaces.
- F. Damp cure for four days.

3.08 FORMWORK ERECTION

- A. Erect formwork in accordance with the detail drawings to ensure that the finished concrete members conform accurately to the indicated dimensions, lines, elevations, and finishes.
- B. Deflection shall not exceed 1/360th of each component span or distance between adjacent supports.
- C. Deflections and tolerance shall not be cumulative.
- D. Install form liners as necessary to provide the required finish.
- E. Forms shall be coated with form release agents before reinforcement is placed.

3.09 CONCRETE REPAIRS

- A. General:
 - 1. Accomplish repairs in accordance with ACI C-10, ACI C-20, ACI 301, and ACI 304R.
 - 2. Repair cracks, if required, in accordance with ACI 224.1R.
 - 3. Detailing shall be in accordance with ACI SP-66.
 - 4. Repaired surfaces shall match adjacent existing surfaces in all respects.
 - 5. Provide formwork, as necessary to reconstruct concrete to match adjacent surfaces. Voids shall be filled flush with adjacent surfaces. Use all products in accordance with the manufacturer's instructions.
 - 6. Provide formwork, as necessary to reconstruct concrete to match adjacent surfaces.
 - 7. Voids shall be filled flush with adjacent surfaces.
 - 8. Use all products in accordance with the manufacturer's instructions.
- B. Spalls:
 - 1. Spalls less than 1 inch (25 mm) deep, where indicated to be repaired, shall be drypacked with an approved patching mortar.
 - 2. Spalls greater than 1 Inch (25 mm) deep shall be excavated and patched with concrete.
- C. Patch Anchors:
 - 1. Surface areas to be patched, which do not have reinforcement or other metal embedments to be placed in the patching concrete and mortar, shall be provided with patch anchors to ensure that the patch is tied to the existing concrete structure.
 - a. Provide patch anchors within the excavation at a frequency of at least one patch anchor per square foot (0.10 square meter) of patch plan surface area; specific locations for patch anchors shall be as indicated.
 - b. Use small handheld, low-speed rotary masonry drills to produce holes in the existing concrete, within the limits of the excavations for the patch anchor installation.
 - 2. Holes:

- a. Drill holes into the existing concrete substrate material of the excavation using rotary (non-hammer) drills.
 - b. Holes shall have a diameter 1/8 inch (3.2 mm) larger than the anchor diameter.
 - c. The holes shall be drilled to a depth of 4 inch (100 mm), except as otherwise indicated or directed.
 - d. Drill holes shall be produced to ensure that the holes do not penetrate completely through the concrete, and will provide at least 1 inch (25 mm) of cover around the drill hole.
 - e. Holes shall be cleaned by water blasting to remove drill dust and other debris and then blown dry with filtered, dry, compressed air.
 - f. Drill holes shall be conditioned in accordance with the epoxy adhesive manufacturer's recommendations
3. Anchor Installation:
 - a. Clean anchors to remove all contaminants which may hinder epoxy bond.
 - b. Epoxy adhesive shall be pressure injected into the back of the drilled holes.
 - c. The epoxy shall fill the holes so that when the anchors are inserted, the epoxy completely fills the holes and excess epoxy is not exuded from the holes.
 - d. Insert anchors immediately into the holes.
 - e. The anchors shall be set back from the exterior face at least 1 inch (25 mm)
 4. Clean-up:
 - a. Remove excess epoxy and spills from the surface of the excavation, leaving it in a clean and uncontaminated condition.
 - b. Spills on adjacent surfaces shall also be removed and surfaces repaired as required.
- D. Mixing Epoxy-Resin Grout Components:
1. General:
 - a. Mix epoxy-resin grout components in the proportions recommended by the manufacturer.
 - b. The components shall be conditioned from 70 to 85 degrees F (20 to 30 degrees C) for 48 hours prior to mixing.
 - c. Mix the two epoxy components with a power-driven, explosion-proof stirring device in a metal or polyethylene container having a hemispherical bottom.
 - d. The polysulfide curing agent component shall be added gradually to the epoxy-resin component with constant stirring until a uniform mixture is obtained.
 - e. The rate of stirring shall be such that the entrained air is at a minimum.
 2. Tools and Equipment: Tools and equipment used further in the work shall be thoroughly cleaned before the epoxy-resin grout sets.
 3. Health and Safety Precautions:
 - a. Provide full-face shields for all mixing, blending, and placing operations as required and protective coveralls and neoprene-coated gloves for all workers engaged in the operations.
 - b. Supply protective creams of a suitable nature for the operation.
 - c. Maintain adequate fire protection at all mixing and placing operations.
 - d. Smoking or the use of spark- or flame-producing devices shall be prohibited within 50 feet (15 m) of mixing and placing operations.
 - e. The mixing, placing, or storage of epoxy-resin grout or solvent shall be

prohibited within 50 feet (15 m) of any vehicle, equipment, aircraft, or machinery that could be damaged from fire or could ignite vapors from the material.

4. Epoxy Pressure-Injection of Cracks:
 - a. Cracks shall be pressure-injected using a two component epoxy system with an in-line mixing and metering capability.
 - (1) System shall be capable of injection pressures up to a maximum of 150 psi (1 MPa) to ensure complete penetration of the crack.
 - (2) Apply an adequate surface seal to the crack or joint to prevent the escape of epoxy.
 - (3) Entry points shall be established along the crack.
 - (4) Fill the crack with a 100 percent solid epoxy adhesive.
 - b. Inject the adhesive into the crack at the first entry point with sufficient pressure to advance the epoxy to the next adjacent port.
 - (1) The original port shall be sealed and injection moved to the port at which the epoxy appears.
 - (2) Continue the process until each joint and crack has been injected for its entire length.
 - (3) Epoxy shall be allowed to cure in accordance with manufacturer's instructions.
 - (4) Sealing materials shall then be removed and surface finished to match adjacent existing surface.

E. Application of Concrete and Patching Mortar:

1. Place concrete and mortar to rebuild spalled or damaged areas to match the original surface finish, level, texture, and color.
2. Concrete shall be cured as specified herein.
3. The finished appearance of the patch shall match the adjacent existing surface.

3.10 CURING AND PROTECTION

A. General:

1. Use an approved method for curing concrete and mortar patching for at least 7 days. Immediately after placement, protect concrete from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water.
2. Maintain air and forms in contact with concrete and mortar at a temperature above 50 degrees F (10 degrees C) for the first 3 days and at a temperature above 32 degrees F (0 degrees C) for the remainder of the specified curing period.
3. Materials and equipment needed for adequate curing and protection shall be available and at the placement site prior to placing concrete and mortar.
4. No fire or excessive heat shall be permitted near or in direct contact with the concrete and mortar at any time.
5. Accomplish curing by any of the following methods, or combination thereof, as approved:

B. Moist Curing:

1. Maintain concrete and mortar to be moist-cured continuously wet for the entire curing period.

2. If water or curing materials stain or discolor concrete and mortar surfaces which are to be permanently exposed, the concrete and mortar surfaces shall be cleaned.
3. When wooden forms are left in place during curing, they shall be kept wet at all times.
4. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials.
5. Horizontal surfaces shall be cured by ponding, by covering with a 2 inch (50 mm) minimum thickness of continuously saturated sand, or by covering with waterproof paper, polyethylene sheet, polyethylene coated burlap, or saturated burlap.

C. Membrane Curing:

1. Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete; except that a styrene acrylate or chlorinated rubber compound meeting COE CRD-C 300 requirements may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or for floors that are to receive adhesive applications of resilient flooring.
2. Select a curing compound that is compatible with any subsequent paint, roofing, waterproofing, or flooring specified.
3. Apply curing compound to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface.
4. Surfaces shall be thoroughly moistened with water, and the curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period.
5. Apply compound in a one-coat continuous operation by mechanical spraying equipment, at a uniform coverage of 200 square feet (20 square meters) per gallon (3.8 L).
6. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified.
7. Keep surfaces coated with curing compound free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

D. Epoxy Adhesives:

1. Protect and cure epoxy adhesives in accordance with the manufacturer's recommendations.
2. The adjacent surfaces and ambient conditions shall be maintained within the manufacturer's recommendations.
3. The patch anchors and epoxy adhesive shall be protected from displacement and disturbances.

3.11 CONCRETE AND MORTAR FINISHES

A. Matching Adjacent Concrete:

1. Concrete and mortar finishes and color shall match the finish, color and texture of the existing adjacent concrete.
2. Accomplish finishing at the time of concrete placement or immediately after

formwork removal.

B. Non-Standard Finish:

1. The exposed surfaces of concrete and mortar patching shall match the finish, texture, and surface detail of the original surface.
2. Mechanical finishing and texturing may be required to produce the required finish and appearance.
3. The finishing and texturing shall be accomplished in such a way as to help conceal bond lines between the patch and adjacent surfaces.
4. The texturing shall replicate all surface details, including tooling and machine marks.
5. The equipment used in finishing and texturing shall be a low-impact energy type which will not weaken the patch or damage the patch bond and the adjacent concrete.
6. Equipment used for finishing and texturing shall be demonstrated on sample panels of concrete and mortar to demonstrate performance and suitability of the equipment and methods
7. Equipment and methods shall be subject to approval.

3.12 CLEANING AND PROTECTION

A. Cleaning:

1. No sooner than 72 hours after completion of the curing period and after joints are sealed, faces and other exposed surfaces of concrete shall be washed down with water applied with a soft bristle brush, then rinsed with clean water.
2. Discolorations which cannot be removed by these procedures will be considered defective work. Perform cleaning work when temperature and humidity conditions are such that surfaces dry rapidly.
3. Protect adjacent surfaces from damage during cleaning operations.

B. Inspection:

1. Following completion of the work, inspect the structure for damage, staining, and other distresses.
2. The patches shall be inspected for cracking, crazing, delamination, unsoundness, staining and other defects.
3. Inspect the finish, texture, color and shade, and surface tolerances of the patches to verify that all requirements have been met.
4. Defective work shall be repaired or replaced, as directed, using approved procedures.

C. Protection of Work:

1. Protect work against damage from subsequent operations.

END OF SECTION

SECTION 030505
UNDERSLAB VAPOR BARRIER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sheet vapor barrier, seam tape and mastic for installation under concrete slabs and crawl spaces.

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 032000 - Concrete Reinforcing.
- C. Section 033000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.
- D. Section 313116 - Soil Treatment for Termite Protection.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI):
 - 1. ACI 302.1R -- Guide for Concrete Floor and Slab Construction.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM D882 -- Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 2. ASTM D1709 -- Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - 3. ASTM E154 -- Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.
 - 4. ASTM E1643 -- Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
 - 5. ASTM E1745 -- Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
 - 6. ASTM F1249 -- Standard Test Method for Water Vapor Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

- B. Product Data: Submit manufacturers' data on manufactured products (i.e., underslab vapor barrier and accessory materials), including but not limited to:
 1. Summary of test results as per Paragraph 8.3 of ASTM E1745.
 2. Test results for individual Performance Requirements specified in this section.
- C. Samples: Submit samples of underslab vapor barrier and accessory materials to be used.
- D. Manufacturer's Installation Instructions: Indicate installation procedures and instructions for placement, seaming, penetration repair, and interface required with adjacent construction.
- E. LEED Submittals: Collect and submit data as required for completing the applicable LEED Submittal Template(s).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Stego Industries LLC: 216 Avenida Fabricante, Suite 101; San Clemente, CA 92672; Tel. 877-464-7834; www.stegoindustries.com.
- B. Substitutions: See Section 016000 - Product Requirements.

2.01 MATERIALS

- A. Underslab Vapor Barrier:
 1. Description: ASTM E1745 Class A compliant underslab sheet vapor barrier.
 2. Composition: Multi-layer plastic extrusion manufactured with only high-grade prime, virgin, polyolefin resins.
 3. Performance Requirements: Shall meet or exceed ASTM E1745 Class A requirements, including but not limited to the following:
 - a. Water Vapor Permeance (ASTM F1249): 0.010 perms, max.
 - b. Permeance, After Conditioning:
 - 1) Permeance after Wetting, Drying, and Soaking (ASTM E154, Section 8): 0.010 perms, max.
 - 2) Permeance after Heat Conditioning (ASTM E154, Section 11): Maximum 0.010 perms, max.
 - 3) Permeance after Low Temperature Conditioning (ASTM E154, Section 12): 0.010 perms.
 - 4) Permeance after Soil Organism Exposure (ASTM E154, Section 13): 0.010 perms, max.
 - c. Puncture Resistance (ASTM D1709, Method B): Minimum 2200 grams.
 - d. Tensile Strength (ASTM D882): 45.0 lbf./in., min.
 4. Thickness (ACI 302.1R): 15 mils (0.4 mm).
 5. Product: Stego Wrap Vapor Barrier (15-mil), or equal.
- B. Accessory Products: Underslab Vapor Barrier manufacturer's recommended termination bars, tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches (150 mm).
- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI):
1. ACI 117 -- Standard Specifications for Tolerances for Concrete Construction and Materials.
 2. ACI 301 -- Specifications for Structural Concrete for Buildings.
 3. ACI 302.1R -- Guide for Concrete Floor and Slab Construction.
 4. ACI 305R -- Guide to Hot Weather Concreting.
 5. ACI 305.1 -- Specification for Hot Weather Concreting.
 6. ACI 306R -- Guide to Cold Weather Concreting.
 7. ACI 306.1 -- Standard Specification for Cold Weather Concreting.
 8. ACI 308R -- Guide to Curing Concrete.
 9. ACI 308.1 -- Specification for Curing Concrete.
 10. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A185/A185M -- Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 2. ASTM A615/A615M -- Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
 3. ASTM C33 -- Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 4. ASTM C94/C94M -- Standard Specification for Ready-Mixed Concrete.
 5. ASTM C150 -- Standard Specification for Portland Cement.
 6. ASTM C171 -- Standard Specification for Sheet Materials for Curing Concrete.
 7. ASTM C260 -- Standard Specification for Air-Entraining Admixtures for Concrete.
 8. ASTM C309 -- Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 9. ASTM C330 -- Standard Specification for Lightweight Aggregates for Structural Concrete.
 10. ASTM C567 -- Standard Test Method for Determining Density of Structural Lightweight Concrete.
 11. ASTM C618 -- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 12. ASTM C989 -- Standard Specification for Slag Cement for Use in Concrete and Mortars.

13. ASTM C1017/C1017M -- Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
14. ASTM C1077 -- Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
15. ASTM C1315 -- Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
16. ASTM D1751 -- Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
17. ASTM D1752 -- Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
18. ASTM E329 -- Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
19. ASTM E1643 -- Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

- D. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI (DA4) – Manual of Standard Practice.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form Section 013516.04
 3. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
 4. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to

complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:

- a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
 5. Product Data for Credit IEQ 4.3: For curing and sealing compounds, documentation including printed statement of VOC content.
 6. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.
- C. Design Mixtures: For each concrete mixture. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 – Concrete Quality, Mixing, and Placing.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.4 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 318, "Building Code Requirements for Structural Concrete."
 2. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

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.
- 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.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. 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."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
 - 1. Maximum Coarse-Aggregate Size: 1 1/2" nominal for foundations, 1" nominal for columns and walls, and 3/4" nominal for slabs.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 VAPOR RETARDERS

- A. See Section 030505 – Underslab Vapor Barriers.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
- D. Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: As indicated.
 3. Slump Limit: 5 inches, plus or minus 1 inch. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- E. Proportion structural lightweight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated at 28 days.
 2. Calculated Equilibrium Unit Weight: 110 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
 3. Slump Limit: 5 inches, plus or minus 1 inch.
 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.9 FABRICATING REINFORCEMENT

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

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

1. See Section 030505 – Underslab Vapor Barriers.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. 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.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- 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.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. 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 indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1 and ACI 318, Section 5.12.
- D. Hot-Weather Placement: Comply with ACI 305R and ACI 318, Section 5.13.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- C. 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.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- 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 to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: 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.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in 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. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated 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.

3.10 CONCRETE SURFACE REPAIRS

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

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF CAST-IN-PLACE CONCRETE

SECTION 034100
PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes precast structural concrete.

1.2 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI):
1. ACI 211.1 -- Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 2. ACI 318 -- Building Code Requirements for Structural Concrete and Commentary.
 3. ACI 423.1 -- Specification for Unbonded Single-Strand Tendon Materials and Commentary.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A27/A27M -- Standard Specification for Steel Castings, Carbon, for General Application.
 2. ASTM A36/A36M -- Standard Specification for Carbon Structural Steel.
 3. ASTM A47/A47M -- Standard Specification for Ferritic Malleable Iron Castings.
 4. ASTM A108 -- Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
 5. ASTM A185/A185M -- Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 6. ASTM A283/A283M -- Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 7. ASTM A307 -- Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 8. ASTM A325 -- Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 9. ASTM A416/A416M -- Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
 10. ASTM A490 -- Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
 11. ASTM A496/A496M -- (Refer to ASTM A1064/A1064M).
 12. ASTM A500/A500M -- Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 13. ASTM A563 -- Standard Specification for Carbon and Alloy Steel Nuts.
 14. ASTM A572/A572M -- Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 15. ASTM A675/A675M -- Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.

16. ASTM A706/A706M -- Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
17. ASTM A1064/A1064M -- Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
18. ASTM C144 -- Standard Specification for Aggregate for Masonry Mortar.
19. ASTM C150/C150M -- Standard Specification for Portland Cement.
20. ASTM C260 -- Standard Specification for Air-Entraining Admixtures for Concrete.
21. ASTM C404 -- Standard Specification for Aggregates for Masonry Grout.
22. ASTM C618 -- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
23. ASTM C642 -- Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.
24. ASTM C881/C881M -- Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
25. ASTM C989 -- Standard Specification for Slag Cement for Use in Concrete and Mortars.
26. ASTM C1107/C1107M -- Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
27. ASTM C1218/C1218M -- Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
28. ASTM C1240 -- Standard Specification for Silica Fume Used in Cementitious Mixtures.
29. ASTM C1610/C1610M -- Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique.
30. ASTM C1611/C1611M -- Standard Test Method for Slump Flow of Self-Consolidating Concrete.
31. ASTM C1621/C1621M -- Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring.
32. ASTM C1712/C1712M -- Standard Test Method for Rapid Assessment of Static Segregation Resistance of Self-Consolidating Concrete Using Penetration Test.
33. ASTM E165 -- Standard Test Method for Liquid Penetrant Examination for General Industry.
34. ASTM E709 -- Standard Guide for Magnetic Particle Testing.
35. ASTM E1444 -- Standard Practice for Magnetic Particle Testing.
36. ASTM F436 -- Standard Specification for Hardened Steel Washers.
37. ASTM F844 -- Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

D. American Welding Society (AWS):

1. AWS C5.4 -- Recommended Practices for Stud Welding.
2. AWS D1.1/D1.1M -- Structural Welding Code – Steel.
3. AWS D1.4/D1.4M -- Structural Welding Code - Reinforcing Steel.

E. Precast/Prestressed Concrete Institute (PCI):

1. PCI MNL 116 -- Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
2. PCI MNL 120 -- PCI Design Handbook - Precast and Prestressed Concrete.

3. PCI MNL 135 -- Tolerance Manual For Precast and Prestressed Concrete Construction.

F. The Society for Protective Coatings (SSPC):

1. SSPC-Paint 25 -- Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel.
2. SSPC-SP 3 -- Power Tool Cleaning.
3. SSPC-PA 1 -- Shop, Field and Maintenance Painting of Steel.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. General:

- a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
2. If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form Section 013516.04
3. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
4. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
5. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each precast concrete mixture.

- D. Shop Drawings:
 - 1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
 - 2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
- E. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Material certificates.
- C. Material Test Reports: For aggregates.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 1. Designated as a PCI-certified plant as follows:
 - a. Group C, Category C2 - Prestressed Hollowcore and Repetitively Produced Products.
- B. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

1.6 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units.
- B. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

- C. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.

2.2 REINFORCING MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- D. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.3 PRESTRESSING TENDONS

- A. Strand: ASTM A 416/A 416M, Grade 270, uncoated, seven-wire, low-relaxation strand.
 - 1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

2.4 CONCRETE MATERIALS

- A. Regional Materials: Precast structural concrete shall be manufactured from aggregates and cement that have been extracted or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.
- C. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C 618, Class N.
 - 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- D. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33/C 33M, with coarse aggregates complying with Class 4S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.5 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel-Headed Studs: ASTM A 108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
- C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.
- D. Malleable-Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.
- E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.
- F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.
- H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.
- I. Deformed-Steel Wire or Bar Anchors: ASTM A 1064/A 1064M or ASTM A 706/A 706M.
- J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.
- K. High-Strength Bolts and Nuts: ASTM A 325 or ASTM A 490 Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.
 - 1. Do not zinc coat ASTM A 490 bolts.
- L. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply SSPC-Paint 25 according to SSPC-PA 1.

2.6 BEARING PADS

- A. Provide bearing pads for precast structural concrete units as recommended by precast fabricator for application.

2.7 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.
- B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content

less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 2. Limit use of fly ash to 20 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 20 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: Limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.9 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
- J. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.
- K. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.
- L. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.
- M. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- N. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.10 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.11 COMMERCIAL FINISHES

- A. Standard Grade per PCI MNL 116: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in.. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.
- B. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.
- C. Apply roughened surface finish according to ACI 318 to precast concrete units that receive concrete topping after installation.

2.12 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712/C 1712M.
- B. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
 - 1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 2. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- D. Field cutting of precast units is not permitted without approval of Architect.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

- F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
- H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.

3.2 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Erection of precast structural concrete members.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.4 REPAIRS

- A. Repair precast structural concrete units if permitted by Architect.
 - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

- C. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- D. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.5 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF PRECAST STRUCTURAL CONCRETE

SECTION 035400
CAST UNDERLAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fluid-applied self-leveling cementitious floor underlayment.

1.02 RELATED SECTIONS

- A. Section 017000 - Execution Requirements: Alteration project procedures; selective demolition for remodeling.
- B. Section 024100 - Demolition: Patching of concrete.
- C. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings; preparation of new and existing concrete floor slabs for installation of floor coverings; testing of concrete floor slabs for moisture and pH; remediation of concrete floor slabs due to unsatisfactory moisture or pH conditions.
- D. Section 093013 - Tiling: Tile floor finish; membrane waterproofing.
- E. Section 096429 - Wood Strip and Plank Flooring: Wood strip and plank floor finish; vapor retarder; wood sleepers.
- F. Section 096500 - Resilient Flooring: Resilient flooring finish.
- G. Section 096813 - Tile Carpeting.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C109/C109M -- Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
 - 2. ASTM C348 -- Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 - 3. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials.
 - 1. Include information on surface preparation, mixing instructions, environmental limitations, and installation instructions.

- C. Certificate: Certify that products meet or exceed specified requirements.
- D. LEED Submittals: Collect and submit data as required for completing the applicable LEED Submittal Template(s).

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F (41 degrees C).

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for combustibility or flame spread requirements.

1.08 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Mapei Corporation: www.mapei.com.
- B. Other Manufacturers:
 - 1. Ardex Engineered Cements Inc: www.ardex.com.
 - 2. ProSpec, an Oldcastle brand: www.prospec.com.
 - 3. Dayton Superior Corporation: www.daytonsuperior.com.
 - 4. Dependable Chemical Co., Inc: www.floorprep.com.
 - 5. Laticrete SuperCap, LLC: www.laticrete.com.
 - 6. W.R. Meadows, Inc: www.wrmeadows.com.

2.02 MATERIALS

- A. Cementitious Underlayment: Cementitious, quick-setting, self-leveling underlayment, designed for featheredge to 2-inch thick applications.
 - 1. Performance Requirements:
 - a. Compressive Strength (ASTM C109): Minimum 4100 psi at 28 days.
 - b. Flexural Strength (ASTM C348): Minimum 1070 psi at 28 days.
 - 2. Product: Mapei Ultraplan Easy with acrylic primer, or equal.
- B. Acrylic Primer: Low-VOC, water based, acrylic primer designed to enhance the performance and adhesion of patching compound to substrate.

1. Product:
 - a. At areas where Moisture Emission Rate of substrate is less than 5 lbs per 1000 sq ft per 24 hours: Mapei Primer T, or equal.
 - b. At areas where Moisture Emission Rate of substrate is greater than 5 lbs per 1000 sq ft per 24 hours: Inform Architect, and provide remedial membrane waterproofing system per Architect's direction.
- C. Epoxy Primer: Two-component, polymer-modified, solvent-free water-based epoxy primer designed to enhance the performance and adhesion of patching compound to substrate.
 1. Product: Mapei Primer WE, or equal.
- D. Water: Potable and not detrimental to underlayment mix materials.
- E. Primer: Manufacturer's recommended type.
- F. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.03 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Mix to self-leveling consistency without over-watering.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi-products, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

- A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.
- B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- C. Vacuum clean surfaces.
- D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- E. Close floor openings.

3.03 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Pump or pour material onto substrate. Do not retemper or add water.
 1. Pump, move, and screed while the material is still highly flowable.
 2. Be careful not to create cold joints.
 3. Wear spiked shoes while working in the wet material to avoid leaving marks.
- C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft (1:1000).

3.04 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field inspection and testing, as specified in Section 014000 - Quality Requirements.
- B. Placed Material: Agency will inspect and test for conformance to specification requirements.

3.06 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 039300

EXTERNALLY BONDED CARBON FIBER

REINFORCED POLYMER STRENGTHENING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Section includes design, supply and installation of bonded carbon fiber reinforced polymer (CFRP) system to strengthen steel reinforced concrete as shown in drawings and supported by calculations.
- B. The entire installation shall conform to the specifications of the FRP design current edition, for provision of the highest character of installation.
- C. Furnishing of materials, labor, equipment and all items necessary for repair of existing concrete members and strengthening by the application of externally bonded FRP reinforcement as specified on the contract drawings and specifications.

1.02 REFERENCES

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI)
 - 1. ACI 224.1R: Causes, Evaluation and Repair of Cracks in Concrete Structures
 - 2. ACI 440.2R-08: Guide for the Design and Construction of Externally Bonded FRP System for Strengthening Concrete Structures
 - 3. ACI 440R-07: Report on Fiber Reinforced Plastic Reinforcement for Concrete Structures
 - 4. ACI 503R-93: Guide for Selection of Polymer Adhesives with Concrete
 - 5. ACI 503.4-92: Standard Specifications for Repairing Concrete with Epoxy Mortars
 - 6. ACI 503.5R-92: Guide for the Use of Polymer Adhesives in Concrete
 - 7. ACI 503.6R-97: Guide for Re-Application of Epoxy and Latex Adhesives for Bonding Freshly Mixed and Hardened Concrete.
 - 8. ACI 546R-04: Concrete Repair Guide
- C. ASTM International:
 - 1. ASTM C882: Test Method for Bond Strength of Epoxy-Resin System used with Concrete
 - 2. ASTM D3039: Test Method for Tensile Properties of Fiber-Resin Composites
 - 3. ASTM D638: Standard Test Method for Tensile Properties of Plastics
 - 4. ASTM D695: Standard Test Method for Compressive Properties of Rigid Plastics
 - 5. ASTM D3039: Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

6. ASTM D4541: Test Method for Pull-Off Strength of Coatings using Portable Adhesion Test
7. ASTM E84-94: Test Method for Surface Burning Characteristics of Building Materials

D. International Concrete Repair Institute (ICRI):

1. ICRI 03730: Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
2. ICRI 03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
3. ICRI 03733: Guide for Selecting and Specifying Materials for Repairs of Concrete Surfaces
4. ICRI Guideline No. 03739, Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials
5. ICRI 03742: Guide for the Selection of Strengthening Systems for Concrete Structures

E. International Code Council (ICC), Formerly International Conference of Building Officials (ICBO):

1. AC 125: Acceptance criteria for concrete and reinforced and unreinforced masonry strengthening using fiber reinforced composite systems.
2. AC 178: Acceptance criteria for inspection and verification of concrete and reinforced and unreinforced masonry strengthening using fiber reinforced polymer (FRP) composite systems.

1.03 SUBMITTALS

A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

B. Working Drawings prepared and sealed by a professional engineer licensed in California detailing the location and orientation of all FRP materials to be installed.

C. Product Data:

1. Manufacturer's product data sheets indicating physical, mechanical, and chemical characteristics of the materials used in the FRP system. Mechanical properties shall be reported as minimum acceptable or guaranteed values in accordance with Section 2.2.
2. Manufacturer's installation instructions, maintenance instructions, and general recommendations regarding each material.
4. Manufacturer's Material Safety Data Sheets (MSDS) for all materials to be used.
5. A 10,000 hour durability report in the name of the manufacturer showing compliance with ICC AC 125.

1.04 QUALITY ASSURANCE

- A. Provide the names of the applicator's key personnel (superintendent and assistant) who will perform the actual work. The superintendent and assistant shall have a minimum three years' experience with CFRP System installation.
- B. Prepare and submit a detailed schedule describing the work to be accomplished CFRP System installation.
- C. The CFRP System shall be completely inspected by the contractor during and immediately following application of the composite materials. Conformance with the design drawings, proper alignment of fibers, and quality workmanship shall be assured. Entrapped air shall be released or rolled out before the epoxy sets.
- D. After CFRP System has cured, the contractor shall inspect all work to check for voids and/or debonding.

1.05 QUALIFICATIONS

- A. Manufacturer / Supplier Qualifications:
 - 1. The Manufacturer / Supplier must specialize in the manufacturing of the products specified in this Section with a minimum of 5 years' experience.
 - 2. The Manufacturer / Supplier must support and instruct applicators in the installation of the products specified in this Section.
 - 3. Manufacturer / Supplier must hold a valid ICBO/ICC-ES evaluation report, in compliance with IBC 2006 or later, in the name of the manufacturer.
- B. Applicator Qualifications:
 - 1. Applicator must be approved by the Composite manufacturer and have been trained by the manufacturer in the installation of the products specified in this section.
 - 2. Applicator must have documented experience on at least 3 projects of a similar nature, using similar materials within the last 5 years.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. The products shall be delivered and stored in original, unopened containers. Containers must be clearly marked with legible and intact labels listing the Manufacturer's name, brand name, product identification and batch number.
- B. Stored fiber reinforcement and epoxies must be protected from dust, moisture, and chemical exposure. Cut fabric on clean surfaces.
- C. Fiber reinforcement shall be stored in a cool, dry area away from direct sunlight, flame sources, moisture, or other hazards.
- D. Epoxies must be stored in areas with an ambient temperature between 45 and 80 degree F (7 – 27 degree C) and away from direct sunlight, flame sources, or other hazards.

- E. Epoxy resins must be stored separately from hardeners. After the resin has been mixed with hardener, the mixed epoxy batch must be used within its pot life.
- F. Fiber reinforcement must not be handled roughly. Fiber, once removed from the original roll, must be stored either in rolls with a radius greater than 8 in (200 mm) or by dry stacking flat.
- G. Products that have exceeded their shelf life shall not be used.
- H. The contractor shall properly dispose of any component of the CFRP system that has exceeded its shelf life or pot life, that has not been properly stored, empty containers, and any unused or excess material that is deemed waste in accordance with local regulations.

PART 2 - PRODUCTS

2.01 FRP COMPOSITE SYSTEM

- A. Manufacturers:
 - 1. CarboDur supplied by Sika Corporatoin. 201 Polito Avenue, Lyndhurst, NJ 07071, (800) 933 7452
 - 2. Or Equal

2.02 MATERIALS

- A. FRP Composite Systems.
 - 1. A single manufacturer/supplier shall supply all constituent materials of the FRP composite system including the fiber reinforcement, all polymers, and protective topcoats, where specified. FRP composite systems consisting of fiber reinforcement and polymers provided by more than one manufacturer/supplier are not allowed. System shall be an ICBO/ICC-ES approved system.
 - 2. The FRP composite system Manufacturer/Supplier shall supply the tensile properties of the composite material as determined by testing in accordance with ASTM D 3039. The tensile properties of the composite system shall be based on a minimum of 25 tests and meet or exceed those tabulated below:

Minimum Property	Laminate-Based Properties
Fiber type - Carbon	
Ply Thickness	0.040 in. (1.01 mm)
Ultimate Tensile Stress	400 ksi (690 Mpa)
Young's Modulus	23,000 ksi(160,000 Mpa)
Elongation at break	1.69%
Rupture Strain	1.5%

- 3. The FRP composite system shall exhibit the following durability in accordance with ICBO/ICC-ES AC 125:

Percentage tensile strength retained after:	
7 days exposure to 100% humidity at 100 F (38 C)	90%

3,000 hrs exposure to Salt water	90%
3,000 hrs exposure to ph 9.5 solution	90%
Percentage tensile modulus retained after:	
7 days exposure to 100% humidity at 100 F (38 C)	90%
3,000 hrs exposure to Salt water	90%
3,000 hrs exposure to ph 9.5 solution	90%

4. The FRP composite system shall have a class 1 fire classification as tested in accordance with ASTM E-84.
5. The FRP system shall be VOC compliant for contact with potable water in accordance with EPA method 8260
6. The FRP system shall have successfully completed 10,000 hr environmental durability testing in accordance with ICBO/ICC-ES AC 125.
7. The FRP system supplier shall provide, on request, independent results of large-scale structural evaluation of the FRP system on representative test specimens in accordance with ICBO/ICC-ES AC 125.
8. The FRP system supplier shall provide a list of failures containing date, name & location of project, contact name and phone number, type of failure and method of mitigation or repair if any, or a statement of no known failures.

B. Fiber Reinforcement:

1. Carbon fiber reinforcement shall be delivered as a dry unidirectional fabric with a minimum fiber areal weight of 9.0 oz/yd².

C. Concrete Surface Primer

1. Surface primer shall be a two component, 100% solids, moisture tolerant, high modulus, high strength epoxy.
2. Maximum VOC content of 70g/L.
3. Surface primer shall meet the following minimum requirements:

Property	Requirement
Tensile Strength	8,000 psi
Tensile Modulus	250,000 psi
Elongation at Break	3.0%
Flexural Strength	11,500 psi
Flexural Modulus	500,000 psi
Heat Deflection Temp. (HDT)	117F (47C)

D. Fabric Saturant

1. Saturant resin shall be two component, 100% solids, moisture tolerant, high strength, high modulus epoxy.
2. Maximum VOC content of 70g/L.
3. Saturants shall meet the following minimum requirements:

Property	Requirement
Tensile Strength	8,000 psi

Tensile Modulus	250,000 psi
Elongation at Break	3.0%
Flexural Strength	11,500 psi
Flexural Modulus	500,000 psi
Heat Deflection Temp. (HDT)	117F (47C)

E. Epoxy Repair Mortar

1. Repair mortar shall be 100% solids, non-sag paste epoxy.
2. Maximum VOC content of 70g/L.

F. Protective Coatings

1. Protective coating shall be polymer or acrylic based and shall be UV resistant.
3. Maximum VOC content of 200g/L.
3. Protective coatings other than those provided by the material Manufacturer/Supplier may be used provided such coatings have been approved by the material manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01300 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Examine existing conditions to assess quality of concrete substrate, identify potential obstructions, and verify dimensions/geometry shown on drawings.

3.02 PREPARATION

A. Environmental conditions

1. Do not install FRP when the ambient temperature is below 40 degrees F (5 degrees C) or above 130 degrees F (55 degrees C). In cold conditions, auxiliary heat may be applied to raise the ambient temperature to a suitable level. Utilize clean heat sources for this purpose (e.g., electric or propane) that do not contaminate the substrate.
2. The presence of moisture inhibits the adhesion of the epoxies to the substrate. Do not install FRP when surface moisture is present on the substrate or when rainfall or condensation is anticipated in the work areas.
3. If water leakage exists through cracks or concrete joints, water flow must be stopped prior to FRP installation.

B. Site Conditions

1. Maintain control of concrete chips, dust, and debris in each area of work. Clean up and remove such material at the completion of each day of blasting.
2. All adjacent areas not receiving FRP shall be protected with plastic sheeting.

C. Concrete Surfaces

1. All concrete surfaces shall be dry and free of surface moisture and frost, and tested by the Contractor to evaluate moisture transmission in accordance with ASTM D4263 "Indicating Moisture in Concrete by the Plastic Sheet Method."
2. All concrete surfaces shall be sound. Remove deteriorated concrete, dust, laitance, grease, paint, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials from the surface by blast cleaning or equivalent mechanical means.
3. All concrete surfaces shall be air blasted and vacuumed clean to a dust free condition.
4. Concrete surface irregularities less than one inch shall be ground and smoothed and/or filled with an approved repair mortar with the addition of 1 part oven dried sand to make epoxy mortar. Surface irregularities shall be limited to less than 0.04 inches (1 mm). Surface irregularities greater than one inch shall be repaired using and approved cementitious repair mortar.
5. External concrete corners shall be rounded to at least a ½" radius when perpendicular to fiber orientation and internal corners shall be smoothed by trowelling epoxy mortar into corners.
6. The adhesive strength of the concrete shall be verified after preparation by random pull-off testing (ACI 503R). Minimum tensile strength is 200 psi with concrete substrate failure.

3.03 INSTALLATION

A. Concrete Repair

1. Unsound areas of the concrete substrate (such as broken pieces, delaminated areas, etc.) must be removed to reveal sound material.
2. If corrosion of the existing steel reinforcement exists, the steel and concrete must be repaired before installation of the FRP. Any deteriorated concrete or corroding reinforcing steel must be repaired per ICRI Guideline 03730. **DO NOT COVER CORRODING REINFORCING STEEL WITH FRP.**
3. Voids in the concrete substrate greater than 0.50 in (500 mm) in depth must be filled with an appropriate repair mortar. The repair material shall be selected per ICRI Guideline 03733 and the project requirements. If required, the bond strength of the repair material to the existing concrete may be verified with pull testing per ASTM D 4541. Minimum direct pull-off strength required is 200 psi (1.4 MPa).
4. Cracks in the concrete substrate greater than 0.010 in (0.25 mm) wide must be injected with epoxy or similar material approved by the Engineer of Record.

B. Surface Preparation

1. Prior to initiating surface preparation procedures, the Contractor shall first prepare a representative sample area. The sample area shall be prepared in accordance with the requirements of this Specification, and shall be used as a reference standard depicting a satisfactorily prepared substrate.

2. Uneven concrete surface irregularities (offsets) must be ground and smoothed to less than 0.04 in (1 mm).
3. When fiber reinforcement is run around outside corners or edges, these corners must be rounded to a radius of no less than 0.5 in (15 mm). Application of fiber reinforcement around inside corners shall be avoided. No detailing is required if fiber is run parallel to corners.
4. When bond of the FRP to the concrete substrate is required for structural performance, the surface of the concrete substrate must be profiled using abrasive blasting and/or disc grinding to a minimum ICRI CSP 3 or smoother (refer to ICRI Guideline 03732). Surface materials (laitance, surface lubricants, broken mortar pieces, paint coatings, staining, etc.) must be removed by abrasive blasting and/or disc grinding. Dust generated from surface grinding must be removed using a clean air blower or other suitable means. If the dust has been removed by means of water washing, the surface must be thoroughly dried.
5. When structural performance relies only on the bond of the FRP to itself at lap splices, the substrate must be cleaned of any dust, debris, or laitance.

C. Application of Surface Primer

1. Prepare epoxy primer in accordance with manufacturer's instructions. Mix only the quantity of primer that can be used within its batch life. Batch life will be reduced in higher temperatures and when mixed in higher volumes. Adjust batch size accordingly. Do not use any epoxy which has exceeded its batch life.
2. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.
3. Do not match delivered units into smaller quantities. Mix only full units.
4. To avoid allowing primer to cure prior to FRP application, apply primer only to surfaces, which will be laminated within 3 hours.
5. Constituent parts must be accurately metered and thoroughly mixed for between 2 and 3 minutes. For large batches (over 1 gallon) use a mechanical mixer.
6. Apply primer in accordance with manufacturer's recommendations.
7. Apply primer to repair surfaces with a medium nap roller or non-shedding brush. Apply 2nd coat, if needed, to areas, which have thoroughly absorbed the 1st coat.
8. Using a brush, stipple primer into any voids, bug holes etc.

D. Application of filler/adhesive paste

1. All surfaces must be primed. Primer, which has cured for over 24hrs, must be abraded with a light sand sweep, sandpaper or abrasive pad or solvent wiped with a fast flashing solvent.
2. Prepare epoxy filler/paste in accordance with manufacturer's instructions. Mix only the quantity of filler that can be used within its batch life. Batch life will be reduced in higher temperatures and when mixed in higher volumes. Adjust batch size accordingly. Do not use any epoxy, which has exceeded its batch life.

3. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.
4. Do not match delivered units into smaller quantities. Mix only full units.
5. To avoid allowing filler to cure prior to FRP application, apply filler only to surfaces, which will be laminated within 1 hour.
6. Constituent parts must be accurately metered and thoroughly mixed for between 2 and 3 minutes. For large batches (over 1 gallon) use a mechanical mixer.
7. Apply filler to surface voids using a steel or stiff plastic spreader. Ensure all voids and offsets are thoroughly filled and excess filler is removed.

E. Application of FRP Reinforcement

1. All surfaces must be primed and, where needed, filled. Primer & filler, which has cured for over 24hrs, must be abraded with a light sand sweep, sandpaper or abrasive pad or solvent wiped with a fast flashing solvent unless still tacky to the touch.
2. Prepare epoxy saturating resin in accordance with manufacturer's instructions. Mix only the quantity of epoxy that can be used within its batch life. Batch life will be reduced in higher temperatures and when mixed in higher volumes. Adjust batch size accordingly. Do not use any epoxy, which has exceeded its batch life.
3. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.
4. Do not match delivered units into smaller quantities. Mix only full units.
4. Fabric should be pre-cut to required lengths and widths and clearly labeled.
5. Using a roller, apply a coat of mixed resin to a suitable worktable, which has been protected with plastic sheeting. Lay precut fabric onto resin coat and press down with a soft plastic spreader. Apply more resin to the fabric and spread evenly until fabric is fully covered and saturated thoroughly with resin. Allow to sit for 1 minute, applying more resin if needed. Squeegee off excess resin if necessary and roll fabric onto a plastic tube with approx 4" diameter.
6. Alternatively, an additional coat of epoxy may be applied to the surface (or previous layer/s) and the dry fabric may be applied to the surface and by means of a squeegee, the epoxy is drawn up through the fabric.
7. Apply saturated or dry fabric to repair surface. Orient fibers as detailed in project drawings and within specified tolerances. Fibers shall be laid taut and without wrinkles. Using soft plastic spreaders and (suitably protected) hands, smooth out wet fabric ensuring full contact with the surface and to remove trapped air. Fibers must be straight and aligned correctly. Apply additional saturating resin, if needed, during the smoothing out to assist in handling.
8. To join ends of fabric, overlaps in the longitudinal direction must be a minimum of 6". Additional saturating resin can be used to insure complete bonding between layers and lack of voids. No overlap is needed between adjacent bands of fabric. Overlaps must be staggered for multiple layers.

9. For applying additional layers, follow items 3 through 6.
10. Check applied laminates after 30 - 45 minutes and again prior to gel stage to ensure that no voids or delaminations are present.
11. The installed composite must be protected from rain, direct sunlight, dust, sand etc for 24 hrs.
12. Use of a manufacturer approved mechanical saturator is recommended for large projects. Refer to manufacturer's installation manual for instructions.

F. Application of Protective coatings

1. Protective coatings may be applied as a final, outermost layer to the externally bonded FRP reinforcement.
2. Protective coatings shall not be applied before the final resin coat has become tack free.
3. The surface to which the protective coatings are to be applied must be cleaned of any dust or debris using a dry cloth or brush. The surface must also be free of any moisture, oils, or other substances that would prohibit bond of the coating.

3.04 FIELD QUALITY CONTROL

A. Supervision

1. A field supervisor, trained by Composites manufacturer shall observe all aspects of onsite preparation and material application including surface preparation, resin component mixing, application of primer, application of resin and fiber sheet, curing of composite, and the application of protective coatings.
2. Newly installed FRP composite shall materials shall be visually inspect to insure complete saturation, full contact between layers and to substrate, proper fiber orientation, and lack of wrinkles, bubbles, and voids.

B. Inspection for Voids/Delaminations

1. After allowing at least 24 hours for initial resin cure to occur, perform a visual and acoustic tap test inspection of the layered surface.
2. Large delaminations shall be marked for repair. Small delaminations less than 2 in² (1300 mm²) in size and which are not localized, do not require corrective action.
3. Large delaminations should be repaired by either injection with resin or, by removing delaminated area and patching with new fabric, allowing a 6" overlap all around the repair. This is at the discretion of the inspector.

C. Bond Testing

Direct tension pull-off tests may be conducted to evaluate the bond of the FRP system.

1. Test Conditions

- a. The FRP system shall be allowed to cure a minimum of 48 hours before execution of the direct tension pull-off test

- b. The locations of the pull-off test shall be representative and on flat surfaces. If possible, pull-off tests shall be conducted on areas of the FRP system subjected to relatively low stress during service.
 2. Test Frequency
 - a. Perform a minimum of one pull-off test per 500 ft² (45 m²) of installed FRP reinforcement.
 - b. Pull-off tests must be performed on each area of fiber sheet installed on a single day.
 - c. Pull-off tests must be performed on each type of concrete substrate or for each surface preparation technique used if variations in such conditions exist.
 3. Test Procedure
 - a. The FRP surface to which the adhesion fixture is to be mounted shall be sanded smooth with medium grit sandpaper, rinsed with water, and allowed to dry.
 - b. Attach the adhesion fixture with the designated bonding agent. Leave to cure in accordance with bonding agent manufacturer's instructions.
 - c. Core drill or square cut around the perimeter of the adhesion fixture through the FRP laminate and into the substrate concrete using carbide tipped or diamond core bit or cutting wheel. Cut to a depth of 0.25 to 0.5 in. (6 - 12 mm) into the concrete.
 - d. Position the detaching assembly over the adhesion fixture and attach the adhesion fixture to the detaching assembly. Align perpendicularly. Adjust the detaching-assembly legs as required.
 - e. Take up the slack in the adhesion tester by screwing down the adjustment knob.
 - f. Set the force indicator to the zero mark.
 - g. Apply a manual or mechanised loading force to provide a constant cross head speed until the adhesion fixture detaches from the concrete element.
 - h. The loading rate shall be such that the fixture detaches in less than 100 seconds.
 4. The failure mode must be cohesive failure within the concrete
 5. The tensile bond strength must be in excess of 200 psi (1.4 MPa) or as specified within project drawings or specifications.
 6. Repair the tested areas in accordance with Section 3.5 of this specification.
- D. Witness Panel testing
 1. Witness panels shall be fabricated on site using the same methods used to apply the FRP system to evaluate the tensile properties of the materials. Witness panels shall be prepared on a smooth surface such as a sheet of glass. Witness panels may be tested or retained for future testing.
 2. Panels shall be fabricated as a minimum 12" x 12" (300mm x 300mm) laminate of two stacked layers of identical fiber orientation.
 3. The witness panels shall be allowed to cure on-site for a minimum of 72 hours before delivery to test agency.

- a. Frequency: Two witness panels shall be fabricated near the start and end of each workday.

E. Report

1. The contractor shall submit a quality control report to the Engineer of Record identifying the trained field supervisor, describing the inspection of the completed installation, and detailing the results of the bond testing.
2. The report shall include details of field locations of materials used for fabrication of witness panels.

3.05 REPAIR OF DAMAGED OR DEFECTIVE AREA

- A. Repair of all the defective work after the minimum cure time for the FRP laminates shall comply with material and procedural requirements defined in this specification or as provided by the manufacturer according to the type of defect, the type of application, and the materials used.
- B. Repair all defects in a manner that will restore the system to the designed level of quality. Removal of defective sections shall be replaced and properly spliced with non-damaged areas. Splice locations shall be prepared for bond by abrading cured surfaces. Voids shall be prevented.
- C. The Owner's representative shall approve repair procedures for conditions that are not specifically addressed in this specification. All repairs and touch up shall be made to the satisfaction of the Owner's representative and Engineer of Record.

END OF EXTERNALLY BONDED CFRP

SECTION 042000
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units (CMU's).
- B. Related Sections:
 - 1. Section 076200 "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints.

1.2 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. See Chapter 35 of Florida Building Code 2010 and Section 1.3 of TMS 602/ACI 530.1/ASCE 6 for Reference Standards.

1.3 PRECONSTRUCTION TESTING

- A. 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.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 - 2. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form Section 013516.04
 - 3. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:

- (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
- (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
- (3) the source of the recycled content data.
- 4. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
 - C. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product indicated. For masonry units include data on material properties.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.6 QUALITY ASSURANCE

- A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.7 PROJECT CONDITIONS

- A. 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.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of as indicated.
 - 2. Density Classification: Normal weight.

2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Capital Materials Corporation](#); Flamingo Color Masonry Cement.
 - b. [Cemex S.A.B. de C.V.](#); Citadel Type S or Dixie Type S.
 - c. [Holcim \(US\) Inc.](#); Mortamix Masonry Cement.

- d. [Lafarge North America Inc.](#); Lafarge Masonry Cement.
 - e. [Lehigh Cement Company](#); Lehigh Masonry Cement.
 - f. [National Cement Company, Inc.](#); Coosa Masonry Cement.
- F. Aggregate for Mortar: ASTM C 144.
- 1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Euclid Chemical Company \(The\)](#); Accelguard 80.
 - b. [Grace Construction Products, W. R. Grace & Co. - Conn.](#); Morset.
 - c. [Sonneborn Products, BASF Aktiengesellschaft](#); Trimix-NCA.
- I. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
- 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon 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: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
- 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- F. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
- H. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim".
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene, urethane, or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime or masonry cement mortar.
 - 4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. 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 C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S or Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
 - 1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:
 - a. Pre-faced CMUs.
 - b. Glazed structural-clay facing tile.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

3.2 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.
- 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 head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 1. Space reinforcement not more than 16 inches o.c.
 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.

3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 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 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 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.8 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Testing Prior to Construction: One set of tests.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.9 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.10 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Protect surfaces from contact with cleaner.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF UNIT MASONRY

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.2 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."

1.3 PREINSTALLATION MEETINGS

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
- C. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type PR, partially restrained.
- C. Construction: Shear wall system.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels and Angles-Shapes: ASTM A 36/A 36M.
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Plain.

2.4 PRIMER

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

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.
- B. 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/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces 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 2, "Hand Tool Cleaning."
- C. Priming: 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 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

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, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates, Bearing Plates, and Leveling 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 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.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods 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.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

END OF STRUCTURAL STEEL FRAMING

SECTION 051213

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel (AESS).

1.02 RELATED REQUIREMENTS

- A. Section 051200 - Structural Steel Framing.
- B. Section 099610 - High Performance Coatings for Steel: Field-applied finish for AESS.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Institute of Steel Construction (AISC):
 - 1. AISC S303 -- Code of Standard Practice for Steel Buildings and Bridges.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123/A123M -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A780/A780M -- Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D. American Welding Society (AWS):
 - 1. AWS D1.1 -- Structural Welding Code.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: For each type of product specified.
- C. Shop Drawings: Detailing fabrication of AESS components.
 - 1. Provide erection drawings clearly indicating which members are considered as AESS members.
 - 2. Include details that clearly identify all of the requirements listed under "FABRICATION" and "ERECTION" paragraphs of this Section.
 - a. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.

4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts.
 - a. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections.
 - b. Indicate to which direction bolt heads should be oriented.
 5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
 6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
- D. Qualification data for Fabricator and Erector, to demonstrate their capabilities and experience.
1. Include lists of completed projects names and address, names and addresses of architects and owners, and other information specified.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Section 051200 - Structural Steel Framing, engage a firm experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.
- B. Erector Qualifications: In addition to those qualifications listed in Section 051200 - Structural Steel Framing, engage an experienced Erector who has completed AESS work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Comply with applicable provisions of AISC S303.
- D. Mockups: At least four weeks prior to fabricating AESS, Contractor shall construct mockups to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work. A mockup for each of the following elements shall be constructed:
1. Locate mockups on-site or in the fabricator's shop as directed by Architect.
 - a. Mockups shall be full-size pieces unless the Architect approves smaller models.
 2. Notify the Architect one week in advance of the dates and times when mockups will be available for review.
 3. Demonstrate the proposed range of aesthetic effects regarding each element listed under the fabrication heading below.
 4. Mockup will have finished surface (including surface preparation and paint system).
 5. Obtain Architect's approval of mockups before starting fabrication of final units.
 6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 - a. Approved mockups in an undisturbed condition at the time of Substantial completion may become part of the completed work.
- E. Pre-installation Conference: Contractor shall schedule and conduct conference at the project site.

1. As a minimum, the meeting shall include Contractor, Fabricator, Erector, the finish-painting subcontractor, and the Architect.
2. Coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, fabrication and erection tolerances, surface preparation and finish painting, and other requirements for AESS.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification.
 1. Keep steel members off ground by using pallets, platforms, or other supports.
 2. Protect steel members and packaged materials from erosion and deterioration.
 3. Use special care in handling to prevent twisting or warping of AESS members.
- C. Erect AESS members using padded slings or other methods such that they are not damaged.
 1. Provide padding as required to protect while rigging and aligning member's frames.
 - a. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting.
 - b. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings.

1.08 COORDINATION

- A. Coordinate fabrication schedule with construction progress to avoid delaying the work.
- B. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
 1. Deliver such items to the project site in time for installation.
 2. Anchorage concepts shall be as indicated on drawings and approved on final shop drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 1. Provide materials complying with requirements specified in Section 051200 - Structural Steel Framing, except as amended in this section.

- B. High-Strength Bolts, Nuts, and Washers: Refer to Section 051200 - Structural Steel Framing, heavy hex heads and nuts
 - 1. Provide standard carbon steel mechanically galvanized finish, except as otherwise indicated on approved shop drawings.

2.02 FABRICATION

- A. Fabricate and assemble AESS in the shop to the greatest extent possible.
 - 1. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect.
 - 2. Detail AESS assemblies to minimize field handling and expedite erection.
- B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock up.
- C. Employ the following fabrication techniques.
 - 1. Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the Section 10 of AISC S303.
 - 2. Welds Ground Smooth: Fabricator shall grind welds of AESS smooth.
 - a. For groove welds, the weld shall be made flush to the surfaces each side and be within +1/16 inch / -0 inch of plate thickness.
 - 3. Contouring and Blending of Welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on approved mock-up.
 - 4. Continuous Welds: Where welding is noted on the drawings, provide continuous welds of a uniform size and profile.
 - 5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
 - 6. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8 inch (+/- 1/32 inch) at all copes and blocks.
 - 7. Joint Gap Tolerance: Maintain a uniform gap of 1/8 inch (+/- 1/32 inch).
 - 8. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.
 - 10. Mill Mark Removal: Fabricator shall deliver steel with no mill marks (stenciled, stamped, raised etc) in exposed locations.
 - a. Mill marks shall be omitted by cutting of mill material to appropriate lengths where possible. Or where cutting of mill material is not possible, the fabricator may fill and/or grind to a surface finish consistent with the approved mock up.
 - 11. Grinding of Sheared Edges: Fabricator shall grind all edges of sheared, punched or flame cut steel to match approved mockup.
 - 12. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving.
 - a. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Architect from a distance of 20 feet under any lighting condition determined by the Architect.
 - b. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension +/- 1/2 inch.

13. Seal weld open ends of round and rectangular hollow structural section with 3/8 inch thick closure plates.
 - a. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

2.03 SHOP CONNECTIONS

- A. Bolted Connections: Make in accordance with Section 051200 - Structural Steel Framing. Provide bolt type and finish as noted herein and align bolt heads as indicated on the approved shop erection drawings.
- B. Weld Connections: Comply with AWS D1.1 and Section 051200 - Structural Steel Framing. Appearance and quality of welds shall be consistent with the mock up. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.

2.04 FINISHES

- A. Shop Finish: All AESS members shall receive hot-dip galvanized finish conforming to ASTM A123/A123M, applied after fabrication.
- B. Field-Applied Finish: Refer to Section 099610 - High Performance Coatings for Steel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which might result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION

- A. Set AESS accurately in locations and to elevations indicated, and according to AISC specifications referenced in this Section.
- B. In addition to the special care used to handle and erect AESS, employ the following erection techniques:
 1. AESS Erection Tolerances: Erection Tolerances shall meet the requirements of Chapter 10 of AISC S303.
 2. Welds Ground Smooth: Erector shall grind welds smooth in the connections of AESS members. For groove welds, the weld shall be made flush to the surfaces of each side and be within +1/16 inch / -0 inch of plate thickness.

3. Contouring and Blending of Welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up .
 4. Continuous Welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
 5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
 6. Bolt Head Orientation: All bolt heads shall be oriented as indicated on the contract documents.
 - a. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings.
 - b. Where bolt-head alignment is not noted, the bolt heads in a given connection shall be oriented to one side.
 7. Removal of Field Connection Aids:
 - a. Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up, and welding in the field shall be removed from the structure.
 - b. Field groove welds shall be selected to eliminate the need for backing bars or to permit their removal after welding.
 - c. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth.
 - d. Holes for erection bolts shall be plug welded and ground smooth.
 8. Filling of Weld Access Holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled.
 - a. Filling shall be executed with proper procedures to minimize restraint and address thermal stresses in group 4 and 5 shapes.
- C. Field Welding: Weld profile, quality, and finish shall be consistent with mock-ups approved prior to fabrication.
- D. Splice members only where indicated.
- E. Obtain permission for any torch cutting or field fabrication from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.
- F. Do not enlarge unfair holes in members by burning or by using drift pins.
 1. Ream holes that must be enlarged to admit bolts.
 2. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

3.04 FIELD CONNECTIONS

- A. Bolted Connections: Install bolts of the specified type and finish in accordance with Section 051200 - Structural Steel Framing.
- B. Welded Connections: Comply with AWS D1.1 for procedures and appearance.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 - a. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.
2. Obtain Architects approval for appearance of welds in repaired or field modified work.
3. For additional requirements, refer to Section 051200 - Structural Steel Framing.

3.05 FIELD QUALITY CONTROL

- A. Structural Requirements: For bolt and weld testing requirements, refer to Section 051200 - Structural Steel Framing.
- B. AESS Acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the mockup.

3.06 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 052100
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. Joist accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.

- B. LEED Submittals:

- 1. General:

- a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.

- C. Shop Drawings:

- 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Include structural calculations, stamped by a registered professional engineer licensed in the state of Florida, for the design of all pitched joists and special joists.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Manufacturer certificates.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing pitched joists and special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

2.3 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.

- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.
- B. Apply one coat of shop primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

END OF STEEL JOIST FRAMING

SECTION 053100
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
- C. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Product certificates.
- C. Evaluation reports.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 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. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ROOF DECK

- 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. [Canam United States; Canam Group Inc.](#)
 2. [CMC Joist & Deck.](#)
 3. [Epic Metals Corporation.](#)
 4. [Marlyn Steel Decks, Inc.](#)
 5. [New Millennium Building Systems, LLC.](#)
 6. [Nucor Corp.; Vulcraft Group.](#)
 7. [Roof Deck, Inc.](#)
 8. [Verco Manufacturing Co.](#)
 9. [Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.](#)
- B. 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 with the following:
 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Deck Profile: As indicated.

3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.

2.3 COMPOSITE FLOOR DECK

- 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. [Canam United States; Canam Group Inc.](#)
 2. [CMC Joist & Deck.](#)
 3. [Epic Metals Corporation.](#)
 4. [Marlyn Steel Decks, Inc.](#)
 5. [New Millennium Building Systems, LLC.](#)
 6. [Nucor Corp.; Vulcraft Group.](#)
 7. [Verco Manufacturing Co.](#)
 8. [Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.](#)
- B. Composite 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, with the minimum section properties indicated, and with the following:
 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Profile Depth: As indicated.
 3. Design Uncoated-Steel Thickness: As indicated.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. 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.
- E. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- F. Galvanizing Repair Paint: ASTM A 780.
- G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 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. 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.
- C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- G. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- H. Pour Stops and Girder Fillers: Weld steel-sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- I. 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 deck.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF STEEL DECKING

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Exterior non-load-bearing wall framing.
 2. Joists.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:
 - (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
 - a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.
- C. 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.

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. Custom Stud Inc.
 6. Design Shapes in Steel.
 7. Dietrich Metal Framing; a Worthington Industries company.
 8. Formetal Co. Inc. (The).
 9. MarinoWARE.
 10. MBA Building Supplies, Inc.
 11. Nuconsteel; a Nucor Company.
 12. Southeastern Stud & Components, Inc.
 13. Steel Construction Systems.
 14. Steel Network, Inc. (The).
 15. Steel Structural Systems.
 16. United Metal Products, Inc.
 17. United Steel Manufacturing.

2.2 PERFORMANCE REQUIREMENTS

- A. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60, A60, AZ50, or GF30.
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G90.

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 matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard 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).

2.5 JOISTS

- 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.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, 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.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- 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.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. 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.
- E. 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. 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.

3.2 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 cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. 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.

- F. 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.
- G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- H. 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.

3.3 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 bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated or as required for structural performance.
- 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. Connect vertical deflection clips to infill studs 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. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- 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.

3.4 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 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 COLD-FORMED METAL FRAMING

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rough hardware.
- B. Miscellaneous framing and supports.
- C. Shelf angles.
- D. Shop fabricated steel and aluminum items.
 - 1. Stair nosings.
 - 2. Sump pit grating, except where provided by elevator manufacturer.
 - 3. Elevator pit ladder, except where provided by elevator manufacturer.
 - 4. Galv. Steel grating for elevated platform at Air Cooled Chiller
- E. Miscellaneous mechanical anchors.
- F. Adhesive anchors.

1.02 RELATED SECTIONS

- A. Section 033000 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 051200 - Structural Steel Framing.
- C. Section 052100 - Steel Joist Framing
- D. Section 053100 - Steel Decking
- E. Section 054000 - Cold-Formed Metal Framing.
- F. Section 055110 - Metal Stairs
- G. Section 055133 - Vertical Metal Ladders: Aluminum roof access ladder.
- H. Section 055120 - Historic Replica Fire Escapes.
- I. Section 061000 - Rough Carpentry.
- J. Section 076200 - Sheet Metal Flashing and Trim.
- K. Section 092116 - Gypsum Wallboard Assemblies: Non-loadbearing metal framing.
- L. Section 099000 - Painting and Coating: Field-applied paint finish.
- M. Section 142010 - Passenger Elevators.
- N. Division 26 - Electrical: Miscellaneous framing and supports for lighting.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. Aluminum Association, Inc. (AA):
 - 1. AA DAF-45 -- Designation System for Aluminum Finishes.
- C. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611 -- Voluntary Specification for Anodized Architectural Aluminum.
- D. American National Standards Institute (ANSI):
 - 1. ANSI A14.3 -- American National Standard for Ladders - Fixed - Safety Requirements.
- E. American Society of Mechanical Engineers (ASME):
 - 1. ASME A17.1 -- Safety Code for Elevators and Escalators (including ASME A17.1a and ASME A17.2S).
 - 2. ASME/ANSI B18.2.1 -- Square and Hex Bolts and Screws (Inch Series).
 - 3. ASME/ANSI B18.2.2 -- Nuts for General Applications (Inch Series).
 - 4. ASME/ANSI B18.21.1 -- Lock Washers (Inch Series).
 - 5. ASME/ANSI B18.22.1 -- Plain Washers.
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM A6 -- Standard Specification for General Requirements for Rolled Structural Steel Bars, Shapes, and Sheet Piling.
 - 2. ASTM A36 -- Standard Specification for Carbon Structural Steel.
 - 3. ASTM A53 -- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 4. ASTM A123 -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 5. ASTM A153 -- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 6. ASTM A193 -- Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - 7. ASTM A240 -- Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
 - 8. ASTM A269 -- Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 9. ASTM A276 -- Standard Specification for Stainless Steel Bars and Shapes.
 - 10. ASTM A283 -- Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 11. ASTM A307 -- Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
 - 12. ASTM A312 -- Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - 13. ASTM A320 -- Standard Specification for Alloy Steel Bolting Materials for Low-Temperature Service.
 - 14. ASTM A325 -- Standard Specification for Structural Bolts, Steel, Heat

Treated, 120/105 ksi Minimum Tensile Strength.

15. ASTM A403 -- Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.
16. ASTM A480 -- Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
17. ASTM A500 -- Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
18. ASTM A501 -- Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
19. ASTM A510 -- Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
20. ASTM A563 -- Standard Specification for Carbon and Alloy Steel Nuts.
21. ASTM A570 -- Standard Specification for Structural Steel, Sheet and Strip, Carbon, Hot-Rolled.
22. ASTM A611 -- Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled.
23. ASTM A653 -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
24. ASTM A1011 -- Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
25. ASTM B209 -- Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
26. ASTM B117 -- Standard Practice for Operating Salt Spray (Fog) Apparatus.
27. ASTM B210 -- Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
28. ASTM B211 -- Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
29. ASTM B221 -- Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
30. ASTM D4828 -- Standard Test Methods for Practical Washability of Organic Coatings.
31. ASTM F593 -- Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
32. ASTM F594 -- Specification for Stainless Steel Nuts.
33. ASTM F837 -- Specification for Stainless Steel Socket Head Cap Screws.
34. ASTM F879 -- Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws.
35. ASTM F880 -- Specification for Stainless Steel Socket-Set Screws.
36. ASTM G155 -- Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

G. American Welding Society (AWS):

1. AWS A2.4 -- Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS A5.8 -- Specification for Filler Metals for Brazing and Braze Welding.
 3. AWS B2.1 -- Specification for Welding Procedure and Performance Qualification.
 4. AWS B2.2 -- Standard for Brazing Procedure and Performance Qualification.
 5. AWS D1.1 -- Structural Welding Code - Steel.
 6. AWS D1.2 -- Structural Welding Code - Aluminum.
 7. AWS D10.9 -- Specification for Qualification of Welding Procedures and Welders for Piping and Tubing.
- H. International Code Council, Inc. (ICC):
1. ICC-ES AC-58 -- Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements; ICC Evaluation Service, Inc. (ICBO/ICC-ES AC-58).
- I. International Organization For Standardization (ISO):
1. ISO 13007 -- Standards for Adhesives and Grouts.
- J. The National Association of Architectural Metal Manufacturers (NAAMM)
1. NAAMM MBG532 -- Heavy Duty Metal Bar Grating Manual.
- K. The Society for Protective Coatings (SSPC):
1. SSPC-Paint 11 -- Power Tool Cleaning to Bare Metal.
 2. SSPC-Paint 12 -- Cold-Applied Asphalt Mastic (Extra Thick Film).
 3. SSPC-Paint 15 -- Steel Joist Shop Paint.
 4. SSPC-Paint 20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
 5. SSPC SP-1 -- Solvent Cleaning.
 6. SSPC SP-2 -- Hand Tool Cleaning.
 7. SSPC SP-3 -- Power Tool Cleaning.
 8. SSPC SP-5 -- White Metal Blast Cleaning
 9. SSPC SP-6 -- Commercial Blast Cleaning; Society for Protective Coatings.
 10. SSPC SP-7 -- Brush-Off Blast Cleaning.
 11. SSPC SP-10 -- Near-White Blast Cleaning.
 12. SSPC SP-11 -- Power Tool Cleaning to Bare Metal.
- L. Underwriters Laboratories, Inc. (UL):
1. UL 1994 -- Luminous Egress Path Marking Systems.
- M. Federal Specifications and Standards, U.S. General Services Administration (FS):
1. FF-B-561 -- Federal Specification: Bolts, (Screw), Lag.
 2. FS FF-B-588 -- Bolt, Toggle; and Expansion Sleeve, Screw.
 3. FS FF-S-92 -- Screw, Machine, Slotted, Cross Recessed or Hexagon Head.
 4. FS FF-S-111 -- Screw, Wood.
 5. FS FF-W-84 -- Washers, Lock (Spring).
 6. FS FF-W-92 -- Washer, Flat (Plain).
- N. U.S. Code of Federal Regulations (CFR):
1. 29 CFR 1910 -- U.S. Occupational Safety and Health Standards.
 - a. 29 CFR 1910 Subpart D -- Walking Working Surfaces.
 - (1) 29 CFR 1910.27 -- Fixed ladders.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Structural design criteria.
 - 2. Preparation instructions and recommendations.
 - 3. Installation methods.
 - 4. Storage and handling requirements and recommendations
- C. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 3. Shop drawings for load-carrying components and assemblies shall be signed and sealed by Delegated Professional Structural Engineer; see Quality Assurance.
- D. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

1.05 QUALITY ASSURANCE

- A. Design load carrying components and assemblies, including but not necessarily

limited to railing and handrail assemblies, steel tube support for casework, etc., under direct supervision of a Delegated Professional Engineer experienced in design of this Work and licensed in the State of Florida.

- B. Field Measurements: Where metal fabrications are indicated to fit walls and/or other construction, verify field dimensions by field measurements. Take field measurements prior to preparation of shop drawings and fabrication, and indicate measurements on shop drawings.
 - 1. Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.
- C. Manufacturer Qualifications:
 - 1. Ladder Manufacturer: A firm experienced in producing metal ladders similar to those indicated for this Project.
 - a. Record of successful in-service performance.
 - b. Sufficient production capacity to produce required units.
 - c. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
 - 2. Anchor Manufacturers: Firm having a minimum of five years of experience producing products of the type specified, with a complete line of installation tools and accessories.
- D. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
 - 1. Workmen Qualifications: Provide at least one person who will be present at all times during execution of this portion of the work, and who is thoroughly trained and experienced in metal fabrication of the type specified herein, and who shall direct all work performed under this Section.
- E. Welder Qualifications: Use only certified welders and shielded arc process for all welding performed in connection with the work of this Section.
 - 1. Welders employed on the project must be qualified within the past 12 months under the AWS procedure for the type(s) of work required. Submit certification for welders, verifying AWS qualification within the previous 12 months.
- F. Regulatory Requirements: Fabricate and install metal fabrications in compliance with governing building code and all other applicable regulatory requirements.
 - 1. Design miscellaneous steel framing and support assemblies (including connections, attachments and attachments) to support imposed loads in accordance with applicable requirements of the governing building code.
 - 2. Ladders shall comply with the following:
 - a. 29 CFR 1910.27 minimum standards for ladders.
 - b. ANSI A14.3 fixed ladder requirements.

- G. Welding shall comply with requirements of AWS A2.4, AWS A5.8, AWS B2.1, AWS B2.2, AWS D1.1, AWS D10.9, governing building code, and applicable regulatory requirements.

1.06 STORAGE AND HANDLING

- A. Protection: Use all means necessary to protect work of this Section, before, during and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage or rejection, immediately make all repairs and replacements necessary for the approval of the Consultant, at no additional cost to the City.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurement before fabrication.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Recycled Content
 - 1. Steel Products (Other Than Stainless Steel): Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than the following:
 - a. W-Shapes: 60 percent.
 - b. Channels, Angles, M- and S-Shapes: 60 percent.
 - c. Plate and Bar: 25 percent.
 - d. Cold-Formed Hollow Structural Sections: 25 percent.
 - e. Steel Pipe: 25 percent.
 - f. All Other Steel Materials: 25 percent.
- B. Steel (Other Than Stainless Steel):
 - 1. Except as otherwise indicated, rolled structural steel bars, plates, and shapes used for load carrying applications shall conform to ASTM A6.
 - 2. Steel Sections: ASTM A36.
 - 3. Steel Plates: ASTM A283.
 - 4. Steel Tubing:
 - a. Cold-Formed Structural Tubing: ASTM A500, Grade B except as otherwise indicated.
 - b. Hot-Formed Structural Tubing: ASTM A501.
 - 5. Steel Pipe: ASTM A53.
 - a. Type: Type S, except as otherwise indicated.
 - b. Grade: Grade B, except as otherwise indicated.
 - b. Wall Thickness: Schedule 40, except as otherwise indicated.
 - c. Finish: Hot-dip galvanized finish, except as otherwise indicated.

6. Slotted Steel Channel Framing: ASTM A653, Grade 33.
 7. Slotted Steel Channel Fittings: ASTM A1011.
 8. Steel Sheet: Hot-rolled ASTM A570; or cold-rolled ASTM A611, Class 1, of grade required for design loading.
 9. Bolts, Nuts, and Washers: ASTM A325, Type 1, galvanized to ASTM A153 where connecting galvanized components.
 10. Welding Materials: AWS D1.1; type required for materials being welded.
 11. Shop and Touch-Up Primer:
 - a. Non-galvanized Surfaces: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
 - b. Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- C. Stainless Steel:
1. Stainless Steel Sections (e.g., angles): ASTM A276, Type 304.
 2. Stainless Steel Strip: ASTM A480, Type 304, #2B finish, except as otherwise indicated.
 3. Stainless Steel Plate: ASTM A240, Type 304, #1 finish, except as otherwise indicated.
 4. Stainless Steel Flat Bar: ASTM A240 or A276, except as otherwise indicated.
 5. Stainless Steel Pipe: ASTM A312, Seamless, Type 304L, Schedule 40S, except as otherwise indicated.
 6. Stainless Steel Tubing:
 - a. Polished: ASTM A312, Seamless, Schedule 10, except as otherwise indicated.
 - b. Ornamental, Round: ASTM A269, Seamless, Type 304, 16 gage, unless otherwise indicated.
 7. Wrought Stainless Steel Pipe Fittings: ASTM A403.
 8. Stainless Steel Sheet: ASTM A240, Type 304, #4 satin finish, except as otherwise indicated.
 9. Bolts, Nuts, and Washers: Stainless steel.
- D. Aluminum:
1. Extruded Aluminum: ASTM B221, 6063 alloy, T6 temper, except as otherwise indicated.
 2. Sheet Aluminum: ASTM B209, 5052 alloy, H32 or H22 temper, except as otherwise indicated.
 3. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210, 6063 alloy, T6 temper, except as otherwise indicated.
 4. Aluminum-Alloy Bars: ASTM B211, 6061 alloy, T6 temper, except as otherwise indicated.
 5. Bolts, Nuts, and Washers: Stainless steel.
 6. Welding Materials: AWS D1.2; type required for materials being welded.

2.02 FABRICATION

A. General:

1. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including, but not necessarily limited to, pitting, seam marks, roller marks, rolled trade names and roughness.
2. Fit and shop assemble items in largest practical sections, for delivery to site. Pre-assemble items in shop to greatest extent possible, to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
3. Shear and punch metals cleanly and accurately. Remove burrs.
4. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
5. Fabricate items with joints tightly fitted and secured.
6. Continuously seal joined members by continuous welds. Weld corners and seams continuously to comply with the following:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
7. 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.
8. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place, and to support imposed loads.
9. Cut, reinforce, drill, and tap metal fabrications to receive required finish hardware, screws and similar items.
10. Allow for thermal movement resulting from the following change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Engineering calculations to be based on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - a. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surface.
11. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
12. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

13. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- B. Workmanship:
1. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flathead (countersunk) screws or bolts.
 - a. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
 - b. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
 5. Structural Steel:
 - a. No splices permitted unless approved by Consultant.
 - b. Steel tube columns shall be seamless and concrete filled with vents top, middle, and bottom.
- C. Galvanizing:
1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - a. ASTM A153 for galvanizing iron and steel hardware.
 - b. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8 inch thick or heavier.
 - c. ASTM A123 for galvanizing assembled steel products.
- D. Shop Painting:
1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
 2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 or SSPC SP-3.
 3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
 4. Immediately after surface preparation, brush or spray on primer in

accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mills for each coat. Use painting methods that will result in full coverage of joints, corners, edges and exposed surfaces.

5. Apply one shop coat to fabricated metal items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.03 FABRICATED ITEMS

- A. Rough Hardware:
 1. Furnish bent or otherwise custom fabrication bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
 2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts that bear on wood structural connections; elsewhere, furnish steel washers.
- B. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.
- C. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; hot-dipped galvanized per ASTM A653, Grade G90 finish.
- D. Metal Grating: Rectangular, welded steel bar grating designed to support specified live load (Load Capacity).
 1. Load Capacity: Minimum 200 PSF uniform live load, with deflection not to exceed $L/180$.
 2. Materials:
 - a. Bearing Bars: ASTM A36 rectangular steel bars, on 1-3/16 inch centers, unless otherwise indicated.
 - (1) Bar Size: Appropriate depth and thickness for supporting the specified Load Capacity, but not less than 1 inch x 3/16 inch.
 - b. Cross Bars: ASTM A510 twisted wire rod, at 2 inches on center, resistance welded to the bearing bars and at right angles to them.
 - c. Banding: Continuous steel bar of same material and size as bearing bars, welded to grating panel.
 - d. Fasteners for Removable Panels: Saddle clip anchor assembly, with self-drilling screw or weldable stud bolt.
 - (1) Clips shall have same finish as grating.
 - e. Close Outs at Steps and Stairs: Special grating panel with nosing edge for platform ending at top of stairs.
 - f. Toeplate: Flat steel bar curb secured to outer edge of grating where shown.
 3. Fabrication:

- a. Fabricate with bearing bars on edge, and with all intersecting and abutting members joined by the electro-pressure welding method for the full depth of cross bar.
 - b. All required cutting, fitting and welding shall be performed in the manufacturers shop in accordance with the approved shop drawings and shall be in compliance with the NAAMM MBG532 tolerances and welding standards.
 - c. All cutouts to clear obstructions shall have a recommended clearance of 1 inch. When banding and toe plates are required they shall be welded to the grating in accordance with NAAMM standards.
- 4. Surface: Plain or serrated, as indicated on drawings; if not indicated, then provide plain.
 - 5. Finish: Hot dip galvanized, after fabrication.
 - 6. Manufacturer:
 - a. Basis of Design: Alabama Metal Industries Corp. (Amico).
 - (1) Product: Amico Standard Welded Type "HD" 19-H-4.
 - b. Other Manufacturers: Subject to contract requirements, equivalent products by other manufacturers may be used.
- E. Metal Grating (Elevated Platform at Air Cooled Chillers):
- 1. Material: Galvanized Bar Grating
 - 2. Grating Size: 1-inch x 3/16-inch bars at 1-3/16-inch spacing
- F. Elevator Pit Ladder: Provide pit access ladder conforming to requirements of FBC-B Chapter 30, FAC Chapter 61C-5 (Florida Elevator Code), and ASME A17.1.
- 1. Material: Galvanized steel.
 - 2. Contractor shall coordinate ladder sizing and configuration, location (within the hoistway), and details for attachment to structure (floor and wall) with elevator manufacturer, to ensure proper fit within the hoistway.
- G. Miscellaneous Framing and Supports:
- 1. Provide miscellaneous steel framing and supports as required to complete the work.
 - 2. Fabricate miscellaneous units to sizes, shapes and profiles shown or if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
 - 3. Galvanize miscellaneous framing and supports, except as otherwise indicated.
- H. Miscellaneous Steel Trim:
- 1. Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with

continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

2. Galvanize miscellaneous steel trim where indicated.

2.04 MISCELLANEOUS MECHANICAL ANCHORS

- A. General:
 1. Provide zinc-coated fasteners, except as otherwise indicated.
 - a. Provide stainless steel fasteners where fastener will be installed in contact with pressure-treated wood.
 2. Select fasteners for type, grade and class as appropriate for application and use intended.
- B. Bolts and Nuts: Except as otherwise indicated, provide regular hexagon head type, ASTM A307, Grade A, with hex nuts, ASTM A563, and flat washers.
 1. At structural connections requiring high-strength bolts, provide regular hexagon head type, ASTM A325, Grade A.
 2. At aluminum connections, provide stainless steel bolts, nuts, and washers.
 3. At connections with pressure-treated wood, provide stainless steel bolts, nuts, and washers.
- C. Lag Bolts: Square head type, FS FF-B-561.
- D. Machine Screws: Cadmium-plated steel, FS FF-S-92; ASME B18.2.1.
- E. Wood Screws: Flat-head carbon steel, FS FF-S-111, except as follows:
 1. Provide stainless steel screws for use with pressure-treated wood.
- F. Plain Washers: Round, carbon steel, FS FF-W-92; ASME B18.22.1.
- G. Stainless Steel Bolts (and Nuts): ASTM A320, Type 304.
- H. Stainless Steel Fasteners:
 1. Bolts and hex cap screws: ASTM F593.
 2. Nuts: ASTM F594.
 3. Socket head cap screws: ASTM F837.
 4. Socket button and flat countersunk head cap screws: ASTM F879.
 5. Socket set screws: ASTM F880.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588; type, class and style as appropriate for application and use intended.
- I. Lock Washers: Helical spring type carbon steel, FS FF-W-84; ASME B18.21.1.
- J. Powder-Actuated Fasteners: Not allowed.
- K. Concrete Mechanical Anchors: As indicated in Drawings.
 1. Manufacturers / Products: Use wedge-type expansion anchors such as:
 - a. Hilti Kwik Bolt III.
 - b. Illinois Tool Works (ITW) Ramset Red Head Trubolt Wedge.
 - c. Powers Power Stud.

- d. Simpson Strong Tie Wedge All.
2. Provide type, size and quantity as appropriate for base material (e.g., concrete, CMU), performance (e.g., heavy duty, shear, tension), usage (e.g., permanent, finished appearance), installation (e.g., through fixture, flush surface) and corrosion resistance (e.g., galvanized).
3. Refer to Structural Drawings for additional information.

2.05 ADHESIVE ANCHORS

A. General:

1. As indicated in Drawings; where not indicated, provide type, size and quantity as appropriate for application and use intended.
2. Except as otherwise indicated, provide anchor bolt and sleeve assembly of material indicated below, with capability to sustain, without failure, a load equal to 6 times the load imposed, as determined by testing in accordance with ASTM E488; testing to be conducted by an independent testing agency.

B. Manufacturers:

1. Hilti; P.O. Box 21148; Tulsa, OK 74121; Tel: (800) 879-8000. Fax: (800) 879-7000.
2. Illinois Tool Works (ITW) Ramset/Red Head; Wood Dale, IL 60191; 708-350-1858
3. U.S. Anchor Corp; 450 East Copans Road, Pompano Beach, FL 33064. ASD. Tel: (800) 872-3330. Fax: (800) 362-3320. www.usanchor.com

C. Materials:

1. Anchors: Threaded steel rods with hex nuts.
 - a. Material: ASTM A193, Grade B7, hot-dipped galvanized with ASTM A153 Class C or D coating, except as follows:
 - (1) At connections with pressure-treated wood, provide stainless steel anchors.
 - b. Diameter: As indicated on drawings.
 - c. Length: As indicated on drawings.
2. Anchor Bonding Adhesive: Two-part, non-sag, 100 percent solids, ceramic blend amine-based epoxy adhesive; odorless, solvent- and styrene-free, moisture insensitive; high aspect ratio; gray in color when installed.
 - a. Allowable Tensile Load (3/8 inch diameter threaded rod, with 1/2 inch diameter hole and 3-1/2 inch embedment): 2,000 pounds, minimum.
 - b. Allowable Shear Load (3/8 inch diameter threaded rod, with 1/2 inch diameter hole and 3-1/2 inch embedment): 1,700 pounds, minimum.
 - c. Complying with requirements of ICC-ES AC-58; independent agency certified; in addition to basic testing, show suitability of material for installation in damp holes.
 - d. Complying with requirements of Miami-Dade Product Approval.
3. Accessories and Tools: As recommended by adhesive manufacturer, including:
 - a. Screens for use in hollow and unreinforced masonry, to hold adhesive in place until cured.

- b. Retaining plugs to hold adhesive and anchor in place in overhead applications.
- c. Brushes for cleaning anchor holes.
- d. Dispensing tools.

2.06 FINISHES

A. Steel:

- 1. Galvanized Finish:
 - a. Galvanize the following items:
 - (1) Items specified for galvanized finish, or where galvanized finish is indicated.
 - (2) Items indicated to be embedded in concrete or masonry.
 - (3) Miscellaneous steel framing and supports.
 - (4) Items installed at locations not within air-conditioned spaces.
 - b. Unless otherwise specified or noted, items indicated to be galvanized shall receive a zinc coating by the hot-dip process, after fabrication, complying with the following:
 - (1) ASTM A123 for plain and fabricated material, and assembled products.
 - (2) ASTM A153 for iron and steel hardware.
- 2. Shop Painting:
 - a. Cleaning Steel: Thoroughly clean all steel surfaces.
 - (1) Remove oil, grease, and similar contaminants in accordance with SSPC SP-1.
 - (2) Remove loose mill scale, loose rust, weld slag and spatter, and other detrimental material in accordance with SSPC SP-2, SSPC SP-3, or SSPC SP-7.
 - b. Galvanized Items:
 - (1) Galvanized items which are to be finish painted under Section 099000 - Painting and Coating shall be rinsed in hot alkali or in an acid solution and then in clear water.
 - (2) Welded and abraded areas of galvanized surfaces shall be wire brushed and repaired with a coating of cold galvanizing compound.
 - c. Apply one coat of shop paint to all steel surfaces except as follows:
 - (1) Do not shop paint steel surfaces to be field welded, and steel to be encased in cast-in-place concrete.
 - (2) Apply 2 coats of shop paint, before assembly, to steel surfaces inaccessible after assembly or erection, except surfaces in contact.
 - (3) Do not paint galvanized items which are not to be finish painted under Section 099000 - Painting and Coating.
 - d. Apply paint and compound on dry surfaces in accordance with the manufacturer's printed instructions, and to the following minimum thickness per coat:
 - (1) Shop Paint - General: 4.0 mils wet film.
 - (2) Shop Paint for Galvanized Steel: 3.0 mils wet film.

(3) Galvanizing Repair Paint: 2.0 mils dry film.

- B. Stainless Steel: No. 4 satin polish, except as otherwise indicated.
- C. Aluminum: Except as otherwise indicated, provide Class I natural anodized, AAMA 611 AA-M12C22A41, not less than 0.7 mils (0.018 mm) thick.
 - 1. Comply with AA DAF-45 for aluminum finishes required.
- D. Bituminous Mastic: Cold applied asphalt mastic; SSPC-Paint 12.

2.07 FABRICATION TOLERANCES

- A. General:
 - 1. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
 - 2. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
 - 3. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
 - 4. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
 - 5. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
 - 1. Applicator must examine the areas and conditions under which metal fabrications are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work.
 - 2. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to applicator. Starting of this work will be construed as installer's acceptance of the surfaces and conditions within any particular area; any corrections that may be required will be at the expense of this installer.

3.02 PREPARATION

- A. General:
 - 1. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
 - 2. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- B. Temporarily brace and secure items which are to be built into concrete, masonry, or similar construction.
- C. Isolate non-ferrous metal surfaces to be permanently fastened in contact with ferrous metal surfaces, concrete, or masonry by coating non-ferrous metal surface with bituminous mastic, prior to installation.
 - 1. Comply with applicable requirements of the governing building code, including but not limited to FBC-B Section 2003.8.4.
- D. Adhesive Anchors:

1. Do not begin installation until conditions are such that anchors will not be disturbed before complete adhesive curing is complete.
2. Plan installation so that adhesive can be installed in optimum manner to achieve good bonding.
3. Ensure that anchors are free of grease, oil, dirt, and other foreign material.
4. Install in strict accordance with adhesive manufacturer's instructions and recommendations, following adhesive manufacturer's published structural design information.

3.03 INSTALLATION

A. General:

1. Install items plumb and level, accurately fitted, free from distortion or defects.
2. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
3. Fit exposed connections accurately to form tight hairline joints.
4. Field weld components indicated on shop drawings.
5. Obtain approval prior to site cutting or making adjustments not scheduled.
6. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

1. Cut off exposed threaded portion of bolts flush with nut.

C. Connections:

1. Fit exposed connections accurately together for form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be hop welded because of shipping size limitations.
2. Grind exposed joints smooth and touch-up shop paint coat.
3. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screw filled connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

1. Weld connections which are not intended to be left as exposed joints, but cannot be shop welded because of size limitations.
2. Perform field welding in accordance with AWS D1.1.
3. Grind welded joints smooth.

E. Cutting, Fitting and Placement:

1. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications.
 2. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
 3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
- F. Setting Loose Plates:
1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
 2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
 3. Pack grout solidly between surfaces and plates, to ensure that no voids remain.
- G. Concrete Mechanical Anchors:
1. Prior to drilling hole for expansion anchor, confirm the absence of reinforcing steel by drilling a 1/4 inch diameter pilot hole. Do not cut reinforcing steel without approval of the Structural Engineer.
 2. Refer to manufacturer's installation instructions for appropriate drill size.
 3. Provide anchor embedment, spacing and edge distance as shown on the Drawings.
- H. Adhesive Anchors:
1. Drill holes of proper diameter and depth, in accordance with adhesive manufacturer's published structural design information.
 2. Blow out and brush holes, removing dust and debris.
 3. In Concrete:
 - a. Using nozzle of appropriate size for hole, dispense adhesive into the hole, from bottom up, filling approximately five-eighths of the hole while withdrawing nozzle.
 - b. Insert anchor into hole, to the bottom, while turning clockwise.
 4. In Hollow Masonry:
 - a. Using screen and nozzle of appropriate size for hole, dispense adhesive into screen, filling completely while withdrawing nozzle.
 - b. Insert screen into hole.
 - c. Insert anchor into screen, to the bottom, while turning clockwise.
 5. Do not disturb anchors until minimum cure time to loading has passed.
- I. Stair Nosings:
1. Prior to installation, coat nosing surfaces in contact with cementitious materials with bituminous mastic.

2. Install nosings in accordance with applicable regulatory requirements, industry standards applicable to the work, and manufacturer's written installation instructions, except as otherwise specified.
 3. Install stair nosings centered at edges of stair treads and landings indicated.
 4. Work shall be aligned plumb, level, flush with adjacent surfaces, and rigidly anchored to substrate.
- J. Grating: Weld grating to supporting members, unless otherwise shown or specified.
1. Secure removable panels with saddle clip anchor assemblies.
- K. Elevator Pit Ladder: Install ladder in accordance with requirements of FBC-B Chapter 30, FAC Chapter 61C-5 (Florida Elevator Code), and ASME A17.1.
1. Install ladder in location (within the hoistway) and attach to building structure (floor and wall) in accordance with elevator manufacturer's final installation drawings.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace damaged and defective anchors and anchors not adequately adhered.

3.05 ADJUST AND CLEAN

- A. Touch-up Painted Surfaces: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness (DFT) of 2.0 mils.
- B. Touch-up Galvanized Surfaces: Clean field welds, bolted connections and abraded areas, and apply 2 coats of galvanizing repair paint.

END OF SECTION

SECTION 055110
METAL STAIRS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Manufactured steel stairs.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete fill and mesh reinforcement for landings; placement of metal anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 055000 - Metal Fabrications.
- D. Section 055120 - Historic Replica Fire Escapes.
- E. Section 055213 - Pipe and Tube Railings.
- F. Section 055270 - Cable Railing Systems: Metal stair railings.
- G. Section 093000 - Tiling: Precast terrazzo stair treads.
- H. Section 099000 - Painting and Coating: Field-applied paint finish.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Institute of Steel Construction, Inc. (AISC):
 - 1. AISC 201 -- AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A6/A6M -- Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - 2. ASTM A36/A36M -- Standard Specification for Carbon Structural Steel.
 - 3. ASTM A123/A123M -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153/A153M -- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A283/A283M -- Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 6. ASTM A325 -- Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 7. ASTM A325M -- Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric).
 - 8. ASTM A500/A500M -- Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

9. ASTM A501 -- Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 10. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. American Welding Society (AWS):
1. AWS A2.4 -- Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 2. AWS D1.1/D1.1M -- Structural Welding Code - Steel.
- E. International Accreditation Service, Inc. (IAS):
1. IAS AC172 -- Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
1. NAAMM AMP 510 -- Metal Stairs Manual.
- G. National Ornamental & Miscellaneous Metals Association (NOMMA):
1. NOMMA GL1 -- Guideline 1: Joint Finishes.
- H. Society for Protective Coatings (SSPC):
1. SSPC-Paint 15 -- Steel Joist Shop Primer.
 2. SSPC-Paint 20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
 3. SSPC-SP 2 -- Hand Tool Cleaning.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design Requirements:
1. General: Metal stairs and parts thereof shall be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable requirements of the governing building code.
 2. Strength: Metal stairs and parts thereof shall be designed and constructed to support safely the factored loads in load combinations defined in the governing building code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, metal stairs and parts thereof shall be designed and constructed to support safely the nominal loads in load combinations defined in the governing building code without exceeding the appropriate specified allowable stresses for the materials of construction.
 3. Serviceability: Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.
- B. Structural Performance: Provide metal stairs and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
1. Treads and Platforms: Shall resist the following live loads:
 - a. Uniform Live Load: 100 psf.
 - b. Concentrated Live Load: Minimum concentrated load on stair treads (on area of 4 square inches) is 300 pounds
 2. Railings and Safeguards:

- a. Railings, Stair Railings and Other Similar Safeguards: Shall resist the following live loads applied in any direction at the top of such barriers at any location on the safeguard, whichever condition produces the maximum stresses.
 - (1) Uniform Live Load: 50 pounds per lineal foot (74 kg/m)
 - (2) Concentrated Live Load: 200 pounds (690 N).
- b. Intermediate Rails, Balusters and Panel Fillers: Shall resist a uniform horizontal load of not less than 25 psf (1197 Pa) over the gross area of the guard, including the area of any openings in the guard, of which they are a part without restriction by deflection.
3. Deflection: $L/240$, except where more stringent criteria is required by governing building code.

1.05 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide fabricator's product data substantiating compliance with drawings and specifications.
- C. Shop Drawings: Submit shop drawings for stairs and railings. Include plans, elevations and details.
 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 3. Shop drawings shall be signed and sealed by a qualified Structural Designer. Include the design engineer's signature and seal on each sheet of shop drawings.
- D. Delegated Design Data and Engineering Calculations: Provide documentation as required by governing building code and authorities having jurisdiction.
 1. Include design loads, structural calculations, and material properties.
 2. Engineering calculations shall be signed and sealed by a qualified Structural Designer. Coordinate with shop drawings submittal.
- E. Welders' Certificates.
- F. Fabricator's Qualifications Information:
 1. Provide documentation showing steel fabricator is certified under AISC 201.
 2. Provide documentation showing steel fabricator is accredited under IAS AC172.
- G. LEED Submittals:
 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit MR 4.1 and Credit MR 4.2 (Recycled Content): For products having recycled content, submit documentation required to complete the

recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.

3. Product Data for Credit MR 5.1 and Credit MR 5.2 (Regional Materials): Submit documentation, including measurement and calculations, for "regionally-sourced" materials.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: A company specializing in fabrication of products specified in this section, with not less than ten years of documented experience; in addition, fabricator shall be:
 1. IAS-accredited in accordance with IAS AC172.
 2. AISC-certified in accordance with AISC 201.
- B. Installer Qualifications: Minimum five (5) years experience in the successful installation of steel stair and railing systems of the type indicated for this project.
- C. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
- D. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

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 complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
 2. Structural Design: Provide complete stair and railing assemblies complying with DESIGN AND PERFORMANCE REQUIREMENTS
 3. Dimensions: As indicated on drawings.
 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 6. 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 SHEET STEEL TREAD PANS FORMED FOR CONCRETE FILL

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pans formed for concrete fill.
 - 1. Porcelain Tile Stair Treads:
 - a. Thickness: 5/16 inches (7.93 mm), minimum.
 - b. For additional information, refer to Section 093000 - Tiling.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch (1.9 mm) minimum.
 - 4. Pan Anchorage to Stringers: Continuously welded, from top or bottom on inside of pan to be concealed by concrete fill.
- D. Risers: Steel Sheet, as required by design; 14 gage, 0.075 inch (1.9 mm) minimum.
 - 1. Nosing Depth: Not more than 1-1/4 inch (38 mm) overhang.
 - 2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.
 - 3. Nosing: 3-inch extruded nosing, Style 331-3 by American Stair, or equal.
- E. Stringers: Rolled steel tubing (2x12).
 - 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. Finish: Hot-dip galvanized after fabrication; shop primed; ready for field-applied paint finish.
 - 1. For Field Applied Finish refer to Section 099000 – Painting and Coating

2.03 HANDRAILS AND GUARDS

- A. Guards and Railings:
 - 1. Wall-Mounted Railings: Refer to Section 055213 - Decorative Metal Railings.
 - 2. Post-Mounted Railings: Refer to Section 055200 - Illuminated Railing Systems, 055270 - Cable Railing Systems.

- B. Handrails: Stainless steel handrails as specified in Section 055270 - Cable Railing Systems

2.04 MATERIALS

- A. Steel Sections, Plates, Shapes and Bars: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500 or ASTM A501 structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Ungalvanized Steel Sheet: Cold-rolled only.
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- E. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G90/Z275 coating.
- F. Concrete Fill (Landings): Type specified in Section 033000 - Cast-In-Place Concrete.
- G. Concrete Reinforcement (Landings): Mesh type, galvanized.
- H. Porcelain Stair Treads: Refer to Section 093000 - Tiling.
- I. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- J. Welding Materials: AWS D1.1; type required for materials being welded.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.05 FABRICATION

- A. General: Provide complete stair and landing systems including stringers, risers, tread pans (ready to receive porcelain tile treads), landing framing, landings, connections and other components necessary for the support and installation of stairs and landings.
- B. Metal Jointing and Finish Quality Level (NAAMM AMP 510): Architectural.
 - 1. 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. Exposed Work: True to line and level with accurate angles and surfaces and with straight sharp edges. Use only smooth materials free from burrs, pitting and other marks.
 - 1. Fastener Connections: Provide flush close-fit joints at exposed connections.

2. Welded Connections: To have finished appearance in accordance with NOMMA GL1, as follows:
 - a. Exposed Welds: Finish #3.
 - b. Concealed Welds: N/A.
- C. Stringers: Steel tubes.
- D. Stair Treads: Sheet steel for 2-inch thick cast-in-place concrete to receive porcelain tile treads.
- E. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.
- 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.
 3. Do not prime surfaces in direct contact with concrete or mortar, or where field welding is required.

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 shop drawings. Perform field welding in accordance with AWS D1.1.

- 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, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 055120
HISTORIC REPLICA FIRE ESCAPES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Custom fabricated steel replicas of existing historic fire escapes.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications.
- B. Section 055110 - Metal Stairs.
- C. Section 099610 - High Performance Coatings for Steel: Shop-applied high performance coating for historic replica fire escapes.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Institute of Steel Construction, Inc. (AISC):
 - 1. AISC 201 -- AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A6/A6M -- Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - 2. ASTM A36/A36M -- Standard Specification for Carbon Structural Steel.
 - 3. ASTM A123/A123M -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153/A153M -- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A283/A283M -- Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 6. ASTM A325 -- Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 7. ASTM A325M -- Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric).
 - 8. ASTM A500/A500M -- Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 9. ASTM A501 -- Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 10. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. American Welding Society (AWS):
 - 1. AWS A2.4 -- Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS D1.1/D1.1M -- Structural Welding Code - Steel.
- E. International Accreditation Service, Inc. (IAS):
 1. IAS AC172 -- Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
 1. NAAMM AMP 510 -- Metal Stairs Manual.
- G. National Ornamental & Miscellaneous Metals Association (NOMMA):
 1. NOMMA GL1 -- Guideline 1: Joint Finishes.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design Requirements:
 1. General: Historic replica fire escapes shall be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable requirements of the governing building code.
 2. Strength: Historic replica fire escapes shall be designed and constructed to support safely the factored loads in load combinations defined in the governing building code without exceeding the appropriate strength limit states for the materials of construction.
 - a. Alternatively, historic replica fire escapes shall be designed and constructed to support safely the nominal loads in load combinations defined in the governing building code without exceeding the appropriate specified allowable stresses for the materials of construction.
 3. Serviceability: Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.
- B. Structural Performance: Provide historic replica fire escapes capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
 1. Treads, Landings and Platforms: Shall resist the following live loads:
 - a. Uniform Live Load: 100 psf.
 - b. Concentrated Live Load: Minimum concentrated load on treads (on area of 4 square inches) is 300 pounds.
 2. Railings and Safeguards:
 - a. Railings and Other Safeguards: Shall resist the following live loads applied in any direction at the top of such barriers at any location on the safeguard, whichever condition produces the maximum stresses.
 - (1) Uniform Live Load: 50 pounds per lineal foot (74 kg/m)
 - (2) Concentrated Live Load: 200 pounds (690 N).
 - b. Intermediate Rails, Balusters and Panel Fillers: Shall resist a uniform horizontal load of not less than 25 psf (1197 Pa) over the gross area of the guard, including the area of any openings in the guard, of which they are a part without restriction by deflection.
 3. Deflection: L/240, except where more stringent criteria is required by governing building code.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's product data substantiating compliance with drawings and specifications..
- C. Shop Drawings: Submit shop drawings for historic replica fire escapes. Include plans, elevations and details.
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 3. Shop drawings shall be signed and sealed by a qualified Structural Designer. Include the design engineer's signature and seal on each sheet of shop drawings.
- D. Delegated Design Data and Engineering Calculations: Provide documentation as required by governing building code and authorities having jurisdiction.
 - 1. Include design loads, structural calculations, and material properties.
 - 2. Engineering calculations shall be signed and sealed by a qualified Structural Designer. Coordinate with shop drawings submittal.
- E. Fabricator's Qualifications Information:
 - 1. Provide documentation showing steel fabricator is certified under AISC 201.
 - 2. Provide documentation showing steel fabricator is accredited under IAS AC172.
- F. Welders' Certificates.
- G. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2 (Recycled Content): For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2 (Regional Materials): Submit documentation, including measurement and calculations, for "regionally-sourced" materials.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: A company specializing in fabrication of products specified in this section, with not less than ten years of documented experience; in addition, fabricator shall be:

1. IAS-accredited in accordance with IAS AC172.
 2. AISC-certified in accordance with AISC 201.
- B. Installer Qualifications: Minimum five (5) years experience in the successful installation of steel fire escape, stair and railing systems of the type indicated for this project.
- C. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
- D. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

2.01 HISTORIC REPLICA FIRE ESCAPES

- A. Provide historic replica fire escapes of the design indicated on drawings, complete with support framing and railings, fabricated accurately for anchorage to building structure.
1. Structural Design: Provide complete historic replica fire escapes complying with DESIGN AND PERFORMANCE REQUIREMENTS.
 3. Dimensions: As indicated on drawings.
 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 6. Separate dissimilar metals using paint or permanent tape.
- B. Stringers: To be fabricated from steel channels and angles, as indicated on drawings; supported and reinforced as required to achieve design load capacity.
1. End Closure: Sheet steel of same thickness as risers welded across ends.
- C. Landings: To be fabricated from steel flat bars, angles and channels, as indicated on drawings; supported and reinforced as required to achieve design load capacity
1. Landing shall have a slip-resistant surface complying with FNC-B SECTION 1003.4, and shall not accumulate water.
- D. Treads: To be fabricated from steel flat bars and angles, as indicated on drawings.
1. Anchorage to Stringers: Continuously welded; supported and reinforced as required to achieve design load capacity.
 2. Treads shall have a slip-resistant surface complying with FNC-B SECTION 1003.4, and shall not accumulate water.
- E. Risers: Open, as indicated on drawings.
- G. Railings:
1. Baluster: To be fabricated from steel flat bars and angles, as indicated on drawings.
 2. Handrails: To be fabricated from steel pipe, as indicated on drawings.
 3. Brackets: To be fabricated from steel rods, as indicated on drawings.
- H. Finish: Shop-painted with high-performance coating system; for requirements, refer to Section 099610 - High Performance Coatings for Steel.

- I. Under Side of Historic Replica Fire Escapes: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.02 MATERIALS

- A. Steel Sections (including angles and bars): ASTM A36/A36M.
- B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- C. Steel Tubing: ASTM A500, Grade B cold formed structural tubing.
- D. Steel Plates: ASTM A283/A283M.
- E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1; type required for materials being welded.

2.03 FABRICATION

- A. General: Provide complete historic replica fire escape systems, including but not limited to stringers, treads, landings, railings, support framing, connections and other components necessary for the support and installation.
- B. Metal Jointing and Finish Quality Level (NAAMM AMP 510): Architectural.
 1. 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. Exposed Work: True to line and level with accurate angles and surfaces and with straight sharp edges. Use only smooth materials free from burrs, pitting and other marks.
 1. Fastener Connections: Provide flush close-fit joints at exposed connections.
 2. Welded Connections: To have finished appearance in accordance with NOMMA GL1, as follows:
 - a. Exposed Welds: Finish #3.
 - b. Concealed Welds: N/A.
- D. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- E. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.04 SHOP FINISHING

- A. Refer to Section 099610 - High Performance Coatings for Steel.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. 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 historic replica fire escapes 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 shop drawings. Perform field welding in accordance with AWS D1.1.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 055133
VERTICAL METAL LADDERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Aluminum roof access ladder.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 042000 - Unit Masonry Assemblies: Placement of metal fabrications in masonry wall; anchorage of roof access ladder wall brackets to wall.
- C. Section 055000 - Metal Fabrications: Elevator pit ladder; anchor bolts.
- E. Section 077200 - Roof Accessories: Roof hatch; safety rail for roof hatch.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. Aluminum Association, Inc. (AA):
 - 1. AA DAF-45 -- Designation System for Aluminum Finishes.
- C. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611 -- Voluntary Specification for Anodized Architectural Aluminum.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36/A36M -- Standard Specification for Carbon Structural Steel.
- E. American Welding Society (AWS):
 - 1. AWS A2.4 -- Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - 2. AWS D1.1 -- Structural Welding Code - Steel
 - 3. AWS D1.2 -- Structural Welding Code - Aluminum.
- F. The Society for Protective Coatings (SSPC):
 - 1. SSPC-Paint 12 -- Cold-Applied Asphalt Mastic (Extra Thick Film).
- G. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910 -- Occupational Safety and Health Standards.
 - a. 29 CFR 1910, Subpart D -- Walking-Working Surfaces (29 CFR 1910.21 - 20 CFR 1910.30).
 - (1) 29 CFR 1910.27 -- Fixed Ladders.
 - 2. 29 CFR 1926 -- Occupational Safety and Health Standards (for construction work).
 - a. 29 CFR 1926, Subpart M -- Fall
 - (1) 29 CFR 1926.502 -- Fall Protection Systems Criteria and Practices.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's complete product data for roof access ladder.
- C. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated.
 - 2. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - 3. Indicate profiles, sizes, connection attachments, reinforcing, anchorage to building structure, size and type of fasteners and anchor bolts, and accessories.
 - a. Provide reaction loads for each hanger and bracket.
 - 4. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. Provide templates for anchors and bolts specified for installation under other Sections.
- D. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.

- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualification: Ladders shall comply with requirements of 29 CFR 1910.27.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurement before fabrication.

1.08 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years from date of Substantial Completion against all the conditions indicated below, and when notified in writing from City, manufacturer shall promptly and without inconvenience and cost to City correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Alaco Ladder Company; 5167 G Street; Chino, California 91710; Tel: 888-310-7040 or 909-591-7561.
- B. O'Keeffe's, Inc.; 325 Newhall St.; San Francisco, CA 94124; Tel: 888-653-3333 or 415-824-4900; Web: <http://www.okeeffes.com>.
- C. Precision Ladders, LLC (formerly, Precision Stair Corp.); P.O. Box 2279; Morristown, TN 37816; Tel. 423-586-2265.

2.02 MATERIALS

- A. Steel: Refer to Section 055000 - Metal Fabrications.
- B. Aluminum:
 - 1. Extruded Aluminum: ASTM B221, 6063 alloy, T6 temper.
 - 2. Bolts, Nuts, and Washers: Stainless steel.
 - a. Concrete Mechanical Anchors: Refer to Section 055000 - Metal Fabrications.
 - 3. Welding Materials: AWS D1.2; type required for materials being welded.

2.03 FABRICATION

- A. General:
 - 1. Fit and shop assemble items in largest practical sections, for delivery to site.
 - 2. Fabricate items with joints tightly fitted and secured.
 - 3. Continuously seal joined members by continuous welds.

4. 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.
5. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

B. Tolerances:

1. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
2. Offset Between Faces: Maximum 1/16 inch (1.5 mm).
3. Misalignment of Adjacent Members: Maximum 1/16 inch (1.5 mm).
4. Bow: Maximum 1/8 inch (3 mm) in 48 inches (1.2 m).
5. Deviation from Plane: Maximum 1/16 inch (1.5 mm) in 48 inches (1.2 m).

2.04 ROOF ACCESS LADDER

A. General: Roof access ladder shall comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTION 1509.6 and with the following minimum design criteria:

1. Ladder shall include retractable safety post that extend above the roof edge not less than 30 inches (762 mm).
2. Ladders rung spacing shall not to exceed 14 inches (356 mm) on center.
3. Ladders toe spacing shall be not less than 6 inches (152 mm).

B. Components:

1. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18-3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
 - a. Rungs shall withstand a 1,500 lbs (454 kg) load without deformation or failure.
2. Channel Side Rails: Extruded aluminum; not less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide.
3. Ladder Safety Post: Extruded aluminum; retractable hand hold and tie off.
4. Floor Brackets: Extruded aluminum angle; 4 inches x 1-3/8 inches x 3/16 inch wall thickness x 2 inches long.
 - a. Floor brackets to be anchored to concrete floor deck using sleeve type expansion anchors.
5. Wall Brackets: Extruded aluminum channel; minimum 3/16-inch wall thickness x 10 inches high x width of ladder.
 - a. Side rails to be attached to wall brackets at maximum 10 ft o.c.
 - b. Wall brackets to be anchored to building structure (e.g., CMU walls, concrete beams). Use minimum 3/8-inch diameter sleeve type expansion anchors.

C. Finishes:

1. Aluminum: Class I natural anodized finish.

2.05 FINISHES - ALUMINUM

A. Aluminum: Except as otherwise indicated, provide Class I natural anodized, AAMA

611 AA-M12C22A41, not less than 0.7 mils (0.018 mm) thick.

1. Comply with AA DAF-45 for aluminum finishes required.

B. Bituminous Mastic: Cold applied asphalt mastic; SSPC-Paint 12.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify all measurements and take all field measurements necessary before fabrication.
- C. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- D. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.

3.02 PREPARATION

- A. Coordinate installation of roof access ladder with installation of CMU support wall, roof hatch, and roof hatch safety guardrail system, to ensure proper placement and alignment; for additional information, refer to Section 077200 - Roof Accessories.
 - 1. Where supplemental steel framing is necessary (e.g., for support of roof access ladder wall brackets), coordinate installation requirements to ensure proper placement and alignment; for additional information, refer to Section 055000 - Metal Fabrications.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items at locations indicated, in accordance with manufacturer's instructions, and in proper relationship with adjacent construction.
- B. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied.
- C. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified.
- D. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable.
- E. Thickness of metal and details of assembly and supports shall provide strength and stiffness.
- F. Install items plumb and level, accurately fitted, free from distortion or defects.
- G. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- H. Obtain approval prior to site cutting or making adjustments not scheduled.

- I. Apply one coat of bituminous mastic to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

3.04 PROTECTION

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

3.05 INSTALLATION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 055220
ILLUMINATED RAILING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Illuminated stainless steel railing system.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 055213 - Decorative Metal Railings: Decorative stainless steel railing system.
- C. Division 26 - Electrical: Low-voltage electrical power conductors and cables; sleeves and sleeve seals for electrical raceways and cabling; lighting control devices; low-voltage transformers.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A240/A240M -- Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 2. ASTM A312/A312M -- Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - 3. ASTM A554 -- Standard Specification for Welded Stainless Steel Mechanical Tubing.
 - 4. ASTM A666 -- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. ASTM E935 -- Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 - 6. ASTM E985 -- Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- C. American Welding Society (AWS):
 - 1. AWS D1.6 -- Structural Welding Code - Stainless Steel.
- D. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-A -- Florida Building Code, Accessibility (2012 edition).
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM AMP 503 -- Finishes for Stainless Steel.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design Requirements:

1. General: Decorative stainless steel railing system assemblies shall be designed and constructed:
 - a. in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable requirements of the governing building code.
 - b. to support safely the factored loads in load combinations defined in the governing building code without exceeding the appropriate strength limit states for the materials of construction.
 - c. to support safely the nominal loads in load combinations defined in the governing building code without exceeding the appropriate specified allowable stresses for the materials of construction.
 2. Serviceability: Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.
- B. Structural Performance: Provide decorative stainless steel railing system assemblies capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
1. Railing assemblies shall resist the following live loads applied in any direction at the top of such barriers at any location on the safeguard, whichever condition produces the maximum stresses.
 - a. Uniform Live Load: 50 pounds per lineal foot (74 kg/m)
 - b. Concentrated Live Load: 200 pounds (690 N).
 2. Intermediate rails, balusters and panel fillers shall resist a uniform horizontal load of not less than 25 psf (1197 Pa) over the gross area (including the area of any openings in the assembly) of which they are a part without restriction by deflection.

1.05 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, anchors, and accessories.
- C. Shop Drawings: Submit fabricator's complete shop drawings.
1. Include railing frame components and the following:
 - a. Railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - b. Anchor and joint locations, brazed connections, transitions, and terminations.
 - c. Sizes, dimensions, and details for anchoring decorative stainless steel railing system to mounting surface.
- D. Delegated Design Data and Engineering Calculations: Provide documentation as required by governing building code and authorities having jurisdiction.
1. Include design loads, structural calculations, and material properties.

2. Engineering calculations shall be signed and sealed by a qualified Structural Designer. Coordinate with shop drawings submittal.
- E. Welders' Certificates.
- F. Samples:
1. Two full-sized samples of each type of connection and termination..
 2. Two full-sized samples of ground and polished weld joint at Tee (rail-post connection).
- G. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- H. Manufacturer's Installation Instructions.
- I. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: All railing frame components (e.g., top rail, end posts, intermediate posts) and handrails required for the complete decorative stainless steel railing system shall be fabricated by a single manufacturer/fabricator.
- B. Manufacturer/Fabricator's Qualifications: Manufacturer/fabricator shall certify that all materials comply with the requirements of this section and are suitable for the intended application.
- C. Installer Qualifications: Company specializing in installing decorative stainless steel railing systems, with minimum two (2) years documented experience in work of this Section, and acceptable to manufacturer/fabricator.
- D. Electrician Qualifications: Refer to Division 26 - Electrical.

- E. Pre-Installation Meeting: Not less than two weeks prior to start of work specified in this section.
 - 1. Require attendance of parties directly affecting work of this section, including Architect, Contractor, Fabricator, and Installer.
 - 2. Review the following:
 - a. Specific method of installation of railing frame components into mounting surfaces.
 - b. Installation, adjusting, cleaning, and protection of decorative stainless steel railing system.
 - c. Coordination with other work, including structural connections to cast-in-place concrete, placement of concrete reinforcing, tile floor finishes, etc.
- F. Perform Work in accordance with ASTM E985.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver railing materials in factory provided protective coverings and packaging.
- B. Protect railing materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect railing 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.

1.08 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C).
- B. Maintain ambient temperature of space at minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C) for 24 hours before, during, and after railing installation.

1.09 WARRANTY

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. C. W. Cole & Company, Inc. 2560 N. Rosemead Boulevard. South El Monte, CA 91733-1593; Tel: 626-443-2473; Fax: 626-443-9253; www.colelighting.com
 - a. Product: Lightrail LR5 LED-LE, with remote ballasts and railing loop end design.

2.02 MATERIALS

- A. Aluminum Components:

1. Material: Extruded Aluminum, 6063-T5
5. Aluminum Finishes:
 - a. Finish Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41
Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

2.03 COMPONENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and DESIGN AND PERFORMANCE REQUIREMENTS.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Railing Frame Component Dimensions: See drawings for configurations and heights.
 1. Rails: 1-1/2 inches (38 mm) diameter, round.
 2. Posts: 1-1/2 inches (38 mm) diameter, round.
- D. 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.
- E. Lighting: Refer to Lighting Fixture Schedule, Sheet E0.2.

2.04 FABRICATION

- A. Loads: Design, fabricate and install railing systems, components and anchorages to resist the loads specified in FBC-B SECTIONS 1607.7 and 1618.4.6 without failure, damage, or permanent set.
- B. Factory- or shop- fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure.
 1. Accurately form components to suit specific project conditions, and for proper connection to building structure.
 2. Joints: Tightly fitted and secured with sleeve, machined smooth with hairline seams.
- C. Assembly: Fit and shop-assemble components in largest practical sizes for delivery to site.
 1. Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
- D. Joints:
 1. General:
 - a. 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.

- b. Ease exposed edges to small uniform radius.
- 2. Railing Splice Joints: Use minimum 4 inch long inner sleeve of aluminum, 11 gauge wall thickness; hairline seam between outer tube members.
- 3. Welded Joints - Aluminum:
 - a. Continuously seal joined pieces by continuous welds.
 - b. Exposed joints shall be ground flush and smooth and polished to match adjacent finished metal surface.
 - (1) Ground and polished weld joints shall be visually and tactilely indistinguishable from adjacent finished metal surfaces.

2.04 ACCESSORIES AND FASTENERS

- A. All mechanical fasteners used in the assembly of stainless steel or aluminum railings shall be manufactured from stainless steel.
- B. Exposed mechanical fasteners for use with bronze materials shall be manufactured from yellow brass.
- C. Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground flush and smooth and polished to match adjacent finished metal surface.
- D. Anchors and Fasteners:
 - 1. 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.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION

- A. Comply with approved shop drawings and manufacturer's written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
 - 1. At ramps or steps, erect work parallel to rake of steps or ramp.
- C. Anchor securely to building structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings, except anchor bolts at base plates may have low profile heads.
- E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset from True Alignment: 1/16 inch (1.5 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 FIELD QUALITY CONTROL

- A. Railing System Manufacturer: Provide the services of a railing system manufacturer's representative for field observation of installation of railings.

3.06 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.

3.07 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.

END OF SECTION

SECTION 05 52 13
DECORATIVE METAL RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 DESIGN REQUIREMENTS

- A. Railing systems shall be designed to conform to applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 1009, 1010, 1012, 1013, 11-4, 1607, and 1618 and FBC-A (Accessibility) Code Section 505.
- B. Live Loads: Railing components shall be designed to withstand loads specified in FBC-B SECTIONS 1607 and 1618, without failure, damage, excessive deflection or distortion.
 - 1. See also, RAILINGS - GENERAL REQUIREMENTS in Part 2 of this Section.
- C. Opening Limitations: Shall comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTION 1013.
 - 1. Open guards shall have balusters such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 34 inches (864 mm). From a height of 34 inches (864 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.
 - a. Exception: The triangular openings formed by the riser, tread and bottom rail at the open side of a stairway shall be of a maximum size such that a sphere of 6 inches (152 mm) in diameter cannot pass through the opening.
 - 2. The maximum clearance between the bottom rail of the balustrade and the adjacent surface shall not exceed 2 inches (51 mm).
 - a. For railing assemblies on stairs, the 2-inch (51 mm) clearance shall be measured from the bottom rail of the balustrade to a line passing through the tread nosings.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- G. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 - 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Handrails and Railings:
 - 1. The Wagner Companies; www.wagnercompanies.com
 - 2. KaneSterling; www.sterlingdula.com.

2.02 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 (1095 N/m) 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 (890 N) 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. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.

1. Handrails: 1-1/2 inches (38 mm) OD; round pipe.
 2. Intermediate Baluster Rails: 3/4 inch (19 mm) x 3/4 inch (19 mm) square bar.
 3. Top Guardrail, Bottom Rail, and Posts: 1-1/2 inches (38 mm) OD; round pipe.
- F. 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 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. Posts: Provide adjustable flanged brackets.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 MATERIALS

- A. Aluminum:
1. Aluminum Pipe: Schedule 40; ASTM B429, ASTM B241, or ASTM B483.
 2. Aluminum Tube: Minimum wall thickness of 0.127 inch (3.2 mm); ASTM B429, ASTM B241, or ASTM B483.
 3. Solid Bars and Flats: ASTM B211.
 4. Non-Weld Mechanical Fittings: Slip-on cast aluminum, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
 5. Welding Fittings: No exposed fasteners; cast aluminum.
 6. Exposed Fasteners: No exposed bolts or screws.
- B. Grout: Pre-mixed, factory-packaged, non-shrink, non-metallic, precision structural grout meeting ASTM C1107, Grade C specification at a fluid consistency.
1. Technical and Performance Requirements:
 - a. Working Time: Approximately 60 minutes.
 - b. Initial Set Time: Approximately 5 hours.
 - c. Vertical Expansion at 28 days (ASTM C1090; ASTM C1107):
 - (1) Plastic, 100-percent Flow: +0.03 percent.
 - (2) Fluid, 25-second Flow: +0.02 percent.
 - d. Compressive Strength (ASTM C 109):
 - (1) Plastic / Fluid, at 1 day: 5,300 PSI / 3,800 PSI.
 - (2) Plastic / Fluid, at 3 days: 7,200 PSI / 5,700 PSI.
 - (3) Plastic / Fluid, at 28 days: 10,600 PSI / 9,000 PSI.
 2. Product: CRYSTEX by L&M Construction Chemicals, Inc., or equal.
- C. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015 inch (0.4 mm) dry film thickness per coat..
- D. Finish Touch-Up Materials: As recommended by manufacturer for field

application.

2.04 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.

2.05 ALUMINUM FINISHES

- A. Handrails and mounting brackets : Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
- B. All other railing system components (guardrails and caps, balustrades, top and bottoms horizontal rails, posts, etc.): Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating or AAMA 612 electrolytically deposited colored anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.
 - 1. Color: Black.
- 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. General:
 - 1. Protect existing work.
 - 2. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
 - 3. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
- C. Surface Preparation for Grouting:

1. Clean surfaces of oil, grease, dirt, laitance and loose material, down to sound concrete.
 2. Metal surfaces are to be free of rust and foreign material.
 3. After roughening the concrete surface, saturate the surface with water for 24 hours prior to grouting.
- D. Apply two coats 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. Anchor railings securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 055270
CABLE RAILING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Stainless steel railing framework with horizontal stainless steel cable infill.
- B. Reclaimed wood top cap (guard).

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of metal anchors in masonry.
- C. Section 055110 - Metal Stairs.
- D. Section 055213 - Decorative Metal Railings.
- E. Section 061100 - Reclamation of Historic Lumber
- F. Section 064100 - Architectural Wood Casework

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A312/A312M -- Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - 2. ASTM A492 -- Standard Specification for Stainless Steel Rope Wire.
 - 3. ASTM A554 -- Standard Specification for Welded Stainless Steel Mechanical Tubing.
 - 4. ASTM A555/A555M -- Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods.
 - 5. ASTM A666 -- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. American Welding Society (AWS):
 - 1. AWS D1.6 -- Structural Welding Code - Stainless Steel.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design Requirements:
 - 1. General: Custom cable railing system, including top rail, bottom rail, end posts, intermediate posts, intermediate cable braces, cables, and cable hardware shall be designed and constructed:
 - a. in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable requirements of the governing building code.

- b. to support safely the factored loads in load combinations defined in the governing building code without exceeding the appropriate strength limit states for the materials of construction.
 - c. to support safely the nominal loads in load combinations defined in the governing building code without exceeding the appropriate specified allowable stresses for the materials of construction.
 - 2. Serviceability: Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.
- B. Structural Performance: Provide custom cable railing system, including top rail, bottom rail, end posts, intermediate posts, intermediate cable braces, cables, and cable hardware, capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
 - 1. Railings, Stair Railings and Other Similar Safeguards: Shall resist the following live loads applied in any direction at the top of such barriers at any location on the safeguard, whichever condition produces the maximum stresses.
 - a. Uniform Live Load: 50 pounds per lineal foot (74 kg/m)
 - b. Concentrated Live Load: 200 pounds (690 N).
 - 2. Intermediate Rails, Balusters and Panel Fillers: Shall resist a uniform horizontal load of not less than 25 psf (1197 Pa) over the gross area of the guard, including the area of any openings in the guard, of which they are a part without restriction by deflection.
- C. Opening Limitations:
 - 1. Provide cable infill such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening.
 - 2. The maximum clearance between the bottom rail/cable of the balustrade and the adjacent surface shall not exceed 2 inches (51 mm).
 - a. For railing assemblies on stairs, the 2-inch (51 mm) clearance shall be measured from the bottom rail/cable of the balustrade to a line passing through the tread nosings.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C. Shop Drawings: Submit fabricator's complete shop drawings.
 - 1. Include the following:
 - a. Railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - b. Anchor and joint locations, brazed connections, transitions, and terminations.
 - c. Sizes, dimensions, and details for anchoring cable railing system to mounting

- surface.
2. Indicate railing frame components, intermediate cable braces, cables, cable hardware, and grommets.
- D. Delegated Design Data and Engineering Calculations: Provide documentation as required by governing building code and authorities having jurisdiction.
1. Include design loads, structural calculations, and material properties.
 2. Engineering calculations shall be signed and sealed by a qualified Structural Designer. Coordinate with shop drawings submittal.
- E. Welders' Certificates.
- F. Samples:
1. Connections and Terminations: Two full-sized samples of each.
 2. Cable: Two samples for each type of cable used, representing actual product; 12 inches in length.
- G. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- H. Manufacturer's Installation Instructions.
- I. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: All railing frame components (e.g., top rail, end posts, intermediate posts), cables, cable hardware, and handrails required for the complete cable railing system shall be fabricated by a single manufacturer/fabricator.
- B. Manufacturer/Fabricator's Qualifications: Manufacturer/fabricator shall certify that all materials comply with the requirements of this section and are suitable for the intended

application.

- C. Installer Qualifications: Company specializing in installing custom cable railing systems and acceptable to manufacturer/fabricator.
- D. Pre-Installation Meeting: Not less than two weeks prior to start of work specified in this section.
 - 1. Require attendance of parties directly affecting work of this section, including Architect, Contractor, Fabricator, and Installer.
 - 2. Review the following:
 - a. Specific method of installation of railing frame components into mounting surfaces.
 - b. Installation, adjusting, cleaning, and protection of cable railing system.
 - c. Coordination with other work, including structural connections to cast-in-place concrete, placement of concrete reinforcing, tile floor finishes, etc.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver railing materials in factory provided protective coverings and packaging.
- B. Protect railing materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect railing 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.

1.08 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C).
- B. Maintain ambient temperature of space at minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C) for 24 hours before, during, and after railing installation.

1.09 WARRANTY

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. Seco South, Inc.: 2050 34th Way; Largo, FL 33771; Tel. 888-535-7326 or 727-536-1924; www.secosouth.com.
- B. Other Manufacturers: Subject to compliance with contract requirements, equivalent products meeting all physical and performance criteria indicated on the drawings and specified herein (including but not limited to baluster material, dimensions and

configuration) and manufactured by one of the following may be used.

1. The Cable Connection, Ultra-Tec Cable Railing Systems: 52 Heppner Dr., Carson City, NV 89706; Tel. 80-851-2961 or 775-885-1443; www.ultra-tecrailings.com.
2. Livers Bronze Co.: 4621 East 75th Terrace; Kansas City, Missouri 64132; Tel. 816-300-2828; www.liversbronze.com.
3. P&P Artec, Inc.: 700 Creel Drive; Wood Dale, IL 60191; Tel. 800-927-7346; www.artec-rail.com.
4. Ronstan International, Inc: 45 High Point Avenue, Suite 2; Portsmouth, RI 02871; Tel. 401-293-0539; www.ronstan.com/arch.

2.02 MATERIALS

A. Stainless Steel Components:

1. Rope Wire: ASTM A492, Type 316.
2. Wire and Wire Rods / Cable: ASTM A555/A555M, Type 316.
3. Fittings: ASTM A666, Type 316.
4. Shapes (e.g., sheet, strip, plate, and flat bar): ASTM A666, Type 316.
5. Tubing: ASTM A555/A555M, Type 316; minimum tensile strength of 70,000 PSI.
6. Round Pipe: ASTM A312/A312M, Type 304; minimum tensile strength of 70,000 PSI.
7. Finish: No. 4 satin, non-directional.

2.03 COMPONENTS

A. Railing Frame System: Designed and fabricated for surface mounting.

1. Vertical Balusters:
 - a. Material: Two parallel 1/2 inch x 1-1/2 inch stainless steel flat bars with 1-1/2 inches wide gap between, bridged and welded together with matching stainless steel flat bar at top and spacers of 5/8 inch diameter stainless steel tubing at each cable hole (to house the cable or cable fittings passing through the Vertical Baluster).
 - b. Holes for cable fittings and post cap mounting assembly hardware shall be pre-drilled; hole spacing to be 3 inches on center.
 - c. Each Vertical Baluster shall be a fully welded assembly, with no exposed joints; and shall include welded anchor plate, ready for fascia-mounted attachment to stair assembly.
2. Product: Model FB3-2000 Welded Railing System by Seco South, or equivalent Railing Frame System by one of the Other Manufacturers.

B. Cable Infill System:

1. Cable: Stainless steel cable; 1 x 19 strand; 3/16 inch diameter.
 - a. Minimum Breaking Strength: Not less than 3960 lbs.
 - b. Modulus of Elasticity: 15.59×10^6 PSI.
2. Cable End Fittings: Stainless steel.
 - a. Stud Terminal: Swage stud terminal; design and install to develop full breaking strength of cable.
 - (1) Overall Length: 5-1/4 inches.
 - (2) Threaded Length: 2-1/2 inches.

- (3) Thread Diameter: 3/8 inch.
 - b. Threaded Rod Turnbuckle: Swage turnbuckle with threaded rod; internally threaded; designed for use as adjustable stud terminal.
 - (1) Length (Closed to Extended): 7-1/2 inches to 9-1/4 inches.
 - (2) Thread Diameter: 3/8 inch.
 - 3. Nuts and Washers: Stainless steel; size to match thread diameter of fitting.
 - a. Flat Washers: For use on horizontal cable applications, to protect the finish on balusters.
 - b. Angled Washers: For use on staircase applications, to compensate for the angle between the vertical baluster and the cable assembly.
 - c. Dome Nut: Designed for use as decorative termination for threaded studs.
 - d. Round Nut: Designed for use as tamper-resistant termination for cable end fittings (low profile; no wrench flats).
 - 4. Cable Grommets: Neoprene.
 - 5. Product: System 2115 by Seco South (with both dome and round nuts at each cable end fitting), or equivalent Cable Infill System by one of the Other Manufacturers.
- C. Corner Cable Assemblies: Stainless steel tube; outside diameter 5/8 inch; radius to form an elbow from end baluster to end baluster.
- 1. Radius dimension per manufacturer's recommendation.
 - 2. Tubes to be welded to balusters.
- D. Handrail System:
- 1. Handrail:
 - a. Material: Stainless steel.
 - b. Profile: Round, as indicated on drawings.
 - 2. Handrail Mounting Bracket:
 - a. Material: Stainless steel.
 - b. Baluster Mounted Bracket: Shall be bolted or welded to stainless steel plate welded between the plates in each vertical baluster.
 - c. Wall Mounted Bracket: Shall be anchored to wall using anchor/fastener type suitable for wall construction.
- E. Top Cap (Guardrail cap):
- a. Material: Reclaimed wood - See Section 061100 - Reclamation of Historic Lumber
 - b. Profile: AWI HRL-5021
 - c. Size: Nominal 1-1/in x 3in
- F. 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.

2.04 FABRICATION

- A. Loads: Design, fabricate and install railing systems, components and anchorages to resist the loads specified in FBC-B SECTIONS 1607.7 and 1618.4.6 without failure, damage, or permanent set.
- B. Factory- or shop- fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure.
 - 1. Accurately form components to suit specific project conditions, and for proper connection to building structure.
 - 2. Joints: Tightly fitted and secured with sleeve, machined smooth with hairline seams.
- C. Assembly: Fit and shop-assemble components in largest practical sizes for delivery to site.
 - 1. Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
- D. Joints:
 - 1. General:
 - a. 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.
 - b. Ease exposed edges to small uniform radius.
 - 2. Railing Splice Joints: Use minimum 4 inch long inner sleeve of stainless steel, 11 gauge wall thickness; hairline seam between outer tube members.
 - 3. Welded Joints - Stainless Steel:
 - a. Continuously seal joined pieces by continuous welds.
 - b. Perform welding in accordance with AWS D 1.6.
 - c. Exposed joints shall be ground flush and smooth with adjacent finish surface, and polished to match adjacent surface finish. Ground and polished joints shall be visually indiscernible at a distance of 24 inches.

2.05 ACCESSORIES

- A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- B. Anchors and Fasteners:
 - 1. 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.
- C. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

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

3.03 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 building structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings, except anchor bolts at base plates may have low profile heads.
- E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 FIELD QUALITY CONTROL

- A. Railing System Manufacturer: Provide the services of a railing system manufacturer's representative for field observation of installation of railings.

3.06 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.

3.07 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.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Dimension lumber, including miscellaneous framing, blocking, nailers, grounds and furring; wood sleepers, and rough opening framing for doors, windows, and roof openings.
- B. Construction panels, including plywood subflooring, wall sheathing, and communications and electrical room mounting boards.
- C. Accessories, including fasteners and anchors, connectors, gasket and flashing, and subfloor glue.
- D. Factory wood treatment, including preservative treatment and fire-retardant treatment.
- E. Reclaimed Lumber for general wood blocking, parapet coping blocking

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 061100 - Reclamation of Historic Lumber.
- C. Section 062000 - Finish Carpentry.
- D. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
- E. Section 061643 - Gypsum Sheathing.
- F. Section 096429 - Wood Strip and Plank Flooring

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Forest and Paper Association (AFPA):
 - 1. AFPA (WFCM) -- Wood Frame Construction Manual for One- and Two-Family Dwellings.
- C. American Lumber Standard Committee, Inc. (ALSC).
- D. The Engineered Wood Association (APA):
 - 1. APA PRP-108 -- Performance Standards and Qualification Policy for Structural-Use Panels (Form E445).
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM A153/A153M -- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM D2898 -- Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

3. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. American Wood Protection Association (AWPA):
 1. AWWPA U1 -- Use Category System: User Specification for Treated Wood.
- G. Florida Building Code, 2010 edition (FBC):
 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- H. U.S. Department of Commerce, National Institute of Standards and Technology (NIST).
 1. Product Standards (PS):
 - a. PS 1 -- Structural Plywood.
 - b. PS 20 -- American Softwood Lumber Standard.
- I. Southern Pine Inspection Bureau, Inc. (SPIB):
 1. SPIB (GR) -- Grading Rules.

1.04 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide technical data on factory wood treatment materials and processes, including manufacturer's technical notes and specifications, and application/installation instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. LEED Submittals: Submit applicable LEED Submittal Form for each different product made of sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, as well as locally-sourced wood, as specified in Section 013515 - LEED Certification Procedures.

1.05 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

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 1. Species: Southern Pine, unless otherwise indicated.
 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

3. 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.
- C. Provide sustainably harvested wood; see Section 016000 - Product Requirements.
- D. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted in lieu of sustainably harvested lumber provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source; for requirements for reused products, see Section 016000 - Product Requirements.
 1. Where salvaged lumber is used for structural applications, provide lumber re-graded by an inspection service accredited by ALSC.

2.02 DIMENSION LUMBER

- A. Grading Agency: SPIB.
- 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.

2.03 CONSTRUCTION PANELS

- A. Wall Sheathing: APA PRP-108, Structural I Rated Sheathing, preservative and fire-retardant treated.
 1. Exposure Class: Exterior.
 2. Span Rating: As indicated on drawings, but not less than 24/0 (610/0).
 3. Thickness: As indicated on drawings, but not less than 3/4 inch (19 mm), nominal.
 4. Edges: Tongue and groove.
 5. Product: "Exterior Fire-X Exterior" by Hoover Treated Wood Products, Inc.; or equal.
 - a. Flame Spread Index: 25 or less, Class A
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners:
 1. Fasteners for High Humidity and Preservative-Treated Wood Locations: Hot-dipped galvanized steel or stainless steel.
 2. Fasteners for Fire-Retardant-Treated Wood Used in Exterior Applications or Wet or Damp Locations (FBC-B SECTION 2304.9.5.3): Hot-dipped zinc-coated galvanized steel or stainless steel.

- a. Fasteners other than nails, wood screws and lag screws may be of mechanically-deposited zinc-coated steel; coating weight shall be in accordance with ASTM B695, Class 55 minimum.
- 3. Fasteners for Fire-Retardant-Treated Wood Used in Interior Locations (FBC-B SECTION 2304.9.5.4): Fasteners for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer's recommendations.
 - (1) In the absence of manufacturer's recommendations, hot-dipped zinc-coated galvanized steel or stainless steel.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
- C. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.
- D. Sill Flashing: As specified in Section 076200 - Sheet Metal Flashing and Trim.
- E. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.
- F. Water-Resistive Barrier: As specified in Section 072500 - Weather Barriers.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. 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 AWWA standards.
- B. Fire Retardant Treatment:
 - 1. General:
 - a. Manufacturers:
 - (1) Arch Wood Protection, Inc.: www.wolmanizedwood.com.
 - (2) Hoover Treated Wood Products, Inc.: www.frtw.com.
 - b. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - c. Do not use treated wood in direct contact with the ground.
 - 2. Exterior Type: AWWA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Applications:
 - (1) Treat plywood wall sheathing used in exterior stud-framed wall assemblies.
 - (2) Treat exterior rough carpentry items as indicated.
 - b. Product: "Exterior Fire-X" by Hoover Treated Wood Products, or equivalent by Arch Wood Protection.

3. Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Applications:
 - (1) Treat communications and electrical room mounting boards.
 - (2) Treat interior rough carpentry items as indicated.
 - (3) Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft (4.0 kg/cu m) retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing, flashing, or waterproofing.
 - c. Treat lumber in contact with masonry or concrete.
 - d. Treat lumber less than 18 inches (450 mm) above grade.
 - e. Treat lumber in other locations as indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

3.02 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.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

- C. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA (WFCM).
- D. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches (38 mm) of bearing at each end.
- E. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 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 metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Plywood Subflooring: Glue and nail to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.07 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.09 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 017419 - Construction Waste Management.
 - 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

SECTION 061100
RECLAMATION OF HISTORIC LUMBER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Remilling of salvaged historic lumber for reuse in new wood strip and plank flooring work, baseboards, window sills, and solid lumber paneling, including but not limited to wood selection, metal removal, kiln drying, grading and sizing, milling, face preparation, and packaging.
- B. Sale and/or distribution of salvaged historic lumber deemed not suitable for reuse in finished work of this project.

1.02 RELATED REQUIREMENTS

- A. Section 024100 - Demolition: General demolition of non-historic materials, and salvage of designate historic materials for reuse in finished work; asbestos abatement; lead-based paint hazard abatement; and removal of resulting rubbish and debris
- B. Section 062000 - Finish Carpentry: Interior wood trim, including installation of wood baseboards, sills, and solid lumber paneling, fabricated from salvaged historic lumber.
- C. Section 096429 - Wood Strip and Plank Flooring: Wood flooring system, including installation of salvaged historic wood flooring lumber.
- D. Section 099000 - Painting and Coating: Field applied finishes.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D173/D173M - Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
 - 2. ASTM D3274 -- Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
 - 3. ASTM D3359 -- Measuring Adhesion by Tape Test
 - 4. ASTM D4214 -- Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
- C. American Woodwork Institute (AWI):
 - 1. AWI (QSI) -- Architectural Woodwork Quality Standards Illustrated; 8th edition.
- D. National Wood Flooring Association (NWFA):
 - 1. NWFA (SPEC) -- Installation Guidelines and Methods.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201

- 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

- B. Shop Drawings: Refer to Section 062000 - Finish Carpentry and Section 096429 - Wood Strip and Plank Flooring.
- C. Samples: Refer to Section 062000 - Finish Carpentry and Section 096429 - Wood Strip and Plank Flooring.
- D. LEED Report: Refer to Section 062000 - Finish Carpentry and Section 096429 - Wood Strip and Plank Flooring.

1.05 QUALITY ASSURANCE

- A. Wood Restoration Contractor Qualifications: Company specializing in performing work of this section with minimum five years experience.
 - 1. Provide qualified workers trained and experienced in the restoration of wood components in historic structures.
 - 2. Prequalified Contractors:
 - a) Hansen and Bringle Millwork, Key West, Fl.
Contact: Steve Bringle at 305-747-0020
 - b) Goodwin Lumber, Micanopy, Fl.
Contact: Carol Goodwin at 800-336-3118

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint removers, solvents, and other chemicals, used for surface preparation, in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer.
 - 1. Furnish such materials in containers not larger than 20 L 5 gallons; store them in accordance with the manufacturer's written directions; and, as a minimum, store them off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 4 and 35 degrees C 40 and 95 degrees F.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Unless otherwise recommended by the product manufacturer, the ambient temperature shall be between 7 and 35 degrees C 45 and 95 degrees F when applying paint removers, solvents, or other preparation materials.

PART 2 - PRODUCTS

2.01 HISTORIC LUMBER

- A. General:
 - 1. Species: Assumed to be Long Leaf Southern Yellow Pine (antique heart pine); and Old-Growth Southern Yellow Pine.

- B. Selection and Grading Criteria: On the demolition site, salvaged lumber shall be carefully removed, graded for best use, and reasonably cleaned up of debris and metal, as follows:
1. Lumber Selected for Reuse in Finished Work: Boards selected for reuse in finished work shall meet the following criteria:
 - a. Knots: Less than one knot per three square feet of flooring; some knots may be broken.
 - b. Holes: Occasional nail holes allowed, except with ferrous bleed; bolt holes not allowed.
 - c. Cracks/Checks: Moderate surface checking is allowed; cracks through the thickness of the board are not allowed.
 - d. Color: 90-percent or more of the surface area of the floor to be red heart content; otherwise color variances are unlimited, but predominately range from red to brown and yellow.
 - e. Grain: The majority of the wood to be flat or cathedral grain; some rift cut or quarter sawn boards may be included.
 2. Lumber Deemed Not Suitable for Reuse in Finished Work: Lumber not selected for reuse in finished work shall be distributed in the following preferential order:
 - a. Sold as reclaimed lumber with proceeds accruing to the Owner
 - b. Offered to the public free of charge
 - c. Ground up for reuse on site as mulch per Landscape Architect's direction
 - d. Diverted from landfills by recycling

2.02 PAINT REMOVERS

- A. Chemical paint removers shall be a commercial item specifically manufactured for the type of paint to be removed.

PART 3 - EXECUTION

3.01 REMILLING OF HISTORIC LUMBER

- A. Wood Selection: On the demolition site the wood shall be graded for best use and reasonably cleaned up of debris and metal.
1. Boards and timbers that do not meet high standards will remain on the site while the best wood is milled for re-use on site.
- B. Metal Removal: Use metal detectors and basic hand tools (e.g., hammers, claws, chisels) to get the wood free enough of metal to mill, and grade the wood a second time.
- C. Removal of Applied Finishes:
1. Hazardous Materials: Comply with requirements specified in Section 024100 - Demolition, and with applicable regulatory requirements.
 2. Paints and Coatings: Refer to Section 099000 - Painting and Coating.
- D. Grading and Sizing: The dry boards are to be ripped two edges with a laser guided saw to predetermined widths. For a third time the boards are to be graded, unsuitable boards are discarded, and only sound, solid and attractive boards are to be milled into flooring or other millwork.
- E. Milling and Fabrication:

1. General:
 - a. Fabricate to Custom Quality Standards (or better) per AWI (QSI).
 2. Standing and Running Trim:
 - a. Window Sills:
 - (1) Dimensions: Fabricated from on-site reclaimed Old-Growth Southern Yellow Pine, as indicated on drawings.
 - (2) Profile: As indicated on drawings; exposed end shall be half-round bullnose profile; then edges and ends of the boards to be cut square.
 - (3) Length: Equal to full width of window opening.
 - (4) Depth: Sill to return to window frames
 - b. Wall Base (Baseboards)
 - (1) Dimensions: 1 x 6 inches, nominal (3/4 x 5-1/2 inches, actual).
 - (2) Profile: Fabricated from on-site reclaimed Old-Growth Southern Yellow Pine as indicated on drawings; or if not indicated, then match "BAS-1027" per Section 300-D-4 in AWI (QSI).
 - (3) Length: 12 ft, min.
 3. Solid Lumber Paneling (Wainscot):
 - a. Reclaimed Tongue and Groove flooring recovered from the building
 - b. Dimensions: Fabricated from on-site reclaimed lumber (Old-Growth Southern Yellow Pine) as indicated on drawings; or if not indicated, then 1 x 3 inches, nominal (7/8in x 3 inches, actual).
 - c. Profile: As indicated on drawings; or if not indicated, then "Tongue and Groove V Joint" per AWI (QSI) Section 300.
 4. Flooring Lumber:
 - a. Reclaimed Tongue and Groove Long Leaf Southern Yellow Pine (antique heart pine) flooring recovered from the building
 - b. Reclaimed T&G Plank Dimensions: 1-1/8in thick, 3-inches wide
 - c. Length(s): 2 ft through 10 ft, with an average length of about 6 ft; boards up to 12 ft may be included if available.
 - d. Actual final dimensions will be predicated on characteristics and milling requirements of the specific reclaimed lumber used.
- G. Surface Pre-finishing: Faces of re-milled lumber to be sanded smooth to 100 grit or finer.

3.02 SURFACES TO BE PREPARED FOR FIELD-APPLIED PAINTING/COATING

- A. Surfaces designated to receive field-applied painting or coating shall be prepared as specified in Section 062000 - Finish Carpentry, and Section 096429 - Wood Plank Flooring, as applicable. For surface preparation and field-applied painting and coating requirements, refer to Section 099000 - Painting and Coating.

3.03 CLEANING

- A. Place cloths, cotton waste and other debris, that might constitute a fire hazard, in closed metal containers for removal at the end of each day. Containers shall be removed from the site or destroyed in an approved manner. Preparation materials and other deposits on adjacent surfaces shall be removed and the entire job left clean and ready for painting.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items fabricated from reclaimed historic lumber, including:
 - 1. Wood standing and running trim (e.g., wall bases, window sills, chair rails).
 - 2. Wood wainscot paneling.
 - 3. Wood railing guards

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 061100 - Reclamation of Historic Lumber.
- C. Section 099000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Woodwork Institute (AWI):
 - 1. AWI (QSI) -- Architectural Woodwork Quality Standards Illustrated; 8th edition.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings: Provide complete shop drawings for all finish carpentry items.
 - 1. Indicate materials; component profiles and dimensions; methods of fixation; assembly techniques; jointing details; back priming and finish; transitions; blocking; and accessories.
 - 2. Include details showing type of end or termination.
 - 3. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot (1:8).
- C. Samples:
 - 1. Wood Window Sills (fabricated from reclaimed historic lumber): Submit two samples 12 inch (300 mm) long.

2. Wood Wall Base (fabricated from reclaimed historic lumber): AWI Profile "BAS 1027". Submit two samples 12 inch (300 mm) long.
3. Wood Paneling (fabricated from reclaimed historic lumber): Submit two samples 12 inch (300 mm) long.
4. Wood Flooring and Subflooring (fabricated from reclaimed historic lumber): Submit two samples 12 inch (300 mm) long.
5. Wood Railing Guard Cap (fabricated from reclaimed historic lumber): AWI Profile HRL 5021. Submit two samples 12 inch (300 mm) 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 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.

PART 2 - PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Grade: Perform work in accordance with AWI (QSI) Custom Grade quality or better.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items (e.g., wall bases, and window sills): Reclaimed historic lumber.
 1. For additional information, refer to Section 061100 - Reclamation of Historic Lumber

2.02 LUMBER MATERIALS

- A. Reclaimed Historic Lumber: Refer to Section 061100 - Reclamation of Historic Lumber.

2.03 FASTENINGS AND ACCESSORIES

- A. Fasteners: Of size and type to suit application; exposed fasteners are not permitted.
- B. Lumber for Shimming, Blocking, and Nailers: Refer to Section 061000 - Rough Carpentry.
- C. Primer: Low or Zero VOC Alkyd primer sealer.
- D. Wood Filler: Low or Zero VOC Solvent base, tinted to match surface finish color.

2.04 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.

2.05 FINISHING

- A. Sand work smooth and set exposed nails.
- 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. Back prime woodwork items to be field finished, prior to installation.
- E. Painting and Coating: For surface preparation and field-applied painting and coating requirements, refer to Section 099000 - Painting and Coating.

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.
- C. For installation of recessed wood blocking, see Section 061000 - Rough Carpentry.

3.02 INSTALLATION

- A. Install work in accordance with AWI (QSI) requirements for Custom Grade.
- 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 (1 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 099000 - Painting and Coating.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.5 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.7 mm).

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Custom built-in cabinets and casework.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Miscellaneous steel sections, including but not limited to posts, plates, etc. for support and bracing of architectural woodwork; bolts, anchors and other metal components not specified elsewhere.
- B. Section 061000 - Rough Carpentry: Wood stud framing and plywood sheathing, used in conjunction with wood cabinets, casework, and other architectural woodwork.
- C. Section 061100 - Reclamation of Historic Lumber
- D. Section 062000 - Finish Carpentry: Hardwood interior running trim.
- E. Section 066200 - Quartz Surfacing Fabrications: Countertops for custom built-in cabinetwork
- F. Section 092116 - Gypsum Board Assemblies: Backer plates for proper attachment and support of casework, cabinets and other surface-mounted components fastened to drywall over stud-framing or furring.
- G. Section 113100 - Residential Appliances: Countertop and undercounter kitchen appliances.
- H. Division 22 - Plumbing: Sink installation in cabinetry or casework.
- I. Division 26 - Electrical: Electrical power outlets, lighting, and other related electrical work installed in cabinetry or casework.
- J. Division 27 - Communications: Datacomm outlets installed in cabinetry or casework.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Hardboard Association (AHA):
 - 1. AHA A135.4 -- Basic Hardboard.
- C. American National Standards Institute (ANSI):
 - 1. ANSI A208.1 -- American National Standard for Particleboard.
- D. American Society of Mechanical Engineers (ASME):
 - 1. ASME B18 -- Fasteners.
 - a. ASME B18.2.1 -- Square and Hex Bolts and Screws (Inch Series).
 - b. ASME B18.2.2 -- Nuts for General Applications (Inch Series).
 - c. ASME B18.6.1 -- Wood Screws (Inch Series).

- d. ASME B18.21.1 -- Lock Washers (Inch Series).
 - e. ASME B18.22.1 -- Plain Washers.
- E. American Society for Testing and Materials (ASTM):
- 1. ASTM A307 -- Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
 - 2. ASTM A325 -- Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 3. ASTM A563 -- Standard Specification for Carbon and Alloy Steel Nuts.
 - 4. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 5. ASTM F593 -- Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 6. ASTM F594 -- Specification for Stainless Steel Nuts.
- F. Architectural Woodwork Institute (AWI):
- 1. AWI (QSI) -- Architectural Woodwork Quality Standards Illustrated; 2006, 8th Ed., Version 2.0.
 - 2. AWI P-200 -- Architectural Woodwork Quality Standards Illustrated; 1999, 7th Ed., Version 1.2.
- G. American Wood-Preservers' Association (AWPA):
- 1. AWPA C2 -- Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes.
- H. Builders Hardware Manufacturers Association (BHMA):
- 1. BHMA A156.9 -- American National Standard for Cabinet Hardware (ANSI/BHMA A156.9).
- I. Florida Building Code, 2010 edition (FBC):
- 1. FBC-B -- Florida Building Code, Building.
 - 2. FBC-A -- Florida Building Code, Accessibility, 2012 edition.
- J. Hardwood Plywood Veneer Association (HPVA):
- 1. HPVA HP-1 -- American National Standard for Hardwood and Decorative Plywood.
- K. National Electrical Manufacturers Association (NEMA):
- 1. NEMA LD-3 -- High-Pressure Decorative Laminates.
- L. Federal Specifications and Standards, U.S. General Services Administration (FS):
- 1. FS FF-B-588 -- Bolt, Toggle; and Expansion Sleeve, Screw.
 - 2. FS FF-N-105 -- Nails, Brads, Staples and Spikes; Wire, Cut and Wrought.
 - 3. FS FF-S-111 -- Screw, Wood.
 - 4. FS FF-S-325 -- Shield, Expansion; Nail, Expansion and Nail, Drive Screw (Devices, Anchoring, Masonry).

1.04 SUBMITTALS

- A. General:
- 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201

- 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

- B. Product Data:
 - 1. Provide data on wood treatment materials and application instructions.
 - 2. Provide data for attachment hardware and finish hardware.
 - a. Include evidence that products to be installed in this Project meet or exceed BHMA 156.9 Grade 1 requirements.
 - b. Provide data and instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Provide complete and detailed shop drawings for all custom built-in cabinets and casework.
 - 1. Indicate plan layouts and elevations, assembly methods, accessory listings, hardware locations, and schedule of finishes.
 - 2. Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft (1:8).
 - 3. Coordination:
 - a. Coordinate shop drawings for cabinets and casework with shop drawings for the following:
 - (1) Miscellaneous steel posts, plates and other components specified in Section 055000 - Metal Fabrications.
 - (2) Wood stud framing and other rough carpentry specified in Section 061000 - Rough Carpentry.
 - (3) Countertops for custom built-in cabinetwork specified in Section 066200 - Quartz Surfacing Fabrications.
 - (4) Metal furring, metal stud framing and backer plates specified in Section 092113 - Gypsum Board Assemblies.
 - b. Shop drawings are to be unified and submitted jointly with product data.
- D. Samples:
 - 1. Plastic Laminate:
 - a. Preliminary Selection Samples: Submit three samples each, at least 2 x 3 inches in size, of complete range of plastic laminate manufacturer's plastic laminate materials, for preliminary selections.
 - b. Final Selection / Verification Samples: Submit three samples each, 12 x 12 inches in size, of preliminary selections, for final selections, verification and acceptance.
 - 2. Quartz Surface Fabrications (Countertops, Backsplashes and Endsplashes) refer to Section 066100 - Quartz Surface Fabrications
 - 2. Hardware: Submit two samples of each type of hardware to be provided.
 - 3. All samples will be reviewed by Architect before fabrication for Project, with final selection samples used for comparison inspections.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Custom grade.
- B. Manufacturer/Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Contractor's personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity, and quality to that shown and specified.
2. Manufacturer shall be a member in good standing of the American Woodwork Institute (AWI).
3. Manufacturer shall be a company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Protect work from moisture damage and exposure to sunlight, humidity, and other conditions detrimental to appearance of wood.
- B. Cabinets and casework must be delivered, stored, and handled in a manner that will prevent damage and disfigurement.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install paneling when temperature or humidity conditions may have a detrimental effect on paneling.

1.08 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated on shop drawings.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Laminate Materials:
 1. Formica Corp: www.formica.com.
 2. Nevamar, International Paper: www.nevamar.com.
 3. Wilsonart International, Inc: www.wilsonart.com.
- B. Particleboard:
 1. Flakeboard Company Limited: www.flakeboard.com.
- C. Cabinet Hardware:
 1. Accuride International Inc.: 12311 Shoemaker Avenue; Santa Fe Springs, CA 90670; Tel: 562-903-0200.
 2. Blum, by Julius Blum, Inc.: 7733 Old Plank Road; Stanley, NC 28164; Tel. 800-438-6788.
 3. Colonial Bronze Company: 511 Winsted Road; Torrington, CT 06790; Tel: 860-489-9233.
 4. Garcy
 5. Grant Slides & Track
 6. Grass America, Inc.: P.O. Box 1019; 1202 Hwy 66 South; Kernersville, NC

- 27284; Tel: 800-334-3512.
7. Hager Hinge Company: St. Louis, MO 63104.
 8. Knappe and Vogt Manufacturing Company: 2700 Oak Industrial Drive NE; Grand Rapids, MI 49505; Tel: 800-253-1561.
 9. Rakks Counter Support Brackets, by Ragine Corporation: Millis, Massachusetts 02054; Tel: 800-826-6006.
 10. Salice America, Inc.: 2123 Crown Centre Drive; Charlotte, NC 28227; Tel. 800-222-9652.
 11. Soss Invisible Hinges, by Universal Industrial Products Company: Tel: 800-922-6957; Local Rep: Access International Sales, Tel: 954-796-1683.
 12. Stanley Hardware, by The Stanley Works: 480 Myrtle Street; New Britain, CT 06053; Tel: 800-337-4393.

2.02 MATERIALS

A. Lumber

1. Softwood Lumber: Refer to Section 061000 - Rough Carpentry.
2. Hardwood Lumber: Graded in accordance with AWI P-200, Custom quality; plain sawn, worked to shapes indicated, maximum moisture content of 6 percent.

B. Sheet Materials:

1. Softwood Plywood: Refer to Section 061000 - Rough Carpentry.
2. Hardwood Plywood / Veneer Plywood: HPVA HP-1, Grade AA, Type as indicated; Graded in accordance with AWI P-200, Custom quality.
3. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
 - a. Density: Medium, 48-50 lbs/cu ft
 - b. Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread: 25
 - (2) Fuel Contributed: 10
 - (3) Smoke Developed: 25
 - c. Finish:
 - (1) Paint or varnish all surfaces and edges not covered with plastic laminate.
 - (2) At cutouts made for particleboard countertops, seal all edges to prevent water damage or swelling of material.
 - d. Product: Duraflake FR (as manufactured by Flakeboard), or equal.
4. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch (6 mm) thick, smooth two sides (S2S).
 - a. Comply with AWI P-200, Grade 1.

C. Laminate Materials:

1. Plastic Laminate: NEMA LD-3, HGP; through color; color and finish as selected by Architect.
2. Laminate Backing Sheet: NEMA LD-3, BKL; undecorated plastic laminate; color white.
3. Sheet Metal: Sheet steel galvanized to 1.2 oz/sq ft (380 gm/sq m); 0.396 inch (1.0 mm) thick.

- D. Quartz counter tops, backsplashes and endsplashes, as specified on 066100 - Quartz Surface Fabrications.

2.03 FASTENERS AND ANCHORS

A. General:

1. Select material, type, size, and finish required by each substrate for secure attachment/anchorage.
2. Use only stainless steel fasteners/anchors in the following applications:
 - a. When fastener/anchor will be in contact with treated wood.
 - b. When fastener/anchor will be exposed to view.
 - c. When fastener/anchor will be located in an area where high humidity or moisture is anticipated (e.g., restroom).

B. Fasteners:

1. Wood Screws: ASME B18.6.1.
2. Bolts and Nuts: ASME B18.2.1, ASME B18.2.2, and ASTM A307.
3. Concealed Joint Fasteners: Threaded steel.
4. Screws: Select material, type, size and finish required to suit application. Comply with FS FF-S-111 for applicable requirements.
5. Nails: Select material, type, size, and finish required to suit application. Comply with FS FF-N-105 for applicable requirements.

C. Anchors:

1. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
2. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.
3. Furnish anchors and inserts, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.04 ACCESSORIES

- A. Adhesive: Low-VOC type recommended by AWI to suit application.
- B. Lumber for Shimming, Blocking, Sleepers and Grounds: Refer to Section 061000 - Rough Carpentry.
- C. Wood Filler: Solvent base, tinted to match surface finish color.
- D. Miscellaneous Metal Attachment Accessories: See Section 055000 - Metal Fabrications.

2.05 CABINET HARDWARE

- A. General: Comply with BHMA A156.9, and as specified herein.

B. Hinges:

1. Doors 4 Feet (1.22 m) or Less in Height: Provide 1 pair per leaf.
2. Doors 4 Feet (1.22 m) or More in Height: Provide 1-1/2 pair per leaf.
3. Overlay Doors: Provide pivot type hinges.
4. Product:
 - a. Horizontal Stiles: Hager No. 1043-US26D, or equal.

- b. Vertical Stiles: Hager No. 1044-US26D, or equal.
- C. Drawer and Door Pulls: 6-5/16" Satin Stainless Steel Rod mounted onto smaller diameter posts.
 - 1. Drawers 24 Inches (610 mm) or Less in Width: Provide 1 pull per drawer.
 - 2. Drawers over 24 Inches (610 mm) in Width: Provide 2 pulls per drawer.
 - 3. Doors: Provide 1 pull per door leaf.
 - 4. Product: DP55A, Satin Stainless Steel (SSS) manufactured by Doug Mockett & Company, Inc., or equal.
- D. Drawer Slides:
 - 1. Type 1: Medium-duty, full-extension, side-mount drawer slides with steel ball bearings, handed lever disconnect, vertical cam adjustment, hold-in detents and self-closing feature; 0.050 inch slide space; clear zinc finish.
 - a. Applications: Drawers up to 16 inches (406 mm) wide in base cabinets.
 - b. Load Rating: Up to 100 lbs per pair.
 - c. Product: Accuride Model 3832SC, or equal.
 - 2. Type 2: Heavy-duty, full-extension, side-mount drawer slides with steel ball bearings, rail/mount disconnect, vertical cam adjustment, hold-in detents; 0.050 inch slide space; clear zinc finish.
 - a. Applications: Drawers 16 inches (406 mm) to 27 inches (686 mm) wide in base cabinets, including file drawers.
 - b. Load Rating: Up to 150 lbs per pair.
 - c. Product: Accuride Model 4032, or equal.
- E. Drawer Stops: Manufacturer's standard type.
- F. Adjustable Shelf Hardware:
 - 1. General:
 - a. Provide adjustable shelves for cabinets with the following hardware, to provide shelf adjustment on 1/2 inch centers, except where drawings indicate fixed shelving.
 - b. Provide cantilever type shelf standards and cantilever brackets where indicated. For shelves longer than 48 inches, support at intermediate points at not more than 48 inches spacing by cantilever shelf standards and cantilever brackets.
 - 2. Shelf End Standards:
 - a. Product: Knappe and Vogt No. 255AL, or equal.
 - 3. Shelf Support Clips:
 - a. Product: Knappe and Vogt No. 256AL, or equal.
 - 4. Shelf Standards for Cantilever Brackets:
 - a. Product: Knappe and Vogt No. 80A, or equal.
 - 5. Cantilever Shelf Brackets:
 - a. Product: Knappe and Vogt No. 180A, or equal.
- H. Concealed Hinges for Wood Casework: Concealed, zinc die-cast, screw-on, self-closing type; degree of opening as selected.
 - 1. Provide 1-1/2 pair per leaf.

2. Product:
 - a. For door thickness 3/4 inch to 1-1/32 inches: Salice Series 200, or equal.
 - b. For door thickness up to 1-1/2 inches, and other special applications: Salice Series F, or equal.
- I. Countertop Support Brackets: Provide heavy-gage welded Stainless Steel bracket, framed into cavity of partition, as shown on details 1 and 2 on Sheet A15.1.
- J. Fasteners:
 1. Assembly Fasteners:
 - a. Product: Knappe and Vogt Type 516 Tite-Joint, or equal.
 2. Screws: ASME B18.6.1, Group, Type and Class as applicable.
 3. Anchoring Devices: FS FF-S-325, Group, Type and Class as applicable.
 4. Toggle Bolts: FS FF-B-588, Type I, Class A, Style 2.
 5. Nuts: ASTM F594 stainless steel, or ASTM A563 corrosion-resistant steel.
 6. Bolts: ASTM F593 stainless steel, or ASTM A325 heavy, hexagon head bolts, corrosion-resistant steel.
- K. Plastic Grommets: Provide quantity and sizes as required for miscellaneous cut-out openings; color as selected by Architect.
- L. Paper Lots: Provide molded plastic, paper lot liner with 1/4 inch lip; color as selected by Architect.

2.06 FABRICATION

- A. General:
 1. Fabricate work of this Section in conformance with AWI P-200, Custom Grade quality.
 - a. Architectural Cabinets and Casework:
 - (1) Thicknesses of material shall be not less than minimums indicated in AWI P-200, Section 400-G-8 standards.
 - (2) Thickness of shelving material shall be not less than minimums indicated in AWI P-200, Section 400-G-8 standards for type of material used.
 - (a) All shelves in each cabinet unit shall be of same thickness, based on longest span.
 - (3) Casework dimensions as indicated on drawings, or if not indicated as per AWI P-200, Section 400-G-9 standards for "Casework Standard Dimensions".
 - (a) Comply with height and clearance requirements of FBC-A and other applicable accessibility requirements.
 - (b) Where there is a discrepancy between dimensions indicated on drawings and referenced AWI standards, request direction from Architect.
 - (4) Fabricate cabinets per AWI P-200, Section 400-G-10 standards for "Flush Overlay Construction"; provide optional blocking for pivot hinges.
 - (a) HPDL cabinets and casework to be finished per AWI P-200, Section 400C-series standards.
 - (b) Direction and matching of pattern/grain of Type 2 HPDL finish shall

be per AWI P-200, Section 400-B-S-1 for Custom Grade; door and drawer face matching per "door set match" pattern.

- (5) Fabricate and install cabinet hardware per AWI P-200, Section 400-G-14 standards.
 - (6) Where plastic laminate finish is indicated for cabinets, direction and matching of pattern/grain shall be per AWI P-200, Section 400-B-S-1 for Custom Grade; door and drawer face matching per "door set match" pattern.
2. Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas
 3. Field Dimensions: Woodwork manufacturer to be responsible for details and dimensions not controlled by job conditions and to show on shop drawings all required field measurements beyond his control. Contractor and woodwork manufacturer to cooperate as necessary to establish and maintain these field dimensions.
 4. Complete fabrication processes, including assembly, finishing, and hardware application, prior to shipment to project site, to maximum extent possible. Disassemble components only as necessary for shipment and installation, permitting passage through building openings.
 5. Fit exposed sheet material edges with matching veneer edging. Use one piece for full length only.
 6. Shop-prepare and identify paneling sheets and other wood components for sequenced grain matching during site erection.
 7. Factory-cut openings to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.
 - a. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
 - b. Smooth edges of cutouts and other openings, where located in countertops.
 8. Apply plastic laminate finish in full, uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
 9. Coordinate with electrical requirements and provide raceways, with complete access panels for electrical.
- B. Custom Built-in Architectural Cabinets and Casework:
1. Plastic Laminate (HPDL) Cabinets and Casework:
 - a. AWI P-200, Section 400B, Custom grade.
 - b. Core: Particleboard or plywood, per specified grade and standard.
 - c. All interior and exterior surfaces shall be finished with plastic laminate (HPDL).
 - d. Plastic Laminate Color Schedule: To be selected by Architect, from manufacturer's complete range of colors, textures, and sheens.
 2. Quartz Surfacing Countertops, Backsplashes and Endsplashes: Refer to Section

066200 - Quartz Surfacing Fabrications.

3. Cabinet Hardware and Accessory Materials:
 - a. Provide cabinet hardware and accessory materials to comply with requirements indicated for design, material, finish, and manufacturer. Install in accordance with hardware manufacturer's installation instructions.
 - b. Hinges: Concealed, self-closing.
 - c. Drawer Slides: Provide one pair drawer slides per drawer; slide type as follows:
 - (1) Drawer up to 16 inches (406 mm) wide: Type 1 drawer slides.
 - (2) Drawer 16 inches (406 mm) to 27 inches (686 mm) wide, including file drawers: Type 2 drawer slides.
 - d. Pulls: Stainless Steel Rod Type
 - e. Locks: Custom grade, master key capabilities.
 - f. Exposed Finishes: Satin chrome, except as otherwise indicated.

2.07 WOOD TREATMENT

- A. Wood Preservative by Pressure Treatment (PT Type): AWPA C2, using water borne preservative with 0.25 percent retainage.
- B. Re-dry wood after pressure treatment to maximum 15 percent moisture content.

2.08 SHOP FINISHING

- A. Factory Finishing: To the greatest extent possible, finish work of this Section at factory. Defer only final touch-up, cleaning, and polishing until after installation.
- B. Quality Standard:
 1. Cabinets and Casework with High Pressure Decorative Laminate (HPDL) Finish: Comply with AWI P-200, Section 400B-S-1 standards for Custom Grade.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork.
- D. Sand work smooth and set exposed nails and screws.
- E. Apply wood filler in exposed nail and screw indentations.
- F. Back prime woodwork items to be field finished, prior to installation.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Openings for Cabinetwork: Supplier to make request to Contractor, for temporary openings in walls or windows which may be required for passing large sections of cabinetwork into building and spaces where work will be installed. This applies only to such items that cannot be accommodated through permanent openings.
- B. Verify adequacy of backing and support framing.
 1. Coordinate work of this section with requirements of Section 055000 - Metal Fabrications, to ensure proper installation of steel posts integral to casework or

- cabinets.
- 2. Coordinate work of this section with requirements of Section 061000 - Rough Carpentry, to ensure proper installation of recessed wood blocking related to casework or cabinets.
- 3. Coordinate work of this section with requirements of Section 092113 - Gypsum Board Assemblies, to ensure proper installation of furring, stud framing and backing plates for anchoring and support of casework and cabinets attached to walls or partitions.
- C. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- D. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- E. Prior to installing work of this Section, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.
- F. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. General:
 - 1. Install work in accordance with AWI P-200, Section 1700, Custom quality.
 - 2. Verify dimensions before proceeding and obtain measurements at site for work required to be accurately fitted to other construction.
 - 3. Coordinate work with other trades affected by this installation.
 - a. Moving Items: If it is necessary for other trades to move cabinetwork to make final connections, cabinetwork supplier shall assist such trades in moving such cabinetwork and shall be on the job to carefully level and adjust cabinetwork as last connections are made.
 - 4. Give particular attention to work of supporting and attachment items, so as not to delay progress.
 - 5. Discard materials which are unsound, warped, bowed, twisted, improperly treated, too small to fabricate work with minimum joints, or defective fabrication with respect to surface, size, profile, or pattern.
 - 6. Set and secure materials and components in place, plumb and level.
 - a. Anchor woodwork to anchors or blocking built in or directly attached to substrates.
 - b. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
 - c. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
 - d. Use fixture attachments in concealed locations for wall mounted components.
 - e. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
 - f. Secure cabinet bases to floor using appropriate angles and anchorages.

- g. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
 - h. Install prefinished paneling with nails at 16 inch (400 mm) on center, except as otherwise indicated; where indicated, install paneling with beveled wood rails.
 - 7. Coordinate the installation of firestopping behind paneling.
 - 8. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim to conceal larger gaps.
 - a. Refinish cut surfaces to match adjacent surfaces.
 - 9. Install hardware in accordance with manufacturer's instructions and accepted shop drawings.
- B. Cabinets and Casework:
- 1. General:
 - a. Install without distortion for proper opening and accurate alignment of doors and drawers.
 - b. Adjust hardware to center doors and drawers.
 - c. Anchor tops to base units and other support systems.
 - d. Erect straight, level and plumb to tolerances, and securely anchor in place.
 - e. Scribe and closely fit to adjacent work.
 - f. Cut and fit around pipes, ducts, and other items.
 - 2. Base Cabinets:
 - a. Set base cabinets in line and plumbed, and leveled by means of wood shims, or by adjustable levelers provided in each cabinet unit.
 - b. Secure base units together with concealed galvanized steel bolts, washers and nuts.
 - c. Secure base cabinets to masonry walls and to concrete floors at concealed locations, near each end, with 1/4 inch diameter zinc-plated anchors or toggles.
 - d. Secure base cabinets to wood blocking in metal stud partitions and furred areas at concealed locations near each end, with 1/4 inch diameter zinc-plated screws.
 - 3. Cabinet Tops:
 - a. Field cut and scribe cabinet tops and splashes as required to fit job conditions. Quartz surface tops to be placed on base cabinets, carefully fitting all field joints.
 - b. Draw countertop and backsplash joints tight with concealed "tite-joint" type fasteners.
 - c. Quartz surface countertop, backsplash and endsplash field joints to be sealed watertight on assembly with mildew-resistant silicone sealant. Stainless steel sinks to be set in mildew-resistant silicone sealant. Secure tops to base cabinets with galvanized screws from inside cabinets.
 - d. Cabinet tops not supported on base cabinets to be secured to walls at side and rear with wood cleats. Support and secure countertops at intermediate points with metal brackets and zinc-plated screws.
 - 4. Wall Cabinets:
 - a. Carefully align wall units, level, and firmly anchor to wall.

- b. At furred or stud-framed walls/partitions, install wall cabinets with sheet metal screw anchors into backing plates attached to metal studs or furring.
 - (1) Coordinate placement and installation of backer plates with work installation of stud framing and furring, before installation of gypsum board.
 - (2) Attach cabinet unit using sufficient number of anchors to support weight of cabinet and anticipated load. Anchors to be spaced maximum 16 inches on center, with not less than 4 anchors per unit; minimum 2 anchors to be installed in top mounting rail, and minimum 2 anchors in bottom rail.
 - c. At masonry walls (without furring), anchor wall cabinets with sheet metal screws or machine screws in concrete expansion anchors or toggles.
 - d. Scribe fillers where required, fit and install, to produce a neat closure between building walls and cabinet units.
5. Adjustable Shelving:
- a. Install wood and plastic laminate finished wood shelving where indicated in cabinetwork, supported by specified end standards and clips.
 - b. For shelves longer than 48 inches, support at intermediate points at not over 48 inches spacing by specified cantilever shelf standards and cantilever brackets.
 - c. Erect shelf standards plumb, and secure with zinc-plated steel screws.
6. Fixed Shelving:
- a. Install wood and plastic laminate shelving where indicated in cabinetwork.
 - b. Fixed shelving in open and closed cabinets to be factory-built into cabinets.

3.03 ERECTION TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.5 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.7 mm).
- C. Maximum Offset in Surface Alignment: 1/16 inch.
- D. Maximum Offset in Revealed Adjoining Surface: 1/8 inch.
- E. Plumb and Level: 1/8 inch in 8 ft., maximum.

3.04 ADJUSTING

- A. Repair damaged work or replace with new to eliminate defects.
- B. Adjust joinery for uniform appearance.
- C. Clean, lubricate and adjust hardware.
- D. Adjust moving or operating parts to function smoothly and correctly.
- E. Touch-up factory applied finishes, to restore finish on joints and damaged or soiled areas. Completed work shall have uniform finish throughout.

3.05 CLEANING

- A. Clean all surfaces in accordance with manufacturer's recommendations.
- B. Provide protection and maintain installed condition until Substantial Completion.

C. Remove all protective coatings at time of Final Acceptance.

END OF SECTION

SECTION 066100
QUARTZ SURFACE FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Countertops.

1.02 RELATED REQUIREMENTS

- A. Section 064100 - Architectural Wood Casework.
- B. Section 079005 - Joint Sealers.
- C. Section 224216.16 - Commercial Sinks: Sinks.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C97 -- Absorption and Bulk Specific Gravity of Dimension Stone.
 - 2. ASTM C99 -- Modulus of Rupture of Dimension Stone.
 - 3. ASTM C170 -- Compressive Strength of Dimension Stone.
 - 4. ASTM C370 -- Moisture Expansion.
 - 5. ASTM C501 -- Relative Resistance to Wear of Unglazed Tile to Taber Abraser.
 - 6. ASTM C482 -- Bond Strength of Ceramic Tile to Portland Cement.
 - 7. ASTM C484 -- Thermal Shock Resistance of Glazed Ceramic Tile.
 - 8. ASTM C531 -- Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concrete.
 - 9. ASTM C648 -- Breaking Strength of Ceramic Tile.
 - 10. ASTM C1026 -- Resistance of Ceramic Tile to Freeze Thaw Cycling.
 - 11. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 12. ASTM E662 -- Smoke Density.
- C. International Solid Surface Fabricators Association (ISSFA):
 - 1. ISSFA-2 -- Classification and Standards for Solid Surfacing Material.
- D. Marble Institute of America, Inc. (MIA):
 - 1. MIA (DSDM) -- Dimensional Stone Design Manual.
- E. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA LD 3 -- High-Pressure Decorative Laminates.
- F. U.S. Product Standards (PS):
 - 1. PS 1 -- Structural Plywood

1.04 SUBMITTALS

- A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - 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. Specimen warranty.
- C. Shop Drawings: Provide complete detailed shop drawings showing installation of quartz surfacing fabrications.
 1. General:
 - a. Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, design load parameters, methods of support, integration of plumbing components, and anchorages.
 - b. Indicate materials, component profiles, fastening methods, jointing details, hardware and accessories.
 2. Countertops: Coordinate and submit shop drawings required in this section with shop drawings of cabinets and casework specified in Section 064100 - Architectural Wood Casework.
- D. Samples:
 1. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns; and samples of actual product representing manufacturer's full range of available surface finish options.
 2. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, pattern and surface finish.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Installation Instructions: Manufacturer's installation instructions and recommendations.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Company specializing in fabrication and installation of the products and assemblies specified in this section, with minimum five years of documented experience and certified in writing by the countertop manufacturer.

1.06 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.

1.07 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 MATERIALS

- A. Quality Standard: Same as custom built-in cabinets and casework; see Section 064100 - Architectural Wood Casework.
- B. Quartz Surfacing: Sheet or slab of natural quartz and plastic resin self-supporting over structural members.
 - 1. Flat Sheet Thickness: 3/8 inch (1 cm), 3/4 inch (2 cm) or 1-1/4 inches (3 cm), as indicated on drawings; if not indicated, provide 3/4 inch (2 cm).
 - 2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Shall comply with ISSFA-2 and NEMA LD 3; high-performance polyester resin, unfilled, 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. NSF approved for food contact.
 - 3. Performance Requirements:
 - a. Surface Burning Characteristics (ASTM E84): Flame spread 25, maximum; smoke developed 450, maximum.
 - b. Moisture Absorption (ASTM C97): 0.02 percent.
 - c. Modulus of Rupture (ASTM C99): 6,800 psi.
 - d. Compressive Strength (ASTM C170): 24,750 psi.
 - e. Moisture Expansion (ASTM C370): Less than 0.01.
 - f. Abrasion Resistance (ASTM C501): 223.
 - g. Bond Strength (ASTM C482): 205 psi.
 - h. Thermal Shock (ASTM C484): Passes at 5 cycles.
 - i. Coefficient of Thermal Expansion (ASTM C531): 0.000012 inch/degree F.
 - j. Breaking Strength (ASTM C648): 3,661 lbf.
 - k. Resistance to Freeze Thaw Cycling (ASTM C1026): Unaffected at 15 cycles.
 - l. Stain Resistance (ANSI Z124.6): Unaffected.
 - 4. Manufacturers:
 - a. Basis of Design:
 - (1) Cambria USA; 11000 West 78 Street, Suite 220; Eden Prairie, MN 55344; Tel. 866-226-2742; www.cambriausa.com (Florida Sales Rep.: Georgia Farmer; Tel. 952-944-1676; Cell. 612-751-6962; email Georgia.Farmer@CambriaUSA.com).
 - b. Other Manufacturers:
 - (1) Caesarstone Corporation: www.caesarstoneus.com
 - (2) Seieffe Corporation: www.okite.us.
- C. Accessory Materials:
 - 1. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
 - a. For additional information, refer to Section 061000 - Rough Carpentry.

2. Adhesives:
 - a. Mounting Adhesive: Chemical-resistant waterproof structural grade "50-year" silicone or epoxy adhesive of a type recommended by manufacturer for materials being joined, application and conditions of use.
 - (1) Product: "Two-Part Acrylic Adhesive" by Cambria, or equal by one of the following:
 - (a) Akemi North America.
 - (b) Bonstone Material Corporation.
 - (c) Tenax USA.
 - b. Quartz Surfacing Adhesive: Chemical-resistant waterproof epoxy or polyester adhesive of a type recommended by manufacturer for materials being joined, application and conditions of use.
 - (1) Adhesive which will be visible in finished Work shall be tinted to match quartz surface.
 - (2) Product: "Two-Part Acrylic Adhesive" by Cambria, or equal by one of the following:
 - (a) Akemi North America.
 - (b) Bonstone Material Corporation.
 - (c) Tenax USA.
3. Joint Sealant: Mildew-resistant silicone sealant, clear.
4. Solvent: Denatured alcohol for cleaning quartz surfacing, to assure adhesion of adhesives and sealants.
5. Cleaning Agents: Mild soap and water.

2.03 FABRICATION

A. General:

1. Inspect materials for defects prior to fabrication.
2. Layout quartz surfacing fabrications to minimize joints and avoid L-shaped pieces of quartz surfacing, and fabricate with hairline joints.
3. Shop-fabricate quartz surfacing components to the greatest extent practical; comply with the MIA (DSDM).
4. Fabricate quartz surfacing components in the largest sections practicable, with exposed surface of joints flush.
5. Join lengths of quartz surfacing materials using best method recommended by manufacturer.
6. Cut and polish with water-cooled power tools.
7. Cutouts shall have a minimum of 3/8 inch (1 cm) radius.
8. Polish exposed edges (including edges of cutouts) that will be exposed in finished Work.
9. Laminate layers of quartz surfacing as required to create built-up edges, following procedures recommended by the manufacturer.

B. Countertops:

1. Material: Quartz surfacing.
 - a. Thickness: As indicated on drawings; if not indicated, provide 3/4 inch (2 cm) except at exposed edges (see Exposed Edge Detail).

- b. Color and Pattern: To be selected by Architect from manufacturer's full line of colors and patterns.
 - 2. Fabricate countertops to overhang 1 inch (25 mm) beyond fronts and ends of cabinet or wall beneath, except at edges abutting adjacent cabinet or wall finish.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
 - 4. Exposed Edge Detail: Exposed edges to be built up to 1-1/2 inch (4 cm) thick, and finished with edge profile as indicated on drawings.
 - 5. Exposed Surface Finish: To be selected by Architect from manufacturer's full line of surface finish options.
 - 6. Secure countertop to base cabinet or wall beneath, as applicable, with concealed fasteners and with contact surfaces set in waterproof glue, per approved shop drawings.
- C. Backsplashes and Endsplashes:
- 1. Material: Quartz surfacing.
 - a. Thickness: As indicated on drawings; if not indicated, provide 3/4 inch (2 cm) x 6 inch (15.24 cm)
 - b. Color and Pattern: To be selected by Architect from manufacturer's full line of colors and patterns.

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.
- D. Site Verification:
 - 1. Verify dimensions by field measurements prior to installation.
 - 2. Verify that substrates supporting quartz surfaces are plumb, level and flat to within 1/8 inch in 10 ft, and that all necessary supports and blocking are in place.
 - 3. Base cabinets shall be secured to adjoining units and back wall.
- E. Inspect quartz surface materials for defects prior to installation.

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. Install materials in accordance with manufacturer's instructions and approved shop drawings

- B. Preliminary Installation:
 - 1. Position materials to verify the correct size.
 - 2. If size adjustments, or additional fabrication is necessary, use water-cooled tools. Protect jobsite and surface from dust and water. Perform work away from installation site if possible.
 - 3. Allow gaps for expansion of not less than 1/8 inch (1.5 mm) per 10 ft when installed between walls or other fixed structure.
- C. Permanent Installation:
 - 1. After verification of fit and finish, clean substrate; remove loose and foreign matter which may interfere with adhesion. Clean quartz surface backside and joints using denatured alcohol.
 - 2. Horizontal Surface: Apply continuous bead of mounting adhesive around perimeter of structural substrate and supports.
 - 3. Vertical Surface: Apply continuous bead of mounting adhesive around perimeter. In addition, apply 1/4 inch mounting adhesive bead every 8 inches on vertical center.
 - 4. Install quartz surfacing plumb, level, square and flat, to within 1/8 inch in 10 feet, non-cumulative.
 - 5. Align adjacent pieces in same plane.
 - 6. Securely attach quartz surfacing fabrications to cabinets or wall, as applicable, using concealed fasteners. Make flat surfaces level; shim where required.
- D. Joints:
 - 1. Joints between Adjacent Pieces of Quartz Surfacing:
 - a. Joints shall be flush, tight fitting, level and neat.
 - b. Securely join adjacent pieces using specified Quartz Surfacing Adhesive; fill joints level to polished surface.
 - c. Secure adjacent quartz surfaces with vacuum clamps until adhesive hardens.
 - 2. Joints between Quartz Surfacing and Other Materials or Finishes: Seal joint between quartz surfacing fabrications and adjacent construction, using specified Joint Sealant.

3.04 TOLERANCES

- A. Variation from Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- B. Offset from Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.
- C. Joint Width between Adjacent Pieces of Quartz Surfacing: Hairline.
- D. Surface Lippage at Joints between Adjacent Pieces of Quartz Surfacing: Exposed surfaces shall be flush, with no lippage.
- E. Field Joints (except Joints between Adjacent Pieces of Quartz Surfacing): 1/8 inch (3 mm) 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 Substantial Completion.

END OF SECTION

SECTION 071713
BENTONITE PANEL WATERPROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sub-grade waterproofing system comprised of bentonite clay waterproofing panels and accessories.
- B. Protection boards.

1.02 RELATED REQUIREMENTS

- A. Division 31 - Earthwork: Backfilling and compaction.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D3776 -- Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
 - 2. ASTM D5084 -- Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- D. National Roofing Contractors Association (NRCA):
 - 1. NRCA ML104 -- The NRCA Roofing and Waterproofing Manual.
 - 2. NRCA (RM) -- The NRCA Roofing Manual.
 - 3. NRCA (WM) -- The NRCA Waterproofing Manual.

1.04 PERFORMANCE REQUIREMENTS

- A. Permeability Rating (ASTM D5084): 1×10^{-9} cm/sec, min.
- B. Hydrostatic Resistance (single ply): System shall be rated to withstand 33 ft (10 m) of hydrostatic head, min.
- C. Crack Bridging Ability: System shall be capable of bridging cracks in concrete up to 1/16 in (1.5 mm), min.
- D. Bentonite Mass per Unit Area (ASTM D3776): 1.0 lb/sq ft (4.8 kg/m²), min.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.

- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C. Shop Drawings: Indicate required flashings, sealing at openings, projections, and penetrations.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special preparation of substrate, panel attachment methods, and perimeter conditions requiring special attention.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA (WM).
- B. Waterproofing: Provide complete waterproofing system at walls and floor or each elevator pit, as follows:
 1. Elevator Pit Floors: Waterproofing shall be accomplished by placing a continuous membrane of bentonite clay waterproofing panels under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.
 2. Elevator Pit Walls:
 - a. Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the adjacent finished grade. The remainder of the wall shall be dampproofed in accordance with FBC-B SECTION 1805.2.2.
 - b. Waterproofing shall consist of a continuous membrane of bentonite clay waterproofing panels. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.
 3. Joints and Penetrations: Joints in walls and floors, joints between the wall and floor, and penetrations of the wall and floor shall be made watertight utilizing approved methods and materials.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Maintain bentonite products dry. Protect with waterproof cover.
- B. Maintain minimum ambient storage temperatures of 40 degrees F (5 degrees C) for bentonite gel products.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application.

1.09 WARRANTY

- A. For additional warranty requirements, see Section 017800 - Closeout Submittals.

- B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.
- C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Epro Waterproofing Systems: www.eproserv.com.
- B. CETCO: www.cetco.com.
- C. Tremco Commercial Sealants and Waterproofing: www.tremcosealants.com.

2.02 MATERIALS

- A. Bentonite: Granulated pure, dry, bentonite clay comprised of 90 percent minimum sodium montmorillonite; 90 percent minimum passing No. 20 (850 micro m) mesh sieve and 10 percent maximum passing No. 200 (75 micro m) mesh sieve.
- B. Single-Ply Panels: Single corrugated core, smooth faced Kraft paper panels, core filled with bentonite clay granules.
 - 1. Nominal Panel Size: 48 x 48 x 3/16 inches (1200 x 1200 x 5 mm).
 - 2. Minimum Bentonite Fill: 1 lb/sq ft (5 kg/sq m).
 - 3. Minimum Panel Weight: 18 lbs (8 kg).
 - 4. Product: CETCO "Volclay Panels", or equal.
- C. Joint Packing: Water soluble casing tube filled with bentonite clay granules; 2 inch (50 mm) diameter x 24 inches (600 mm) long.
 - 1. Product: CETCO "Hydrobar Tubes", or equal.
- D. Joint Seal: Moist and hydrated bentonite clay gel using water for above-freezing application.
 - 1. Product: CETCO "Bentoseal", or equal.
- E. Adhesive: Manufacturer's recommended multi-purpose, single-component, polyether, moisture-cure sealant/adhesive.
 - 1. Product: CETCO "CETSEAL", or equal.:
- F. Polyethylene Sheet: 4 mil (1 mm) thick.
- G. Flashing: Panel manufacturer's recommended flashing membrane, designed for use at grade and thru-wall detailing
 - 1. Product: CETCO "GF-40SA", or equal.
- H. Protection Board: 1/4 inch (6 mm) thick biodegradable hardboard.
- I. Granular Bentonite: Pure granular bentonite used to detail critical areas that may require extra protection.
 - 1. Product: CETCO "Waterstoppage", or equal.

- J. Waterstops: Flexible, expanding bentonite-based concrete joint strip waterstop, designed to be adhered into place with adhesive.
 - 1. Product: CETCO "Waterstop-RX", or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are smooth and durable; free of matter detrimental to application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Surface Preparation of Walls: Prior to the application of waterproofing materials, walls shall be prepared in accordance with FBC-B SECTION 1805.2.2.1 and as follows:
 - 1. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
 - 2. Remove concrete fins, projections, and form ties.
 - 3. Fill holes, cracks, honeycombs, and voids with bentonite gel seal, minimum 1/8 inch (3 mm) thick, extending minimum 3 inches (75 mm) beyond defect.

3.03 APPLICATION

- A. General:
 - 1. Install panels and accessories in accordance with manufacturer's instructions.
 - 2. Cut panels parallel to corrugations to prevent bentonite loss.
 - 3. Seal construction joints and through-wall projections and penetrations with joint seal.
- B. Application:
 - 1. Vertical Surfaces:
 - a. Install single-ply panels with adhesive, starting at base of foundation.
 - b. Fold panels around corners with corrugations vertical. Install unfolded panels with corrugations horizontal.
 - c. Lap adjoining panels 1-1/2 inches (38 mm).
 - d. Stagger vertical joints minimum 16 inches (400 mm) on succeeding courses.
 - e. Install one extra layer of panels at external corners.
 - f. Place joint packing continuous along junction of wall and footing, at termination of panels, and at penetrations through panels. Secure to prevent movement.
 - 2. Below Slabs:
 - a. Place polyethylene sheet over subgrade; lap joints 4 inches (100 mm).
 - b. Lay single-ply panels in slab form. Align panels with edge of slab. Do not lay panels over pile caps or footings supporting slab edges. Stagger joints of adjoining panel rows.
 - c. Lap joints 1-1/2 inch (38 mm). Secure laps to prevent displacement.

- d. Extend panels up vertical surfaces minimum 12 inches (300 mm) to overlap vertically applied bentonite panels.
- e. Install joint seal in 1 inch (25 mm) high beads around penetrations through panels and 1/2 inch (13 mm) high beads around chair legs not placed on pads. Cover beads with polyethylene sheet collars, cut to size.
- f. Lay joint seal continuously along and around protrusions, penetrations, and at abutting walls. Secure to prevent movement.

3.04 INSTALLATION - PROTECTION BOARD

- A. Place protection board directly over waterproofing; butt joints.
- B. Scribe and cut boards around projections, penetrations, and interruptions.
- C. Adhere protection board to substrate with mastic.

3.05 BACKFILLING AND COMPACTION

- A. Placement of Backfill: The excavation outside the elevator pits shall be backfilled with soil that is free of organic material, construction debris, cobbles and boulders or with a controlled low-strength material (CLSM). The backfill shall be placed in lifts and compacted in a manner that does not damage the foundation or the waterproofing material.
 - 1. Exception: CLSM need not be compacted.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered waterproofing.
- B. Cover installed waterproofing with temporary polyethylene sheeting. Remove sheeting just before backfilling begins.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Batt insulation in exterior stud-framed wall construction, between exterior wall sheathing and furred interior wall finish.
- B. Batt insulation in exterior stud-framed soffit construction.
- C. Batt insulation for filling perimeter window and door shim spaces.

1.02 RELATED REQUIREMENTS

- A. Section 042000 - Unit Masonry Assemblies: CMU walls.
- B. Section 054000 - Cold-Formed Metal Framing: Stud framing system for exterior walls.
- C. Section 072129 - Sprayed Insulation: Sprayed-on, adhered fibrous insulation.
- D. Section 075200 - Modified Bituminous Membrane Roofing: Insulation specified as part of roofing system.
- E. Section 078400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.
- F. Section 092116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions; furring.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C578 -- Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 2. ASTM C665 -- Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 3. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E136 -- Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-EC -- Florida Building Code, Energy Conservation (including 2012 Supplement).
- D. National Fire Protection Association (NFPA):

1. NFPA 285 -- Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 PERFORMANCE REQUIREMENTS

- A. Energy Conservation Requirements: Thermal insulation installed in exterior wall assemblies of the building envelope shall comply with the following:
 1. Comply with requirements of FBC-EC, except as follows:
 - a. Historic Property Exception: The existing building meets the requirements specified in FBC-EC SECTION 101.4.2 for designation as a historic property, and therefore is exempt from compliance with requirements of FBC-EC.
 2. Thermal Resistance (R-factor):
 - a. Exterior Walls: Min. R-19
 - b. Exterior Soffits: Min. R-19

1.05 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

PART 2 - PRODUCTS

2.01 APPLICATIONS

- A. Insulation in Metal Stud Framed Walls: Batt insulation with no vapor retarder/facing.

2.02 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 1. Flammability (ASTM E84):
 - a. Flame Spread Index: 25 or less.
 - b. Smoke Developed Index: 450 or less.
 2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 3. Formaldehyde Content: Zero.
 4. Thermal Resistance: As indicated on drawings; if not indicated on drawings provide R-19 min.
 - a. For additional requirements, refer to PERFORMANCE REQUIREMENTS.
 5. Thickness: As indicated on drawings; if not indicated, then as required to achieve required thermal resistance.
 6. Facing: Unfaced.
 7. Manufacturers:
 - a. CertainTeed Corporation: www.certainteed.com.
 - b. Johns Manville Corporation: www.jm.com.

c. Owens Corning Corp: www.owenscorning.com.

2.03 ACCESSORIES

- A. Insulation Fasteners: Appropriate for purpose intended and approved by insulation manufacturer.

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 and adhesive.

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall 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. Tape insulation batts in place.

3.03 PROTECTION

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

END OF SECTION

SECTION 072500
WEATHER BARRIERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water-resistive barrier, installed between wall cladding and wall sheathing in stud-framed exterior wall assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Plywood wall sheathing, installed in stud-framed exterior wall assemblies.
- B. Section 061643 - Gypsum Sheathing: Gypsum wall sheathing, installed in stud-framed exterior wall assemblies.
- C. Section 092236 - Metal Lath: Galvanized metal lath for Portland cement plaster cladding, installed over water-resistive barrier in stud-framed exterior wall assemblies.
- D. Section 092400 - Portland Cement Plastering: Portland cement plaster wall cladding, installed in stud-framed exterior wall assemblies

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D226/D226M -- Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

1.04 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. Water-Resistive Barrier: Provide on exterior walls under exterior cladding (fiber-reinforced Portland cement plaster), over sheathing in exterior stud-framed wall assemblies; and where indicated in other sections.
 - 1. Use asphalt felt unless otherwise indicated.

2.02 WATER-RESISTIVE BARRIER MATERIALS

- A. Asphalt Felt: ASTM D226 Type I felt (No.15).

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.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
 - 4. Install water-resistive barrier over jamb flashings.
 - 5. Install air barrier and vapor retarder UNDER jamb flashings.
 - 6. Install head flashings under weather barrier.
 - 7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
 - 8. Attach sheets to wall sheathing with 18 gage 1-1/4 inch long galvanized staples at 16 inches on center in both directions.
- D. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) 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 at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) 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. Do not cover installed weather barriers until required inspections have been completed.

B. 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.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 075200

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Modified bituminous membrane roofing systems.
- B. Membrane and sheet materials.
- C. Board insulation (flat and tapered) and deck sheathing.
- D. Adhesives and fasteners.
- E. Roofing cant strips, accessories, and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete: Substrate for membrane roofing system.
- B. Section 053000 - Metal Decking: Substrate for membrane roofing system.
- C. Section 061000 - Rough Carpentry: Wood blocking, cants and nailers.
- D. Section 076200 - Sheet Metal Flashing and Trim: Sheet metal counterflashings and reglets.
- E. Section 075600 - PMMA Liquid-Applied Roofing.
- F. Section 077200 - Roof Accessories: Roof hatches; prefabricated curbs.
- G. Section 221423 - Storm Drainage Piping Specialties: Roof drains.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C209 -- Standard Test Methods for Cellulosic Fiber Insulating Board.
 - 2. ASTM C473 -- Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 3. ASTM C1177/C1177M -- Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 4. ASTM C1289 -- Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 5. ASTM D41 -- Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - 6. ASTM D312 -- Standard Specification for Asphalt Used in Roofing.
 - 7. ASTM D1621 -- Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 8. ASTM D2126 -- Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 - 9. ASTM D3746 -- Standard Test Method for Impact Resistance of Bituminous

Roofing Systems.

10. ASTM D4272 -- Standard Test Method for Total Energy Impact of Plastic Films By Dart Drop.
 11. ASTM D4586/D4586M -- Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 12. ASTM D5147/D5147M -- Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 13. ASTM D6163 -- Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
 14. ASTM D6164 -- Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
 15. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 16. ASTM E96 -- Standard Test Methods for Water Vapor Transmission of Materials.
 17. ASTM E108 -- Standard Test Methods for Fire Tests of Roof Coverings.
 18. ASTM E1980 -- Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. Canadian General Standards Board (CGSB):
1. CGSB 37-GP-52M -- Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric Membrane, Modified Bituminous, Prefabricated and Reinforced for Roofing.
- D. Cool Roof Rating Council (CRRC):
1. CRRC-1 -- CRRC Product Rating Program.
- E. Factory Mutual Research Corporation (FM):
1. FM 4470 -- Approved Standard for Class 1 Roof Coverings.
- F. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-EC -- Florida Building Code, Energy Conservation (including 2012 Supplement).
 3. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP RAS-111 -- Standard Requirements for Attachment of Perimeter Woodblocking and Metal Flashing.
 - b. FBC-TP RAS-117 -- Standard Requirements for Bonding or Mechanical Attachment of Insulation Panels and Mechanical Attachment of Anchor and/or Base Sheets to Substrates.
- G. National Roofing Contractors Association (NRCA):
1. NRCA ML104 -- The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.
- H. Single Ply Roofing Institute (SPRI):
1. ANSI/SPRI ES-1 -- Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- I. Underwriters Laboratories Inc. (UL):
1. UL (RMSD) -- Roofing Materials and Systems Directory.

2. UL (FRD) -- Fire Resistance Directory.
 3. UL790 -- Standard for Standard Test Methods for Fire Tests of Roof Coverings.
- J. U.S. Department of Energy (DOE).
1. DOE Energy Star Program (DOE-ES):
 - a. DOE-ES (RPQPL): US DOE Energy Star Roof Products Qualified Product List.
- K. U.S. General Services Administration (GSA):
1. Federal Specifications (FS):
 - a. FS HH-1-529 -- Insulation Board, Thermal (Mineral Aggregate).
 - b. FS HH-1-1972 -- Insulation Board, Thermal, Polyurethane and Polyisocyanurate Faced.
 - c. FS SS-A-701B -- Asphalt, Petroleum (Primer, Roofing, and Waterproofing).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated roofing systems, flashings and counterflashings specified in related sections.
- B. Pre-installation Meeting: At least one week prior to starting the work of this section, a pre-roofing meeting shall be arranged by the Contractor and attended by the material manufacturers' technical representatives, Roofing Contractor, Contractor, Architect and Owner's representative, to discuss specific expectations and responsibilities, Owner occupancy and maintenance of Owner's operations, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
 2. Plan and coordinate the installation of the roofing system with other trades in such a manner as to avoid membrane damage, keeping the complete installation weather-tight and in accordance with all approved details and warranty requirements.
 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 4. Review and finalize construction schedule and verify availability of materials, roofing contractor's personnel, equipment, and facilities needed to make progress and avoid delays.
 5. Review methods and procedures for removal of existing roofing and examination of deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 6. Review structural loading limitations of roof deck during and after roofing.
 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 8. Review governing regulations and requirements for insurance and certificates, if applicable.
 9. Review temporary protection requirements for roofing system during and after installation.
 10. Review roof observation and repair procedures after roofing installation.

1.05 DESIGN & PERFORMANCE REQUIREMENTS

- A. General: Installed roofing system shall withstand specified uplift pressures, thermally-induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspection agency to resist uplift pressure calculated according to the requirements of the governing building code and ASCE 7, including but not limited to code requirements for High Velocity Hurricane Zone (HVHZ).
 - 1. Wind Load Design Criteria:
 - a. Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
 - b. Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*V_{ult}*): 245 mph (395 km/hr).
 - (1) Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.
 - c. Wind Exposure Category (FBC-B SECTION 1620.3): C.
 - d. Enclosure Classification: Enclosed Building.
 - e. Roof Height: As indicated on drawings.
 - f. Building Width: As indicated on drawings.
 - g. Corner / Perimeter Zone: As indicated on drawings.
 - h. Minimum Parapet Height: As indicated on drawings.
 - i. Deck Type:
 - (1) Roofing System Type 1: Structural concrete deck (Wing A, Wing B, Chiller Building, Bridge)
 - (2) Roofing System Type 2: Steel deck (Commission Chamber, North Breezeway)
 - (3) Roofing System Type 3: Wood deck (White Street Portico)
 - j. Main Roof Slope: Low slope.
- D. Maximum Design Pressure (MDP) Rating (per Product Approval): Provide roofing system that is identical to systems that have been successfully tested and approved for use in HVHZ, with MDP rating equal to or greater than pressures indicated on the drawings.
- E. Metal Edge Securement: Shall be designed and installed for wind loads in accordance with FBC-B CHAPTER 16 and tested for resistance in accordance with ANSI/SPRI ES-1 or FBC-TP RAS-111, except the basic wind speed shall be determined from Roofing System Design criteria as specified in this section.
- F. Impact Resistance: Roof coverings shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M,

or the “Resistance to Foot Traffic Test” in Section 5.5 of FM 4470.

- G. Roof Covering External Fire Classification (ASTM E108 or UL 790; FBC-B SECTION 1516.2.1): Class A.
- G. Fire Resistance Ratings (ASTM E119): Where indicated, provide fire-resistance-rated roof assembly identical to assembly tested for fire resistance by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- H. Energy Conservation Requirements: Thermal insulation installed in exterior roof assemblies of the building envelope shall comply with the following:
 - 1. Comply with requirements of FBC-EC, except as follows:
 - a. Historic Property Exception: The existing building meets the requirements specified in FBC-EC SECTION 101.4.2 for designation as a historic property, and therefore is exempt from compliance with requirements of FBC-EC.
 - 2. Thermal Resistance (R-factor): As determined by energy analysis simulation model.
- I. Energy Performance Requirements:
 - 1. US DOE Energy Star: Provide roofing system that is listed on the DOE-ES (RPQPL) for low-slope roof products.
 - 2. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
 - a. Field-applied coating may not be used to achieve specified SRI.

1.06 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer’s printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used.
 - 1. Include current Product Approval(s) for proposed roofing system(s); identify applicable Deck Type(s) and System Type(s), specific product selections and optional components, and Design Pressure Rating(s).
 - 2. Include manufacturer’s installation instructions, including but not limited to membrane seaming precautions and perimeter conditions requiring special attention.
 - 3. Include complete list of accessories or materials not manufactured or expressly authorized for use in manufacturer's literature, with written approval from manufacturer confirming that such accessories or materials are acceptable and compatible with the proposed roofing system.
- C. Shop Drawings: Submit large scale shop drawings for installation of all parts of the work of this section and related requirements.
 - 1. Include dimensioned roof plans indicating all roofing-related detail references,
 - a. Indicate orientation of roof deck, orientation of membrane roofing, and

- fastener spacing and patterns for mechanically-fastened membrane roofing (where applicable).
- b. Cross-reference to the applicable Product Approval for each reroofing location, and identify Deck Type and System Type.
2. Include details indicating membrane seams, connections and accessory items; layout of flat and tapered insulation, including slopes and drain sumps; joint or termination detail conditions; conditions of interface with work of other trades and existing work to remain; perimeter enhancement; curbs; drains; metal edges (e.g., raised metal edge, coping); flashings (e.g., membrane flashings, metal flashings, high wall base flashing, reglets); counter flashings and termination bars; cants, curb supports, blocking and nailers; and parapet horizontal termination.
- D. Manufacturer's Certificate: Provide certificate signed by an authorized representative of the manufacturer, stating that the proposed application, materials and systems comply with manufacturer's requirements in order to qualify the project for the specified Manufacturer's Roofing System Warranty.
- E. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit SS 7.2 (Heat Island Effect - Roof): Submit documentation required to complete the LEED Submittal Template, including but not limited to documentation showing that membrane roofing system has a Solar Reflectance Index (SRI) of 78 or better.
 3. Product Data for Credit MR 4.1 and Credit MR 4.2 (Recycled Content): For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 4. Product Data for Credit MR 5.1 and Credit MR 5.2 (Regional Materials): Submit documentation, including measurement and calculations, for "regionally-sourced" materials.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- D. Installer (Roofing Contractor) Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
 1. Roofing Contractor shall be an "Authorized Applicator", authorized and approved by the membrane manufacturer to install the specified roofing system.
 2. Roofing contractor and key supervisory personnel shall have received sufficient training by manufacturer.
 3. Roofing Contractor's key supervisory personnel shall have not less than three years experience in the installation of like products, and shall be present at all times

during roofing installation.

- C. Manufacturer's Representative: Contractor to make arrangements and pay costs to have roofing system manufacturer's authorized technical representative available for the following:
 - 1. Manufacturer's authorized technical representative must attend the Pre-installation Meeting to offer technical assistance on proper procedures, quality control techniques, and requirements for compliance with manufacturer's warranty requirements.
 - 2. Manufacturer's authorized technical representative must be on the roof at beginning of roofing work to advise installer on proper procedures and quality control techniques.
 - 3. Manufacturer's authorized technical representative must be available throughout roofing installation work to make recommendations necessary to insure compliance with manufacturer's warranty requirements.
 - 4. Upon completion and certification by the Contractor that a quality installation has been completed in accordance with the approved contract specifications and all field welds have been probed and inspected, a quality assurance inspection of the roof system shall be performed by the manufacturer's authorized technical representative for acceptance and approval; and upon acceptance, manufacturer shall issue Manufacturer's Roofing System Warranty.
- D. UL Listing: Provide roof system that has been tested and listed by UL as Class A for roof deck, slope and application indicated.
- E. Wind Uplift: Provide complete roofing system, including all materials in conformance with Miami-Dade County Product Approval, and designed to comply with the applicable requirements of the governing building code, including High Velocity Hurricane Zone requirements of the Florida Building Code.
- F. LEED: The roof membrane system shall be eligible to achieve 1 credit point according to SS Credit 7.2 Heat Island Effect-Roof as recorded in LEED 2009 for New Construction and Major Renovations.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original containers with seals intact and unbroken, and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Storage and Handling:
 - 1. Store and handle materials in strict compliance with manufacturer's instructions and recommendations.
 - a. Follow precautions as outlined in manufacturer's Material Safety Data Sheets.
 - 2. Store materials in clean, dry, and weather-protected environment, clear of ground and moisture.
 - 3. Sequence material deliveries to avoid delays, but minimize on-site storage.
 - 4. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to

manufacturer's recommendations of handling and storage.

- C. Materials determined by the Architect to be damaged shall be removed immediately from the construction site and replaced at no cost to the Owner.

1.09 PROJECT CONDITIONS

- A. Weather: Perform work of this section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.
- B. Substrates: Proceed with work only when substrate construction and preparation work is complete.
- C. Environmental Considerations: Comply with roofing manufacturer's guide specifications for installation, and as follows:
 - 1. Adhesives can be temperamental. Contractor must be aware of all potential environmental variables when installing adhered roofing systems.
 - 2. Contractor to pay careful attention to and follow adhesive manufacturer's storage and application precautions and recommendations referenced in roofing manufacturer's guide specifications for installation.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Roofing System Warranty: Furnish manufacturer's NDL roofing system warranty stating that manufacturer shall maintain roofing system in water-tight condition at its own expense, provided that Owner gives manufacturer written notice of any leak within thirty (30) days from the discovery of such leak.
 - 1. Warranty shall protect the Owner against the costs of repairing leakage resulting from defects in materials, including, but not limited to, roofing membrane, base flashings, roof insulation, adhesives, cover boards, walkway products, accessories and all other roofing system components, as well as workmanship related thereto.
 - 2. Acceptable Exclusions: Roofing system manufacturer will have no obligation under the warranty if a leak or damage is caused by:
 - a. Natural forces, disasters, or acts of God, including, but not limited to, fires, tornadoes, hail less than 2-inches in diameter, wind-blown debris, lightning, insects or animals;
 - b. Wind of peak "3-second gust" speed greater than 100 miles per hour, calculated at ten (10) meters above ground using available meteorological data;
 - c. Act(s) of war, terrorism or vandalism;
 - d. Failure by the Owner to use reasonable care in maintaining the roofing system;
 - e. Deterioration or failure of other building components, including, but not limited to, roof substrate, walls, or roof-mounted HVAC units;
 - f. Construction generated moisture, condensation or infiltration of moisture in, from, through, or around the walls, copings, rooftop hardware or equipment, building structure or underlying or surrounding materials;
 - g. Acid, oil, harmful chemicals, or the reaction between them;
 - h. Alterations or repairs to the roofing system that are not completed in accordance with roofing manufacturer's published specifications, not

- completed by an approved contractor, and/or not completed with proper notice to roofing system manufacturer;
- i. Deterioration to metal flashing materials and accessories caused by marine salt water or by regular spray of either salt or fresh water.
3. Unacceptable Exclusions: The warranty shall include no exclusion for damage or failure to maintain roofing system in water-tight condition caused by:
 - a. Wind of peak “3-second gust” speed less than or equal to 100 miles per hour, calculated at ten (10) meters above ground using available meteorological data;
 - b. Hail of an inch or less in diameter.
 4. No Dollar Limit (NDL): No limit shall be placed on the amount to be paid under the warranty.
 5. Warranty Period: Minimum 20 years, commencing on the date of Substantial Completion of the Project.
- C. Roofing Contractor’s Warranty: The roofing contractor shall furnish the Owner with a workmanship warranty; and a copy shall be sent to the roofing system manufacturer
1. In the event any work related to roofing, flashings, or metalwork is found to be defective or otherwise not in accordance with the Contract Documents or manufacturer’s instructions within warranty period, the roofing contractor shall provide removal and replacement at no additional cost to the Owner.
 2. Warranty Period: Minimum 2 years, commencing on the date of Substantial Completion of the Project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General:
1. For each material type required for the work of this section:
 - a. Use a product of one of the manufacturers named and meeting specifications.
 - b. Provide primary materials (e.g., Membrane and Sheet Materials) that are the product of one manufacturer.
 - c. Provide secondary and accessory materials that are acceptable to manufacturer of primary materials.
 - d. Products used shall be certified for use in the applicable roofing system in accordance with the roofing system’s Product Approval.
- B. Membrane and Sheet Materials:
1. Basis of Design:
 - a. Siplast, Inc.: 1111 Highway 67 South; Arkadelphia, AR 71923; www.siplast.com
 2. Other Manufacturers:
 - a. Danosa Caribbean, Inc.: P.O. Box 13757; San Juan, PR 00908; www.danosapr.com.
 - b. The Garland Company: 3800 East 91 Street; Cleveland, OH 44105; Tel. 800-321-9336; www.garlandco.com.
- C. Insulation Materials:
1. Base Layer (Polyisocyanurate Foam): Same as Membrane and Sheet Materials manufacturer, or one of the following in accordance with the roofing system’s

Product Approval:

- a. Hunter Panels, LLC: 15 Franklin Street; Portland, ME 04101; Tel. 888-746-1114; www.hpanels.com.
 - b. Atlas Roofing Corporation: www.atlasroofing.com.
 - c. Johns Manville: P. O. Box 5108; Denver, CO 80217; Tel. 800-922-5922; www.jm.com.
2. Top Layer (Water-Resistant Gypsum Board):
- a. Georgia-Pacific Gypsum, LLC: Tel. 800-225-6119; www.buildgp.com
 - b. U.S. Gypsum Corporation: Tel. 800-874-4968; www.usg.com.
- D. Adhesives and Fasteners:
1. Insulation Fasteners:
 - a. OMG, Inc.: 153 Bowles Road; Agawam, MA 01001; Tel. 800-633-3800; www.olyfast.com.
 2. Insulation Adhesive: Same as Membrane and Sheet Materials manufacturer, or one of the following in accordance with the roofing system's Product Approval:
 - a. Dow Chemical Company: Tel. 800-258-2436; www.dow.com.

2.02 ROOFING SYSTEMS

A. General:

1. All roofing systems for this project shall be by one manufacturer.
2. Roofing Assembly Requirements:
 - a. Solar Reflectance Index (SRI): Greater than 78 (calculated in accordance with ASTM E1980), and as required to achieve LEED Credit SS 7.2 (Heat Island Effect - Roof).
 - (1) Field applied coating may not be used to achieve specified SRI.
 - b. External Fire Exposure Classification: ASTM E108, Class A, UL listed.
 - c. Surfacing: Mineral granules.
3. Insulation:
 - a. Types/Products: Use insulation types/products that meet requirements of and are approved by membrane manufacturer for application; comply with requirements for Manufacturer's Roofing System Warranty; and certified for use in the applicable roofing system in accordance with the roofing system's Product Approval requirements.
 - b. Thermal Resistance Value: R-20 min.

B. Roofing System Type 1: Multiple-ply SBS-modified bitumen membrane roofing system over insulated concrete deck, including insulation base layer(s) adhered to concrete deck, insulation top layer adhered to insulation base layer, ply sheet torch-applied to insulation top layer, and roofing membrane cap sheet torch-applied to base ply sheet.

1. Product: "Siplast Modified Bitumen Roof Systems over Concrete Deck" in accordance with requirements of Miami-Dade Product Approval NOA No. 13-0514.04 System A(11), pg. 17 of 31; or equal by one of the other Membrane and Sheet Materials manufacturers named.

C. Roofing System Type 2: Multiple-ply SBS-modified bitumen membrane over insulated steel deck, including insulation base layer over steel deck, insulation top layer adhered

to base layer insulation, base sheet mechanically-fastened through all layers of insulation and steel deck, ply sheet adhered to base sheet, and roofing membrane cap sheet adhered to ply sheet.

1. Product: "Siplast Modified Bitumen Roof Systems over Steel Deck" in accordance with requirements of Miami-Dade Product Approval NOA No. 12-1220.05 System C(7), pg. 16 of 22; with Limitation # 7 - enhanced fasteners via rational analysis, or equal by one of the other Membrane and Sheet Materials manufacturers named.
- D. Roofing System Type 3: Roofing System Type 3: Multiple-ply SBS-modified bitumen membrane over minimum 19/32" plywood or wood plank non-insulated deck, 1/4in roof cover board loose laid, base sheet mechanically-fastened through roof cover board into wood deck , ply sheet torch-applied to base sheet, and roofing membrane cap sheet torch applied to ply sheet.
1. Product: "Siplast Modified Bitumen Roof Systems over Wood Deck" in accordance with requirements of Miami-Dade Product Approval NOA No. 12-1220.03 System Type (D), pg. 13 of 15; with Limitation # 7 - enhanced fasteners via rational analysis, or equal by one of the other Membrane and Sheet Materials manufacturers named.

2.03 MEMBRANE AND SHEET MATERIALS

- A. Base Sheet (Roofing System Type 2 only): High-performance modified bitumen ply sheet, designed for use in multi-layer modified bitumen roof membrane systems.
1. Physical and Mechanical Property Requirements:
 - a. Minimum Quality: ASTM D6164, Type I; with fiberglass scrim reinforced/polyester mat composite impregnated and coated with SBS-modified bitumen.
 - b. Thickness (ASTM D5147/D5147M): 91 mils (2.3 mm), average.
 - c. Coverage Weight per Square: 60 lbs, minimum.
 2. Product: Siplast "Paradiene 20 PR", or equal.
- B. Ply Sheet: High-performance torch-grade modified bitumen base ply, designed for use in multi-layer modified bitumen roof membrane systems.
1. Physical and Mechanical Property Requirements:
 - a. Minimum Quality: ASTM D6163, Type I; SBS-modified, glass fiber reinforced.
 - b. Thickness (ASTM D5147/D5147M): 138 mils (3.5 mm), average.
 - c. Coverage Weight per Square: 100 lbs, minimum.
 2. Product: Siplast "Paradiene 20 EG TG", or equal.
- C. Membrane (Cap Sheet): High-performance torch-grade modified bitumen finish ply surfaced with reflective white synthetic chips, designed for use in multi-layer modified bitumen roof membrane systems.
1. Physical and Mechanical Property Requirements:
 - a. Minimum Quality: ASTM D6163, Type I; SBS-modified, glass fiber reinforced.
 - b. Thickness (ASTM D5147/D5147M): 130 mils (3.3 mm), average.
 - c. Coverage Weight per Square: 80 lbs, minimum.
 2. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM

E1980.

- a. Membrane shall qualify for LEED certification points as defined by the USGBC, including but not limited to: SSc7.2 - Heat Island, Roof.
3. Product: Siplast "Paradiene 30 CR FR TG", or equal.
- D. Flexible Flashing Material: Same material as Membrane (Cap Sheet); shall comply with requirements for Manufacturer's Roofing System Warranty.

2.04 INSULATION MATERIALS

- A. Insulation Top Layer (Deck Sheathing): Noncombustible, moisture- and mold-resistant, glass mat sheathing panel, with treated gypsum core and fiberglass face and back, conforming to ASTM C1177/C1177M; fire resistant type; designed for use as fire barrier, thermal barrier, coverboard in commercial roofing systems.
 1. Fire Resistance Classification (UL 790): Shall be classified for use as a fire barrier over combustible and noncombustible decks.
 2. Flammability (ASTM E84): Flame Spread 0, Smoke Developed 0.
 3. Water Absorption (ASTM C1177/C1177M): Less than 10 percent, max.
 4. Compressive Strength (ASTM C473): 900 psi, nom.
 5. Thickness: As specified in the applicable roofing system's Product Approval, and as necessary to achieve applicable fire resistance rating.
 6. Product: Shall comply with requirements for Manufacturer's Roofing System Warranty, and as follows:
 - a. Roofing System Type 1: "DensDeck Roof Board" by Georgia Pacific, or equal specified in the applicable roofing system's Product Approval.
 - b. Roofing System Type 2: "SECUROCK Glass-Mat Sheathing Panels" by U.S. Gypsum, or equal specified in the applicable roofing system's Product Approval.
 - c. Roofing System Type 3: Wood deck over portico (No insulation)
- B. Insulation Base Layer (Board Insulation): Rigid roof insulation board composed of a closed cell polyisocyanurate foam core bonded on each side to fiberglass-reinforced facers, conforming to ASTM C1289, Type II, Class 1.
 1. Physical and Mechanical Property Requirements:
 - a. Compressive Strength (ASTM D1621): 20 psi (Grade 2).
 - b. Dimensional Stability (ASTM D2126): 2 percent linear change, 7 days.
 - c. Moisture Vapor Transmission (ASTM E96): Less than 1 perm.
 - d. Water Absorption (ASTM C209): Less than 1 percent, volume.
 - e. Board Thickness: 2 inches, minimum.
 - f. Tapered Board: Slope as indicated; fabricate of fewest layers possible.
 - (1) Tapered insulation shall have a minimum average thickness per panel of 1 inch
 - g. Thermal Resistance (ASTM C1289): LTTR-20 min.
 - h. Board Edges: Square.
 2. Product: Shall comply with requirements for Manufacturer's Roofing System Warranty, and shall be certified for use in the applicable roofing system in accordance with the roofing system's Product Approval requirements.

2.05 BITUMINOUS MATERIALS

- A. Asphalt Primer: Asphalt-based primer, specially formulated for use as a primary coating for concrete, masonry and metal surfaces prior to application of specified roofing and flashing systems.
 - 1. Shall meet or exceed requirements of ASTM D41 and FS SS-A-701B.
 - 2. Product: "PA 1125" by Siplast, or equal.
- B. Mopping Asphalt: High-quality, inter-ply mopping asphalt.
 - 1. Shall meet or exceed requirements of ASTM D312, Type IV.
 - 2. Product: "PA 100" by Siplast, or equal.
- C. Flashing Cement: High-quality, asbestos-free, asphalt-based roofing cement, specially formulated for use as a roofing membrane base flashing cement; slump resistant and highly flexible for high slope and vertical applications
 - 1. Shall meet or exceed requirements of ASTM D4586/D4586M, Type II.
 - 2. Product: "PA 828" by Siplast, or equal.
- D. Plastic Cement: High-quality, asbestos-free, general purpose roof cement produced from refined asphalt and petroleum solvents with fibers added for reinforcement; specially formulated for use as a mastic for setting metal flanges on flat or low slope applications where slumping is not a concern.
 - 1. Shall meet or exceed requirements of ASTM D4586/D4586M, Type II.
 - 2. Product: "PA 1021" by Siplast, or equal.

2.06 ADHESIVES & FASTENERS

- A. Insulation Adhesive: Single-component, moisture-curing, solvent-free, polyurethane foam adhesive; specially formulated for use in attaching board insulation to substrate, and certified for use in the applicable roofing system in accordance with the roofing system's Product Approval requirements.
 - 1. Product:
 - a. "ParaStik" as manufactured by Siplast.
 - b. "Insta-Stik" as manufactured by Dow Chemical.
- B. Insulation Fasteners and Stress Plates:
 - 1. Fasteners: High-performance fastener designed to secure roofing materials, with oversized heavy shank and thread diameters for enhanced pullout resistance, appropriate for attaching insulation to steel roof deck; approved by roofing assembly manufacturer and conforming to requirements of roofing assembly Product Approval.
 - a. Physical and Mechanical Property Requirements:
 - (1) Material: Heat-treated steel.
 - (2) Shank: 0.202 inch diameter
 - (3) Threads: 0.265 inch diameter; 12 per inch.
 - (4) Tip: Drill point.
 - (5) Head: #3 Phillips truss head; 0.435 inch diameter.
 - (6) Corrosion Resistance: Less than 15 percent red rust after 30 Kesternich cycles (DIN 50018); shall meet or exceed requirements of FM 4470.
 - (7) Length: As required to penetrate top flange of steel deck not less than 1/2 inch; refer to FBC-TP RAS-117 for additional requirements.
 - b. Product: "Olympic Extra Heavy Duty (XHD) Roofing Fastener (#15)" by

- OMG, or equal.
2. Stress Plates: Stamped metal plate for use for use with specified fasteners in attaching insulation to steel roof deck; approved by roofing manufacturer and conforming to requirements of roofing assembly Product Approval.
 - a. Physical and Mechanical Property Requirements:
 - (1) Material: Galvalume coated steel.
 - (2) Thickness and Shape: As required to provide even distribution of loads and eliminate sharp corners that can damage the insulation or membrane.
 - (2) Size: 2-3/4 inch diameter, minimum.
 - b. Product: "Olympic Super Extra Heavy Duty (XHD) Steel Stress Plates" by OMG, or equal.

2.07 SURFACING MATERIALS

- A. Walkway Pads: Modified bitumen sheet material designed to be used as a protective course at roof areas with anticipated high pedestrian traffic or mechanical abuse potential.
 1. Material / Composition: Modified bitumen sheet material, composed of an asphalt-impregnated, puncture-resistant, polyester fabric core, coated with a polymer-modified bitumen, and topped with a ceramic-coated granule wearing surface.
 2. Panel Dimensions:
 - a. Thickness: 217 mils (5.5 mm).
 - b. Width: 30 inches (roll width).
 - c. Length: As indicated on drawings; or if not indicated, cut to max. 48 inches.
 3. Product: "Paratread" by Siplast, or equal.

2.08 ACCESSORIES

- A. Pre-formed Cants: Pre-formed cant and edge strips, compatible with insulation and roofing materials; cants formed to 45 degree angle; as manufactured by Insulation Base Layer manufacturer.
- B. Pre-Cut Tapered Insulation: Pre-cut crickets, compatible with insulation and roofing materials; as manufactured by Insulation Base Layer manufacturer.
- C. Strip Reglet Devices: Stainless steel, maximum possible lengths per location, with attachment flanges.
- D. Sealants: As recommended by membrane manufacturer.
- E. 1-inch roof expansion joint, where shown in drawings:
 - a. Roof to Roof: SBS Modified Bitumen, Torch Applied low-profile waterproof expansion Joint.
 - (1) REDLINE by Situra Inc., detail MBM/TD-01 with optional mechanical cover protection.
 - b. Roof to Wall: SBS Modified Bitumen, Torch Applied low-profile waterproof expansion Joint.
 - (2) REDLINE by Situra Inc., detail MBM/TD-02

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION

- A. Concrete Deck Preparation:
 - 1. Fill surface honeycomb and variations with latex filler.
 - 2. A "Deck Dryness Test" shall be performed on structural concrete decks prior to asphalt application. The following procedures are specified for testing the dryness of the roof deck.
 - a. Heat not less than one pint of the specified asphalt to 400 deg F. Pour into a container.
 - b. Pour the asphalt on the primed deck surface. If the asphalt foams, the deck contains too much moisture for the asphalt to bond.
 - c. After the asphalt has cooled, pull the asphalt patch from the deck surface. If the asphalt patch strips clean, the deck is not dry enough for Roof System Assembly application. Wait a further period for the deck to dry and a sufficient asphalt bond can be achieved. Repeat the test procedure.
 - 3. For applications where the insulation panels are to be bonded to a structural concrete deck, the deck shall be fully primed with Asphalt Primer. Asphalt Primer shall be allowed to completely dry prior to Mopping Asphalt applications.
- B. Steel Deck Preparation:
 - 1. Prepare steel roof deck in accordance with roofing manufacturer's instructions.
- C. Existing Wood Deck Preparation:
 - 1. Prepare wood roof deck in accordance with roofing manufacturer's instructions.

3.03 INSTALLATION - INSULATION

- A. General:
 - 1. Mechanically Attached Insulation Panels:
 - a. All insulation fasteners shall be installed in compliance with the fastener manufacturer's published installation instructions and the limitations set forth in the Product Approval. Insulation attachment for panels in the field area of the roof shall use a fastener spacing in compliance with FIGURES 1 through 4 of FBC-TP RAS-117, as referenced in the roof assembly Product Approval. Fastener placement guidelines shall be as follows:
 - (1) Fasteners installed at insulation panel edges shall be spaced not greater than 13-1/2 inches nor less than 4-1/2 inches from the edge of the panel.

- (2) Fasteners shall be evenly distributed over the panel area.
- b. All insulation fasteners and stress plates shall be tested in compliance with FBC-B CHAPTER 15 (HVHZ).
 - (1) Minimum withdrawal resistance for insulation fasteners shall be 275 lbf.
- c. Insulation fasteners and stress plates, and minimum acceptable insulation panel size and thickness shall be as listed in the roofing assembly Product Approval.
- d. Installation of more than one insulation layer using a single fastener shall utilize the fastening pattern and fastener designated for the top insulation panel.
- e. Only as much insulation as can be roofed shall be installed each working day.
 - (1) Water shall not be allowed to run in the flutes of steel deck ribs under completed roof sections.
- f. Insulation panels shall be installed with minimum joint dimensions and shall be tightly butted.
 - (1) Maximum joint widths shall be 3/8 in.
- g. All insulation joints shall be staggered.
 - (1) Tapered insulation shall be installed in accordance with manufacturer's recommendations.
- h. Tapered insulation may be substituted for any flat stock type listed in the roofing assembly Product Approval.
 - (1) The fastening requirements shall remain the same.
- i. Insulation pieces that are cut from larger panels and are smaller than one square foot shall not be acceptable.
- j. All overdriven fasteners or fasteners driven at an angle, shall be removed and replaced.
 - (1) If the insulation facer has been broken by a stress plate, that section of insulation panel shall be removed and replaced.
- k. Insulation fasteners and stress plates shall be installed with tooling specified by the fastener manufacturer.
- l. Pre-drilling, if any, shall be with the diameter bit listed in the withdrawal resistance test report. The drill bit tolerance range noted in the test report shall be maintained throughout the project.
 - (1) Should a change in bit size be required due to varying density of the deck material, an additional withdrawal resistance test shall be conducted to confirm fastener performance.
 - (2) Drill holes shall not be spalled.
- m. Concrete dust shall be removed by brushing or forced air from the insulation top surface prior to the application of hot asphalt or adhesive.
- 2. Adhered Insulation Panels:
 - a. Insulation panels up to 4 ft. by 4 ft. may be installed in hot asphalt or approved cold adhesive, as specified in roof assembly Product Approval.
 - b. Not less than 85 percent of each insulation panel shall be in contact with the substrate and bonded with asphalt or adhesive, unless a specific intermittent adhesive attachment pattern is detailed in the roof assembly manufacturer's Product Approval.
 - c. Approved foam adhesive applications of insulation panels shall be applied in

- strict compliance with the foam adhesive manufacturer's Product Approval.
3. Roof Drains: All insulated decks containing interior drains shall be sumped at the drains, using factory-tapered boards.
 - a. Sump area insulation shall be tapered at a minimum slope of 1/8 of an inch per foot to the drain.
 - b. The drain sump area shall be a minimum of (24 in. by 24 in.) 576 square inches, unless restricted by a wall or any other obstruction.
 - c. For additional information, refer to Section 221423 - Storm Drainage Piping Specialties.
 - B. Roofing System Type 1: All insulation shall be adhered to primed structural concrete deck in full mopping of approved Mopping Asphalt within the EVT range specified in roofing system's Product Approval requirements.
 1. Attachment of Insulation: Embed each layer of insulation in flood coat mopping of hot Mopping Asphalt in accordance with roofing and insulation manufacturers' instructions and FBC-TP RAS-117.
 - a. Where applied directly to the deck, insulation shall be adhered in a full mopping of hot Mopping Asphalt at an application rate of between 20 and 40 pounds per square, depending on the asphalt EVT. Asphalt types and temperature ranges shall be in compliance with FBC-B CHAPTER 15 (HVHZ).
 2. Insulation panels set in hot asphalt shall be "walked in" to ensure complete adhesion to the substrate. Multiple "walk-in" procedures may be required for foam adhesive products that expand during the curing process.
 3. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.
 - C. Roofing System Type 2:
 1. Base layer of Board Insulation to be loose laid on roof deck.
 2. Additional layer(s) of Board Insulation, if applicable, to be adhered to base layer in full mopping of approved Mopping Asphalt within the EVT range specified in roofing system's Product Approval requirements.
 3. Top layer of Deck Sheathing to be adhered to base layer(s) of Board Insulation in full mopping of approved Mopping Asphalt within the EVT range specified in roofing system's Product Approval requirements.
 4. Base Sheet to be mechanically-fastened through all layers of insulation and steel deck using specified fasteners, in accordance with applicable requirements of roofing system Product Approval and FBC-TP RAS-117.
 - D. Roofing System Type 3: Existing Wood Deck over Portico
 1. 1/4in Dens Deck roof cover panel loose laid over the existing wood deck.
 3. Base Sheet: polyester reinforced smooth surfaced membrane; heat welded at the seams. This sheet is then mechanically attached with screws and plates through all layers into the wood substrate, in accordance with applicable requirements of roofing system Product Approval and FBC-TP RAS-117.
 4. Intermediate Sheet to be torch-applied to base sheet
 5. Cap sheet to be torch applied to the intermediate sheet.

3.04 INSTALLATION - ROOFING MEMBRANE AND SHEET MATERIALS

A. Membrane:

1. Apply membrane in accordance with approved shop drawings, roofing system Product Approval, manufacturer's instructions, and Manufacturer's Roofing System Warranty requirements.
2. Apply membrane; lap and seal edges and ends permanently waterproof.
3. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate.
4. At end of day's operation, install waterproof cut-off. Remove cut-off before resuming roofing.
5. At intersections with vertical surfaces:
 - a. Extend membrane over cant strips and up a minimum of 8 inches (200 mm) onto vertical surfaces.
 - b. Apply flexible flashing over membrane.
 - c. Secure flashing to nailing strips at 4 inches (100 mm) on center.
 - d. Insert base flashing into reglets and secure.
6. Around roof penetrations, mop in and seal flanges and flashings with flexible flashing.
7. Coordinate installation of roof drains and sumps and related flashings.
 - a. For additional information, refer to Section 221423 - Storm Drainage Piping Specialties.

B. Walkway Pads:

1. Layout and install Walkway Pad panels in patterns as indicated on drawings, to provide a protective course at roof areas with anticipated high pedestrian traffic or mechanical abuse potential (e.g., around roof-mounted access hatches and mechanical equipment).
 - a. Provide a 2-inch wide gap between adjacent panels, to allow for proper drainage of roof areas.
2. Set each Walkway Pad panel in a full bed of Plastic Cement.
 - a. Apply Plastic Cement to the back surface of each panel in spots approximately 5 inches (12.7 cm) square, then use notched trowel to spread the Plastic Cement to uniform thickness of approximately 3/8-inch (0.97-cm).
 - b. Install each panel in proper position on the roof, and the walk-in to ensure complete contact with the membrane surface.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.06 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and

conform to their documented instructions.

- C. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 PROTECTION

- A. Protect installed roofing and flashings from damage due to construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 075600
PMMA LIQUID-APPLIED ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fluid-applied membrane roofing system for direct application over concrete.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete: Concrete substrate.
- B. Section 075200 - Modified Bituminous Membrane Roofing.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D412 -- Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - 2. ASTM D570 -- Standard Test Method for Water Absorption of Plastics.
 - 3. ASTM D2240 -- Standard Test Method for Rubber Property--Durometer Hardness.
 - 4. ASTM D3746 -- Standard Test Method for Impact Resistance of Bituminous Roofing Systems.
 - 5. ASTM D4272 -- Standard Test Method for Total Energy Impact of Plastic Films By Dart Drop.
 - 6. ASTM D4541 -- Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 7. ASTM D5147/D5147M -- Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 - 8. ASTM E108 -- Standard Test Methods for Fire Tests of Roof Coverings.
 - 9. ASTM E119 -- Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 10. ASTM E1980 -- Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. Cool Roof Rating Council (CRRC):
 - 1. CRRC-1 -- CRRC Product Rating Program.
- D. Factory Mutual Research Corporation (FM):
 - 1. FM 4470 -- Approved Standard for Class 1 Roof Coverings.
- E. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building.
 - 2. FBC-EC -- Florida Building Code, Energy Conservation.
 - 3. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP RAS-111 -- Standard Requirements for Attachment of Perimeter

- Woodblocking and Metal Flashing.
- b. FBC-TP RAS-117 -- Standard Requirements for Bonding or Mechanical Attachment of Insulation Panels and Mechanical Attachment of Anchor and/or Base Sheets to Substrates.
- F. National Roofing Contractors Association (NRCA):
 1. NRCA ML104 -- The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.
- G. Single Ply Roofing Institute (SPRI):
 1. ANSI/SPRI ES-1 -- Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- H. Underwriters Laboratories Inc. (UL):
 1. UL (RMSD) -- Roofing Materials and Systems Directory.
 2. UL (FRD) -- Fire Resistance Directory.
 3. UL790 -- Standard for Standard Test Methods for Fire Tests of Roof Coverings.
- I. U.S. Department of Energy (DOE).
 1. DOE Energy Star Program (DOE-ES):
 - a. DOE-ES (RPQPL): US DOE Energy Star Roof Products Qualified Product List.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated roofing systems, flashings and counterflashings specified in related sections.
- B. Pre-installation Meeting: At least one week prior to starting the work of this section, a pre-roofing meeting shall be arranged by the Contractor and attended by the material manufacturers' technical representatives, Roofing Contractor, Contractor, Architect and Owner's representative, to discuss specific expectations and responsibilities, Owner occupancy and maintenance of Owner's operations, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
 2. Plan and coordinate the installation of the roofing system with other trades in such a manner as to avoid membrane damage, keeping the complete installation weather-tight and in accordance with all approved details and warranty requirements.
 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 4. Review and finalize construction schedule and verify availability of materials, roofing contractor's personnel, equipment, and facilities needed to make progress and avoid delays.
 5. Review methods and procedures for removal of existing roofing and examination of deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 6. Review structural loading limitations of roof deck during and after roofing.
 7. Review base flashings, special roofing details, roof drainage, roof penetrations,

equipment curbs, and condition of other construction that will affect roofing system.

8. Review governing regulations and requirements for insurance and certificates, if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.05 DESIGN & PERFORMANCE REQUIREMENTS

- A. General: Installed roofing system shall withstand specified uplift pressures, thermally-induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspection agency to resist uplift pressure calculated according to the requirements of the governing building code and ASCE 7, including but not limited to code requirements for High Velocity Hurricane Zone (HVHZ).
 1. Wind Load Design Criteria:
 - a. Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
 - b. Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*Vult*): 245 mph (395 km/hr).
 - (1) Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.
 - c. Wind Exposure Category (FBC-B SECTION 1620.3): C.
 - d. Enclosure Classification: Enclosed Building.
 - e. Roof Height: As indicated on drawings.
 - f. Building Width: As indicated on drawings.
 - g. Corner / Perimeter Zone: As indicated on drawings.
 - h. Minimum Parapet Height: As indicated on drawings.
 - i. Deck Type: Structural concrete deck
 - j. Main Roof Slope: Low slope.
- D. Maximum Design Pressure (MDP) Rating (per Product Approval): Provide roofing system that is identical to systems that have been successfully tested and approved for use in HVHZ, with MDP rating equal to or greater than pressures indicated on the drawings.
- E. Metal Edge Securement: Shall be designed and installed for wind loads in accordance with FBC-B CHAPTER 16 and tested for resistance in accordance with ANSI/SPRI ES-1 or FBC-TP RAS-111, except the basic wind speed shall be determined from Roofing

System Design criteria as specified in this section.

- F. Impact Resistance: Roof coverings shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M, or the “Resistance to Foot Traffic Test” in Section 5.5 of FM 4470.
- G. Roof Covering External Fire Classification (ASTM E108 or UL 790; FBC-B SECTION 1516.2.1): Class A.
- G. Fire Resistance Ratings (ASTM E119): Where indicated, provide fire-resistance-rated roof assembly identical to assembly tested for fire resistance by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- H. Energy Performance:
 - 1. US DOE Energy Star: Provide roofing system that is listed on the DOE-ES (RPQPL) for low-slope roof products.
 - 2. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
 - a. Field-applied coating may not be used to achieve specified SRI.

1.06 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's data for membrane and accessory materials.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Include standard installation instructions, acceptable installation temperature range, and procedures for unusual perimeter conditions.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- B. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used.
 - 1. Include current Product Approval(s) for proposed roofing system(s); identify applicable Deck Type(s) and System Type(s), specific product selections and optional components, and Design Pressure Rating(s).
 - 2. Include manufacturer's installation instructions, including but not limited to precautions and perimeter conditions requiring special attention.
 - 3. Include complete list of accessories or materials not manufactured or expressly authorized for use in manufacturer's literature, with written approval from manufacturer confirming that such accessories or materials are acceptable and

compatible with the proposed roofing system.

- C. Shop Drawings: Submit large scale shop drawings for installation of all parts of the work of this section and related requirements.
 - 1. Include dimensioned roof plans indicating all roofing-related detail references,
 - a. Indicate orientation of roof deck, orientation of membrane roofing, and fastener spacing and patterns for mechanically-fastened membrane roofing (where applicable).
 - b. Cross-reference to the applicable Product Approval for each reroofing location, and identify Deck Type and System Type.
 - 2. Include details indicating joint or termination detail conditions; conditions of interface with work of other trades and existing work to remain; flashings, counter flashings and termination bars; and parapet horizontal termination.
- D. Manufacturer's Certificate: Provide certificate signed by an authorized representative of the manufacturer, stating that the proposed application, materials and systems comply with manufacturer's requirements in order to qualify the project for the specified Manufacturer's Roofing System Warranty.
- E. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit SS 7.2 (Heat Island Effect - Roof): Submit documentation required to complete the LEED Submittal Template, including but not limited to documentation showing that membrane roofing system has a Solar Reflectance Index (SRI) of 78 or better.
 - 3. Product Data for Credit MR 4.1 and Credit MR 4.2 (Recycled Content): For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
 - 4. Product Data for Credit MR 5.1 and Credit MR 5.2 (Regional Materials): Submit documentation, including measurement and calculations, for "regionally-sourced" materials.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- D. Installer (Roofing Contractor) Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
 - 1. Roofing Contractor shall be an "Authorized Applicator", authorized and approved by the membrane manufacturer to install the specified roofing system.
 - 2. Roofing contractor and key supervisory personnel shall have received sufficient training by manufacturer.

3. Roofing Contractor's key supervisory personnel shall have not less than three years experience in the installation of like products, and shall be present at all times during roofing installation.
- C. Manufacturer's Representative: Contractor to make arrangements and pay costs to have roofing system manufacturer's authorized technical representative available for the following:
1. Manufacturer's authorized technical representative must attend the Pre-installation Meeting to offer technical assistance on proper procedures, quality control techniques, and requirements for compliance with manufacturer's warranty requirements.
 2. Manufacturer's authorized technical representative must be on the roof at beginning of roofing work to advise installer on proper procedures and quality control techniques.
 3. Manufacturer's authorized technical representative must be available throughout roofing installation work to make recommendations necessary to insure compliance with manufacturer's warranty requirements.
 4. Upon completion and certification by the Contractor that a quality installation has been completed in accordance with the approved contract specifications and all field welds have been probed and inspected, a quality assurance inspection of the roof system shall be performed by the manufacturer's authorized technical representative for acceptance and approval; and upon acceptance, manufacturer shall issue Manufacturer's Roofing System Warranty.
- D. UL Listing: Provide roof system that has been tested and listed by UL as Class A for roof deck, slope and application indicated.
- E. Wind Uplift: Provide complete roofing system, including all materials in conformance with Miami-Dade County Product Approval, and designed to comply with the applicable requirements of the governing building code, including High Velocity Hurricane Zone requirements of the Florida Building Code.
- F. LEED: The roof membrane system shall be eligible to achieve 1 credit point according to SS Credit 7.2 Heat Island Effect-Roof as recorded in LEED 2009 for New Construction and Major Renovations.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original containers with seals intact and unbroken, and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Storage and Handling:
1. Store and handle materials in strict compliance with manufacturer's instructions and recommendations.
 - a. Follow precautions as outlined in manufacturer's Material Safety Data Sheets.
 2. Store materials in clean, dry, and weather-protected environment, clear of ground and moisture.
 3. Sequence material deliveries to avoid delays, but minimize on-site storage.

4. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to manufacturer's recommendations of handling and storage.
- C. Materials determined by the Architect to be damaged shall be removed immediately from the construction site and replaced at no cost to the Owner.

1.09 PROJECT CONDITIONS

- A. Weather: Perform work of this section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.
- B. Substrates: Proceed with work only when substrate construction and preparation work is complete.
- C. Environmental Considerations: Comply with roofing manufacturer's guide specifications for installation, and as follows:
 1. Adhesives can be temperamental. Contractor must be aware of all potential environmental variables when installing adhered roofing systems.
 2. Contractor to pay careful attention to and follow adhesive manufacturer's storage and application precautions and recommendations referenced in roofing manufacturer's guide specifications for installation.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Roofing System Warranty: Furnish manufacturer's NDL roofing system warranty stating that manufacturer shall maintain roofing system in water-tight condition at its own expense, provided that Owner gives manufacturer written notice of any leak within thirty (30) days from the discovery of such leak.
 1. Warranty shall protect the Owner against the costs of repairing leakage resulting from defects in materials, accessories and all other roofing system components, as well as workmanship related thereto.
 2. Acceptable Exclusions: Roofing system manufacturer will have no obligation under the warranty if a leak or damage is caused by:
 - a. Natural forces, disasters, or acts of God, including, but not limited to, fires, tornadoes, hail less than 2-inches in diameter, wind-blown debris, lightning, insects or animals;
 - b. Wind of peak "3-second gust" speed greater than 100 miles per hour, calculated at ten (10) meters above ground using available meteorological data;
 - c. Act(s) of war, terrorism or vandalism;
 - d. Failure by the Owner to use reasonable care in maintaining the roofing system;
 - e. Deterioration or failure of other building components, including, but not limited to, roof substrate, walls, or roof-mounted HVAC units;
 - f. Construction generated moisture, condensation or infiltration of moisture in, from, through, or around the walls, copings, rooftop hardware or equipment, building structure or underlying or surrounding materials;
 - g. Acid, oil, harmful chemicals, or the reaction between them;

- h. Alterations or repairs to the roofing system that are not completed in accordance with roofing manufacturer's published specifications, not completed by an approved contractor, and/or not completed with proper notice to roofing system manufacturer;
 - i. Deterioration to metal flashing materials and accessories caused by marine salt water or by regular spray of either salt or fresh water.
3. Unacceptable Exclusions: The warranty shall include no exclusion for damage or failure to maintain roofing system in water-tight condition caused by:
 - a. Wind of peak "3-second gust" speed less than or equal to 100 miles per hour, calculated at ten (10) meters above ground using available meteorological data;
 - b. Hail of an inch or less in diameter.
 4. No Dollar Limit (NDL): No limit shall be placed on the amount to be paid under the warranty.
 5. Warranty Period: Minimum 20 years, commencing on the date of Substantial Completion of the Project.
- C. Roofing Contractor's Warranty: The roofing contractor shall furnish the Owner with a workmanship warranty; and a copy shall be sent to the roofing system manufacturer
1. In the event any work related to roofing, flashings, or metalwork is found to be defective or otherwise not in accordance with the Contract Documents or manufacturer's instructions within warranty period, the roofing contractor shall provide removal and replacement at no additional cost to the Owner.
 2. Warranty Period: Minimum 2 years, commencing on the date of Substantial Completion of the Project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General:
1. For each material type required for the work of this section:
 - a. Use a product of one of the manufacturers named and meeting specifications.
 - b. Provide primary materials (e.g., Membrane and Sheet Materials) that are the product of one manufacturer.
 - c. Provide secondary and accessory materials that are acceptable to manufacturer of primary materials.
 - d. Products used shall be certified for use in the applicable roofing system in accordance with the roofing system's Product Approval.
- B. Fluid-Applied Membrane Roofing System:
1. Siplast, Inc.: 1111 Highway 67 South; Arkadelphia, AR 71923..
 2. Substitutions: See Section 016000 - Product Requirements.

2.02 SYSTEM DESCRIPTION

- A. General:
1. All roofing systems for this project shall be by one manufacturer.
 2. Roofing Assembly Requirements:
 - a. Solar Reflectance Index (SRI): Greater than 78 (calculated in accordance with ASTM E1980), and as required to achieve LEED Credit SS 7.2 (Heat Island

- Effect - Roof).
 - b. External Fire Exposure Classification: ASTM E108, Class A, UL listed.
- B. Basis of Design: Miami-Dade Product Approval NOA No. 13-0627.03, System F(1) with primer.
- 1. MDP Rating: -322.5 psf, minimum.

2.03 MATERIALS

- A. Primer:
- 1. Masonry and Vertical Concrete Substrates: Fast-curing PMMA-based primer as supplied by the membrane system manufacturer, for use over masonry, concrete repair materials and vertical concrete substrates.
 - a. Product: "Pro Primer W" by Siplast, or equal.
 - 2. Horizontal Concrete Substrates: Fast-curing PMMA-based primer as supplied by the membrane system manufacturer, for use over horizontal concrete substrates.
 - a. Product: "Pro Primer T" by Siplast, or equal.
- B. Resin for Field Membrane Construction: Flexible, PMMA-based resin as supplied by the membrane system manufacturer, for use in combination with fleece fabric to form a monolithic, reinforced roofing membrane..
- 1. Physical and Performance Requirements (based upon a 90 mil resin thickness):
 - a. Thickness (ASTM D5147/D5147M, section 5): 90 mils.
 - b. Weight: Minimum 68.4 lb per 100 ft² of coverage.
 - c. Peak Load (ASTM D5147 section 6): 70 lbf/in (average) at 73 degrees F.
 - d. Peak Load (ASTM D412, dumbbell): 90 lbf/in (average) at 73 degrees F.
 - e. Elongation at Peak Load (ASTM D 5147/D5147M, section 6): 35 percent (average) at 73 degrees F.
 - f. Elongation at Peak Load (ASTM D 412, dumbbell): 35 percent (average) at 73 degrees F.
 - g. Shore A Hardness (ASTM D2240): 81 (average).
 - h. Water Absorption (ASTM D570):
 - (1) Method I (24h at 73 degrees F): 0.8 percent.
 - (2) Method II (48h at 122 degrees F): 1.2 percent.
 - i. Low Temperature Flexibility (ASTM D5147/D5147M, section 11): Pass, at 23 degrees F.
 - j. Dimensional Stability (ASTM D5147/D5147M, section 10): 0.15 percent (maximum).
 - k. Tear Strength (ASTM D5147/D5147M, section 7): 90 lbf (average).
 - 2. Approvals (products shall bear seals of approval):
 - a. UL Class listed.
 - b. FM Approved.
 - 3. Product: "Parapro Roof Membrane Resin" by Siplast, or equal.
- C. Fleece Fabric: Non-woven, 110 g/m², needle-punched, polyester fabric reinforcement as supplied by the membrane system manufacturer.
- 1. Product: "Pro Fleece" by Siplast, or equal.

2.04 ACCESSORIES

- A. Cleaning Solution/Solvent: Clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin.
 - 1. Product: "Pro Prep" by Siplast, or equal.
- B. Preparation Paste: PMMA-based paste used for remediation of depressions in substrate surfaces or other irregularities.
 - 1. Product: "Pro Paste Resin" by Siplast, or equal.
- C. Repair Mortar: Two-component, PMMA-based, aggregate filled mortar used for patching concrete substrates.
 - 1. Product: "Pro Repair Mortar" by Siplast, or equal.
- D. Thixotropic Agent: Liquid additive used to increase the viscosity of the PMMA-based resin products, allowing the resins to be applied over sloped substrates.
 - 1. Product: "Pro Thixo" by Siplast, or equal.
- E. Color Finish Resin: Pigmented, PMMA-based resin for used to provide a color finish for both field and flashing membranes.
 - 1. Product: "Pro Color Finish" by Siplast, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are free of dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of roofing system.
- C. Ensure that substrates are free from gross irregularities, loose, unsound or foreign material such as dirt, water, grease, oil, bituminous products, release agents, laitance, paint, loose particles/friable matter, rust or any other material that would be detrimental to adhesion of the catalyzed primer and/or resin to the substrate. Some surfaces may require scarification, shotblasting, or grinding to achieve a suitable substrate.
- D. Structural concrete shall be cured a minimum of 28 days in accordance with ACI-308, have a minimum compressive strength of 3,500 psi, and have a moisture content that conforms with the waterproofing system manufacturer's requirements prior to commencement of work.
- E. Moisture Content Evaluation: Evaluate the level of moisture in the substrate to determine that the moisture content is acceptable for application of the specified waterproofing system. Concrete substrates shall have a maximum moisture content of 6 percent by weight and a maximum internal relative humidity of 75 percent.
- F. Adhesion Testing for Concrete Substrates to Receive Resin Materials: Test the concrete substrate using a device conforming to ASTM D4541 using a 50 mm dolly adhered with the specified catalyzed primer. Utilize the same concrete preparation methods as that which will be used prior to application of the waterproofing for areas to be evaluated for adhesion. Ensure that a minimum adhesion value of 220 psi is obtained before

application of the PMMA-based primer. If multiple areas or substrates are involved in the scope of work, evaluate each to determine suitability. Maintain testing/evaluation records.

3.02 PREPARATION

- A. General:
 - 1. Clean and prepare surfaces to receive roofing in accordance with manufacturer's instructions and recommendations.
 - 2. Seal cracks and non-moving open joints less than 1/2 inch (12 mm) wide with sealant using methods recommended by roofing and sealant manufacturers. Do not seal expansion joints or moving joints of any width.
 - 3. Install cant strips at inside corners, where indicated and where required by roofing manufacturer.
 - 4. Protect adjacent surfaces not designated to receive roofing.
- B. Preparation of Newly Placed Concrete Substrates to Receive a Direct Application of Resin Materials: Newly placed concrete shall be cured a minimum of 28 days in accordance with ACI 308, and have a minimum compressive strength of 3,500 psi. Following evaluation for moisture content and confirmation that the moisture content is at an acceptable level, shot-blast or scarify/shot blast the surface to provide a sound substrate free from laitance and to generate a concrete surface profile of CSP-2 to CSP-4 as defined by the ICRI. Grinding may be used as a preparation method for localized areas that cannot be reached by a shot blasting equipment provided that a surface profile of CSP-2 to CSP 4 can be generated. Repair spalls and voids on vertical or horizontal surfaces using the specified primer and preparation paste.
- C. Preparation of Existing Concrete/Masonry Substrates to Receive Resin Materials: Existing concrete substrates shall have a minimum compressive strength of 3,500 psi. Following evaluation for moisture content and confirmation that the moisture content is at an acceptable level, shot blast or scarify/shot-blast concrete or masonry surfaces to provide a sound substrate free from laitance and residue from bitumen, coal tar, primer, coatings, adhesives, sealer or any material that may inhibit adhesion of the specified primer. Generate a concrete surface profile of CSP-2 to CSP-4 as defined by the ICRI. Grinding may be used as a preparation method for localized areas that cannot be reached by a shot blasting equipment provided that a surface can be prepared to a CSP-2 to CSP 4. Repair spalls and voids on vertical or horizontal surfaces using the specified primer and preparation paste.
- D. Preparation of Concrete Substrates to Receive a Modified Bitumen Base Ply: Poured reinforced concrete shall be cured a minimum of 28 days in accordance with ACI 308, with a minimum compressive strength of 3,500 psi. Concrete decks shall be fully cured, dry, frost-free, broom-cleaned, free from release/curing agents and smooth enough to allow for full adhesion of the ply sheet. Ensure that the moisture content is at a level suitable for proper application of the primer and roofing system components. Level projections or depressions that may interfere with proper application of roofing system components. Prime the deck with the specified primer at the rate required by the primer manufacturer and allow to dry thoroughly.

- E. Repair and Leveling of Concrete Substrate to Receive Resin Materials: Before application of the roofing membrane, and after priming, fill all joints, cracks, voids, fractures, depressions, small indentations, and low areas in the substrate using the specified paste or repair mortar.
- F. Static Crack and Cold Joint Preparation: Clean cracks/joints and treat with the specified PMMA primer. Fill the cracks and joints using the specified preparation paste prior to membrane/flashing application.

3.03 MIXING OF RESIN PRODUCTS

- A. Preparation/Mixing/Catalyzing Resin Products: Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder needed using the manufacturer's guidelines and add the pre-measured catalyst to the resin component. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before pot life expires.
- B. Preparation/Mixing/Catalyzing Aggregate-Filled Resin Products: Pour the entire desired quantity of resin into a clean container and slowly add the pre-measured quantity of aggregate using a spiral mixer or mixing paddle, stirring the mixture for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder needed using the manufacturer's guidelines and add the pre-measured catalyst to the resin/aggregate mixture. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before pot life expires.

3.04 PREPARATION PASTE AND PRIMER MIXING/APPLICATION

- A. Primer Application: Apply primer resin using a roller or brush at the rate specified by the primer manufacturer over qualified and prepared substrates. Apply primer resin at the increased rate specified by the primer manufacturer over DensDeck Prime or other porous substrates. Do not let resin pool or pond. Do not under-apply or over-apply primers as this may interfere with proper primer catalyzation. Make allowances for waste, including saturation of roller covers and application equipment.
- B. Paste Application: Apply catalyzed preparation paste using a trowel over prepared and primed substrates. Before application of any resin product over cured paste, wipe the surface of the paste using the specified cleaner/solvent and allow to dry. Treat the surface again if not followed up by resin application within 60 minutes.

3.05 INSTALLATION

- A. Apply roofing in accordance with requirements of Product Approval and manufacturer's instructions and recommendations, to specified minimum thickness.

- B. Do not apply roofing to surfaces unacceptable to manufacturer.
- C. Install liquid-applied materials (e.g., primer, resin) at rate recommended by manufacturer and conforming to requirements of Product Approval.
- D. Over Sealant-Filled Joints and Cracks: Install an extra coat of roofing membrane over joint and to minimum of 6 inches (150 mm) each side of joint.
- E. Penetrations: Unless otherwise indicated on the drawings, or otherwise recommended by roofing manufacturer, seal flexible flashing sheet around penetration and to substrate prior to installation of roofing membrane, embedding sheet in one coat of roof membrane material.
- F. Intersecting Vertical Surfaces: Extend membrane up a minimum 6 inches (150 mm) of above horizontal surface.
- G. Embedded Flexible Flashing Sheet: Apply full thickness of roofing membrane over exposed sheet.
- H. Apply extra thickness of roofing material at corners, intersections, and angles, when recommended by roofing manufacturer.

3.06 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. 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.
- C. 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.
- D. Issuance of the Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

3.07 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM, GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sheet metal flashings and trim, including but not limited to sill and ledge flashings, roof drip edge flashings and fascias, roof cap flashings, roof penetration flashings, and counterflashings.
- B. Copper rainwater gutters and leaders, roof drip edge flashings and fascias.
- C. Reglets and accessories.

1.02 RELATED SECTIONS

- A. Section 042000 - Unit Masonry Assemblies.
- B. Section 061000 - Rough Carpentry: Wood nailers and blocking; sheathing.
- C. Section 075200 - Modified Bituminous Membrane Roofing.
- D. Section 075600 - PMMA Liquid-Applied Roofing.
- E. Section 077100 - Roof Specialties.
- F. Section 077200 - Roof Accessories.
- G. Section 079005 - Joint Sealers.
- H. Section 099000 - Painting and Coating.
- I. Division 23 - Heating, Ventilating and Air Conditioning: Roof-mounted mechanical equipment and pipes penetrating roofing.
- J. Division 26 - Electrical: Roof-mounted electrical equipment, lightning protection system, and conduits penetrating roofing.
- K. Section 334000 - Storm Drainage Utilities: Storm drain connections to rain water leaders.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A666 -- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 2. ASTM B32 -- Standard Specification for Solder Metal.
 - 3. STM C665 -- Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 4. ASTM D41/D41M -- Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

5. ASTM D43/D43M -- Standard Specification for Coal Tar Primer Used in Roofing, Dampproofing, and Waterproofing.
 6. ASTM D1785 -- Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 7. ASTM D2178/D2178M -- Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 8. ASTM D2665 -- Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
 9. ASTM D2846/D2846M -- Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
 10. ASTM D4586/D4586M -- Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 11. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 12. ASTM E136 -- Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
 13. ASTM F493 -- Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- C. American Welding Society (AWS):
1. AWS D1.1/D1.1M -- Structural Welding Code - Steel.
 2. AWS D1.3 -- Structural Welding Code - Sheet Steel.
- D. American Water Works Association (AWWA):
1. AWWA C111/A21.11 -- Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings (ANSI/AWWA C111/A21.11).
 2. AWWA C151/A21.51 -- Ductile-Iron Pipe, Centrifugally Cast, for Water (ANSI/AWWA C151/A21.51).
- F. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building.
 2. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP RAS-111 -- Standard Requirements for Attachment of Perimeter Woodblocking and Metal Flashing.
- G. National Roofing Contractors Association (NRCA):
1. NRCA ML104 -- The NRCA Roofing and Waterproofing Manual.
- H. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
1. SMACNA (ASMM) -- Architectural Sheet Metal Manual.
- I. Single Ply Roofing Industry (SPRI):
1. SPRI ES-1 -- Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems (ANSI/SPRI ES-1).
- J. The Society for Protective Coatings (SSPC):
1. SSPC-Paint 15 -- Steel Joist Shop Paint.
 2. SSPC-Paint 20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- K. Industry Standard: Except as otherwise shown or specified, comply with applicable

recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Conform to dimensions and profiles shown.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work of this section with installation of associated roofing systems, flashings and counterflashings specified in related sections.
- B. Pre-installation Meeting: At least one week prior to starting the work of this section, a pre-roofing meeting shall be arranged by the Contractor and attended by the material manufacturers' technical representatives, Roofing Contractor, Contractor, Architect and Owner's representative, to discuss specific expectations and responsibilities, Owner occupancy and maintenance of Owner's operations, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 2. Plan and coordinate the installation of the roofing system with other trades in such a manner as to avoid membrane damage, keeping the complete installation weather-tight and in accordance with all approved details and warranty requirements.
 - 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 4. Review and finalize construction schedule and verify availability of materials, roofing contractor's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 5. Review methods and procedures for removal of existing roofing and examination of deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 6. Review structural loading limitations of roof deck during and after roofing.
 - 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 8. Review governing regulations and requirements for insurance and certificates, if applicable.
 - 9. Review temporary protection requirements for roofing system during and after installation.
 - 10. Review roof observation and repair procedures after roofing installation.

1.05 DESIGN & PERFORMANCE REQUIREMENTS

- A. General: Installed sheet metal roof flashing systems shall withstand specified uplift pressures, thermally-induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Material Compatibility: Provide sheet metal flashing and trim materials that are compatible with one another and with related roofing system materials under conditions of service and application required.
- C. Wind Load Design Criteria: Provide sheet metal roof flashing systems that will resist

wind load pressure calculated according to the requirements of the governing building code and ASCE 7, including but not limited to code requirements for High Velocity Hurricane Zone (HVHZ) - as follows:

1. Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
2. Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*Vult*): 245 mph (395 km/hr).
 - a. Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.
3. Wind Exposure Category (FBC-B SECTION 1620.3): C.
4. Enclosure Classification: Enclosed Building.
5. Roof Height: As indicated on drawings.
6. Building Width: As indicated on drawings.
7. Corner / Perimeter Zone: As indicated on drawings.
8. Minimum Parapet Height: As indicated on drawings.

D. Metal Edge Securement:

1. Metal edge securement assemblies shall be designed and installed for wind loads in accordance with FBC-B CHAPTER 16 and tested for resistance in accordance with ANSI/SPRI ES-1 or FBC-TP RAS-111, except the basic wind speed shall be determined from Wind Load Design Criteria as specified in this section.
2. Wind Resistance Tests: The following minimum securement criteria apply to edging systems. Roof edge systems shall pass SPRI Test Method RE-1, RE-2 or RE-3, as appropriate for the application.
 - a. Membrane Attachment: Edge devices designed to act as membrane terminations shall pass SPRI Test Method RE-1 (attached to SPRI ES-1).
 - (1) The design of perimeter attachment, when terminating the roofing system, shall provide a minimum holding power of 100 pounds/foot, which force shall be measured in direction of 45 degrees back onto the roof as tested according to SPRI Test Method RE-1.
 - (2) Specifically for mechanically attached membrane roofing systems, the perimeter attachment loadings shall be calculated based on the force required to hold the roof system's perimeter sheet in place for the design wind speed.
 - (3) The fastener spacing shall be adjusted and the edge detail shall have sufficient strength to meet and resist these loads.
 - b. Edge Flashing: Edge flashings and other edge devices for which the exposed vertical component area exceeds the exposed horizontal component area shall pass SPRI Test Method RE-2 (attached to SPRI ES-1).
 - (1) The vertical face of edge flashing shall be tested according to SPRI Test Method RE-2.
 - (2) Test results shall meet or exceed horizontal and vertical design wind pressures as calculated according to SPRI Test Method RE-2.
3. Fasteners/Anchors:
 - a. Powder-actuated fasteners shall not be used.

- b. Fasteners/anchors which have published withdrawal resistance values generated from laboratory testing, shall have a margin of safety applied to average laboratory test results as noted in Table 1 of FBC-TPHVHZ RAS-111.
- E. Copper Gutters and Leaders:
- 1. Dimensional Requirements:
 - a. Vertical Conductors and Leaders: Size shall meet or exceed requirements of FBC-P SECTION 1106.2.
 - b. Roof Gutters: Size shall meet or exceed requirements of FBC-P SECTION 1106.6.
 - 2. Rainwater gutters and leaders, and hold down components shall be constructed in accordance with the SMACNA (ASMM), and the Copper Development Association (CDA)'s "Copper in Architecture" handbook , except as otherwise indicated; in addition to the following requirements:
 - a. Gutter joints shall be lapped 4 inches sealed with two rows of approved sealant, and riveted with two rows of closed end rivets offset 1 inch o.c.
 - b. Maximum gutter lengths shall not exceed 50-ft. Gutter ends shall not be butted tight to a wall or other obstruction, which may prevent thermal expansion of metal.
 - c. Rainwater leaders shall discharge at least 1 foot (305 mm) away from the structure sidewall, or directly into storm drainage system.

1.06 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data:
 - 1. Provide manufacturer's data on prefabricated components, including the following:
 - a. Vandal proof cap.
 - b. Clamp-type umbrella pipe/conduit flashing.
- C. Shop Drawings: Submit complete shop drawings for all roof flashing and rainwater gutter and leader assemblies.
 - 1. Indicate material, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
 - 2. Indicate profile and configuration, thickness of metal, dimensions, anchor details, fastening methods, terminations, and installation details.
 - 3. Indicate related work of other trades, including but not limited to cast-in-place concrete, concrete masonry, roofing, and roof penetrating components (e.g., pipe, conduit).
- D. Engineering Calculations: Submit engineering calculations showing that sheet metal roof flashing assemblies meet or exceed specified performance criteria and applicable requirements of the governing building code.
 - 1. Coordinate engineering calculations with shop drawings.
 - 2. Engineering calculations shall be prepared by a Florida-registered professional

engineer.

- E. Test Reports: Submit copies of test reports showing compliance with specified Design and Performance Requirements.
- F. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with the requirements and standard details, of SMACNA (ASMM), and the Copper Development Association (CDA)'s "Copper in Architecture" handbook , except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in manufacturing or fabricating the products specified in this section with minimum ten years of documented experience.
- C . Installer Qualifications: Shall be approved Roofing Contractor; for qualification requirements, refer to Section 075200 - Modified Bituminous Membrane Roofing.
- d. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper gutter and downspout work components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper work. If accepted, mock-up may be incorporated as part of copper work.
 - 1. Mock-up area is indicated on Drawings.
 - 2. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards. Protect from damage.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

- C. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- D. Prevent contact with materials that could cause discoloration or staining.

1.09 SEQUENCING AND SCHEDULING

- A. Perform work of this section in coordination with other sections to provide the highest quality work which best fulfills the intent requirements of this work.

1.10 WARRANTY

- A. Warrant installed gutters, downspouts, and trim components to be free from defects in material and workmanship for period of 5 years.
- B. Include coverage against leakage and damages to finishes.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS

- A. Metal flashings, counterflashings and terminations shall be of the material indicated on Drawings; if not indicated, metal shall be stainless steel.
 - 1. Metal thickness shall conform to requirements of FBC-B SECTION 1517.6 and FBC-TP RAS-111.
- B. Stainless Steel: ASTM A666 Type 304, soft temper; smooth No. 4 finish.
- C. Copper: ASTM B 370; minimum temper H00 (cold-rolled) except where temper 060 is required for forming;
 - 1. Hung Gutters and Downspouts: 20 oz. per sq. ft. (0.0270-inch thick) (0.69-mm) except as otherwise indicated.
- D. Gutter Cover Guards: 20-gage bronze mesh or fabricated units, with selvaged edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.
- E. Bronze wire ball downspout strainer meeting the Copper Development Association Inc details.

2.02 FLASHINGS AND COUNTERFLASHING

- A. General:
 - 1. Material: Stainless steel sheet.
 - 2. Minimum Metal Thickness (Edge Metal and Coping):
 - a. Maximum Vertical (Flange) Face Dimension Less than 8 inches: 22 gage (0.795 mm) (0.0313 in).
 - b. Maximum Vertical (Flange) Face Dimension Less than 10 inches: 20 gage (0.952 mm) (0.0375 in).
 - c. Maximum Vertical (Flange) Face Dimension Less than 12 inches: 18 gage (1.270 mm) (0.0500 in).
 - 3. Fabrication:
 - a. Form sections true to shape, accurate in size, square, and free from distortion

or defects.

- b. Form pieces in longest possible lengths.
- c. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- d. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- e. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- f. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- g. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing. Return and brake edges.
- h. Side Joints:
 - (1) 22 gage thick: Lock seam.
 - (2) 20 gage thick and heavier: Lapped, welded.
- i. End Joints: Butt joint with cover plate; 2 beads of sealant at each side of butt joint.

B. Copper Drip Edge Flashing: Profiles as shown on Drawings, and as follows:

1. The vertical face shall be a minimum of 1-1/2 inches (38 mm) and shall extend down not less than 1 inch (25.4 mm) below the sheathing or other member immediately contiguous thereto. In all cases, the deck flange shall be not less than 2 inches (51 mm) in width. Drip edge shall be sized, designed and installed in compliance with FBC-TP RAS-111.
2. Drip edge shall be fabricated and installed so that the bottom (the kick of the metal) of the drip edge shall have a minimum of 1/2-inch (12.7 mm) clearance from the structure.
3. Eaves drip shall be installed in compliance with FBC-TPHVHZ RAS-111.
4. Drip edge shall be installed after all roofing felts have been applied, or in compliance with the application method set forth in the roofing assembly Product Approval. All asphalt or approved cold adhesive bonding areas shall be coated with ASTM D41/D41M or ASTM D43/D43M, as required, and allowed to dry prior to application.
5. Drip edges shall be joined by lapping a minimum of 4 inches (102 mm) and the entire interior of the joints shall be coated with approved flashing cement. Cover and splice plates shall be of the same material as the drip edge, and shall be sized, fabricated and installed in compliance with FBC-TPHVHZ RAS-111.
6. Conform to details specified in Schedule, except as otherwise indicated on Drawings.

C. Stainless Steel Copings: Profiles as shown on Drawings, and as follows:

1. Slope top of copings 1 inch per foot down to interior face.
2. Conform to details specified in Schedule, except as otherwise indicated on Drawings.

2.03 RAINWATER GUTTERS AND LEADERS

A. Copper Gutters: Profile as indicated.

- B. Copper Leaders: Profile as indicated.
- C. Anchors and Supports: Profiled to suit gutters and leaders.
 - 1. Anchoring Devices: In accordance with SMACNA requirements, and the Copper Development Association
 - 2. Gutter Supports: Premanufactured Brackets, as indicated on Drawings.
 - 3. Downspout Supports: Hinged-collar brackets, as indicated on Drawings
- D. Fasteners: Same metal as flashing/sheet metal or gutter/downspout, or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

2.04 ACCESSORIES

- A. Provide all clips, cleats, straps, anchors and similar items necessary to properly complete the work. Provide accessories that are compatible with sheet metal materials used and which are of sufficient size and gage to perform as intended.
- B. Underlayment: ASTM D2178/D2178M, glass fiber roofing felt.
- C. Vandal Proof Caps (for Sanitary Vent Stacks): Except as otherwise indicated, provide a vandal proof vent stack cap at each plumbing vent, to protect open-ended VTR ventilation pipes from rain, debris, and other foreign objects while allowing for airflow and regular maintenance.
 - 1. Material: Spun aluminum.
 - 2. Features:
 - a. Vent cap shall provide a complete, simple to install, and economical method of vandal proofing any plumbing vent.
 - b. Vent cap shall not obstruct vent pipe, thus allowing "snaking" of pipe.
 - c. Vent cap shall be lightweight and rustproof.
 - d. The annular space between the cap and vent or the flashing sleeve shall be not less than the cross area of the vent.
 - 3. Manufacturer: SBC Industries, Inc.; Product: Model VTRCAP.
- D. Clamp-Type Umbrella Pipe/Conduit Flashing: Except as otherwise indicated, provide a stainless steel clamp type umbrella pipe/conduit flashing at each pipe/conduit penetration through roofing, when more clearance is necessary between pipe penetration and stack flashing or when venting between pipe penetration and stack flashing is required.
 - 1. Manufacturer: SBC Industries, Inc.; Product: Clamp-Type Umbrella.
- E. Pipe:
 - 1. PVC Pipe: ASTM D1785; Schedule 80.
 - a. Fittings: ASTM D2665, PVC.
 - b. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.
 - 2. Ductile Iron Pipe: AWWA C151/A21.51.
 - a. Fittings: Ductile or gray iron, standard thickness.
 - b. Joints: AWWA C111/A21.11, rubber gasket with 3/4 inch (19 mm) diameter rods.
- F. Bracing, Plates, Gussets, Clips: Formed sheet steel; thickness determined for conditions

encountered.

1. Material:
 - a. ARBS: Galvanized steel sheet.
 - b. Flashing: Stainless steel sheet.

G. Fasteners:

1. General: Stainless steel, with soft neoprene washers.
2. Anchorage Devices - Concrete Screw Anchors: Cold-formed fasteners with twin-lead threads and a nail point tip.
 - a. Manufactured from heat-treated steel or stainless steel, with alternating low-high thread form.
 - b. Size / Length / Embedment: As required to achieve specified Load Capacity criteria; comply with specified Design and Performance Requirements, and with applicable requirements of governing building code.
 - c. Head:
 - (1) Carbon Steel Screw Anchors: Slotted hex washer head or Scots stainless steel head, as appropriate for application.
 - (2) Stainless Steel Screw Anchors: Slotted hex washer head.
 - d. Load Capacity: Allowable tension and shear loads for each screw anchor installed in normal weight concrete (3000 PSI compressive strength) shall be as follows:
 - (1) Tension: 400 lb, minimum.
 - (2) Shear: 400 lb, minimum.
3. Anchorage Devices (except Concrete Screw Anchors): Drilled expansion bolts.
4. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers:
 - a. General:
 - (1) Provide neoprene sealant washers and stainless steel washers under screw heads.
 - b. For Attaching Sheet Metal Flashing to Metal Substrate: No.10 (minimum) pan head stainless steel sheet metal screws.
5. Welding: In conformance with AWS D1.1/D1.1M and AWS D1.3.

H. Accessories for Copper Gutter Systems:

1. Solder: ASTM B 32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder. Killed acid flux.
2. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
3. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
4. Bituminous Coating: SSPC-Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
5. Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07.

6. Metal Accessories: Provide cleats, straps, hangers, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gage required for performance.
7. Rivets:
 - a) Pop Rivets: 1/8-inch (3-mm) to 3/16-inch (4.5-mm) diameter, with solid brass mandrels.
 - b) Provide solid copper rivet (tinner 's rivets) where structural integrity of seam is required.

I. Paint:

1. Primer:
 - a. Stainless Steel Surfaces: Zinc chromate type.
 - b. Galvanized Steel Surfaces: Zinc chromate type, or galvanized iron primer.
 - c. Aluminum Surfaces: Zinc chromate type.
2. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
3. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
4. Protective Backing Paint: Zinc molybdate alkyd.
5. Field Painting: Refer to Section 099000 - Painting and Coating.

J. Protective Backing Paint: Zinc molybdate alkyd.

K. Sealant: Type specified in Section 079005 - Joint Sealers; if not indicated, use single part urethane.

1. Backer Rod: Open cell foam; size as indicated.

L. Plastic Cement: ASTM D4586, Type I.

M. Reglets: Recessed or Surface mounted type (as indicated on Drawings), stainless steel; face and ends covered with plastic tape.

N. Solder: ASTM B32; Sn50 (50/50) type.

O. Mineral Fiber Batt Insulation: ASTM C665; preformed batt; friction fit, conforming to the following:

1. Material: Rock or slag fiber, not glass fiber.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
4. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
5. Formaldehyde Content: Zero.
6. Facing: Unfaced.

P. Splash Pads: Precast concrete type, sizes and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.05 FABRICATION (STAINLESS STEEL)

- A. Shop fabricate work to the greatest extent possible. Fabricate work to match approved

shop drawings and to provide the best possible watertight, weatherproof performance with expansion provisions in running work. Minimize oil-canning, buckling, tool marks and other defects.

- B. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- C. Fabricate cleats of same material as sheet, full width (continuous), interlocking with sheet.
- D. Form pieces in longest possible lengths.
- E. Fabricate work with uniform, watertight joints. Make seams as inconspicuous as possible.
- F. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- G. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- I. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- J. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.
- K. Isolate dissimilar materials with isolation coating recommended by the manufacturer or other permanent separation acceptable to the Consultant.

2.3 FABRICATION (COPPER)

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of Copper Development Association Inc. (CDA) "Copper in Architecture" handbook and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Fabricate to allow for adjustments in field for proper anchoring and joining.
 - 2. Form sections true to shape, accurate in size, square, free from distortion and defects.
 - 3. Cleats, Spacers, Straps, and Hanger Brackets: Fabricate of same material as gutters and downspouts, interlockable with sheet in accordance with CDA recommendations.
 - 4. Fabricate corners from one piece with minimum 18-inch (450-mm) long returns; solder corners for rigidity.

- B. Seams: Fabricate nonmoving seams with 1-inch (25-mm) lapped riveted and soldered seams. Tin edges to be seamed, lap seams, rivet seams, and solder.
- C. Expansion Provisions: Follow CDA Copper in Architecture Handbook guidance and provisions to accommodate expansion and contraction of gutter systems.
- D. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- E. Solder:
 - 1. Solder metal joints except those indicated or required to be movement type joints in accordance with the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA).
 - 2. Tin edges of copper sheets and cleats at soldered joints.
 - 3. After soldering, remove flux. Wipe and wash solder joints clean with fresh water and baking soda to neutralize flux.
- F. Copper Thickness: As shown on drawings.
- G. Gutters and Downspouts:
 - 1. Fabricate as indicated on Drawings and in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
 - 2. Fabricate front edge at least 1 inch (25-mm) lower than back edge.
 - 3. Transverse Seams in Gutter Liners: lapped, riveted and soldered for watertight gutter condition.
 - 4. Provide spacers, hanger brackets and straps, and fasteners as indicated and as recommended by CDA.
 - 5. Fabricate gutters and downspouts to sizes and profiles shown on Drawings.

2.4 FINISHES

- A. Natural weathering mill finished copper. No applied finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.

- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION - STAINLESS STEEL COUNTERFLASING, COPINGS

A. General:

1. Flashings shall be installed in such a manner as to prevent moisture entering the wall through the joints in the coping, through moisture permeable materials, at intersections with the roof plane or at parapet wall penetrations.
 - a. All roof flashing and terminations shall be fabricated and installed resist the windload requirements of FBC-B CHAPTER 16 (High-Velocity Hurricane Zone), and shall be in compliance with the provisions set forth in FBC-TPHVHZ RAS-111.
 - b. Flashings conforming with the provisions of FBC-TPHVHZ RAS-111 shall be installed at wall and roof intersections; gutters; wherever there is a change in roof slope or direction; around roof openings; and at other locations indicated on the Drawings or where required by the governing building code.
 - c. Membrane Flashing: All membrane flashing shall be installed according to the roof assembly manufacturer's published literature and in accordance with the provisions set forth in FBC-TPHVHZ RAS-111.
 - d. Metal Flashing and Termination: Metal flashings and termination shall be fabricated and installed in accordance with FBC-TPHVHZ RAS-111.
 - (1) Metal flashing shall be installed after the roofing felts have been laid and turned up the vertical surfaces, in compliance with the roofing assembly Product Approval. Such felts shall be embedded in hot bitumen or an approved adhesive.
 - (2) Metal surfaces shall be primed with an ASTM D41/D41M or ASTM D43/D43M primer, as appropriate and allowed to dry prior to receiving hot bitumen or cold adhesive.
 - e. Metal Counterflashing: Metal counterflashing shall be fabricated and installed in accordance with FBC-TPHVHZ RAS-111.
 - (1) Metal counterflashing shall be built into walls, set in reglets or applied as stucco type and shall be turned down over base flashing not less than 3 inches (76 mm).
 - (2) Metal counterflashing shall be side lapped a minimum of 4 inches (102 mm).
 - (3) Metal counterflashing, where set in reglets or surface-mounted, shall be waterproofed, in accordance with applicable application standards.
 - (4) Where metal counterflashing is used as the means of sealing (such as a vented system) it shall be set in an approved sealant, sealed with an approved adhesive on the top flange and all joints shall be sealed with an approved sealant and lapped a minimum of 4 inches (102 mm).
 - f. Roof Penetration Flashing:
 - (1) All pipes shall be flashed with approved methods detailed in the roofing system assembly Product Approval. Flanges shall be a minimum of 4

inches (102 mm).

- (2) Other roof penetrations shall be suitably flashed with curbs, collars, etc. in compliance with FBC-TPHVHZ RAS-111 or an approved method, in compliance with the roofing system assembly Product Approval.
 - (3) No roof penetration shall be located in roof valleys.
- B. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges. Seal flashings into reglets with sealant.
 - C. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
 - D. Apply plastic cement compound between metal flashings and felt flashings.
 - E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
 - F. Joints:
 1. Metals, except Copper: Seal metal joints watertight.
 2. Copper: Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

3.4 INSTALLATION - COPPER GUTTERS AND DOWNSPOUTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
 1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction; except install gutters with required slope.
 2. Apply asphalt mastic on copper surfaces of units in contact with cementitious materials and dissimilar metals.
 3. Fit gutters to downspouts and flashings for watertight connections. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
 4. Miter, lap seam and close corner joints with solder. Seal seams and joints watertight with solder
 5. Install expansion joints at frequency recommended by the CDA "Copper in Architecture" handbook. Do not fasten moving seams such that movement is restricted.
 6. Coordinate with installation of roofing system and roof accessories.
- B. Gutters and Downspouts:
 1. Flash and seal gutter to downspout.

2. Slope gutters not less than 1/8 inch per foot (1:100).
 3. Provide expansion joints at 48 ' -0" (14,400-mm) maximum, not more than 24 feet (7200 mm) from corners.
 4. Hang gutter with copper straps spaced 30-inches (750-mm) centers maximum. Closer spacing may be required to handle system loads.
 5. Integrate gutter flashing conditions with requirements of adjacent roofing for watertight installation.
- C. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at downspouts in open gutters; removable for cleaning downspouts.
- D. Install counterflashing as indicated to prevent water from migrating behind gutter system.
- E. Conductor Heads: Flash and seal conductor head to scupper.

3.04 FIELD QUALITY CONTROL

- A. For field inspection requirements, see Section 014000 - Quality Requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

- A. Rainwater Gutters and Leaders:
 1. Material: Copper.
 2. Conform to details indicated on approved shop drawings.
- B. Roof Flashing:
 1. Material: Stainless steel or copper-clad stainless steel, except as follows:
 - a. Drip Edge Flashings: Copper.
 - b. Counterflashings and Roof-to-Wall Joint Covers: Stainless steel
 - c. Parapet Copings: Stainless steel

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Roof hatches and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete: Structural roof deck.
- B. Section 055133 - Vertical Metal Ladders: Roof access ladder.
- C. Section 075200 - Modified Bituminous Membrane Roofing.
- D. Section 076200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.
- E. Section 099000 - Painting and Coating: Field applied finish coating.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 1304 -- Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A53 -- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A653/A653M -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM F588 -- Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- D. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP TAS-201 -- Impact Test Procedures.
 - b. FBC-TP TAS-202 -- Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
 - c. FBC-TP TAS-203 -- Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- E. The National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM AMP 500-06 -- Metal Finishes Manual.
- F. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910 -- Occupational Safety and Health Standards.

- a. 29 CFR 1910, Subpart D -- Walking-Working Surfaces (29 CFR 1910.21 - 20 CFR 1910.30).
 - (1) 29 CFR 1910.23 -- Guarding Floor and Wall Openings and Floors.
 - (2) 29 CFR 1910.27 -- Fixed Ladders.
- 2. 29 CFR 1926 -- Occupational Safety and Health Standards (for construction work).
 - a. 29 CFR 1926, Subpart M -- Fall Protection (29 CFR 1926.500 - 29 CFR 1926.503).
 - (1) 29 CFR 1926.502 -- Fall Protection Systems Criteria and Practices.

1.04 DESIGN & PERFORMANCE REQUIREMENTS

A. Roof Hatches:

- 1. General:
 - a. Installed roof hatches shall withstand specified uplift pressures, thermally-induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
 - b. Roof hatch shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span with a wind design pressure of +/- 100 psf with a factor of safety of 2.
- 2. Roof Hatch Design: Provide roofing hatch assemblies identical to systems that have been successfully tested by a qualified testing and inspection agency to resist uplift pressure calculated according to the requirements of the governing building code and ASCE 7, including but not limited to code requirements for High Velocity Hurricane Zone (HVHZ).
 - a. Wind Load Design Criteria:
 - (1) Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
 - (2) Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*Vult*): 245 mph (395 km/hr).
 - (a) Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.
 - (3) Wind Exposure Category (FBC-B SECTION 1620.3): C.
 - (4) Enclosure Classification: Enclosed Building.
 - (5) Roof Height: As indicated on drawings.
 - (6) Building Width: As indicated on drawings.
 - (7) Corner / Perimeter Zone: As indicated on drawings.
 - (8) Minimum Parapet Height: As indicated on drawings.
 - (9) Deck Type: Structural concrete deck
 - (10) Main Roof Slope: Low slope.
- 3. Maximum Design Pressure (MDP) Rating (per Product Approval): Provide roofing system that is identical to systems that have been successfully tested and approved for use in HVHZ, with MDP rating equal to or greater than pressures indicated on the drawings.

4. Testing - Product Approval: Comply with applicable requirements of the governing building code, including but not limited to the following:
 - a. Roof hatch assemblies shall be tested in accordance with quality control test methods intended to confirm compliance with the large missile impact and wind load requirements of FBC-B CHAPTERS 15 and 16 (including HVHZ requirements), FBC-B SECTIONS 1626 and 1714.5, and FBC-TP TAS-202.
 - (1) Air Infiltration Test, per FBC-TP TAS-202.
 - (2) Uniform Static Air Pressure Test, per FBC-TP TAS-202.
 - (3) Water Resistance Test, per FBC-TP TAS-201.
 - (4) Large Missile Impact Test, per FBC-TP TAS-201.
 - (5) Cyclic Wind Pressure Test, per FBC-TP TAS-203.
 - (6) Forced Entry Resistance Test, per ASTM F588, AAMA 1304.
- B. Safety Railing for Roof Hatch:
1. Safety railing assembly shall be designed, fabricated and installed in accordance with dimensional requirements of FBC-B SECTIONS 1013.2 and 1013.6.
 - a. Height: Not less than 42 inches (1067 mm) high, measured vertically above the adjacent roof surface.
 - b. Openings: Shall be configured so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.
 2. Safety railing assembly shall be designed, fabricated and installed so as to withstand applied live loads in accordance with 29 CFR 1910.23, 29 CFR 1926.502, and FBC-B SECTION 1618.4.6.
 - a. Safety railing assembly shall be designed to resist a load of 50 pounds per lineal foot (74 kg/m) or a concentrated load of 200 pounds (690 N) applied in any direction at any location on the top rail, whichever condition produces the maximum stresses.
 - b. Mid-rails shall be designed for a uniform horizontal load of not less than 25 psf (1197 Pa) over the gross area of the roof edge railing system, including the area of any openings in the guard rail system, of which they are a part without restriction by deflection.

1.05 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product/system to be used.
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Maintenance requirements.
 5. Engineering and Testing Reports:
 - a. Roof Hatch: Submit copies of Miami-Dade County Product Approval NOA, showing compliance with DESIGN & PERFORMANCE REQUIREMENTS.
 - b. Safety Railing for Roof Hatch: Submit copies of engineering and testing

reports showing compliance with 29 CFR 1910.23 and 29 CFR 1910.27.

- C. Shop Drawings: Provide complete shop drawings showing Roof Hatch and Safety Railing for Roof Hatch assemblies indicated in the drawings.
 - 1. Indicate the following:
 - a. Hatch, frame, safety railing, and hardware assemblies, including operating components.
 - b. Materials and details of design and construction; and hardware locations, and reinforcement type and locations.
 - c. Interface with roof deck construction, including roofing, flashing and interior finishes; anchorage and fastening methods; and methods of assembling sections, and finish requirements.
 - 2. Provide project-specific design and engineering calculations, establishing conformance with applicable requirements of the governing building code and specified DESIGN & PERFORMANCE REQUIREMENTS and applicable OSHA requirements. Submit shop drawings and engineering calculations, signed and sealed by a qualified Florida registered professional engineer.
- D. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.

1.06 QUALITY ASSURANCE

- A. Certifications:
 - 1. Submit manufacturer's certification for each roof hatch assembly constructed in accordance with Miami-Dade County product approval single listing, demonstrating compliance with specified Design & Performance Requirements.
 - 2. Certificate of Compliance: Provide manufacturer's certification that products comply with referenced standards.

1.07 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.

PART 2 - PRODUCTS

2.01 ROOF HATCH

- A. Manufacturers:
 - 1. Basis of Design: Babcock-Davis; www.babcockdavis.com; Tel. 888-412-3726.

- a. Product: Series "Hurricane Zone" Steel/Aluminum Roof Hatch (Miami-Dade County Product Approval NOA No. 12-0320.29).
 2. Other Manufacturers: Subject to compliance with contract requirements, equivalent products by one of the following manufacturers:
 - a. Nystrom Incorporated.: www.nystrom.com; Tel. 800-547-2635.
- B. Roof Hatches: Factory-assembled steel frame and cover, complete with operating and release hardware.
 1. Style: Single leaf with flat metal cover unless otherwise indicated.
 2. Mounting: Provide frames and curbs suitable for mounting conditions indicated on the drawings.
 3. Size(s): As indicated on drawings; or if not indicated, the as follows:
 - a. Length: 54 inches.
 - b. Width: 30 inches.
- C. Frames/Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 1. Material: ASTM A653/A653M steel (galvanized or galvanized); 14 gage, 0.075 inch (1.90 mm) thick.
 2. Finish: Shop-applied red oxide powder coat.
 3. Insulation: 1 inch (25 mm) rigid glass fiber, located on outside face of curb.
 4. Curb Height: 12 inches (305 mm) from finished surface of roof, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 1. Material: ASTM A653/A653M steel (galvanized or galvanized); thickness as follows:
 - a. Cover: 14 gage, 0.075 inch (1.90 mm).
 - b. Cover Liner: 22 gage, 0.03 inch (0.76 mm).
 2. Finish: Shop-applied red oxide powder coat.
 3. Insulation: 1 inch (25 mm) polystyrene; R-4.0, min.
 4. Gasket: EPDM, continuous around cover perimeter.
- E. Hardware:
 1. Hinges: Zinc-plated steel tamperproof hinge contained within hatch as part of spring assembly.
 2. Hold-Open Devices: Zinc-plated steel hold open arm with red vinyl grip handle that automatically locks the door when opened.
 3. Springs: Greased heavy-duty compression springs in telescoping tubes.
 4. Weather-stripping: EPDM gasket type weather-stripping continuous around perimeter of cover.
 5. Latch: Zinc-plated steel slam latch with turn handle and inside/outside padlock hasps.
 6. Locking Device: Furnish padlock for each hatch, sized to fit inside padlock hasp.
 - a. Product: As selected by Architect.
- F. Fasteners used for attachment to structure shall meet the following allowable minimum load values (using fastener manufacturer's recommended safety factors):
 1. Pullout: 627 lbs.

2. Shear: 133 lbs.
- G. Finishes: Shall comply with NAAMM AMP 500-06.
 1. Steel Surfaces: Shop-applied red oxide powder coat, ready for field-applied finish coating; for field-applied finish coating, refer to Section 099000 - Painting and Coating.
- H. Labels: Provide labels complying with applicable requirements of governing building code and OSHA (29 CFR 1910, Subpart D and 29 CFR 1926, Subpart M).

2.02 ACCESSORIES

- A. Safety Railing for Roof Hatch: Manufacturer's standard complete system including rails, fittings, fasteners, mounting brackets, safety barrier at railing opening and all accessories required for a complete installation.
 1. Product: Babcock-Davis Model BSRC, or approved equal:
 2. Size: Size according to roof hatch size and application.
 3. Description: Railing mounting brackets designed to be bolted on exterior surfaces of curb counterflashing. Railing shall provide protection of roof opening while roof hatch is open to comply with 29 CFR 1910.23 and 29 CFR 1926.502
 - a. Test Load: 200 pounds.
 - b. Top Rail Height: 42 inches (+/-3 inches) above finished roof deck.
 - c. Mid Rail spaced to eliminate passage of 21 inches diameter sphere.
 - d. Upright post spacing of 8 feet maximum.
 4. Materials:
 - a. Top Rail, Mid Rail, and Swinging Gate: To be fabricated of ASTM A53 Grade B seamed pipe, 1-1/4 inch ID, hot-dip galvanized.
 - b. Self-Closing Gate: To be fabricated of ASTM A53 Grade B seamed pipe, 1-1/4 inch ID, galvanized; U-bolt with hinge attachment and galvanized mounting bolts and nut hardware.
 - c. Fittings: Manufacturer's standard cast with set screw pipe mount.
 - d. Flat Bar Mounting Bracket: Zinc-plated steel with nuts for easy bolt installation
 - e. Fasteners: Manufacturer's standard 3/8-16 x 0.75 screws.
- B. Safety Post: Manufacture's standard system for mounting on fixed vertical ladders rungs.
 1. Description: Safety Post for installation on fixed vertical ladders mounted below hatch cover. Tubular post shall lock automatically when fully extended. Release lever shall disengage the post to allow it to be returned to its lowered position.
 2. Materials: Post manufactured of high-strength square steel tubing, 1-1/2 inch x 1-1/2 inch x 1/8 inch. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
 - a. Finish: Hot-dip galvanized.
 3. Balancing Spring: A stainless steel constant force balancing spring mechanism shall provide smooth, easy, controlled operation when raising and lowering the safety post

4. Hardware: Shall be zinc-plated steel or stainless steel. Shall attach directly to the top two rungs of fixed ladder.

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.
 1. Verify that substrate is smooth and clean to extent needed to receive work.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Safety Railing for Roof Hatch:
 1. Paint and or repair all mechanical hatch parts and flashings as needed or required.
 2. Make any roof related repairs or replacement to base flashing before installing new guard-rail system, use only materials recommended by the roofing manufacturer.

3.03 INSTALLATION

- A. General:
 1. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.
- B. Roof Hatch:
 1. Install in accordance with accepted shop drawings, requirements of the product approval, and manufacturer's instructions.
- C. Safety Railing for Roof Hatch:
 1. Field customize to fit existing condition.
 2. Set curb framing gasket around roof opening, tighten to fit opening.
 3. Add the four corner posts into receiver and bolt to frame.
 4. Install cross rails into preset clamps and adjust with wrench.
 5. Add chain or gate as specified by manufacturer.

3.04 ADJUSTING

- A. Adjust movable parts for smooth operation.
- B. Operational Units:
 1. Test-operate units with operable components.
 2. Clean and lubricate joints and hardware.
 3. Adjust for proper operation.

3.05 CLEANING

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

3.06 PROTECTION

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

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 092116 - Gypsum Board Assemblies
- C. Section 210517 - Sleeves and Sleeve Seals for Fire-Suppression Piping.
- D. Section 220517 - Sleeves and Sleeve Seals for Plumbing Piping.
- E. Section 230517 - Sleeves and Sleeve Seals for HVAC Piping.
- F. Section 260544 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling.
- G. Section 270544 - Sleeves and Sleeve Seals for Communications Pathways and Cabling.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASSTM)
 - 1. ASTM G21 -- Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- C. Intertek Testing Services NA, Inc. (ITS):
 - 1. ITS (DIR) -- Directory of Listed Products.
- D. Factory Mutual Research Corporation (FM):
 - 1. FM P7825 -- Approval Guide.
- E. South Coast Air Quality Management District (SCAQMD):
 - 1. SCAQMD 1168 -- South Coast Air Quality Management District Rule No.1168; www.aqmd.gov.
- F. Underwriters Laboratories Inc. (UL):
 - 1. UL (FRD) -- Fire Resistance Directory.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. LEED Report: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Certificate from authority having jurisdiction indicating approval of materials used.

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 the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
 - 2. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- 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:
 - 1. Trained by the manufacturer.
 - 2. With minimum 3 years documented experience installing work of this type.

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.
 - 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft (1/3 linear m).
- B. If accepted, mock-up will represent minimum standard for the Work.
- C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

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 3 days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 - PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

- A. Manufacturers:
 - 1. Basis of Design:
 - a. Hilti, Inc: 3399 NW 72 Avenue; Miami, FL 33122; Tel. 800-879-8000; www.us.hilti.com.
 - b. Isolatek International: 41 Furnace Street; Stanhope, NJ 07874; Tel. 800-631-9600 or 973-347-1200
 - c. Thermafiber, Inc.: 3711 Mill Street; Wabash, Indiana 46992; Tel. 888-834-2371 or 260-563-2111.
 - d. W.R. Grace: www.grace.com.
 - 2. Other Manufacturers: Equivalent products by the following:
 - a. A/D Fire Protection Systems Inc: www.adfire.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Nelson FireStop Products: www.nelsonfirestop.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
- B. Materials: Use any material meeting requirements.
- C. Firestopping Materials with Volatile Content: Provide only products having lower volatile organic compound (VOC) content of 250g/L as required by SCAQMD 1168.
- D. Mold Resistance: Provide firestopping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.
- E. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.
- F. Fire Ratings: See Drawings for ratings of fire-rated floor and wall assemblies.

2.02 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

- A. Concrete and Concrete Masonry Walls and Floors:
 - 1. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor, Wall Parallel to Ribs: UL System HW-D-0181, or equal.
 - 2. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor, Wall Perpendicular to Ribs: UL System HW-D-1037, or equal.
 - 3. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Floor: UL System HW-D-0268, or equal.
 - 4. Concrete/Concrete Masonry Wall to Wall Joints: UL System WW-D-0032, or equal.
- B. Gypsum Board Walls:
 - 1. Wall to Wall Joints: UL System WW-D-0067, or equal.
 - 2. Top of Wall Joints at Underside of Flat Concrete: UL System HW-D-1068, or equal.
 - 3. Top of Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs: UL System HW-D-0049 or HW-D-0184 (as appropriate for conditions), or equal.
 - 4. Top of Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs: UL System HW-D-0045, or equal.

5. Top of Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit: UL System HW-D-0042 or HW-D-0045 (as appropriate for conditions), or equal.

2.03 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:

1. In Floors or Walls: UL System C-AJ-0090, or equal.

B. Penetrations Through Floors or Walls By:

1. Multiple Penetrations in Large Openings: UL System C-AJ-8143, or equal.
2. Uninsulated Metallic Pipe, Conduit, and Tubing: UL System C-AJ-1498, or equal.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. PVC Pipe, CPVC Pipe, or FRPP Pipe Penetrant: UL System C-AJ-2109, or equal.
 - b. Rigid Non-Metallic Conduit, PEX Tubing, or ABS Pipe Penetrant: UL System C-AJ-2567, or equal.
4. Electrical Cables Not In Conduit: UL System W-J-3198 or W-J-3199 or W-J-3200 (as appropriate for conditions), or equal.
5. Cable Trays with Electrical Cables: UL System C-AJ-4071, or equal.
6. Electrical Busways: UL System C-AJ-6017, or equal.
7. Insulated Pipes: UL System C-AJ-5091 or C-AJ-5048 (as appropriate for conditions), or equal.
8. HVAC Ducts, Uninsulated: UL System C-AJ-7084, or equal.

C. Penetrations Through Floors By:

1. Multiple Penetrations in Large Openings: UL System F-A-8012, or equal.
2. Uninsulated Metallic Pipe, Conduit, and Tubing: UL System F-A-1016, or equal.
 - a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. ABS Pipe, EMT Tubing, FNMC, PEX Tubing, FRPP Pipe, PVC-XFR Pipe Penetrant: UL System F-A-2015, or equal.
 - b. PVC Pipe, CPVC Pipe, Rigid Non-Metallic Conduit Penetrant: UL System F-A-2053, or equal.
4. Electrical Cables Not In Conduit: UL System F-A-3033, or equal.
5. Electrical Busways: UL System F-A-6002, or equal.
6. Insulated Pipes: UL System F-A-5015 or F-A-5017 (as appropriate for conditions), or equal.

D. Penetrations Through Walls By:

1. Uninsulated Metallic Pipe, Conduit, and Tubing: UL System W-J-1067, or equal.
2. Electrical Cables Not In Conduit: UL System W-J-3060, or equal.
3. Insulated Pipes: UL System W-J-5042 or W-J-5028, or equal.
4. HVAC Ducts, Uninsulated: UL System W-J-7109, or equal.
5. HVAC Ducts, Insulated: UL System W-J-7112, or equal.

2.04 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings: UL System W-L-3334, or equal.

B. Penetrations By:

1. Multiple Penetrations in Large Openings: UL System W-L-8079 or W-L-8087 (as appropriate for conditions), or equal.
2. Uninsulated Metallic Pipe, Conduit, and Tubing: UL System W-L-1054 or W-L-1164 (as appropriate for conditions), or equal.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing: UL System W-L-2078 or W-L-2411 (as appropriate for conditions), or equal.
4. Electrical Cables Not In Conduit: UL System W-L-3065, or equal.
5. Cable Trays with Electrical Cables: UL System W-L-4011 or W-L-4060 (as appropriate for conditions), or equal.
6. Insulated Pipes: UL System W-L-5096, or equal.
7. HVAC Ducts, Insulated: UL System W-L-7156, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to arrest liquid material 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 authority having jurisdiction.
- C. Install labeling required by governing building code.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079005
JOINT SEALERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Elastomeric joint sealers, backings, bond breakers, fillers, and related materials.
- B. Pre-formed seals and gaskets.
- C. Removal and recaulking of exterior joint sealers at the following locations:
 - 1. Perimeter joints at fenestration elements.
 - 2. Joints at through-wall penetration elements.
 - 3. Control and expansion joints.
 - 4. Lap joints in sheet metal work.
 - 5. Joint sealant at metal-to-metal joints and metal-to-glass joints in storefronts and window assemblies (only if water infiltration testing indicates leakage).

1.02 RELATED SECTIONS

- A. Section 062000 - Finish Carpentry.
- B. Section 064100 - Architectural Wood Casework.
- C. Section 066100 - Quartz Surface Fabrications.
- D. Section 092116 - Gypsum Board Assemblies.
- E. Section 092410 - Portland Cement Plaster Repairing: Patching and repair of defects and damage in existing cement plaster (stucco) work; patching materials.
- F. Section 093013 - Tiling: Movement joints.
- G. Section 099000 - Painting and Coating: Surface preparation and field-application of paints and coatings on new and existing surfaces, except exterior cement plaster (stucco).
- H. Section 099723 - Acrylic Waterproof Coating System: Surface preparation and field-application of high-build acrylic waterproof coating system over existing and repaired exterior cement plaster (stucco) surfaces.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C510 -- Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 - 2. ASTM C639 -- Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants.
 - 3. ASTM C661 -- Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

4. ASTM C719 -- Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
 5. ASTM C790 -- (refer to ASTM C1193).
 6. ASTM C794 -- Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 7. ASTM C804 -- (refer to ASTM C1193).
 8. ASTM C834 -- Standard Specification for Latex Sealants.
 9. ASTM C919 -- Standard Practice for Use of Sealants in Acoustical Applications.
 10. ASTM C920 -- Standard Specification for Elastomeric Joint Sealants.
 11. ASTM C962 -- (refer to ASTM C1193).
 12. ASTM C1087 -- Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
 13. ASTM C1193 -- Standard Guide for Use of Joint Sealants.
 14. ASTM C1248 -- Standard Test Method for Staining of Porous Substrate by Joint Sealants.
 15. ASTM C1382 -- Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints.
 16. ASTM D412 -- Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 17. ASTM D1004 -- Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 18. ASTM D1056 -- Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 19. ASTM D2203 -- Standard Test Method for Staining from Sealants.
 20. ASTM D2240 -- Standard Test Method for Rubber Property Durometer Hardness.
 21. ASTM D2628 -- Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
- C. U.S. Federal Specifications and Standards (FS):
1. FS TT-S-00227 -- Sealing Compound: Elastomeric Type, Multi-component.
 2. FS TT-S-00230 -- Sealing Compound: Elastomeric Type, Single Component.
 3. FS TT-S-001543 -- Sealing Compound: Silicone Rubber Base.
 4. FS TT-S-001657 -- Sealing Compound: Single Component, Butyl Rubber Based, and Solvent Release Type.

1.04 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Manufacturers' Project Review Services Report: Prior to product selection, manufacturers' technical service staff shall review all exterior joint sealer applications for compliance with manufacturer's recommended design principles, and shall submit report indicating recommendations for changes (if any) and/or limitations of the proposed products and designs.
1. Test Reports: If requested by Architect, include the following:

- a. Results of Laboratory Pre-Construction Testing.
 - b. Results of Field Pre-Construction Testing.
 - c. Manufacturer's recommendations for joint preparation, priming, and joint accessory materials based on test results.
 - d. Manufacturer's recommended installation procedure modifications resulting from field adhesion tests.
- C. Product Data:
- 1. Submit complete list of joint sealers and related materials proposed for use on this project.
 - a. Coordinate with Manufacturers' Project Review Services Report.
 - 2. Submit manufacturer's product data sheet for each product; data shall include sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability, and primer data.
 - 3. If requested by Architect, submit Material Safety Data Sheet for each solvent, primer and sealant material.
- D. Samples:
- 1. Submit color charts for each sealant type for initial selection.
 - 2. Submit standard cured color samples for each sealant type illustrating selected colors.
- E. LEED Report: Submit VOC content documentation for all non-preformed sealants and primers.
- F. Manufacturer's Installation Instructions: Submit manufacturer's recommended joint preparation, priming and installation instructions for each joint sealant and backing material.
- 1. Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and warranty requirements.
 - 2. Include instructions for completing sealant intersections when different materials are joined.
 - 3. Include instructions for removing existing sealants and preparing joints for new sealant.

1.05 QUALITY ASSURANCE

- A. Provide single source responsibility for each type of joint materials.
- B. Joint sealant and backing materials shall be compatible with one another, with joint substrate, and with other adjacent materials including finishes.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.
- D. Applicator Qualifications:
 - 1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.
 - 2. Designate one individual as project foreman who shall be on site at all times during installation.

- E. Field Pre-Construction Testing: Test each elastomeric sealant and joint substrate in accordance with the following, before beginning work of this section:
 - 1. Install field samples or mockups using joint preparation methods determined by laboratory pre-construction testing or manufacturer's installation instructions.
 - a. Install field test joints in inconspicuous location as approved by Architect.
 - 2. Remove existing sealant and clean joint using manufacturer's recommended joint preparation methods, and install new sealant in accordance with manufacturer's installation instructions.
 - 3. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
 - 4. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.
- F. Perform work in accordance with ASTM C1193 and manufacturer's installation instructions.
- G. Joint Tolerance: Provide joint tolerances in accordance with product data and manufacturer's installation instructions.

1.06 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Include coverage for replacement of sealants, backing materials and accessories which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Elastomeric Joint Sealants:
 - 1. BASF Construction Chemicals-Building Systems.
 - 2. Bostick, Inc.
 - 3. Dow Corning Corp.
 - 4. Momentive Performance Materials, Inc (formerly GE Silicones).
 - 5. Pecora Corporation.
 - 6. Tremco Global Sealants.
- B. Pre-formed Foam Seals and Gaskets:
 - 1. Acme Highway Products Corp.
 - 2. Emseal Corp.
 - 3. Illbruck Sealant Systems.
 - 4. Sandell Manufacturing Co., Inc.
 - 5. Watson Bowman Associates, Inc.

2.02 GENERAL

- A. Manufacturer's Recommendations: Only products recommended for the specific application indicated shall be used.
- B. Single Source Responsibility: All joint sealer materials for a specific application shall be obtained from a single manufacturer.

- C. Compatibility: Joint sealers, backings, bond breakers, fillers, and other related materials shall be provided which are compatible with one another and with joint substrates under the indicated conditions of service and application, as demonstrated by manufacturer's testing and field experience.
- D. Provide products having volatile organic compound (VOC) content as specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions..
- E. Colors: Colors of exposed joint sealers shall be provided as indicated or, if not otherwise indicated, as selected by the Architect from manufacturer's standard colors.

2.03 ELASTOMERIC JOINT SEALANTS

A. General:

- 1. Manufacturer's standard chemically curing elastomeric sealant shall be of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses indicated.

B. Silicone Sealants:

- 1. Sealant Type S-1: One-part, non-acid-curing, low modulus, silicone sealant, meeting the following requirements:
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 25, Uses NT, M, G, A, and Use O (as applicable to joint substrates indicated).
 - b. Durometer Hardness, Shore A (ASTM C661): 15.
 - c. Tensile Strength (ASTM D412):
 - (1) at 25 percent extension: 15 psi, max.
 - (2) at 50 percent extension: 20 psi, max.
 - (3) at 100 percent extension: 45 psi, max.
 - d. Peel Strength (ASTM C794): 25 lb/in.
 - e. Joint Movement Capability (ASTM C719): +100/-50 percent.
 - f. Staining (ASTM C1248): None.
 - g. Color(s): As selected by Architect from manufacturer's complete range of not less than 10 colors.
 - h. Product: "Dow Corning 790" by Dow Corning, or equal.
- 2. Sealant Type S-2: One-part, non-acid-curing, medium modulus, silicone sealant, meeting the following requirements:
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 25, Uses NT, M, G, A, and Use O (as applicable to joint substrates indicated).
 - b. Durometer Hardness, Shore A (ASTM C661): 35.
 - c. Tensile Strength (ASTM D412):
 - (1) at 25 percent extension: 45 psi, max.
 - (2) at 50 percent extension: 60 psi, max.
 - (3) at 100 percent extension: 75 psi, max.
 - d. Peel Strength (ASTM C794): 32 lb/in.
 - e. Joint Movement Capability (ASTM C719): +50/-50 percent.
 - f. Staining (ASTM C1248; concrete, limestone): None.
 - g. Color(s): As selected by Architect from manufacturer's complete range of not less than 10 colors.

- h. Product: "Dow Corning 795" by Dow Corning, or equal.
- 3. Sealant Type S-3: One-part, acid-curing, silicone sealant.
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 25, Uses NT, M, G, A, and Use O (as applicable to joint substrates indicated).
 - b. Durometer Hardness, Shore A (ASTM C661): 25.
 - c. Tensile Strength, Ultimate (ASTM D412): 325 psi.
 - d. Tear Strength (ASTM D624): 25 pli.
 - e. Peel Strength (ASTM C794): 20 lb/in.
 - f. Color(s): As selected by Architect from manufacturer's complete range of not less than 8 colors.
 - g. Product: "Dow Corning 999-A" by Dow Corning, or equal.
- 4. Sealant Type S-4:
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 25, Uses NT, G, A and O; non-staining, non-bleeding.
 - b. Color: As selected by Architect.
 - c. Product: "Dow Corning 999" or "Dow Corning 799" by Dow Corning, or equal.
- 5. Sealant Type S-5: Premium, very-low-modulus, high-movement, non-sag, fast-curing, ready-to-use, solvent-free, silyl-terminated polyether polymer (STPe) sealant; compatible with non-rigid coatings (may be painted soon after installation).
 - a. Compliance Requirements:
 - (1) ASTM C920, Type S, Grade NS, Class 50, Use NT, M, A, G, and O.
 - (2) FS TT-S-001543A, Type II, Class A, Type Non-sag.
 - (3) FS TT-S-00230C, Type II, Class A.
 - (4) COE CRD-C-541, Type II, Class A.
 - b. Physical and Performance Requirements:
 - (1) Movement Capability (ASTM C719): +/-50 percent.
 - (2) Extension (ASTM C1382): 100 percent.
 - (3) 100-percent Modulus (ASTM D412): 35 psi (0.24 MPa).
 - (4) Tensile Strength (ASTM D412): 140 to 180 psi.
 - (5) Tear Strength (ASTM D1004): 40 lb/in (7.1 kg/cm).
 - (6) Ultimate Elongation at Break (ASTM D412): 800 to 1,000 percent.
 - (7). Sag in Vertical Displacement (ASTM C639): No sag.
 - (8) Hardness, Shore A (ASTM C661): 17.
 - (9) Stain and Color Change (ASTM C510): Pass (no visible stain).
 - (10) Bond Durability (ASTM C719): Pass (on glass, aluminum, concrete; +/- 50 percent).
 - (11) Adhesion, in peel (ASTM C794):
 - (a) Aluminum: 35 pli (6.2 kg/cm).
 - (b) Glass: 33 pli (5.8 kg/cm).
 - (c) Concrete: 36 pli (6.4 kg/cm).
 - c. Product: "MasterSeal NP 150" (formerly "Sonolastic 150 VLM") by BASF, or equal.
- 6. Sealant Type S-6:
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 50, Uses NT, M, G, A and O; non-staining, non-bleeding.

- b. Color: As selected by Architect.
- c. Product: "Dow Corning CC5" by Dow Corning, or equal.
- 7. Sealant Type S-7: Single-component, ready to use, silicone rubber sealant with integral fungicide; recommended by manufacturer for use in bathrooms, spas and similar applications where joints need protection against fungi and bacteria
 - a. Compliance Requirements: ASTM C920, Type S, Grade NS, Class 25, Uses NT, G, A and O; mildew resistant.
 - b. Durometer Hardness, Shore A (ASTM C661): 25.
 - c. Tensile Strength, Ultimate (ASTM D412): 325 psi.
 - d. Tear Strength (ASTM D624): 25 ppi.
 - e. Peel Strength (ASTM C794): 20 lb/in.
 - f. Color: White.
 - g. Product: "Dow Corning 786 Sealant M White" by Dow Corning, or equal.
- 8. Sealant Type S-8: Low modulus, high performance, single component; gun grade, as appropriate; sealant.
 - a. Color: As selected by Architect.
 - b. Product: "Dow Corning 888" or "Dow Parking Sealant NS" by Dow Corning, or equal.
- 9. Sealant Type S-9: Two-part, self-leveling, non-acid curing, silicone sealant.
 - a. Compliance Requirements: ASTM C920, Type M, Grade NS, Class 25, Uses T, M, and Use O (as applicable to joint substrates indicated).
 - b. Durometer Hardness, Shore 00 (ASTM C661): 60.
 - c. Tensile Strength, Ultimate (ASTM D412): 75 psi.
 - d. Joint Movement Capability (ASTM C719): +100/-50 percent.
 - e. Color: Gray, except as otherwise indicated.
 - f. Product: "Dow Corning Parking Sealant FC" by Dow Corning, or equal.
- 10. Sealant Type S-10: Low modulus, high performance, single component; self leveling, as appropriate; sealant.
 - a. Compliance Requirements:
 - (1) ASTM D5893 Type SL.
 - b. Durometer Hardness, Shore 00 (ASTM C661): 41 to 50.
 - c. Joint Movement Capability (ASTM C719): +100/-50 percent.
 - d. Color: Gray, except as otherwise indicated.
 - e. Product: "Dow Corning 890" or "Dow Parking Sealant SL" by Dow Corning, or equal.

C. Urethane Sealants:

- 1. Sealant Type U-1:
 - a. Compliance Requirements: ASTM C920, Type M, Grade NS, Class 50, Use T, M, A, O, and I (Class 2); non-staining, non-bleeding.
 - b. Color: As selected by Architect.
 - c. Product: "Dymeric 240FC": by Tremco, or equal.
- 2. Sealant Type U-2: Two-part, non-sag, urethane sealant for Use T.
 - a. Compliance Requirements: ASTM C920, Type M, Grade NS, Class 25, Uses T, M, A, and Use O (as applicable to joint substrates indicated).
 - b. Product: "Dynatred" by Pecora, or equal.

3. Sealant Type U-3:
 - a. Compliance Requirements: ASTM C920, Type M, Grade P, Class 25, Use T, M, and O; non-staining.
 - b. Color: As selected by Architect.
 - c. Product: "THC-900/THC-901" by Tremco, or equal.
4. Sealant Type U-4:
 - a. Compliance Requirements: ASTM C920, Type S, Grade P, Class 50, Use T, M, A, O, and I (Class 2); non-staining, non-bleeding.
 - b. Color: As selected by Architect.
 - c. Product: "Vulkem 45 SSL" by Tremco, or equal.
5. Sealant Type U-7: One-part, high-performance, moisture-cure, polyurethane sealant.
 - a. Compliance Requirements:
 - (1) ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A, and O.
 - (2) FS TT-S-00230C, Class A, Type I.
 - b. Physical and Performance Requirements:
 - (1) Movement Capability (ASTM C719): +/-35 percent.
 - (2) Hardness, Shore A (ASTM C661): 25.
 - (3) Stain and Color Change (ASTM C510): Pass (no visible stain).
 - (4) Adhesion, in peel (ASTM C794): 30.
 - c. Product: "Sonolastic NP 1" by BASF, or equal.
6. Sealant Type U-8: One-part, low-modulus, silane end-capped, moisture-cure, polyurethane hybrid sealant.
 - a. Compliance Requirements:
 - (1) ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O.
 - (2) FS TT-S-00230C, Class A, Type II.
 - b. Physical and Performance Requirements:
 - (1) Movement Capability (ASTM C719): +/-35 percent.
 - (2) Hardness, Shore A (ASTM C661): 25.
 - (3) Stain and Color Change (ASTM C510): Pass (no visible stain).
 - (4) Adhesion, in peel (ASTM C794):
 - (a) Aluminum: 20-25 pli (89-112 N).
 - (b) Concrete: 18-22 pli (80-98 N).
 - c. Product: "Dymonic FC" by Tremco, or equal

D. Other Sealants:

1. Sealant Type A-1: ASTM C834 single-component water-based siliconized acrylic-latex caulk for use in general purpose interior applications.
 - a. Product: BASF Sonolac, or equal.
2. Sealant Type L-1: Highly elastic, latex sealant for sound-rated partition and ceiling systems; compatible with gypsum board, cementitious backer board, and metal stud framing system components.
 - a. Shall provide excellent adherence, permanent flexibility, and lasting seal.
 - b. Shall meet or exceed ASTM C919 and ASTM C834.
 - c. Acceptable Product: USG SHEETROCK® acoustical sealant; for additional requirements, refer to Section 092116 - Gypsum Board Assemblies.

2.04 PRE-FORMED SEALS AND GASKETS

- A. Pre-formed Foam Sealant: Manufacturer's standard preformed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by the manufacturer. Provide products which are permanently elastic, mildew-resistant, non-migratory, non-staining, compatible with joint substrates and other joint sealers, and comply with the following requirements:
 - 1. Impregnating Agent: Manufacturer's standard
 - 2. Density: Manufacturer's standard
 - 3. Backing: Pressure sensitive adhesive, factory applied to one side, with protective wrapping or coated on one face with release agent serving as bond breaker for primary joint sealant.
- B. Pre-formed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D2628 and with requirements indicated for size, profile and cross-section design.

2.05 BACKING AND BOND BREAKER MATERIALS

- A. General:
 - 1. Provide sealant backings of material and type which are:
 - a. Non-staining.
 - b. Compatible with joint substrates, sealants, primers and other joint fillers.
 - c. Approved by sealant manufacturer for applications indicated.
- B. Backup strip shall be a flexible and compressible type of closed cell foam polyethylene, butyl rubber, rounded at surface to contact sealant, conforming to sealant manufacturer's installation instructions.
 - 1. Backup strip must fit neatly into the joint without compacting and to such a height to allow a sealant depth of 1/2 the width of the joint.
 - 2. Sealant must not bond to the backup material.
- C. Plastic Foam Joint-Fillers: Pre-formed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, subject to sealant manufacturer's approval; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- D. Elastomeric Tubing Joint Fillers: Neoprene, butyl, silicone or EPDM tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to minus 26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer for preventing bond between sealant and joint filler or other

materials at the back or third surface of the joint. Provide self-adhesive tape where applicable.

2.06 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- B. Removal of existing joint sealants:
 - 1. Remove sealant at existing exterior joints, including but not limited to the following locations:
 - a. Control and expansion joints in paving.
 - b. Exterior wall expansion joints.
 - c. Control and soft joints in masonry, and between masonry and adjacent work.
 - d. Lap joints in exterior sheet metal work.
 - e. Joints between exterior metal frames and adjacent work.
 - 2. If water infiltration testing indicates leakage at storefronts, remove existing sealant/gasket at the following locations:
 - a. Metal-to-metal joints in storefronts.
 - b. Metal-to-glass joints in storefronts.
 - 3. At locations where existing joint sealant is to be removed, do so in accordance with sealant manufacturer's recommended procedures.
- C. Surface Cleaning of Joints: All joints shall be cleaned out immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 - 1. All foreign material shall be removed from joint substrates which could interfere with adhesion of joint sealer, including dust; paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer) oil; grease; waterproofing; water repellents; water, and surface dirt.
 - 2. Concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces shall be cleaned by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Loose particles remaining from the above cleaning operations shall be removed by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Laitance and form release agents shall be thoroughly removed from all concrete

surfaces.

4. Metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other nonporous surfaces shall be cleaned with chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

D. Joint Priming:

1. Clean and prime joints in accordance with manufacturer's instructions.
2. Joint substrates shall be primed where indicated or where recommended by joint sealer manufacturer. Primer shall be applied so as to comply with joint sealer manufacturer's recommendations. Primers shall be confined to areas of joint sealer bond. Spillage or migration onto adjoining surfaces shall not be allowed.

E. Protect elements surrounding the work of this section from damage or disfigurement.

1. Masking tape shall be used where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Tape shall be removed immediately after tooling without disturbing joint seal.

3.03 INSTALLATION

A. General:

1. Unless otherwise indicated, comply with joint sealer manufacturers' printed installation instructions.
 - a. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
2. Perform installation in accordance with ASTM C1193.
3. Perform acoustical sealant application work in accordance with ASTM C919.
4. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
5. Install bond breaker where joint backing is not used.
6. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
7. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
8. Tool joints concave.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C962 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C804 for use of solvent-release-curing sealants.

D. Latex Sealant Installation Standard: Comply with requirements of ASTM C790 for use of latex sealants.

E. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.

- F. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint-fillers of the types indicated to provide support of sealants during application and at position necessary to produce the required cross-sectional shapes and depths.
 - a. Do not leave gaps between ends of joint-fillers.
 - b. Do not stretch, twist, puncture or tear joint-fillers.
 - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints, where required to prevent third-side adhesion of sealant to back of joint.
 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint-fillers.
- G. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- H. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by the sealant manufacturer.
1. Concave joint configuration per Figure 6A in ASTM C962, unless otherwise indicated.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and complying with sealant manufacturer's directions for installation methods, materials and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.
- J. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together to provide watertight joints. Recess gaskets below adjoining surfaces by 1/8 inch to 1/4 inch.

3.04 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so

that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers and reseal joints with new materials to produce installations with repaired areas indistinguishable from original work.

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

3.05 SEALANT SCHEDULE

A. Exterior Joints:

1. Control and Expansion Joints in Concrete Paving:
 - a. Concrete Slab on Grade: Sealant Type U-2 or Sealant Type S-9.
 - b. Elevated Concrete Deck: Sealant Type S-9.
2. Preformed Expansion Joints in Walls: As indicated in drawings.
3. Control, Expansion, and Movement Joints in Cement Plaster: Sealant Type S-5.
4. Control, Expansion, and Movement Joints between Cement Plaster and Adjacent Work: Sealant Type S-5.
5. Joints between Metal Frames and Adjacent Work (except masonry): Sealant Type S-5.
6. Metal-to-Metal Joints (except lap joints in sheet metal work): Sealant Type S-1 or Sealant Type S-2.
7. Lap Joints in Sheet Metal Work: Sealant Type S-1 or Sealant Type S-2.
8. Metal-to-Glass Joints (except joints sealed with dry gasket or tape): Sealant Type S-2.
9. Joints for Which No Other Sealant Type is Indicated: Sealant Type U-8 or Sealant Type S-5.

B. Interior Joints:

1. Perimeter Joints between Gypsum Board Wall/Ceiling Finish and Metal Frame (e.g., window frame/trim; storefront framing): Sealant Type U-7.
2. Joints between Metal Stud Track/Runner and Adjacent Construction, and between Outlet Boxes and Gypsum Board: Refer to Concealed Joints.
3. Joints between Plumbing Fixtures and Tile: Sealant Type S-7.
4. Joints between Solid Surface Fabrications (e.g., vanity backsplash) and Tile: Sealant Type S-7.
5. Perimeter Joints between Stucco Wall/Ceiling Finish and Metal Frame (e.g., door frame; window frame; metal storefront; louver) or Steel Framing Member (e.g., steel roof beam): Sealant Type U-7.
6. Perimeter Joints between Tile Wall Finish and Metal Frame (e.g., door frame; window frame; metal storefront):
 - a. Tile to Site Finished Steel Frame (e.g., door frame): Sealant Type U-7.
 - b. Tile to Shop-Finished Aluminum Frame (e.g., storefront): Sealant Type S-1 or Sealant Type S-3.
7. Perimeter Joints between Gypsum Board Wall/Ceiling Finish and Metal Frame (e.g., door frame; window frame; metal storefront): Sealant Type U-7.
8. Joints between Gypsum Board and Quartz Surface Fabrications, Architectural

Woodwork or Cabinetry: Sealant Type U-7.

a. For additional requirements, refer to Section 064100 - Architectural Wood Casework and Section 066100 - Quartz Surface Fabrications.

9. Tile Movement Joints:

a. Floor Tile to Floor Tile: Sealant Type S-5.

b. Floor Tile to Base Tile: Sealant Type S-5.

c. Wall Tile to Wall Tile: Sealant Type S-5.

d. For additional requirements, refer to Section 093013 - Tiling.

10. Joints for Which No Other Sealant Type is Indicated: Sealant Type P-1.

C. Concealed Joints:

1. Concealed Metal Lap Joints (e.g., concealed lap and hook joints in sheet metal flashing and trim): Sealant Type S-1.

2. Concealed Bedding Joints (e.g., joints under metal thresholds and saddles; joints between sheet metal flashing and other materials): Sealant Type P-1.

3. Concealed Acoustical Joints at Interior Stud-Framed Partitions (e.g., joints between metal stud track/runner and adjacent construction; sealant joints between outlet boxes and gypsum board):

a. Dry Areas: Sealant Type L-1.

b. Wet Areas (e.g., restrooms): Sealant Type S-5 or Sealant Type S-7.

.END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior and exterior steel doors and frames.
- B. Steel door frames for interior wood doors.
- C. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete.
- B. Section 042000 - Unit Masonry Assemblies.
- C. Section 061000 - Rough Carpentry.
- D. Section 079005 - Joint Sealers.
- E. Section 081416 - Flush Wood Doors.
- F. Section 087100 - Door Hardware.
- G. Section 092116 - Gypsum Board Assemblies: Non-loadbearing metal framing.
- H. Section 099000 - Paints and Coatings: Field painting of doors and frames.
- I. Division 26 - Electrical.
- J. Division 28 - Electronic Safety and Security: Access control.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. ANSI/AAMA/NWDA 101/I.S.2 -- Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
 - 2. ANSI/AAMA/WDMA 101/I.S.2/NAFS -- Voluntary Performance Specification for Windows, Skylights and Glass Doors.
- C. American National Standards Institute (ANSI):
 - 1. ANSI A250.4 -- American National Standard Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
 - 2. ANSI A250.6 -- Hardware on Standard Steel Doors (Reinforcement - Application).
 - 3. ANSI A250.8 -- SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
 - 4. ANSI A250.10 -- Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI A250.11 -- Recommended Erection Instructions for Steel Frames.

- D. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 -- Minimum Design Loads for Buildings and Other Structures.
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM A591/A591M -- Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight (Mass) Applications.
 - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A1008/A1008M -- Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - 4. 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.
 - 5. ASTM E336 -- Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
 - 6. ASTM E413 -- Classification for Rating Sound Insulation.
 - 7. ASTM E488/E488M -- Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
 - 8. ASTM E1408 -- Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems.
- F. Builders Hardware Manufacturers Association (BHMA):
 - 1. BHMA A156.115 -- Hardware Preparation in Steel Doors and Steel Frames.
- G. Door Hardware Institute (DHI):
 - 1. DHI A115.1 -- Specifications for Preparation of 1-3/8" and 1-3/4" Standard Steel Doors and Steel Frames for Series 1000 Mortise Locks and Latches.
 - a. DHI A115.1G -- Installation Guide for Doors and Hardware.
- H. Florida Building Code, 2010 edition (FBC):
 - 2. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 1. FBC-A -- Florida Building Code, Accessibility (2012 edition).
 - 3. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP TAS-201 -- Impact Test Procedures.
 - b. FBC-TP TAS-202 -- Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
 - c. FBC-TP TAS-203 -- Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- I. Hollow Metal Manufacturers Association (HMMA): A division of NAAMM.
- J. Master Painters Institute (MPI):
 - 1. MPI (APL) -- Master Painters Institute Approved Products List.
 - 2. MPI (APSM) -- Master Painters Institute Architectural Painting Specification Manual.
- K. The National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM/HMMA 820 -- Hollow Metal Frames (including TN01 and TN02).

- L. National Wood Window and Door Association (NWWDA): Refer to WDMA.
- M. National Fire Protection Association (NFPA):
 - 1. NFPA 80 -- Standard for Fire Doors and Other Opening Protectives.
- N. Steel Door Institute (SDI):
 - 1. SDI 111 -- Recommended Standard Details for Steel Doors & Frames.
 - 2. SDI 113 -- Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
 - 3. SDI 122 -- Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
- O. Uniform Building Code (UBC):
 - 1. UBC 43.2 -- Fire Tests of Door Assemblies.
- P. Window and Door Manufacturers Association (WDMA).

1.04 DESIGN & PERFORMANCE REQUIREMENTS - EXTERIOR OPENINGS

- A. General: Design, materials, construction and quality of exterior steel door assemblies shall comply with design criteria specified in the Contract Documents and applicable requirements of the governing building code, including but not limited to FBC-B CHAPTERS 15 and 16 (including HVHZ provisions), and ASCE 7.
 - 1. Refer to FBC-B SECTION 1620 for wind loads, except that minimum Basic Wind Speed shall be as specified in this Section and as indicated on the Structural Drawings.
- B. Design Loads: Exterior steel door components and assemblies shall comply with requirements of governing building code, criteria indicated on the Structural Drawings, and as follows:
 - 1. Exterior steel door assemblies shall be designed and constructed to be of sufficient strength to support the estimated or actual imposed dead, live, wind, and any other loads, both during construction and after completion of the structure, without exceeding the allowable materials stresses specified by the governing building code.
 - 2. Wind Load Design Criteria:
 - a. Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
 - b. Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*Vult*): 245 mph (395 km/hr).
 - (1) Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.
 - c. Wind Exposure Category (FBC-B SECTION 1620.3): C.
 - d. Enclosure Classification: Enclosed Building.
 - e. Roof Height: As indicated on drawings.
 - f. Building Width: As indicated on drawings.
 - 3. Maximum Design Pressure (MDP) Rating (per Product Approval): Provide steel door components and assemblies that are identical to systems that have been successfully tested and approved for use in HVHZ, with MDP rating equal to or

greater than pressures indicated on the drawings.

- C. Testing - Product Approval: Comply with applicable requirements of the FLORIDA BUILDING CODE, including but not limited to the following:
 - 1. Exterior steel door assemblies shall be tested in accordance with:
 - a. Quality control test methods intended to confirm compliance with the large missile impact and wind load requirements of FBC-B CHAPTERS 15 and 16, including FBC-B SECTIONS 1625 and 1626 and FBC-TP TAS-201, TAS-202 and TAS-203.
 - b. Requirements of FBC-B SECTION 2411.3.2, FBC-TP TAS-202, and provisions from ANSI/AAMA/NWDA 101/I.S.2, and the forced entry prevention requirements of the AAMA 1302.5 and AAMA 1303.5.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's standard details and catalog data demonstrating compliance with referenced standards.
 - 1. Include manufacturer's recommended installation instructions.
 - 2. Product Approval (Exterior Doors): Submit copies of current Miami-Dade County Product Control Notice of Acceptance (NOA) indicating conformance with applicable requirements of Florida Building Code (FBC), including but not limited to design pressures and large and small missile impact tests.
 - a. Include copies of evidence submitted with Product Approval, including but not limited to drawings, test reports, calculations, and material certifications.
 - b. Indicate options selected for this project.
- C. Shop Drawings: Provide complete shop drawings showing all steel door and frame assemblies indicated in the drawings.
 - 1. Indicate the following:
 - a. Door, frame, and hardware schedule, in accordance with SDI 111.
 - b. Door frame types and profiles; materials and details of design and construction; and hardware locations, and reinforcement type and locations.
 - c. Interface with wall construction, including furring, framing, and interior wall finishes; anchorage and fastening methods; and methods of assembling sections, and finish requirements.
 - 2. Fire-Rated Openings: Indicate applicable fire-rating and label.
 - 3. Exterior Openings: Provide project-specific design and engineering calculations, establishing conformance with applicable requirements of governing building code and specified Design & Performance Requirements. Submit shop drawings and engineering calculations, signed and sealed by a qualified Florida registered professional engineer.
- D. LEED Submittals:
 - 1. General:

- a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.
3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

1.06 QUALITY ASSURANCE

- A. Fire-rated Assemblies:
 1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies complying with NFPA 80, and tested, listed and labeled by a nationally recognized independent testing agency.
 2. The label shall comply with requirements of NFPA 80, and shall be permanently affixed to the door or frame.
- B. Certifications:
 1. Exterior Door Certification: For exterior door assemblies, submit manufacturer's certification for each door and frame assembly constructed in accordance with Miami-Dade County product approval single listing with specified door, door frame, and hardware, demonstrating compliance with specified Design & Performance Requirements.
 2. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for each door and frame assembly constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.
 3. Certificate of Compliance: Provide manufacturer's certification that products comply with referenced standards.
- C. Manufacture products only after receipt of approved hardware schedule and templates.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver steel doors and frames cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory-finished doors.
- B. Inspect steel doors and frames upon delivery for damage. Minor damage may be repaired if refinished items are equal in all respects to new work and acceptable to

Architect and Owner. Remove and replace damaged items as directed.

- C. Store doors and frames at building site under cover. Place units on minimum 4-inch high wood blocking. Avoid use of non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.
- D. Deliver all doors and frames to the jobsite in a timely manner to not delay progress of other trades.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Ingersoll-Rand / Steelcraft.
- B. Amweld / Firedoor.
- C. Next Door Company.

2.02 MATERIALS

- A. Steel Sheet for Doors and Frames:
 - 1. Cold rolled steel: ASTM A1008/A1008M, Designation CS.
 - 2. Hot rolled steel: Pickled and oiled, ASTM A1011/A1011M, Designation CS Type B.
 - 3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed), ASTM A653/A653M, with A60/ZF180 coating (minimum).
- B. Steel Sheet for Anchors and Accessories: Electrolytically deposited zinc coated steel; ASTM A591/A591M, coating 40Z(12G), minimum.
- C. Finish Materials:
 - 1. Shop-Applied Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
 - a. Coordinate with paint to be used for field finishing; refer to Section 099000 - Painting and Coating.
 - 2. Field-Applied Protective Coating (for back-coating of frame prior to grouting):
 - a. Automotive Undercoating: Premium quality, water-based, high-build, rubberized automotive undercoating with excellent coverage and corrosion corrosion-resistance performance.
 - b. Epoxy Mastic Coating: Premium quality, two-component, high-build, self-priming, amido amine epoxy, meeting requirements of MPI (APL) #108.
- D. Grout for Frames: Portland cement grout; gypsum-based products are prohibited.
 - 1. Grout shall conform to requirements of the door assembly Product Approval NOA, and the following:
 - a. Compressive Strength: 3000 PSI.
 - b. Slump: Maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
 - 2. For additional information, refer to Section 033000 - Cast-In-Place Concrete.

- E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
 - 1. For additional information, refer to Section 087100 - Door Hardware.
- F. Bolts and Anchors:
 - 1. Existing Wall Anchors: 3/8-inch diameter, flat-head, sleeve-type, expansion anchor; tested to ASTM E488/E488M criteria; length and minimum embed depth per door manufacturer's Product Approval.

2.03 DOORS AND FRAMES

- A. General:
 - 1. Accessibility: Comply with FBC-A.
 - 2. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard and as follows:
 - a. Exterior Door Assemblies: In accordance with Miami-Dade Product Control Notice of Acceptance (NOA).
 - 3. Galvanizing: All components to be hot-dipped zinc-iron alloy-coated (galvannealed), ASTM A653/A653M, with A60/ZF180 coating (minimum).
 - 4. Finish: All components to be factory-primed, ready for field finishing.
 - a. For field finishing requirements, refer to Section 099000 - Painting and Coating.
 - 5. Fire-Rated Openings: Comply with NFPA 80; UL listed.
 - a. Affix permanent labels attesting to fire resistance.
 - b. Provide manufacturer's certificate that oversized openings have been constructed in accordance with all other applicable requirements for labeled door construction.
 - 6. STC Rating:
 - a. Exterior Openings: 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E336 or ASTM E1408.
 - b. Interior Openings: 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E336 or ASTM E1408.
 - 7. Exterior Openings:
 - a. Core Construction: Provide "polystyrene foam core", except where "steel-stiffened core" or "temperature rise mineral fiber core" is indicated.
 - b. Weatherstripping: In accordance with Miami-Dade Product Control Notice of Acceptance (NOA). For additional information, refer to Section 087100 - Door Hardware.
 - c. Any and all products shall be permanently labeled with manufacturer's name, city, state, and the following:
 - (1) "Miami-Dade County Product Control Approved".
 - 8. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all 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.

B. Doors:

1. Grade:
 - a. Interior: ANSI A250.8 Level 2 (heavy-duty), Model 2 (seamless design, fully welded).
 - b. Exterior: ANSI A250.8 Level 3 (extra heavy-duty), Model 2 (seamless design, fully welded).
2. Thickness: 1-3/4 inches (44 mm).
3. Door Top Closures: Manufacturer's standard closure channel, flush with top of faces and edges.
 - a. Provide top closure at all doors.
4. Door Edge Profile: Beveled on both edges.
5. Door Texture: Smooth faces.
6. Finish: Factory-primed, for field finishing.

C. Frames:

1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 2 (heavy-duty) Doors: 16 gage frame.
 - b. ANSI A250.8 Level 3 (extra heavy-duty) Doors: 16 or 14 gage frame.
2. Provide continuous full-profile welded unit type frames.
 - a. Weld miter joints between head and jamb faces completely along their length either internally or externally.
 - b. Internally weld perimeter profile joints full length of soffit and rabbets with hairline seams on external meeting surfaces.
 - c. Grind and finish face joints smooth.
3. Frame Profile: Double rabbet, with equal rabbet depth.
 - a. Face Width: 2 inches.
 - b. Jamb Depth: As indicated in drawings; not less than 5-3/4 inches.
 - c. Rabbet Depth: 1-15/16 inch; typical at both rabbets of each frame.
 - d. Existing Wall Anchors: Holes for jamb anchor bolts shall be located at the center of the soffit, equidistant from both faces; spacing per Product Approval NOA.
4. Finish: Factory-primed, for field finishing.

D. Frame Anchors:

1. Jamb Anchors:
 - a. Exterior Opening at CMU/Concrete Wall: Provide jamb anchors in accordance with requirements of the applicable Miami-Dade County Product Control Notice of Acceptance (NOA).
 - (1) Type: Existing wall anchor with 3/8-inch diameter, sleeve-type expansion anchor bolt.
 - b. Interior Opening at CMU/Concrete Walls, where such opening is subject to wind load and/or missile impact: Same as Exterior Opening at CMU/Concrete Wall.
 - c. Interior Opening at CMU/Concrete Walls, where such opening is not subject to wind load or missile impact:
 - (1) Type: Existing wall anchor with concealed 3/8-inch diameter, sleeve-type expansion anchor bolt.

- (a) Provide plastic plug at each anchor hole, to conceal head of anchor bolt.
 - (2) Provide one jamb anchor at 6 inches from top of jamb and one at 6 inches from bottom, plus one jamb anchor per 24 inches of jamb height or fraction thereof between top and bottom anchors; not less than 4 anchors per jamb.
 - 2. Interior Opening at Stud-framed Drywall Partition:
 - (1) Manufacturer's standard steel stud anchors welded to frame, to accommodate frame jamb depth and face dimension on fully-welded frame; galvanized; two #12 SMS per anchor.
 - (2) Provide one jamb anchor per 30 inches of jamb height or fraction thereof; not less than 3 anchors per jamb.
 - 2. Head/Ceiling Strut Anchors: Provide where indicated in drawings; if not indicated, provide per manufacturer's recommendations.
 - 3. Floor Anchors (Interior Opening at Stud-framed Drywall Partition): Steel angle clip type; provide one anchor per jamb.
 - a. Metal Thickness: 16 gage, minimum.
 - b. Fasteners: Two per jamb, minimum.
 - c. Weld anchor to bottom of each jamb, except as otherwise indicated; weld prior to galvanizing of frame assembly.
- D. Products:
- 1. Interior Doors and Frames: Ingersoll Rand Steelcraft "L" Series with polystyrene core and "LW" edge options, or equal.
 - 2. Exterior Doors and Frames:
 - a. Single Flush Outswing Door With Mortised Lock Set: IR / Steelcraft "H-16-4Series" (Miami-Dade NOA 11-0921.11)
 - b. Flush Outswing Door With Rim Exit Device: IR / Steelcraft "H Series" Double Flush Outswing Commercial Steel Doors w/ SVR (Surface Vertical Rod) Panic Exit Devices (Miami-Dade NOA 12-0305.12; Core Option C, E or F; fully welded frame), or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are suitable before beginning installation of frames.
 - 1. For wrap-around frames, verify that completed openings are of correct size and thickness.
 - 2. For butt type frames, verify that completed openings are of correct size.
- B. Correct unsatisfactory condition before proceeding with installation.

3.02 INSTALLATION

- A. Install doors plumb and in true alignment and fasten to achieve the maximum operational effectiveness and appearance of the unit.
 - 1. Install frames as recommended in ANSI A250.11 and DHI A115.1G.
 - 2. Maintain clearances specified in ANSI A250.8 and NFPA 80, whichever is more restrictive.

3. Shim as indicated in DHI A115.1 and SDI 122.
- B. Grouting of Frames in Concrete / Masonry Openings:
 1. Brace or fasten frame in such a way to prevent pressure of the grout from deforming frame.
 2. Prior to installation, field coat the inside of frames with a Field-Applied Protective Coating to prevent electrolysis or corrosion.
 3. Mix grout to provide 4-inch maximum slump consistency, and hand trowel into place.
 - a. Do not use grout mixed to thinner "pumpable" consistency.
 4. For additional information, refer to NAAMM/HMMA 820 TN01.
- C. Install hardware in accordance with hardware manufacturer's recommendations and templates.
 1. Consult DHI A115.1G and ANSI A250.6 as necessary.

3.03 ADJUST AND CLEAN

- A. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective plastic wrappings from prefinished doors.
- C. Fill all dents, holes, etc. with metal filler and sand smooth flush with adjacent surfaces-paint to match.
- D. Adjust doors for proper operation, free from binding or other defects.
- E. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Provide final adjustment as follows:
 1. Door Contact with Silencers: Doors shall strike a minimum of two silencers without binding lock or latch bolts in the strike plate.
 2. Head, Strike, and Hinge Jamb Margin: 1/8 inch.
 3. Meeting Edge Clearance, Pairs of Doors: $\pm 1/16$ inch.
 4. Bolts and Screws: Leave tight and firmly seated.
 5. Soundseal gasketing.
 6. Vermin Protection:
 - a. Drop Seal: Full contact with no gaps.
 - b. Brush weatherstripping.
- F. Clean and restore soiled surfaces.
- G. Remove scraps and debris, and leave site and a clean condition.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames.
- B. Section 081433 - Stile and Rail Doors.
- C. Section 087100 - Door Hardware.
- D. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM E413 -- Classification for Rating Sound Insulation.
 - 2. ASTM E1408 -- Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door System).
- C. American Woodwork Institute (AWI).
 - 1. AWI/AWMAC/WI (AWS) -- Architectural Woodwork Standards.
- D. Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- E. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- F. Intertek Testing Services NA, Inc. (ITS):
 - 1. ITS (DIR) -- Directory of Listed Products.
- G. National Fire Protection Association (NFPA):
 - 1. NFPA 80 -- Standard for Fire Doors and Other Opening Protectives.
 - 2. NFPA 252 -- Standard Methods of Fire Tests of Door Assemblies.
- H. Underwriters Laboratories Inc. (UL):
 - 1. UL (BMD) -- Building Materials Directory.
 - 2. UL 10B -- Standard for Fire Tests of Door Assemblies.
 - 3. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
 - 4. UL 1784 -- Standard for Air Leakage Tests of Door Assemblies.
- I. Window and Door Manufacturers Association (WDMA):
 - 1. WDMA I.S.1-A -- Architectural Wood Flush Doors.
- J. Woodwork Institute (WI).

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
 - 1. Include product data for doors; finishing specifications and materials; and product data for glass and glazing materials.
- 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. Illustrate door opening criteria; glazing details; hardware types and locations, and hardware blocking requirements and location.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS).
 - 3. Include certification program label.
- D. Specimen warranty.
- E. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- F. Samples:
 - 1. Door Construction Samples: Submit two samples of door construction, 12 x 12 inch (300 x 300 mm) in size cut from top corner of door.
 - 2. Finish Selection Samples (for factory pre-finishing):
 - a. Submit wood veneer color charts illustrating available range of wood grains, stain colors, and sheens, for selection of up to four initial finishes.
 - b. Submit samples of door veneer, 6 x 6 inch (150 x 150 mm) in size illustrating Architect's four initial finish selections.
 - c. Make adjustments in finish characteristics (e.g., wood grain, stain color, sheen) per Architect's request, and resubmit samples of for final finish selection.
 - 3. Finish Verification Samples (for factory pre-finishing): Submit two samples of door veneer, 12 x 12 inch (300 x 300 mm) in size illustrating wood grain, stain color, and sheen.
- G. LEED Report: Submit for wood products made from sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, and locally-sourced wood, as specified in Section 013515 - LEED Certification Procedures.
- H. Manufacturer's Installation Instructions: Indicate special installation instructions.
- I. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three 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.
- C. Installed Fire Rated Assembly: Conform to NFPA 80 for fire rated class as indicated.

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. For additional warranty requirements, see Section 017800 - Closeout Submittals.
- 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. Graham Wood Doors: www.grahamdoors.com.
 - 2. Eggers Industries: www.eggersindustries.com.
 - 3. Haley Brothers: www.haleybros.com.
 - 4. Marshfield Door Systems, Inc: www.marshfielddoors.com.

2.02 DOORS

- A. All Doors:
 - 1. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI (AWS).
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) 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 FBC-B SECTION 715; UL or WH (ITS) labeled.
 - a. Fire rated door assemblies required to have a minimum fire protection rating of 20 minutes where located in corridor walls or smoke barrier walls having a fire-resistance rating in accordance with FBC-B TABLE 715.4 shall be tested in accordance with NFPA 252 or UL 10C without the hose stream test.
 - 3. Smoke and Draft Control Doors: 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 (0.01524 cu m/s/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure at both ambient and elevated temperatures; with "S" label; no additional gasketing or edge sealing allowed.

- a. Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with FBC-B SECTION 715.4.6.1 and shall show the letter "S" on the fire rating label of the door.
4. Sound Retardant Doors: Minimum STC of 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E1408.
5. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated above.
- B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Specie to be selected by Architect; veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated.
 1. Vertical Edges: Same species as face veneer.
 2. Pairs: Pair match each pair; set match pairs within 10 feet (3 m) of each other when doors are closed.
- B. Facing Adhesive: Type I - waterproof.

2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- B. Astragals for Non-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge.
- C. Astragals for Fire Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

2.06 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 and top of door for closer for hardware reinforcement.
 2. Provide solid blocking for other through-bolted hardware.

- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for Grade specified and as follows:
 - 1. Transparent:
 - a. System - 11, Polyurethane, Catalyzed.
 - 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.

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 and UL 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.

3.03 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to 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.

3.05 SCHEDULE - See Drawings

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wall access panels.
- B. Ceiling access panels.
- C. Related hardware and attachments.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete.
- B. Section 042000 - Unit Masonry Assemblies.
- C. Section 083226 - Overhead Coiling Grilles.
- D. Section 092116 - Gypsum Board Assemblies.
- E. Section 092400 - Portland Cement Plaster.
- F. Section 099000 - Painting and Coating.
- G. Division 21 - Fire Suppression.
- H. Division 22 - Plumbing.
- I. Division 23 - Heating, Ventilating and Air Conditioning.
- J. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. Intertek Testing Services NA, Inc. (ITS):
 - 1. ITS (DIR) - Directory of Listed Products.
- C. Underwriters Laboratories Inc. (UL):
 - 1. UL (FRD) - Fire Resistance Directory.

1.04 DESIGN REQUIREMENTS

- A. Verification: Obtain specific locations and sizes for required access doors and frames from trades, including mechanical and electrical, requiring access to concealed equipment and indicate on submittal schedule.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 -

Administrative Requirements.

- B. Shop Drawings:
 - 1. Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
 - 2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
 - 3. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.
- C. Product Data: Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.
 - 1. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain access door and panel units, and frames for entire Project from one source and one single manufacturer.
- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door and panel assemblies with panel door, frame, hinge, and latch from manufacturer listed by UL for rating indicated.
 - 1. Provide 90 minute UL label at 2-hour rated partitions.
 - 2. Provide 3 hour Warnock-Hersey label at horizontal applications, up to 24 inch wide x 36 inch high.
 - 3. Provide 2 hour Warnock-Hersey label at horizontal applications greater than 24 inch wide x 36 inch high.
- D. Size Variations: Obtain Architect's acceptance and approval of manufacturer's standard size units that may vary slightly from sizes indicated on Drawings.
- E. Coordination: Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies. Coordinate delivery with other Work to avoid delay.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Package and ship in accordance with manufacturer's recommendations.
- B. Store per manufacturer's instructions.
 - 1. Store in dry area out of direct sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Nystrom Building Products: www.nystrom.com

B. Other Manufacturers:

1. Subject to compliance with requirements, equivalent products by one of the following manufacturers may be used:
 - a. Acudor Products Inc.: www.acudor.com.
 - b. Karp Associates, Inc.: www.karpinc.com.
 - c. Milcor Inc.: www.milcorinc.com.
2. Manufacturer shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.02 MATERIALS

- A. Commercial quality, cold steel sheet with baked on rust inhibitive gray primer.
- B. Galvanized, bonderized steel with baked on rust inhibitive gray primer.
- C. Type: No. 304 stainless steel with No. 4 satin polish finish.

2.03 ACCESS PANELS

A. Type 1 Access Panel (Interior, Insulated, Fire-Rated, Flush - Walls and Ceilings):

1. Product:
 - a. Wallboard Surfaces: Nystrom IW (or equal).
2. Size: As indicated on Drawings; if not indicated, provide 20 x 30 inches.
 - a. Maximum size
 - (1) Horizontal Applications: 20 inch x 30 inch.
 - (2) Vertical Applications: 36 inch x 48 inch
3. Door: Fabricate from 20-gauge cold rolled sheet steel, insulated sandwich type construction.
4. Frame: Fabricate from 16-gauge cold rolled steel of configuration to suit material application.
 - a. Wallboard Surfaces: 22-gauge galvanized drywall bead at perimeter.
 - b. Plaster Surfaces: 22-gauge galvanized plaster bead at perimeter.
5. Hinge: Concealed pin hinge
6. Latching/Locking mechanism: Knurled knob/flush key-operated latch bolt.
7. Finish: Galvanized, bonderized steel, with factory applied prime coat.
8. Insulation: 2 inch thick fire-rated mineral fiber.
9. Automatic Closure Device: Integral automatic spring closure device for each door.
10. Interior Latch Release: Mechanism to allow for panel to open from interior side.

B. Type 2 Access Panel (Exterior, Insulated, Flush):

1. Product: Nystrom XT, or equal.
2. Size: As indicated on Drawings; if not indicated, provide 20 x 30 inches.
3. Door: Fabricate from 20-gauge galvanized steel, insulated sandwich type construction.
4. Hinge: Stainless steel continuous piano type.
 - a. Type No. 304 stainless steel (door only).
5. Frame: Fabricate from 6063-T5 extruded aluminum.
6. Latching/Locking device: 1 or 2 dual acting handles, depending on door size.
 - a. Lockable handle for exterior only.

7. Flange: 0.080 6063-T5 extruded aluminum 1.25 inch flange.
 8. Finish: Paint grip.
 9. Insulation: 2 inch thick fiberglass.
 10. Gasket: Extruded santoprene.
- C. Type 3 Access Panel (Interior, Flush - Walls and Ceilings):
1. Product:
 - a. Wallboard Surfaces: Nystrom NW (or equal).
 2. Size: As indicated on Drawings; if not indicated, provide 20 x 30 inches.
 3. Door: Fabricate from 14-gauge cold rolled sheet steel.
 4. Frame: Fabricate from 16-gauge cold rolled sheet steel. Provide 1/4 inch mounting holes.
 - a. Wallboard Surfaces: 22-gauge galvanized drywall bead at perimeter.
 - c. Plaster Surfaces: 22-gauge galvanized plaster bead at perimeter.
 5. Hinge: Concealed continuous piano hinge.
 6. Latching/Locking Devices: Key-operated cylinder cam lock with 2 keys per lock, keyed alike.
 7. Finish: Galvanized, bonderized steel, with factory applied prime coat.
- D. Type 4 Access Panel (Interior, Fire-Rated, Flush - Walls Only):
1. Product:
 - a. Wallboard Surfaces: Nystrom UW (or equal).
 2. Size: As indicated on Drawings; if not indicated, provide 20 x 30 inches.
 - a. Maximum Size: 36 inches W x 48 inches H.
 3. Door: Fabricate from 14-gauge cold rolled sheet steel.
 4. Frame: Fabricate from 16-gauge cold rolled sheet steel of configuration to suit material application.
 - a. Wallboard Surfaces: 22-gauge galvanized drywall bead at perimeter.
 - b. Plaster Surfaces: 22-gauge galvanized plaster bead at perimeter.
 5. Finish: Galvanized, bonderized steel, with factory applied prime coat.
 6. Hinge: Flush continuous piano type.
 7. Latching/Locking mechanism: Knurled knob/flush key-operated latch bolt.
 8. Automatic Closure Device: Integral automatic spring closure device for each door.
 9. Interior Release: Mechanism to allow for panel to open from interior side.
- E. Type 5 Access Panel (Interior, Recessed):
1. Product:
 - a. Wallboard Surfaces: Nystrom RW (or equal).
 2. Size: As indicated on Drawings; if not indicated, provide 20 x 30 inches.
 3. Door: Fabricate from 16-gauge cold rolled sheet steel recessed 5/8 inch for in-fill of material.
 4. Frame: Fabricate from 16-gauge cold rolled sheet steel of configuration to suit material application.
 - a. Wallboard Surfaces: 22-gauge galvanized drywall bead at perimeter.
 - b. Plaster Surfaces: 22-gauge galvanized plaster bead at perimeter.
 5. Hinge: Concealed pivoting rod.
 6. Latching: Key-operated cylinder cam lock with 2 keys per lock, keyed alike.

7. Finish: Phosphate dipped with factory applied prime coat.

2.04 FABRICATION

- A. Manufacture each access panel assembly as an integral unit ready for installation.
- B. Welded construction: Furnish with a sufficient quantity of 1/4 inch mounting holes to secure access panels to types of supports indicated.
- C. Recessed panel: Form face of panel to provide specified recess for application of finish material. Reinforce panel as required to prevent buckling.
- D. Furnish number of latches required to hold door in flush, smooth plane when closed.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings for door and frame are correctly sized and located.
- B. Verify mechanical and electrical requirements for ceiling or wall access panels.

3.02 PREPARATION

- A. Advise installers of work relating to access panel installation including rough opening dimensions, locations of supports, and anchoring methods. Coordinate delivery with other work to avoid delay.

3.03 INSTALLATION

- A. Install access door and frame units per manufacturer's written instructions.
- B. Install frames plumb and level in opening. Secure rigidly in place.
- C. Position units to provide convenient access to concealed Work requiring access.
- D. Fire-rated Units: Include UL or Warnock-Hersey labels.

3.04 ADJUST AND CLEAN

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

END OF SECTION

SECTION 083326
OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling metal grilles..

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Support framing.
- B. Section 083100 - Access Doors and Panels: Ceiling access panel, for access to overhead coiling door motor mounted in ceiling plenum.
- C. Section 087000 - Door Hardware. Master-keyed cylinders.
- D. Division 26 - Electrical: Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, and installation of control station and wiring.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. 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 B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

1.04 DESIGN REQUIREMENTS

- A. Cycle Life: Design grilles of standard construction for normal use of up to 5 cycles per day maximum.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide general construction, component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, installation details, and interface with related work.
- D. Samples: Submit two grille members, minimum 6 inches in length, illustrating shape, color and finish texture.
- E. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions.

1.07 WARRANTY

- A. Provide manufacturer's warranty against defects in material and workmanship, for a period of not less than two years after Substantial Completion.
- B. Maintenance: Submit, for Owner's consideration and acceptance, a maintenance service agreement for installed products.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Cornell Iron Works, Inc.: www.cornelliron.com.
 - a. Product: "Visionaire" Model ESG10 Straight Pattern Grille.
- B. Other Manufacturers: Equivalent products by the following manufacturer(s):
 - 1. The Cookson Company: www.cooksondoor.com.

2.02 MATERIALS

- A. Aluminum: ASTM B221 (ASTM B221M).

2.03 GRILLE AND COMPONENTS

- A. Grille: Aluminum horizontal bar curtain, coiling on overhead counterbalanced shaft assembly.
 - 1. Finish: Color anodized; black.
 - 2. Operation: Electric motor.
 - 3. Mounting: Within framed opening.
- B. Curtain: Round horizontal bars connected with vertical links.
 - 1. Horizontal Bars: 5/16 inch (8 mm) diameter.
 - 2. Bar Spacing: 2 inches (50.8 mm) on center.
 - 3. Tube Spacers: 1/2 inch (13 mm) diameter.
 - 4. Spacer Spacing: 3-1/4 inch (81 mm) on center.
 - 5. Link Spacing: 6 inch (150 mm) on center.
 - 6. Bar Ends: Provide with nylon runners for quiet operation.
 - 7. Bottom Bar: Back-to-back angles with tubular resilient cushion.
- C. Guides, Tube Mounted: Heavy duty extruded aluminum sections, of profile to retain grille in place, with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide aluminum tubes, floor saddles and hardware as recommended by manufacturer to support grille.
 - 1. Finish: Color anodized; black.
- D. Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of grille to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- E. Brackets: Fabricate from minimum 3/16 inch (4.76 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
1. Finish: Phosphate treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.
- F. Hood Enclosure: Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape.
1. Material: Same metal as grille.
- G. Locking: Keyed cylinder locking into both jambs operable from both sides of curtain with motor interlock cutout switches.

2.04 ELECTRIC OPERATION

- A. Motor and Control Station: Industrial duty rated for a maximum of 20 cycles per hour, UL-listed, totally enclosed non-ventilated gear head operator(s) rated hp as recommended by door manufacture for size and type of door, Volts and Phase as indicated on Electrical drawings.
1. Provide complete, with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, provisions for auxiliary push-up operation, and control station(s).
 2. Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device.
 3. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position.
 4. Operator shall be equipped with a disconnect cable for auxiliary push-up operation.
 5. Operator drive and door driven sprockets shall be provided with #50 roller chain.
 6. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided.
 7. Operator shall be capable of driving the door at a speed of 6 to 9 inches per second (15 to 23 cm/sec).
 8. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door.
 9. Contractor shall mount the control station(s) and supply the appropriate disconnect switch, conduit and wiring per the overhead door wiring instructions.
 10. Control Station: Flush mounted, "Open/Close/Stop" push buttons; NEMA 1B.
- B. Constant Pressure Close Operation: Provide operator to function with constant pressure close operation to meet UL325 listing standard requirements.
1. Provide a continuously monitored, wireless sensing/weather edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened

position.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install grille unit assembly 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.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Install perimeter trim and closures.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).
- C. Maximum Variation From Level: 1/16 inch (1.5 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.04 ADJUSTING

- A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean grille and components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 084013
FIRE-RATED GLAZED WALLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire-rated glazed interior partitions.
- B. Fire-rated full-vision doors, including prefinished door, frame, glazing and hardware.
- C. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 084313 - Aluminum-Framed Storefronts: Non-fire-rated aluminum storefronts and doors.
- C. Section 087100 - Door Hardware.
- D. Division 28 - Electronic Safety and Security: Access control.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA CW-10 -- Care and Handling of Architectural Aluminum From Shop to Site.
 - 2. AAMA 611 -- Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.
 - 3. AAMA 612 -- Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum.
- C. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1 -- Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- D. 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 B221M -- Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
 - 3. ASTM E90 -- Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 4. ASTM E119 -- _____
 - 5. ASTM E413 -- Classification for Rating Sound Insulation.
- E. Florida Building Code, 2010 edition (FBC):

1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- F. Florida Fire Prevention Code, 2010 edition (FFPC):
- G. Glass Association of North America (GANA):
 1. GANA (GM) -- GANA Glazing Manual.
 2. GANA (SM) -- GANA Sealant Manual.
- H. National Fire Protection Association (NFPA):
 1. NFPA 80 -- Standard for Fire Doors and Fire Windows.
 2. NFPA 257 -- Standard on Fire Test for Window and Glass Block Assemblies.
- I. Society for Protective Coatings (SSPC):
- J. Underwriters Laboratories, Inc. (UL):
 1. UL 9 -- Fire Tests of Window Assemblies.
 2. UL 263 -- Fire Tests of Building Construction and Materials
- K. U.S. Code of Federal Regulations (CFR):
 1. CFR Title 16, Chapter II -- Consumer Product Safety Commission (CPSC):
 - a. 16 CFR 1201 -- Safety Standard for Glazing Materials (CPSC 16 CFR 1201).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Pre-installation Meeting: Conduct a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Fire and Smoke Protection Requirements: Design fire rated glazed wall and door assemblies complying with fire and smoke protection requirements of the governing building code, including but not limited to FBC-B SECTIONS 703, 707, 708 and 715, and as follows:
 1. Fire rated glazed wall and door assemblies shall provide smoke and flame barrier, and protection from radiant and conductive heat transfer with limited temperature rise on the unexposed face.
 - a. Fire Rating: 60 minutes, determined in accordance with the test procedures set forth in ASTM E119 or UL 263 (with hose stream test); listed by Underwriters Laboratories.
 - b. Certification: Temperature on the non-fire side of the system at the conclusion of fire test shall be below 250 degree F (121 degree C) above ambient room temperature.
 - c. Testing Laboratory: Fire tests shall be conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.
 2. Provide completed fire rated glazed wall assemblies conforming with UL Design Number U542, or equal.
- B. Structural Performance Requirements: Design fire rated glazed wall and door assemblies to support dead loads and horizontal live loads complying with structural

requirements of the governing building code, including but not limited to FBC-B SECTIONS 1604, 1607 and 1618, and as follows:

1. Partitions shall have adequate strength to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m²); deflection at this load shall not exceed L/360.
2. Coordinate connection to main structural members.

1.06 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.
 1. Include evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors.
- C. 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.
- D. Product Test Listings: From a qualified testing agency indicating fire rated glass complies with requirements, based on comprehensive testing of current product.
- E. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.
- F. Shop Drawings:
 1. Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 2. Indicate reinforcement and other provisions for mounting and installation of low-energy door operators; for additional information, refer to Section 084229 - Low-Energy Door Operators.
- G. Samples: Submit samples illustrating each exposed metal finish, outside and inside.
 1. For color anodized aluminum, submit minimum of two samples illustrating expected range of color in actual production.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.07 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 at the State in which the Project is located.

- B. Manufacturer Qualifications: Company experienced in designing and manufacturing storefront or curtain wall with at least 10 years experience manufacturing aluminum storefront or curtain wall.
- C. Installer Qualifications: Company specializing in installing storefront or curtain wall systems.
 - 1. Minimum three years of documented experience of installing systems similar to that specified.
 - 2. Approved by manufacturer.
- D. Glazing Standards: GANA (GM) and GANA (SM).
- E. Listings and Labels: Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification.
 - 1. Assemblies shall be labeled in accordance with limits of listings.
- F. Fire Rated Glass: Each lite shall bear a permanent, non-removable label of Underwriters Laboratories and/or Intertek Testing Services (Warnock-Hersey) certifying it for use in tested and rated fire protective assemblies.

1.08 MOCK-UP

- A. For general requirements for mock-ups, see Section 014000 - Quality Requirements,.
- B. Provide mock-up including all components occurring on project. Assemble to illustrate all components of the assembly, including attachments, anchors, and perimeter sealant.
- C. Locate on-site where directed. Mock-up may remain as part of the Work.
- D. Locate off-site where directed. Remove when directed.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products of this section in accordance with AAMA CW-10 and manufacturer's instructions.
- B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- B. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- C. Maintain minimum and maximum temperature limits as recommended by manufacturers.

1. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

D. Protect adjacent surfaces during progress of the Work in this Section.

1.11 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. For additional warranty requirements, see Section 017800 - Closeout Submittals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 1. Vetrotech Saint-Gobain USA: www.vetrotechusa.com.
- B. Other Manufacturers: Equivalent products by other manufacturers may be submitted for consideration in accordance with requirements for substitutions.

2.02 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless or galvanized steel.
 1. Arrange fasteners and attachments to conceal from view.
- C. Joint Sealers and Adhesives:
 1. Sealants Within Fire-Rated Assembly: Silicone sealant, as required by fire-rating and manufacturer.
 2. Perimeter Sealant: Type specified in Section 079005 - Joint Sealers.

2.03 INTERIOR FIRE-RATED / TEMPERATURE-RISE GLAZED WALL AND DOOR ASSEMBLIES

- A. General:
 1. Factory-fabricated, factory-finished, fire rated / temperature rise glazed wall and door assemblies, designed and tested to provide smoke and flame barrier and protection from radiant and conductive heat transfer with limited temperature rise on the unexposed face.
 2. 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.
 3. Expansion/Contraction: Provide for expansion and contraction within system components caused by anticipated temperature changes without causing detrimental effect to system components, anchorages, and other building elements.
 4. Perimeter Clearance: Minimize space between perimeter framing members and adjacent construction while allowing expected movement.
 5. Performance Requirements:
 - a. Fire and Smoke Protection Requirements: Shall provide smoke and flame barrier, and protection from radiant and conductive heat transfer with limited

temperature rise on the unexposed face; UL Design No. U542, or equal.

- (1) Fire Rating: 60-minutes (with hose stream test), when tested in accordance with:
 - (a) Walls: ASTM E119 or UL 263.
 - (b) Door Assemblies with Side-Hinged and Pivoted Swinging Doors: NFPA 252 or UL 10C.
 - (2) Certification (System Tested in Accordance with ASTM E119 or UL 263): Temperature rise on the non-fire side of the system at the conclusion of fire test shall be not more than 250 degree F (121 degree C) above ambient room temperature.
 - (3) For additional requirements, refer to DESIGN AND PERFORMANCE REQUIREMENTS.
- b. Structural Performance Requirements: Refer to DESIGN AND PERFORMANCE REQUIREMENTS.
- c. Acoustical Performance Requirements: Substantiate acoustical performance using test sample identical to that to be installed, including glazing.
- (1) Sound Attenuation: STC of 41, minimum, both directions.
 - (2) Test Method: ASTM E90, with calculation in accordance with ASTM E413.
- B. Fire-Rated Glazing Material:
1. Description: Fire-rated, wireless, laminated glazing material with intumescent interlayers, for use in interior, impact safety rated locations such as doors, transoms, borrowed lites, and glass wall applications.
 2. Physical Requirements:
 - a. Thickness: 1 inch (25 mm), nominal.
 - b. Weight: 10.3 lbs / sq. ft. (50.5 kg per sq. meter), nominal.
 - c. Maximum Dimensions:
 - (1) Exposed Height:
 - (a) Transom, Borrowed Lite, and Glass Wall Panel: 94-13/16 in.
 - (b) Door Panel: 89-1/2 in.
 - (2) Exposed Width:
 - (a) Transom, Borrowed Lite, and Glass Wall Panel: 89-1/2 in.
 - (b) Door Panel: 30 in.
 - (3) Exposed Area:
 - (a) Transom, Borrowed Lite, and Glass Wall Panel: 4,449 sq in.
 - (b) Door Panel: 2,685 sq in..
 3. Performance Requirements:
 - a. Sound Transmission Coefficient (STC) Rating: 40, nominal.
 - b. Visible Light Transmission (VLT): 85 percent, min.
 - c. Fire Rating: 60 minutes, min.
 - d. Impact Safety Rating: Shall comply with applicable requirements of governing building code, including but not limited to FBC-B SECTION 2406.2, and ANSI Z97.1 (Class A) or 16 CFR 1201 (Cat. II).
 4. Product: "CONTRAFLAM 60" Fire-Rated Clear Tempered Safety Glass by Vetrotech Saint-Gobain USA, or equal.

- C. Metal Framing Components:
1. Framing Members:
 - a. Construction: Integral structure and glazing stops fabricated from extruded and thermally-broken aluminum profiles; filled internally with cement composite material.
 - (1) Sealing:
 - (a) Framing system shall insulate against effects of fire, smoke, and heat transfer from either side.
 - (b) Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.
 - b. Profile: As indicated on drawings.
 - (1) Glazing Position: Center.
 - (2) Cross Section Dimensions:
 - (a) Perimeter Framing: 2-1/2 in. W x 3-3/8 in. D, nominal.
 - (b) Vertical/Horizontal Mullions: 3-1/2 in. W x 3-3/8 in. D, nominal.
 - (c) Segmented Vertical/Horizontal Mullions: 5 in. W x 3-3/8 in. D, nominal.
 - c. Assembly: Frame corners assembled by means of crimped and bonded miter joints.
 - d. Finish:
 - (1) Exposed Surfaces: Class I 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.
 - (c) Color: Black.
 - (2) Concealed Surfaces:
 - (a) Concealed Metal Surfaces That Will Be in Contact with Cementitious Materials or Dissimilar Metals: Coat with bituminous paint.
 2. Glazing Beads: Framing manufacturer's extruded aluminum beads, designed to snap into extruded aluminum framing member along perimeter of both sides of glazing material.
 - a. Finish: Shall match finish of framing members.
 3. Retaining Clips: Stainless steel retaining clips; as required by fire-rating and manufacturer.
 - a. Size: 1/32 in. thick, 3/4 in. W x 2 in. L, with 7/8 in. vertical leg; pre-punched hole for screw fastener.
 4. Aperture Lining: Intumescent tape; as required by fire-rating and manufacturer.
 5. Spline: Extruded aluminum spline with PVC jacket, sized to fit within groove in framing member, designed for connecting multiple adjacent frame assemblies.
 - a. Size: 1 in. W x 5/32 in. thick, nominal; cut to match width or height of assembly.
 - b. Finish: Black, to match framing members.
 6. Glazing Gaskets/Seals: PVC seals, nominal 1/4 in. deep, applied to glazing bead and fixed stop of the frame, cut to length to match framing and supplied with the glazing material; as required by fire-rating and manufacturer.

- D. Fire-Rated Aluminum Full Vision Doors and Frames:
1. Framing:
 - a. Construction: Integral structure and glazing stops from extruded and thermally broken aluminum profiles; filled internally with cement composite material.
 - (1) Sealing: Stiles and rails shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.
 - b. Profile: As indicated on drawings.
 - (1) Glazing Position: Center.
 - (2) Cross Section Dimensions:
 - (a) Jamb/Head Frame: Shall match Framing Members.
 - (b) Door Stiles/Rails: 3-9/16 in. W x 3-3/8 in. D, nominal.
 - (c) Door Cross Rail (where indicated): 3-9/16 in. W x 3-3/8 in. D, nominal.
 - c. Assembly:
 - (1) Door frames and door leaves shall be furnished pre-assembled.
 - (2) Door assemblies shall be factory-prepared for field glazing and field mounting of hardware.
 - d. Finish: Shall match finish of framing members
 2. Glazing Beads: Framing manufacturer's extruded aluminum beads, designed to snap into extruded aluminum stiles and rails along perimeter of both sides of glazing material.
 - a. Finish: Shall match finish of framing members.
 3. Glazing Gaskets/Seals: PVC seals, nominal 1/4 in. deep, applied to glazing bead and fixed stop of the frame, cut to length to match framing and supplied with the glazing material; as required by fire-rating and manufacturer.
 4. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.
 5. Door Hardware:
 - a. Pivots: Offset type; top, intermediate, and bottom.
 - (1) Product: Dr Hahn A925 series.
 - (2) Finish: Aluminum.
 - b. Closers: Surface-applied door closer.
 - (1) Product: LCN 4020 series.
 - (2) Finish: Aluminum.
 - c. Exit Devices: Rim-based exit device.
 - (1) Product: Dorma 9700 series.
 - (2) Finish: Stainless.
 - d. Handle Latch: Lever handles.
 - (1) Product: FSB 1080 series.
 - (2) Finish: Stainless.

2.04 FINISHES - ALUMINUM

- A. Finishing:
1. Provide factory-applied Class I Color Anodized Finish at all metal surfaces that will be exposed in completed assemblies.

2. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.
- B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating or AAMA 612 electrolytically deposited colored anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.
 1. Finish system (i.e., AAMA 611 or AAMA 612) and color shall match non-fire-rated aluminum storefronts and doors. For additional information, refer to Section 084313 - Aluminum-Framed Storefronts.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

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.
- C. Verify that anchorage devices have been properly installed and located.

3.02 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. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Set door thresholds in bed of mastic and secure.
- I. Install door hardware using templates provided.
 1. For hardware installation requirements, see Section 087100 - Door Hardware.
- J. Install perimeter sealant in accordance with Section 079005.
- K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 feet (1.5 mm/m) non-cumulative or 0.5 inches per 100 feet (12 mm/30 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).
- C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

- A. Provide the services of the manufacturer's field representative to observe installation and make report.

3.05 ADJUSTING

- A. Adjust doors for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished 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. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION

- A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior aluminum-framed glazed storefronts.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 087100 - Door Hardware: Hardware items other than specified in this section.
- C. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association
 - 1. AAMA CW-10 -- Care and Handling of Architectural Aluminum from Shop to Site.
 - 2. AAMA 611 -- Voluntary Specification for Anodized Architectural Aluminum.
- C. 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 B221M -- Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Conduct a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and glazing, and door hardware.
- 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. Design Data: Provide framing member structural and physical characteristics, dimensional limitations.

- 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. Samples: Submit two sample mullions 12 inches (300 mm) in length illustrating finished aluminum surface and glazing materials.

1.06 QUALITY ASSURANCE

- A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum 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 (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
- C. For additional warranty requirements, see Section 017800 - Closeout Submittals.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Center-Set Style:
 - 1. Basis of Design: YKK AP America Inc; YES 45 FS.
 - 2. Vertical Mullion Dimensions: 1-3/4 inches wide by 4-1/2 inches deep (440 mm wide by 114 mm deep).
- B. Substitutions: See Section 016000 - Product Requirements.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I color anodized finish.

- a. Factory finish all 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.
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. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
5. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
6. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections.
 1. Glazing Stops: Flush.
 2. Cross-Section: As indicated on drawings.
 3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: As specified in Section 088000 - Glazing.
- C. Swing Doors: Flush wood; refer to Section 081416 - Flush Wood Doors.
 1. Thickness: 1-3/4 inches (43 mm).

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Perimeter Sealant: Type specified in Section 079005 - Joint Sealers.
- D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- E. Glazing Accessories: As specified in Section 088000 - Glazing.

2.06 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating or AAMA 612 electrolytically deposited colored anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.
 1. Color: Black.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.07 HARDWARE

- A. For each door, include weatherstripping and threshold.

- B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Finish on Hand-Contacted Items: Polished chrome.
 - 2. For each door, include butt hinges, push handle, pull handle, exit device, and closer.

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. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Set thresholds secure.
- I. Install hardware using templates provided.
 - 1. For hardware installation requirements, see Section 087100 - Door Hardware.
- J. Using glazing method required to achieve performance criteria, install glass in accordance with Section 088000 - Glazing.
- K. Install perimeter sealant in accordance with Section 079005 - Joint Sealers.
- L. 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 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.05 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. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

- A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 085123
STEEL WINDOWS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hot-rolled steel, triple-weatherstripped, impact-approved windows, for replacement of historic steel windows.
- B. Window anchors, mullions, covers and trim.
- C. Factory applied finish.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications.
- B. Section 079005 - Joint Sealers.
- C. Section 085124 - Steel Doors.
- D. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 501.1 -- Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
 - 2. AAMA 501.2 -- Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage.
 - 3. AAMA 501.4 -- Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.
 - 2. ANSI/AAMA/NWDA 101/I.S.2 -- Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
 - 3. ANSI/AAMA/WDMA 101/I.S.2/NAFS -- Voluntary Performance Specification for Windows, Skylights and Glass Doors.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 5. ASTM E1300 -- Standard Practice for Determining Load Resistance of Glass in Buildings.
 6. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- D. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP TAS-201 -- Impact Test Procedures.
 - b. FBC-TP TAS-202 -- Criteria for Testing Impact and Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
 - c. FBC-TP TAS-203 -- Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- F. National Wood Window and Door Association (NWWDA): Refer to WDMA.
- G. Steel Window Institute (SWI):
1. SWI (INTRO) - Architect's Guide to Steel Windows and Doors.
- P. Window and Door Manufacturers Association (WDMA).

1.04 DESIGN & PERFORMANCE REQUIREMENTS - EXTERIOR OPENINGS

- A. General: Design, materials, construction and quality of exterior steel window assemblies shall comply with design criteria specified in the Contract Documents and applicable requirements of the governing building code, including but not limited to FBC-B CHAPTERS 15 and 16 (including HVHZ provisions), and ASCE 7.
1. Refer to FBC-B SECTION 1620 for wind loads, except that minimum Basic Wind Speed shall be as specified in this Section and as indicated on the Structural Drawings.
- B. Design Loads: Exterior steel window components and assemblies shall comply with requirements of governing building code, criteria indicated on the Structural Drawings, and as follows:
1. Exterior steel window assemblies shall be designed and constructed to be of sufficient strength to support the estimated or actual imposed dead, live, wind, and any other loads, both during construction and after completion of the structure, without exceeding the allowable materials stresses specified by the governing building code.
 2. Wind Load Design Criteria:
 - a. Building Risk Category (FBC-B TABLE 1604.5 and ASCE 7 Table 1-1): III.
 - b. Basic Wind Speed (Ultimate Design Wind Speed, 3-second gust (*Vult*): 245 mph (395 km/hr).
 - (1) Wind Velocity design criteria is based on 3-second gust equivalent to Threshold Category 5 Hurricane sustained wind speed per Saffir-Simpson Hurricane Wind Scale. This criteria exceeds the minimum requirements of governing building code.

- c. Wind Exposure Category (FBC-B SECTION 1620.3): C.
 - d. Enclosure Classification: Enclosed Building.
 - e. Roof Height: As indicated on drawings.
 - f. Building Width: As indicated on drawings.
3. Maximum Design Pressure (MDP) Rating (per Product Approval): Provide steel window components and assemblies that are identical to systems that have been successfully tested and approved for use in HVHZ, with MDP rating equal to or greater than pressures indicated on the drawings.
- C. Testing - Product Approval: Comply with applicable requirements of the FBC, including but not limited to the following:
- 1. Exterior steel window assemblies shall be tested in accordance with:
 - a. Quality control test methods intended to confirm compliance with the large missile impact and wind load requirements of FBC-B CHAPTERS 15 and 16, including FBC-B SECTIONS 1625 and 1626 and FBC-TP TAS-201, TAS-202 and TAS-203.
 - b. Requirements of FBC-B SECTION 2411.3.2, FBC-TP TAS-202, and provisions from ANSI/AAMA/NWDA 101/I.S.2, and the forced entry prevention requirements of the AAMA 1302.5 and AAMA 1303.5.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data:
 - 1. Include product approval certification report from Miami-Dade County Building Code Compliance Office.
- C. Shop Drawings:
 - 1. Submit shop drawings showing window and installation details, including anchorage, fastening and recommended sealing methods.
 - 2. Dimensioned elevations showing window opening and window sizes.
- D. Samples:
 - 1. Color charts for finishes.
 - 2. Color sample of finish.
 - 3. Typical 6-inch long window profile with glazing beads.
 - 4. Sample of specified muntin, showing welded intersections and glazing beads.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of steel windows with not less than 10 years experience in the fabrication of heavy custom steel windows and be a member of The Steel Window Institute (SWI).
- B. Installer Qualifications: Installation of windows shall be performed by experienced window installers approved by the manufacturer.

- C. Allowable Tolerances: Size dimensions + 1/16 inch.
- D. Source Quality Control:
 - 1. All windows shall comply with applicable requirements of the Florida Building Code (FBC) and the Dade County Product Control Division.
 - 2. Air Infiltration Test:
 - a. Products must be independently lab tested and meet or exceed requirements of FBC-TP TAS-202.
 - b. Maximum air infiltration 0.30 CFM/SQ Ft. with differential pressure across window unit of 1.57/ 6.24 PSF.
 - 3. Water Penetration Test:
 - a. Products must be independently lab tested and meet or exceed FBC-TP TAS-202.
 - b. No water penetration for 15 minutes when window is subjected to a rate of flow of 5 gal./hr./sq. ft. with differential pressure across window unit of 4.50 PSF or 15 percent design pressure, whichever is greatest.
 - 4. Field Test: Field testing criteria shall be in accordance with AAMA 502.
 - 5. Structural Test: Products must be independently lab tested and meet or exceed requirements of:
 - a. FBC-TP TAS-202
 - b. ASTM E330.
 - 6. Forced Entry Test: Products must be independently lab tested and meet or exceed requirements of:
 - a. FBC-TP TAS-202
 - b. ASTM F588, Grade 40 at 300 pounds.
 - 7. Impact Test – Large Missile: Products must be independently lab tested and meet or exceed requirements of:
 - a. FBC-TP TAS-201.
 - b. ASTM E1996.
 - 8. Cyclic Wind Loading Test: Products must be independently lab tested and meet or exceed requirements of:
 - a. FBC-TP TAS-203.
 - a. ASTM E1886.
 - 9. Quality of finishing process shall meet or exceed the following:
 - a. Paint Blistering Test (ASTM D714): ____
 - b. Humidity Test (ASTM D4585): ____
 - c. Salt Spray (Fog) Test (ASTM B117): ____
 - d. Painted Products in Corrosive Environments (ASTM D1654): ____
 - e. Cyclic Fog/Dry Test (Prohesion) (ASTM G85): ____
 - f. Salt Fog/UV Painted Metal (ASTM D5894): ____
 - g. Pull off Strength of Coating Test (ASTM D4541): ____
 - 11. Upon request, the window manufacturer shall provide a test report from a qualified independent U.S. testing laboratory regularly engaged in testing windows to verify that products conform to test requirement as outlined.

1.07 PRODUCT, STORAGE AND HANDLING

- A. The General Contractor shall be responsible for the protection and storage of the windows after delivery to the site.
- B. Store in designated areas in an upright position on wood slats or on a dry floor in a manner that will prevent damage. Ventilate canvas or plastic coverings to prevent humidity buildup.

1.08 WARRANTY

- A. Provide manufacturer's standard 10 year Limited Warranty.

PART 2 - PRODUCT AND FABRICATION

2.01 MANUFACTURERS

- A. General:
 - 1. Furnish all labor and materials to complete the fabrication of windows as shown on the drawings and as specified herein.
 - 2. All exterior steel windows shall be by a single manufacturer.
- B. Basis of Design:
 - 1. Hope's Windows, Inc.: Jamestown, NY; Tel. 716-665-5124; www.hopeswindows.com.
 - a. Product: "Jamestown 175 Steel Series Casement Impact Window", conforming to Florida Product Approval #FL14148-R2-II (Glazing Detail 6).
- C. Other Manufacturers: Equivalent products by other manufacturers may be used only if submitted and approved in accordance with requirements for substitutions and the following:
 - 1. For substitution requirements, refer to Section 016000 - Product Requirements.
 - 2. A request for substitution shall constitute a representation:
 - a. That the submitter:
 - (1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - (2) Will provide the same warranty for the substitution as for the specified product.
 - (3) Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - (4) Waives claims for additional costs or time extension that may subsequently become apparent.
 - b. That the proposed substitute product:
 - (1) Is fabricated from the same material and in the same configuration as the specified product.
 - (2) Is an aesthetic match to the original historic steel windows installed in the building.
 - 3. In addition to request for substitution, submitter shall provide for review the following:
 - a. Full-size window samples matching required scope, showing that proposed product meets applicable physical and aesthetic requirements.

- b. Copies of test reports and current product approval certification report from Miami-Dade County Building Code Compliance Office showing that proposed product meets applicable performance requirements.
- c. List of (5) recently completed projects of similar size and scope.

2.02 MATERIALS

- A. Heavy-duty custom triple-weatherstripped steel windows shall be manufactured from solid hot rolled steel shapes.
 - 1. Profiles made from steel with flanges rolled integrally at the mill.
 - 2. Perimeter frames and ventilator profiles shall have glazing rebates providing an unobstructed glazing surface of at least 3/4 inch.
 - 3. Glazing rebate surfaces must be perpendicular to the web or stem of the profile. Applied glazing rebate extensions and rebate surfaces that are tapered will not be acceptable.
 - 4. Combined weight of frame and ventilator profiles shall be a minimum of 4.20 pounds per lineal foot. Frame profile alone shall not weigh less than 1.80 pounds per lineal foot.
 - 5. All steel profiles must be a minimum of 1-3/4 inches in depth.
 - 6. The frame and ventilator profiles shall have integral grooves located in the exterior and interior bedding contacts for the reception of triple weatherstripping`.
- B. Muntins (Simulated Divided Lite Grids):
 - 1. Interior/Exterior Applied Muntins: Profiles shall be extruded aluminum Alloy 6063-T5 matching the profiles as detailed.
- C. Glazing Beads: Extruded aluminum Alloy 6063-T5 with a minimum thickness of 0.062 inch.
- D. Weatherstripping: Extruded EPDM closed cell sponge, closed cell neoprene, flexible silicone, or polyethylene clad urethane foam.
- E. Operable Hardware: N/A.
- F. All screws that are furnished by Hope's, for hardware, trim, covers, anchoring, weather bars, water dams, screens, etc. shall be non-ferrous brass or stainless steel. Glazing bead retainer screws are plated steel.
- G. Stainless Steel Insect Screens (Optional): N/A.
- H. Finishing:
 - 1. Cleaning
 - 2. Pretreatment
 - 3. Epoxy E-Coat primer
 - 4. Epoxy powder primer
 - 5. Polyurethane top coat
- I. Color: To be selected by Architect from manufacturer's full range of standard, custom and premium colors.

2.03 FABRICATION

- A. Fabricate steel windows in accordance with approved shop drawings.

- B. Corners of frame and ventilator shall be mitered or coped then solidly welded. Exposed and contact surfaces shall be finished smooth flush with the adjacent surfaces. All interior and exterior rail bar and muntin joints shall be face welded and ground smooth.
- C. Muntins (Simulated Divided Lite Grids):
 - 1. Interior/Exterior Applied Muntins: Profile shall be precut to meet perimeter frame. The intersections shall be milled to the extrusion profile. The muntin components shall be applied to the face of the glass with 0.045 inch VHB double adhesive tape after glazing.
- D. Glazing:
 - 1. All windows shall be designed for inside or outside glazing.
 - 2. Provide replaceable continuous glazing beads to suit the glass as specified.
 - 3. Glazing beads shall be cut and shop fitted to each glass lite prior to shipment.
 - 4. Manufacturer to provide correct glazing wedge and tape in accordance with the tested assembly.
- E. Weatherstrip: All ventilators shall receive continuous weatherstripping that shall be applied to the integral weatherstrip grooves in the interior and exterior contact surfaces of the frame and ventilator profiles. Weatherstripping that is surface applied or requires additional retainer or requires screws for application shall not be acceptable.
- F. Operable Hardware: N/A.
- G. Stainless Steel Insect Screens: N/A.

2.04 FACTORY FINISHING

- A. Cleaning: All hot-rolled steel profiles must be acid pickled as defined by SSPC SP-8 to ensure a pristine, white metal substrate prior to fabrication.
- B. Pretreatment: Following welding and all machining operations, hot-rolled products and accessories are subjected to the following pretreatments geared specific to projects proximity to corrosive environment. Cold-rolled, formed sheet steel components are manufactured from A60 galvanized sheet and subjected to applicable processes outlined below.
 - 1. Ocean Front / Coastal Locations (within one mile of salt water environment): Provide 13-stage process, including the following:
 - a. Zinc metal deposition (electroplate and/or hot-dip, per manufacturer's recommendation)
 - b. Alkaline cleaning spray
 - c. Alkaline cleaning – submersion
 - d. Water immersion rinse combo
 - e. Water immersion rinse clean
 - f. Acid immersion
 - g. Neutralizing rinse
 - h. Water immersion rinse clean
 - i. Conditioner immersion
 - j. Zinc phosphate immersion
 - k. Rinse immersion

- l. Sealer immersion
 - m. Water reverse osmosis rinse immersion
- C. Epoxy E-coat Primer: All pickled and pretreated frames and accessories are immersed into an electrostatic (E-coat) bath of PPG epoxy primer to ensure all substrates are encapsulated evenly and completely. Use of spray primers only will not be an acceptable alternative to this process due to benefits from additional cleaning and frame submersion.
1. Permeate spray
 2. Permeate rinse
 3. Epoxy primer immersion and electrostatic encapsulation
 4. Water reverse osmosis rinse
 5. Oven-cure, 45 minutes at 350 deg F
- D. Epoxy Powder Primer: Following pre-treatments and E-coat system, all frames and accessories shall receive an abrasion resistant powder coating prior to final top-coat.
1. Powder is applied electrostatically over cured E-coat to a dry film thickness (DFT) of 2.0-3.0 mils.
 2. Parts oven baked at 325 deg F to completely cure prior to final top coat.
 3. Powder coat is intended as an intermediate finish applied prior to the final finish top coat.
- E. Polyurethane Top Coat: Following all pre-treatments, e-coat and powder abrasion layer, all products shall receive manufacturer's recommended polyurethane finish with touch-up capability, low chalking and fading characteristics, unlimited color matching, and 70,000+ standard colors, including metallics.
- F. Quality Assurance:
1. Combined overall dry film thickness shall be a minimum of 7.1 mils (coastal locations).
 2. Overall process shall provide full documented compliance with the following criteria:
 - a. Acid Pickling, per SSPC SP-8
 - b. Paint Blistering Test, per ASTM D714
 - c. Humidity Test, per ASTM D4585
 - d. Painted Products in Corrosive Environment, per ASTM D1654
 - e. Salt Spray (Fog) Test, per ASTM B117
 - f. Cyclic Fog/ Dry Test (Prohesion), per ASTM G85
 - g. Salt Fog/ UV Painted Metal, per ASTM D5894
 - h. Pull Off Strength of Coating Test, per ASTM D4541

PART 3 - EXECUTION

3.01 INSPECTION

- A. Window openings shall conform to details, dimensions and tolerances shown on the window manufacturers approved shop drawings.
- B. Conditions which may adversely affect the window installation must be corrected before installation commences.

- C. The wash down of the adjacent masonry or surrounding substrate must be completed before erection commences to prevent damage to the finish by the cleaning materials.

3.02 INSTALLATION

- A. Windows specified under this section shall be installed by experienced personnel.
- B. Install windows in openings in strict accordance with approved shop drawings.
 - 1. Set units plumb, level and true to line, without warp or rack of frames.
 - 2. Anchor units securely to surrounding construction with approved fasteners.
 - 3. The exterior joints between the windows, trim and mullions shall be properly sealed watertight with an approved sealant and neatly pointed.
- C. Attach loose muntin grids per approved shop drawings, if applicable.
- D. Repair any abraded areas of the factory finish.

3.03 CLEANING

- A. Window installer shall leave window surfaces clean after installation and ready to receive glass and glazing. The window installer will not be responsible for final cleaning.

END OF SECTION

SECTION 085659
SERVICE AND TELLER WINDOW UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Service and teller window units.
- B. Pass drawer/devices.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611 -- Voluntary Specification for Anodized Architectural Aluminum.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123/A123M -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM B221 -- Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 3. ASTM B221M -- Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- D. The Society for Protective Coatings (SSPC):
 - 1. SSPC-Paint 20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 752 - Standard for Bullet-Resisting Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.

- C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience, with ability to provide test reports showing that their standard manufactured products meet the specified requirements.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.
- B. Store units in area protected from exposure to weather and vandalism.

1.08 WARRANTY

- A. For additional warranty requirements, see Section 017800 - Closeout Submittals.
- B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SERVICE AND TELLER WINDOW UNITS

- A. Service/Teller Window with Pass-Thru Device:
 - 1. Location: Interior.
 - 2. Window: Fixed.
 - a. Size: As indicated on drawings.
 - b. Finish: Colored anodized.
 - c. Finish Color: Black.
 - 3. Glazing: Single (monolithic), clear.
 - a. Tempered safety glazing.
 - 4. Pass-Thru Device: Deal tray built into window sill.
 - a. Finish: Stainless Steel.
 - 5. Communication: Standard talk-through portal.
 - 6. Products:
 - a. Quikserv Corp; T1 Series Ticket Window with deal tray: www.quikserv.com.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

- A. Windows: Factory-fabricated, -finished, and -glazed, extruded aluminum frame and glazing stops; complete with hardware and anchors.

1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
 2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
 3. Apply factory finish to all exposed surfaces.
- B. Deal Tray: Integral with stainless steel window base.
- C. Pass-Thru Devices: Stainless steel construction; transfer area automatically locking when in a closed position; manual operation unless otherwise indicated.

2.03 MATERIALS

- A. Aluminum Extrusions: Minimum 0.125 inch (3.2 mm) thick frame and sash material complying with ASTM B221 and ASTM B221M.
1. Anodized Aluminum Surfaces: Black Architectural Class II, minimum 0.7 mils (0.018 mm) medium matte chemical finish, conforming to AAMA 611.
- B. Stainless Steel: Type 304 with No.3 finish.
- C. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to thickness Grade 85, 2.0 ounces per square foot (610 gm/sq m).
1. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
- D. Monolithic Glass: Fully tempered float glass; minimum 1/4 inch (6.35 mm) thickness.

2.04 ACCESSORIES

- A. Speak-Thru Portal: Heavy duty, non-electric, stainless steel unit; UL 752 ___ bullet resistant.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.
- C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install units in correct orientation (inside/outside or secure/non-secure).
- C. Anchor units securely in manner so as to achieve performance specified.
- D. Seal perimeter joints as specified in Section 079005 - Joint Sealers.

3.03 CLEANING AND PROTECTION

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

- C. Remove and replace defective work.
- D. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION

SECTION 08 57 00

ALUMINUM DOORS

1.1 SECTION INCLUDES

- A. Swing Doors: Impact-resistant aluminum swing doors, frames, sidelites, transoms, and structural mullions, including aluminum extrusions, finish, glass, door hardware, water-barrier thresholds, and weather strips, for high velocity hurricane zone (HVHZ) construction.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 91 26 - Joint Fillers.
- C. Section 08 80 00 - Glazing.

1.3 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 701/702: Pile weatherstripping and replaceable weatherseals.
 - 2. AAMA 2603: Organic coatings on aluminum.
 - 3. AAMA 2605: High-performance organic coatings on aluminum.
- B. American Society of Civil Engineers
 - 1. ASCE 7: Minimum Design Loads for Buildings and other Structures.
- C. American Society for Testing and Materials:
 - 1. ASTM B 221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. ASTM E 283: Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 3. ASTM E 330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - 4. ASTM E 331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- D. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP TAS-201 -- Impact Test Procedures.
 - b. FBC-TP TAS-202 -- Criteria for Testing Impact and Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
 - c. FBC-TP TAS-203 -- Criteria for Testing Products Subject to Cyclic Wind

Pressure Loading.

1.4 PERFORMANCE REQUIREMENTS

- A. Impact-Resistant Aluminum Door Performance:
 - 1. Structural Test: ASTM E 330.
 - 2. Water Infiltration Resistance: ASTM ES47/E 331 and FBC TAS 202.
 - 3. Air Infiltration Resistance: ASTM E 283.
 - 4. Windborne Debris Impact Resistance: Pass large missile impact tests; Florida Building Code, FBC TAS 201.
 - 5. Hurricane Wind Pressure Resistance: After passing large missile impact test, pass cyclic pressure tests following FBC TAS 203.

1.5 SUBMITTALS

- A. Shop Drawings: Refer to Section 013000 - Administrative Requirements for complete submittal procedures. Indicate elevations, locations, markings, quantities, material, head jamb and sill conditions, metal thickness, sizes, shapes, dimensions, finishes and wind pressures.
- B. Product Data: Provide detailed data on Manufacturers catalog data on each product to be used, including Miami Dade County Product Approval (NOA).
- C. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Not less than 10 years of experience in manufacturing impact-resistant aluminum windows and doors.
- B. Installer Qualifications: Skilled and experienced to install manufacturer's units of the types specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging in a clean, dry area until ready for installation.
- B. Protect exposed metal and glass surfaces to prevent damage to finish.

1.8 WARRANTIES

- A. Warranty Period: Contact CGI Windows and Doors, Inc. for details on 10 year limited warranty.
 - 1. Structural, Hardware and Certain Finishes: 10 years.
 - 2. Stress Cracks on Glass: 1 year.
 - 3. Delamination on Laminated Glass Units: 5 years.
 - 4. Insulated Glass (sealed component): 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: CGI Windows and Doors, Inc. , 10100 N. W. 25th St. ; Miami, FL 33172; Toll Free Tel: 800-442-9042 ; Tel: 305-593-6590; Fax: 305-593-6592; Email:ocordova@cgiwindows.com; www.cgiwindows.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SWING DOORS (SENTINEL)

- A. Swing Doors: "Sentinel" Series 450 SN Doors by CGI Windows and Doors, Inc.
- B. Swing Door Design:
 - 1. Out-swing configuration.
 - 2. 2 inches (51 mm) thick (nominal) door panels.
 - 3. Complete frame, threshold and weatherstripping.
 - 4. Extruded snap-on square glazing bead profile (contemporary).
 - 5. Extruded astragal adaptor.
 - 6. Muntins: Semi-contoured (exterior only) 1 inch (25 mm) double applied muntins.
- C. Performance Requirements:
 - 1. Outswing Doors: Max. 3 ft x 8 ft panel.
 - a. 100 psf Positive and Negative with annealed/annealed glass.
 - b. 100 psf Positive and 110 psf Negative with heat strengthened glass.
- D. Air Infiltration Resistance:
 - 1. Outswing Doors: No more than 0.07 cfm/sqft of glass area at static air pressure difference of 6.24 psf.
- E. Water Infiltration Resistance:
 - 1. Outswing Doors: No water penetration at a static air pressure differential of 15 percent of positive design pressure with a maximum tested performance of 15 psf.
- F. Construction: Heavyweight extruded aluminum sections for wet glazing, precision cut and assembled with sealant filled hairline joints and no visible screws. Provide grooves in extrusions to receive 3 lines of weather stripping where doors abut frames.
 - 1. Member Wall Thickness: 0.125 inch (3.2 mm) minimum; 0.150 inch (3.8 mm) at hardware mounting locations.
 - 2. Member Sizes: Widths including glazing beads.
 - a. Top Rails and Stiles: 1.918 inches (48.7 mm) thick by 5.5 inches (157 mm).
 - b. Bottom Rails: 1.918 inches (48.7 mm) thick by 8 inches (203 mm).

3. Sightlines:
 - a. Top Rails: 6.25 inches (15.88 cm).
 - b. Jambs: 6.75 inches (17.146 cm).
 - c. Sills: 8 inches (20.32 cm).
4. Door Corner Construction: Assemble using two 3/8 inch (8.9 mm) threaded compression rods in rails, secured at each end with washers and hex nuts.
5. Glazing Beads: Snap-in design, for interior wet glazing, 0.060 inch (1.5 mm) wall thickness, with at least 0.50 inch (12.7 mm) glass bite for impact-resistant glazing.
6. Finishes: Uniform at all visible surfaces exterior and interior.
7. Factory Glazing:
 - a. Laminated Impact Resistant Glass Units: 7/16 inch (11 mm) thick (nominal) Saflex PVB laminated consisting of clear, non-yellowing, non-crazing interlayer sandwiched between two panes of glass
 - 1) Outer And Inner Panes Of Laminated Unit: 3/16 inch (4.8 mm).
 - a) Type: Heat strengthened.
 - b) Tint in Outer Panes: Green (Solexia).
 - c) Interlayer: 0.090 inch / 90 mil (2.2 mm) film.
 - d) Interlayer Opacity: Clear - standard.
 - e) Low E and high performance glass coatings as indicated on Drawings.

2.3 FINISHES

- A. AAMA 2605 Kynar Finish: Pretreatment plus 2 coat, 70 percent polyvinylidene fluoride (PVDF) coating, or manufacturer approved equal.
 1. Color: As selected by Architect.

PART 3 EXECUTION

3.1 PREPARATION

- A. Before start of unit installation, check openings for adequacy of pressure preservative treated wood blocking that will receive frames. Check the size, quantity, spacing, clearances, and rigidity of fastenings and their conformance to the specified NOA.

3.2 PREPARATION

- A. Coordinate with Section 06 10 00 - Rough Carpentry
 1. 3/4 inch (19 mm) or 1-1/2 inch (38.1 mm) as per specified NOA rectangular or beveled pressure preservative treated South Yellow Pine blocking, set in a full bed of sealant.
 2. Fasten with to structure with drilled concrete fasteners spaced as required in NOA, so that blocking is continuous and is tightly butted to fill corners of each opening.
- B. Coordinate with Section 07 91 26 - Joint Fillers
 1. Sealant at exterior perimeter of aluminum frames, in deeply grooved stucco or

- in 1/4 inch (6 mm) gaps where other exterior finish materials terminate next to frames.
- 2. Sealant in 1/8 inch (3.2 mm) gap at frame interior perimeters where sills and interior finish materials such as gypsum board and tile terminate next to frames.
- C. Perform cutting, fitting, forming, drilling, and grinding of frames, without damage to finish, as needed to fit project conditions and make watertight. Replace components with damage to exposed finishes.

3.3 WINDOW INSTALLATION

- A. Install windows following manufacturer's instructions.
- B. Attach window frame and shims to perimeter blocking at openings to accommodate construction tolerances and other irregularities. Maintain integrity of air barriers and vapor retarder sheets.
- C. Align windows plumb and level, free of warp or twist.
- D. Adjust vents to close snugly and put in smooth operating order.

3.4 DOOR INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions, requirements of NOA for hurricane and impact-resistant construction, and approved shop drawings.
- B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations, requirements of governing NOA, and within specified tolerances.
- C. Where aluminum surfaces contact alkaline substrates such as concrete or mortar, and metals other than stainless steel or zinc, protect from direct contact by painting reactive substrate and dissimilar metals with a heavy coating of bituminous paint in the field.
- D. Hang doors and adjust hardware to achieve specified clearances and proper door operation.
- E. Demonstrate doors and hardware are in good working order.

3.5 CLEANING

- A. Refer to manufacturer's instructions for proper cleaning and maintenance of the products.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
1. Door hardware for steel (hollow metal) doors.
 2. Door hardware for aluminum doors.
 3. Door hardware for wood doors.
 4. Door hardware for other doors indicated.
 5. Keyed cylinders as indicated.
- B. Related Sections:
1. Section 061000 - Rough Carpentry.
 2. Division 8: Aluminum Doors and Frames
 3. Division 8: Hollow Metal Doors and Frames.
 4. Division 8: Wood Doors.
 5. Division 26 - Electrical
 6. Division 28 - Electronic Security
- C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
1. Builders Hardware Manufacturing Association (BHMA)
 2. NFPA 101 - Life Safety Code
 3. NFPA 80 - Fire Doors and Windows
 4. ANSI-A156.xx - Various Performance Standards for Finish Hardware
 5. UL10C - Positive Pressure Fire Test of Door Assemblies
 6. ANSI-A117.1 - Accessible and Usable Buildings and Facilities
 7. DHI /ANSI A115.IG - Installation Guide for Doors and Hardware
 8. Florida Building Codes for Hurricane (NOA) for exterior openings.
- D. Intent of Hardware Groups
1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids

for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

E. Allowances

1. Refer to Division 1 for allowance amount and procedures.

F. Alternates

1. Refer to Division 1 for Alternates and procedures.

1.2 SUBSTITUTIONS:

- A. Comply with Division 1.

1.3 SUBMITTALS:

- A. Comply with Division 1.

- B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

- C. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

- D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.

1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

- E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
 - 1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
- F. Samples: (If requested by the Architect)
 - 1. 1 sample of Lever and Rose/Escutcheon design, (pair).
 - 2. 3 samples of metal finishes
- G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
 - 1. Operating and maintenance manuals: Submit 3 sets containing the following.
 - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - 2. Copy of final hardware schedule, edited to reflect, "As installed".
 - 3. Copy of final keying schedule
 - 4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
 - 5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.4 QUALITY ASSURANCE

- A. Comply with Division 1.
 - 1. Exterior Openings Severe Windstorm Components testing: Listed and labeled by a testing and inspecting agency acceptable to authority having jurisdiction, based on testing according to ANSI A250.13. Further compliance with Florida Building Codes for Hurricane (NOA) for Exterior Openings.
 - 2. Statement of qualification for distributor and installers.
 - 3. Statement of compliance with regulatory requirements and single source responsibility.
 - 4. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
 - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.

- b. Hardware Schedule shall be prepared and signed by an AHC.
 - 5. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
 - 6. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
 - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
 - b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
 - 7. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.
 - B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Packing and Shipping: Comply with Division 1.
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Package hardware to prevent damage during transit and storage.
 - 3. Mark hardware to correspond with "reviewed hardware schedule".
 - 4. Deliver hardware to door and frame manufacturer upon request.
 - B. Storage and Protection: Comply with manufacturer's recommendations.
- 1.6 PROJECT CONDITIONS:
- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
 - B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.
- 1.7 WARRANTY:
- A. Refer to Conditions of the Contract
 - B. Manufacturer's Warranty:

1. Closers: Ten years
2. Exit Devices: Three Years
3. Locksets & Cylinders: Three years
4. All other Hardware: Two years.

1.8 OWNER’S INSTRUCTION:

- A. Instruct Owner’s personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.

1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner’s requirements for delivery, storage and protection of extra service materials.

- B. Maintenance Service: Submit for Owner’s consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Stanley	Bommer,
Locksets	Best	Sargent, Schlage
Cylinders	Best Patented Cormax	Schlage, Sargent
Exit Devices	Precision	Von Duprin, Sargent
Narrow Stile Fire Rated	Dorma	Von Duprin
Closers	Stanley Commercial	LCN 4040XP, Norton 7500
Push/Pull Plates	Trimco	Don-Jo, Burns
Push/Pull Bars	Trimco	Don-Jo, Burns
Protection Plates	Trimco	Don-Jo, Burns
Overhead Stops	ABH	Don-Jo
Door Stops	Trimco	Don-Jo, Burns
Flush Bolts	Trimco	Don-Jo, Burns
Coordinator & Brackets	Trimco	ABH, Rockwood
Threshold & Gasketing	Reese	Zero

2.2 MATERIALS:

A. Hinges: Shall be Five Knuckle Ball bearing hinges

1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.
6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door
11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.

B. Electrified Functions for Hinges: Comply with the following:

1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle. Provide wire quantity and sizes required for electric hardware be served.
2. Monitoring: Concealed electrical monitoring switch.
3. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

C. Mortise Type Locks and Latches:

1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended

9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
 10. Provide sufficient curved strike lip to protect door trim
 11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
 12. Lock shall have self-aligning, thru-bolted trim
 13. Levers to operate a roller bearing spindle hub mechanism
 14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
 15. Spindle to be designed to prevent forced entry from attacking of lever
 16. Provide locksets with 7-pin removable and interchangeable core cylinders
 17. Each lever to have independent spring mechanism controlling it
 18. Core face must be the same finish as the lockset.
- D. Electronic Operated IDH Mortise Locks includes door position indicator and RQE switch.
- E. Exit Devices:
1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
 2. Exit devices to be tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 9 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
 3. Exit devices chassis to be investment cast steel, zinc dichromate.
 4. Exit devices to have stainless steel deadlocking $\frac{3}{4}$ " through latch bolt.
 5. Exit devices to be equipped with sound dampening on touchbar.
 6. Non-fire rated exit devices to have cylinder dogging.
 7. Non-fire rated exit devices to have $\frac{1}{4}$ " minimum turn hex key dogging.
 8. Touchpad to be "T" style constructed of architectural metal with matching metal end caps.
 9. Touchbar assembly on wide style exit devices to have a $\frac{1}{4}$ " clearance to allow for vision frames.
 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
 11. Provide strikes as required by application.
 12. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
 13. Exit device to be heavy investment cast stainless steel with black powder coated finish.
 14. Exit devices to have field reversible handing.
 15. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latchsets.
 16. Provide 9001-Quality Management and 14001-Environmental Management.

17. Vertical Latch Assemblies to have gravity operation, no springs.
18. Approved Manufacturers
 - a. The following manufacturers will be approved contingent on meeting or exceeding the above performance criteria:
 - 1) Precision Manufactured by Stanley Security Solutions

F. Cylinders:

1. Provide the necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
3. Coordinate and provide as required for related sections.

G. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

H. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.

1. Wall stop and floor stop shall be wrought bronze, brass or stainless steel.
2. Provide fastener suitable for wall construction.
3. Coordinate reinforcement of walls where wall stop is specified.
4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered

I. Over Head Stops: Provide a Surface mounted or concealed overhead when a floor or wall stop cannot be used or when listed in the hardware set.

1. Concealed overhead stops shall be heavy duty bronze or stainless steel.
2. Surface overhead stops shall be heavy duty bronze or stainless steel.

J. Push Plates: Provide with four beveled edges ANSI J301, .050 thickness, size as indicated in hardware set. Furnish oval-head countersunk screws to match finish.

- K. Pulls with plates: Provide with four beveled edges ANSI J301, .050 thickness Plates with ANSI J401 Pull as listed in hardware set. Provide proper fasteners for door construction.
- L. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
- M. Door Bolts: Flush bolts for wood or metal doors.
1. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 25 for hollow metal label doors.
 2. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 27 at wood label doors.
 3. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
 4. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.
- N. Coordinator and Brackets: Provide a surface mounted coordinator when automatic bolts are used in the hardware set.
1. Coordinator, Certified ANSI/BHMA A1156.3 Type 21A for full width of the opening.
 2. Provide mounting brackets for soffit applied hardware.
 3. Provide hardware preparation (cutouts) for latches as necessary.
- O. Quick Connect Power Transfer: Power transfer device shall be a steel housing and flexible tube. Secure and inconspicuous channel is to bring power from the frame to the door.
1. Precision EPT-12C
 2. Tube shall contain 12 Wire bundle with Stanley Quick Connect Connectors one 4 wire connector consisting of two 18AWG wires and 2 24AWG wires and one 8 wire connector with 8 24AWG wires.
- P. Power Supply: UL Listed, Field Selectable 12VDC or 24VDC output. The power supply will specifically designed to support electric locks and access controls. The power supply uses 115 VAC at 800mA input. The power shall be able to be expanded to four station controls. The filtered and regulated output power is field selectable for 12 or 24 VDC.
1. Fire Alarm/Life Safety emergency release included in power supply.
 2. Available options for multiple door options four or more control stations, Adjustable Time delay relay, Battery charging, Battery Back up.
- Q. Electric Door Strike: Certified by ANSI/BHMA 156.31, Grade 1. and listed for Burglary Protection ANSI/ UL1034 Grade 1.

1. For General use provide fail-secure electric strike and with fire-rated device.
 2. Listed UL10C for Fire Door assemblies
 3. Latchbolt monitor switch option when specified in hardware sets.
 4. Provide the electric strike in the appropriate model that will accept a 5/8" or 3/4" latchbolt.
- R. Door Position Switch: Provide door position switch for door status monitoring as indicated in hardware sets.
1. At all fired rated doors the door and frames, position switch preparation will be provided by the door and frame manufacturer or by an authorized label service agent.
- S. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- T. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
 2. UL10C Positive Pressure rated seal set when required.
- U. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
 2. UL10C Positive Pressure rated seal set when required.
- V. Thresholds: Thresholds shall be aluminum beveled type with maximum height of 1/2" for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
- W. Provide one wall mounted Telkee, Lund or MMF series key cabinet complete with hooks, index and tags to accommodate 150% expansion. Coordinate mounting location with architect.
- X. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

2.3 FINISH:

- A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

- B. Powder coat door closers to match other hardware, unless otherwise noted.
- C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.4 KEYS AND KEYING:

- A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
- B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin.
- C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
- D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
- E. Furnish keys in the following quantities:
 - 1. 1 each Grand Masterkeys
 - 2. 4 each Masterkeys
 - 3. 2 each Change keys each keyed core
 - 4. 15 each Construction masterkeys
 - 5. 1 each Control keys
- F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
- G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Conform to local governing agency security ordinance.
- C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

- A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
 1. Check and adjust closers to ensure proper operation.
 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
 - a. Verify levers are free from binding.
 - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

Manufacturer List

<u>Code</u>	<u>Name</u>
AB	ABH Manufacturing Inc.
BE	Best Access Systems
BY	By Others
DM	Dorma Door Controls
DY	DynaLock Corp.
PR	Precision
RS	Reese Enterprises Inc.
SE	Securitech
SH	Stanley Commercial Hardware
ST	Stanley
TR	Trimco

Finish List

<u>Code</u>	<u>Description</u>
GR	Grey
PC	Prime Coat
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull

Option List

	<u>Code</u>	<u>Description</u>
HING	54	CONCEALED WIRES (4) STAINLESS STEEL
	56	CONCEALED WIRES (6)
HING	58	CONCEALED WIRES (8) STAINLESS STEEL
	BF	Barrier Free
	C4	CAM-STANDARD CAM
	CE	CONC. WIRES-USE WITH 18,54,56,58 SUFFIX
	ES	ELECTRIC LATCH RETRACTION
	RP	RINGS-RIM CYLINDER
	B4E	BEVELED 4 EDGES - KICK PLATES
	IDH	Integrated Dr. Hardware (45HW,47HW)

HINGE	LBR	LESS BOTTOM ROD
	NRP	NON REMOVEABLE PIN STD/HEAVY WT
	RP3	RINGS-7 PIN MORTISE
	VIN	Visual Indicator
PLATES	LM/MS	LATCH & TOUCHBAR MONITOR
	C-SUNK HOLES	COUNTER SINKING OF KICK and MOP

NOTE: Exterior doors are to be equipped with hardware that is in compliance with the projects building requirements for Windstorm and hurricane, ICC500 and or FEMA361. Hardware for these openings is to be determined based on the Security provider's requirements and the approved tested hardware for the doors being supplied to meet the wind loads and the large missile impact requirements. Coordinate all requirements with the architect, Door provider and Security Provider before providing the hardware.

Hardware Sets

SET #1

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #2

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #3

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #4

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE

1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #5

4 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #6

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

NOTE: Card Reader where shown. See specifications.

SET #7 - VDS CONTRAFLAM 60 Door

4 Hinges	FBB168 4 1/2 X 4 1/2 NRP	US26D	ST
1 Exit Device	F9700BB x ZC03R ES LM/MS	630	DM
1 Rim Cylinder	12E-72 PATD RP	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
1 Card Reader	By Security Provider		BY
1 Drop Plate	8Q00469	689	SH
1 Power Transfer	EPT-12C		PR
1 Power Supply	PS501		DM
1 Conc. Door Position Switch	By Security Provider		BY
1 Gasketing	797W		RS

NOTE: Card Reader unlocks the electric exit device allowing entry, LM/MS switches monitors latch bolt and request to exit. Coordinate electrical requirements with the related trades.

SET #8 - Storefront

4 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
NOTE: Floor Stop 1211 at door 220 and 231 only			
1 Drop Plate	8Q00469 or 8Q00471 as Req.	689	SH

1 Gasketing	By Dr. Mfg.		BY
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SET #9 - Hurricane Compliant

6 Hinges	FBB199 5 X 4 1/2 NRP	US32D	ST
2 Exit Device	CRL Jackson 20 series Panic Bar	630	
2 Cylinder	12E or 1E PATD as Required	626	BE
2 Door Closer	QDC117	689	SH
2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
2 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
2 Meeting Stile Astragals	M35A		RS
2 Door Sweep	323A		RS
1 Threshold	S206A		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards.

NOTE: Install door hardware in strict accordance with Miami-Dade NOA.

SET #10 - Hurricane Compliant

6 Hinges	FBB199 5 X 4 1/2 NRP	US32D	ST
2 Exit Device	Lever Exit Classroom function	630	SE
2 Cylinder	12E or 1E PATD as Required	626	BE
2 Door Closer	QDC117	689	SH
2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
2 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
2 Meeting Stile Astragals	M35A		RS
2 Door Sweep	323A		RS
1 Threshold	S206A		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards.

NOTE: Install door hardware in strict accordance with Miami-Dade NOA.

SET #11

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Pull Plate	1018-3	630	TR
1 Door Closer	QDC111 BF	689	SH
	NOTE: Mount closer on least public view side of door		
1 Push Plate	1001-3	630	TR
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #12

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
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1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

NOTE: Card reader where shown on Door Hardware Schedule.

SET #13

5 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Elect Hinge	CE FBB179 4 1/2 X 4 1/2 56	US26D	ST
1 Set Auto Flush Bolts	3825L X 3815L	626	TR
1 Electro-mech Lock	45HW-7DEU14H PATD IDH	626	BE
1 Coordinator	3094B Series	PC	TR
2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
2 Wall Bumper	1270WV	630	TR
1 Card Reader	By Security Provider		BY
2 Mounting Bracket	3095 or 3096 as Req.	PC	TR
1 Dustproof Strike	3910	630	TR
1 Conc. Door Position Switch	By Security Provider		BY
1 Power Supply	5025	GR	DY
1 Astragal	By Dr. Mfg.		BY
1 Gasketing	797W		RS

NOTE: Card Reader unlocks the electric lock includes the RQE request to exit switch, Door position switch.

SET #14

1 Door Position Switch	By Security Provider		BY
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NOTE: Roll up door all hardware by the door Mfg. Coordinate security and the electrical requirements with the related trades.

SET #15

2 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Elect Hinge	CE FBB179 4 1/2 X 4 1/2 56	US26D	ST
1 Electro-mech Lock	45HW-7DEU14H PATD IDH	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Floor Stop	1211	626	TR
1 Card Reader	By Security Provider		BY
1 Conc. Door Position Switch	By Security Provider		BY
1 Power Supply	5025	GR	DY
3 Door Silencers	1229A		TR

NOTE: Card Reader unlocks the electric lock and the RQE request to exit switch

SET #16

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Privacy Set	45H-0L14H VIN	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #17

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Door Closer	QDC111	689	SH
NOTE: Mount Closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
1 Gasketing	797W		RS
NOTE: Card reader where shown. See specifications.			

SET #18

3 Hinges	FBB168 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Door Closer	QDC111	689	SH
NOTE: Mount Closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
1 Gasketing	797W		RS

NOTE: UL 'C' Label rated door.

SET #19

3 Hinges	FBB168 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Floor Stop	1211	626	TR
1 Sound Gasketing	33C 1 x 42" 2 x 84"		RS
1 Auto Door Bottom	370A 42"		RS

SET #20

6 Hinges	FBB168 4 1/2 X 4 1/2 NRP	US26D	ST
1 Exit Device	2208 X 4908D LBR	630	PR
1 Exit Device	2201 LBR	630	PR
1 Rim Cylinder	12E-72 PATD RP	626	BE

2 Door Closer	QDC117	689	SH
2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
2 Door Silencers	1229A		TR

SET #21

2 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Elect Hinge	CE FBB179 4 1/2 X 4 1/2 56	US26D	ST
1 Electro-mech Lock	45HW-7DEU14H PATD IDH	626	BE
1 Door Closer	QDC113	689	SH
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Card Reader	By Security Provider		BY
1 Power Supply	5025	GR	DY
3 Door Silencers	1229A		TR

NOTE: Card Reader unlocks the electric lock and the lock includes, RQE request to exit switch, Door monitoring position switch

SET #22 - Storefront

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Passage Set	45H-0N14H	626	BE
1 Door Closer	QDC111 BF	689	SH

NOTE: Mount closer on least public view side of door

1 Floor Stop	1211	626	TR
1 Drop Plate	8Q00469	689	SH
1 Gasketing	By Dr. Mfg.		BY

SET #23

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Door Closer	QDC113	689	SH
1 Gasketing	797W		RS

SET #24 - Storefront

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Floor Stop	1211	626	TR
1 Gasketing	By Dr. Mfg.		BY

SET #25 - Storefront

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Passage Set	45H-0N14H	626	BE
1 Floor Stop	1211	626	TR
1 Gasketing	By Dr. Mfg.		BY

SET #26

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
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1 Passage Set	45H-0N14H	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #27

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Door Closer	QDC111 BF	689	SH
NOTE: Mount closer on least public view side of door			
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #28 - Exterior Fixed Door

4 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
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NOTE: Fixed exterior historic door, Provide hinges only for effect, Door not operable.

SET #29 - Storefront

4 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Floor Stop	1211	626	TR
1 Gasketing	By Dr. Mfg.		BY

SET #30 - Hurricane Compliant

3 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 4 1/2 X 4 1/2 54	US32D	ST
1 Mulp Lock	To be determined	630	SE
NOTE: Mulp Lock with Request to exit switch			
1 Door Closer	QDC117	689	SH
1 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jamb		RS
1 Door Sweep	353A		RS
1 Threshold	S205A 36"		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with Request to exit switch, No exterior trim or cylinder.

NOTE: Provide and install stamped metal sign at interior stating 'NO EXIT'.

SET #31

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #32

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC111	689	SH
NOTE: Mount Closer on least public view side of door			
1 Kick Plate	KO050 10" X 2"LDW B4E C-Sunk	630	TR
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A		TR

SET #33

4 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC113	689	SH
1 Drop Plate (100)	8Q00471	689	SH
1 Gasketing	By Dr. Mfg.		BY

SET #34

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Overhead Stop	4420 Series	US32D	AB
3 Door Silencers	1229A		TR

SET #35

6 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Set Auto Flush Bolts	3825L X 3815L	626	TR
1 Lockset	45H-7D14H PATD	626	BE
1 Coordinator	3094B Series	PC	TR
2 Door Closer	QDC111	689	SH
NOTE: Mount Closer on least public view side of door			
2 Wall Bumper	1270WV	630	TR
2 Mounting Bracket	3095 or 3096 as Req.	PC	TR
1 Dustproof Strike	3910	630	TR
1 Astragal	By Dr. Mfg.		BY
1 Gasketing	797W		RS

NOTE: UL 'C' Label rated door.

SET #36 - Hurricane Compliant +120 -120

3 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Multiple Point Lock	84L44G4HVL F	630	SE
1 Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
1 Door Closer	QDC113	689	SH
1 Weatherstrip	769A @ Head and Jambs		RS

1 Door Sweep	353A		RS
1 Threshold	S205A 36"		RS

NOTE: Door to remain locked from Corridor 229 side of door, Free egress at all times from Chiller side of door

SET #39 - Storefront

4 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Door Closer	QDC111	689	SH
	NOTE: Mount Closer on least public view side of door		
1 Wall Bumper	1270WV	630	TR
1 Drop Plate (100)	8Q00471	689	SH
1 Gasketing	By Dr. Mfg.		BY

SET #40 - Hurricane Compliant

5 Hinges	FBB199 5 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 5 X 4 1/2 54	US32D	ST
	NOTE: Electric hinge on active door		
2 Surface Bolt	3923	630	TR
	NOTE: Mount on inactive leaf		
1 Mulp Lock	To be determined	630	SE
	NOTE: Mulp Lock with Request to exit switch		
2 Door Closer	QDC113	689	SH
2 Conc. Door Position Switch	By Security Provider		BY
1 Astragal	By Dr. Mfg.		BY
1 Weatherstrip	769A @ Head and Jambs		RS
2 Door Sweep	353A		RS
1 Threshold	S206A		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with request to exit Request to exit switch, No exterior trim or cylinder.

SET #41 - Hurricane Compliant

4 Hinges	FBB199 5 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 5 X 4 1/2 58	US32D	ST
	NOTE: Electric hinge on active door		
1 Electric Hinge	CE FBB199 5 X 4 1/2 54	US32D	ST
	NOTE: Electric hinge on inactive door		
2 Exit Device	Panic Bar Exit Device Von Duprin Model WS9927F	630	
	NOTE: Provide Electric trim on active door only, RQE switch on both exit devices		
1 Cylinder	12E or 1E PATD as Required	626	BE
2 Door Closer	QDC117	689	SH

2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
1 Card Reader	By Security Provider		BY
1 Power Supply	As Required to be Determined		DM
2 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
2 Meeting Stile Astragals	M35A		RS
2 Door Sweep	323A		RS
1 Threshold	S206A		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Card Reader unlocks the electric Trim allowing access, RQE request to exit switch signals authorized exiting. Coordinate security and electrical requirements with the related trades.

NOTE: Panic bar as tested is Von Duprin Model WS9927F Surface Vertical Mount Exit Hardware.

SET #42 - Hurricane Compliant

3 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 4 1/2 X 4 1/2 54	US32D	ST
1 Mulp Lock	To Be Determined	630	SE
	NOTE: Mulp Point lock lever with key outside, RQE switch to	exit	
1 Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
1 Door Closer	QDC117	689	SH
1 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
1 Door Sweep	353A		RS
1 Threshold	S205A 36"		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with request to exit Request to exit switch, Lever exterior trim with cylinder.

SET #43 - Hurricane Compliant

2 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 4 1/2 X 4 1/2 54	US32D	ST
1 Exit Device	CRL Jackson 20 series Panic Bar	630	
1 Mulp Lock	To be determined	630	SE
	NOTE: Mulp Lock with Request to exit switch		
1 Door Closer	QDC117	689	SH
1 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
1 Door Sweep	353A		RS
1 Threshold	S205A 36"		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with Request to exit switch, No exterior trim or cylinder.

NOTE: Install door hardware in strict accordance with Miami-Dade NOA.

SET #44 -

2 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Electric Hinge	CE FBB199 4 1/2 X 4 1/2 54	US32D	ST
1 Mulp Lock	To Be Determined	630	SE

NOTE: Mulp Point lock lever with key outside, RQE switch to

exit

1 Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
1 Door Closer	QDC117	689	SH
1 Card Reader	By Security Provider		BY
NOTE: Intrusion Alarm Keypad			
1 Power Supply	To be Determined		DM
1 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
1 Door Sweep	323A		RS
1 Threshold	S205A 36"		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with request to exit Request to exit switch and Electric Trim.

SET #45 - Hurricane Compliant

3 Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1 Exit Device	Lever Exit Classroom function	630	SE
1 Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
1 Door Closer	QDC113	689	SH
1 Conc. Door Position Switch	By Security Provider		BY
1 Weatherstrip	769A @ Head and Jambs		RS
1 Door Sweep	323A		RS
1 Threshold	S205A 36"		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards.

NOTE: UL 'C' Label rated door.

SET #46 - Hurricane Compliant

6 Hinges	FBB199 5 X 4 1/2 NRP	US32D	ST
2 Surface Bolt	3923	630	TR
1 Mulp Lock	To be determined	630	SE

NOTE: Mulp Point lock Lever handle, storeroom function

1	Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
2	Door Closer	QDC113	689	SH
2	Conc. Door Position Switch	By Security Provider		BY
1	Astragal	By Dr. Mfg.		BY
1	Weatherstrip	769A @ Head and Jambs		RS
2	Door Sweep	353A		RS
1	Threshold	S206A		RS

NOTE: Provide Hurricane Compliant hardware sufficient to meet ICC500 and or FEMA 361 windstorm standards. Mulp Lock with lever handle, storeroom function

SET #47 - Gate

1	Exit Device	2103 CD	630	PR
1	Rim Cylinder	12E-72 PATD RP	626	BE
1	Mortise Cylinder	1E-74 PATD C4 RP3	626	BE
1	Door Pull	1117-1	626	TR

NOTE: See detail 2/A19.3 for additional hardware required.

NOTE: Ornamental Gate mounting boxes needed for hardware must be provided by gate manufacturer.

OPENING LIST

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>
100A	9	
101	8	
102	3	
103	5	
104	4	
105	6	
106	3	
107	15	
107A	17	
108	16	
109	16	
110	10	
110A	9	
111	11	
112	11	
113	12	
114	13	
114A	27	
115	41	60

115A	7	60
116	8	
117	2	
117A	4	
118	1	
119	10	
120	3	
121	3	
122	3	
123	34	
124	20	
124A	42	
124B	43	
124C	42	
124D	43	
125	19	
126	18	60
127	45	60
128	44	
129	9	
129A	9	
129B	9	
130	2	
130A	2	
130B	10	
131	3	
132	22	
133	3	
134	17	
135	21	
135A	21	
136	26	
137	47, also SEE 2/A19.3	
138	25	
139	3	
140	3	
141	24	
141A	24	
142	41	
142A	7	
143	47, also SEE 2/A19.3	
144	27	
144A	28	
145	16	
146	16	
147	12	

148	15	
149	3	
150	3	
151	3	
152	10	
154	46	
155	45	
156	9	60
161	14	
162	47, also SEE 2/A19.3	
201	16	
202	16	
203	31	
204	17	
205	33	
205A	32	
205B	30	
206	3	
207	29	
208	29	
209	29	
210	29	
212	31	
213	3	
214	35	60
215	7	60
216	29	
216A	29	
218	35	60
219	29	
220	8	
221	29	
222	29	
223	34	
224	3	
225	29	
226	30	
227	29	
228	3	
229	36	
231	8	
232	29	
233	29	
234	29	
235	30	
236	29	

237	29	
238	6	
239	3	
240	3	
241	27	
242	7	60
243	39	
244	17	60
246	29	
248	35	60
249	17	
250	31	
251	12	
252	3	
254	27	
255	24	
255A	3	
256	25	
257	24	
258	24	
259	8	
259A	30	
260	3	
261	6	
262	24	
263	24	
265	16	
266	16	

END OF SECTION

SECTION 08800
GLASS AND GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Glass and glazing for general and special purpose applications including; coated, float, heat-strengthened, impact resistant, insulating, low emissivity, laminated, spandrel and tempered glass.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers.
- B. Section 081113 - Hollow Metal Doors and Frames.
- C. Section 081416 - Flush Wood Doors.
- C. Section 084313 - Aluminum Framed Storefronts.
- D. Section 085123 - Steel Windows.
- E. Section 085124 - Steel Doors.
- F. Section 085659 - Service and Teller Window Units.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1 -- American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 -- Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM C864 -- Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 2. ASTM C920 -- Standard Specification for Elastomeric Joint Sealants.
 - 3. ASTM C1036 -- Standard Specification for Flat Glass.
 - 4. ASTM C1048 -- Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
 - 5. ASTM C1172 -- Standard Specification for Laminated Architectural Flat Glass.
 - 6. ASTM C1193 -- Standard Guide for Use of Joint Sealants.
 - 7. ASTM C1376 -- Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
 - 8. ASTM E283 -- Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen

9. ASTM E331 -- Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 10. ASTM E546 -- Standard Test Method for Frost Point of Sealed Insulating Glass Units
 11. ASTM E547 -- Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential.
 12. ASTM E576 -- Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
 13. ASTM E1105 -- Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 14. ASTM E1300 -- Standard Practice for Determining Load Resistance of Glass in Buildings.
 15. ASTM E2190 -- Standard Specification for Insulating Glass Unit Performance and Evaluation.
- E. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-EC -- Florida Building Code, Energy Conservation (including 2012 Supplement).
 3. FBC-TP -- Florida Building Code, Test Protocols for HVHZ.
 - a. FBC-TP TAS-201 -- Impact Test Procedures.
 - b. FBC-TP TAS-202 -- Criteria for Testing Impact and Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
 - c. FBC-TP TAS-203 -- Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- F. Glass Association of North America (GANA):
1. GANA (GM) -- GANA Glazing Manual.
 2. GANA (SM) -- FGMA Sealant Manual.
 3. GANA (LGDG) -- Laminated Glazing Reference Manual.
- G. Safety Glass Certification Council (SGCC).
1. SGCC (CPD) -- Certified Products Directory.
- H. Sealed Insulating Glass Manufacturers Association (SIGMA):
1. SIGMA TM-3000 -- Glazing Guidelines for Sealed Insulating Glass Units.
- I. U.S. Code of Federal Regulations (CFR):
1. 16CFR1201 -- Safety Standard for Architectural Glazing Materials.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Exterior Glazing:
1. Design, materials, construction and quality of glass and glazing shall comply with criteria specified in the Contract Documents and applicable requirements of the governing building code, including but not limited to FBC-B CHAPTERS 15, 16 and 24 (including HVHZ provisions), and ASCE 7 CHAPTERS 26 through 31.
 - a. Glass and glazing shall be designed and constructed to sufficiently resist the full pressurization from the wind loads prescribed in FBC-B CHAPTER 16

- (HVHZ) and the concentrated loads that result from hurricane-generated wind-borne debris.
2. Live Load Design Requirements: Refer to Section 081113 - Hollow Metal Doors and Frames and Section 085123 - Steel Windows and Doors.
 3. Wind Load and Missile Impact Testing Requirements: Refer to Section 081113 - Hollow Metal Doors and Frames and Section 085123 - Steel Windows and Doors.
 4. Glass Strength: Analysis shall comply with ASTM E1300.
 5. Energy Conservation Requirements: Exterior glazing shall comply with the following:
 - a. Comply with requirements of FBC-EC, except as follows:
 - (1) Historic Property Exception: The existing building meets the requirements specified in FBC-EC SECTION 101.4.2 for designation as a historic property, and therefore is exempt from compliance with requirements of FBC-EC.
 - b. U-factor: As determined by energy analysis simulation model.
 - c. SHGC: As determined by energy analysis simulation model.
- B. Glass Design and Performance Requirements:
1. Safety Glazing: Except as otherwise indicated, all glazing shall be tested in accordance with 16CFR1201, and shall comply with the test criteria for Category II.
 - a. Identification of Safety Glazing: Shall comply with applicable requirements of FBC-B SECTIONS 2406.3 and 2406.4.
 2. Glazed Panel Safeguard: In glazed openings where safeguard is required per FBC-B SECTION 1618.4, laminated glass meeting the following requirements shall be provided.
 - a. In addition to requirements for safety glazing, laminated glazing shall be tested by an accredited laboratory to satisfy the resistance requirements of FBC-B for wind, live and kinetic energy impact loading conditions.
 - (1) Kinetic energy impact loading shall comply with requirements of FBC-B SECTION 2411.4 and ANSI Z97.1 Class A.
- C. Structural Seal Design Requirements (Structural Glazing):
1. The design stress of the structural silicone shall not exceed 20 psi (138 kPa) for materials having a minimum strength of 100 psi (690 kPa) at the weakest element in the line of stress.
 2. Such design stress shall also provide for a safety factor of not less than 5.0.
 3. Safety factors greater than 5.0 shall be specified by the engineer when required or recommended by the manufacturer.
 4. The silicone structural seal shall have a maximum modulus of elasticity to allow no more than 25 percent movement of the joint width at 20 psi (138 kPa) stress.
 5. In insulating glass units, the secondary silicone seal shall be designed to withstand a minimum of one-half the design negative wind load applicable to the outboard lights.

1.05 SUBMITTALS

A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
 2. Submittals required in this Section shall be coordinated with submittals required in Refer to Refer to Section 081113 - Hollow Metal Doors and Frames and Section 085123 - Steel Windows and Doors, and submittals required by all shall be submitted concurrently.
- B. Product Data:
1. For each type of glass product to be used, provide complete product data including but not limited to structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 2. For each type of glazing compound to be used, provide complete product data including but not limited to chemical, functional, and environmental characteristics, limitations, special application requirements.
 - a. Identify available colors.
 3. For each type of glazing accessory (e.g., setting blocks, spacers) to be used, provide manufacturer's specifications and installation instructions.
 4. Product Approvals: Refer to Section 081113 - Hollow Metal Doors and Frames and Section 085123 - Steel Windows and Doors
- C. Shop Drawings: Show details of each type of glazing system in conjunction with the framing system indicating type of glass, sizes, shapes, glazing material and quantity. Show details indicating glazing material, glazing thickness, bite on the glass and glass edge clearance.
1. Glass Supports: Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, submit detailed shop drawings and analysis for the specific installation prepared by a qualified registered design professional. Coordinate with shop drawings required in related section(s).
- D. Samples:
1. Section Samples:
 - a. Color Charts:
 - (1) Preformed glazing materials.
 - (2) Glazing sealants.
 - (3) PVB Interlayer (for laminated glass assemblies).
 2. Verification Samples: Submit two samples 12 x 12 inch (300 x 300 mm) in size of the following types of glass to be used:
 - a. Laminated glass assemblies.
 - b. Insulated glass unit assemblies.
- E. Pre-construction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates, and for compatibility with glass and other glazing materials.
- F. Reports:
1. Test and Evaluation Reports: Submit compatibility and adhesion test reports from

sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.

2. Glass Fabricator's Shop Drawing Review Reports: Submit Glass Fabricator's Shop Drawing Review indicating compliance with glazing standards established by GANA.
 - a. Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGDG), SIGMA TM-3000, and applicable Product Approval.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years documented experience, and approved by manufacturer.
- C. Labels: Comply with labeling requirements of the governing building code, including but not limited to FBC-B SECTIONS 1523, 1703, 1715, 2403 and 2406.
- D. Manufacturer's Certificates:
 1. For each type of glass to be used, provide the following:
 - a. Manufacturer's certificate of compliance indicating that the product meets or exceeds applicable Glass Design and Performance Requirements.
 - b. Manufacturer's certificate of compliance indicating shading coefficient.
 - c. Manufacturer's certificate of compliance indicating "R" value (when value is specified).
- E. Glass of each type shall be supplied by the same manufacturer

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.08 PROJECT CONDITIONS

- A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field-measured products.
- B. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

- D. All glass panels used in each type of glazing application (e.g., curtain wall, storefront, etc.) shall be of the same thickness; minimum thickness shall meet specified performance requirements.

1.09 WARRANTIES

- A. Tempered Glass Warranty: Provide a written warranty including coverage against manufacturing defects for a period of not less than five (5) years from date of Substantial Completion.
 - 1. Defects include but are not limited to failure due to spontaneous breakage (e.g., breakage as a result of Nickel Sulfide (NiS) inclusions) at a rate exceeding 0.5 percent (5/1000) during the warranty period.
- B. Coated Glass Warranty: Provide a written warranty including coverage against manufacturing defects for a period of not less than ten (10) years from date of Substantial Completion.
 - 1. Defects include but are not limited to peeling, cracking and other indications of deterioration in metallic coating.
- C. Laminated Glass Warranty: Provide a written warranty including coverage against manufacturing defects for a period of not less than five (5) years from date of Substantial Completion.
 - 1. Defects include but are not limited to edge separation, delaminating material obstructing vision through glass and blemishes exceeding those allowed by referenced laminated glass standards.
- D. Insulating Glass Warranty: Provide a written warranty including coverage against manufacturing defects for a period of not less than ten (10) years from date of Substantial Completion.
 - 1. Defects include but are not limited to failure of the hermetic seal. Evidence of failure is the obstruction of vision by dust, moisture or film on interior surfaces of glass.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Manufacturers / Fabricators:
 - 1. Float Glass:
 - a. Basis of Design: PPG Industries, Inc.: www.ppgideascape.com.
 - b. Other Manufacturers: Subject to compliance with Contract requirements (including but not limited to Product Approval), equivalent products by one of the following may be used:
 - (1) AGC Flat Glass North America, Inc: www.na.agc-flatglass.com.
 - (2) Guardian Industries: www.sunguardglass.com.
 - (3) Pilkington North America Inc: www.pilkington.com/na.
 - (4) Viracon, Apogee Enterprises, Inc: www.viracon.com.
 - 2. Laminated Glass:
 - a. AGC Flat Glass North America, Inc: www.na.agc-flatglass.com.
 - b. Cardinal Glass Industries: www.cardinalcorp.com.

- c. Viracon, Apogee Enterprises, Inc: www.viracon.com
 - 3. Sealed Insulating Glass Units: Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
 - 4. Glazing Sealant:
 - a. Dow Corning: www.dowcorning.com.
 - b. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 - 5. Obtain glass and glazing materials from one source for each product indicated. Coatings and finished assemblies, such as insulating units and laminated units, to be manufactured by the same fabricator in order to have a common source of warranty.
- B. Identification and Labeling Requirements: Comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 1703.5 and 2406.3 and the following:
- 1. Each pane of glass shall bear the manufacturer's mark designating the type and thickness of the glass or glazing material.
 - a. With the exception of tempered glazing materials or laminated materials, the identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of FBC-B CHAPTER 2403.
 - b. Safety glazing shall be identified in accordance with FBC-B SECTION 2406.3.
 - 2. Each pane of tempered glass (except tempered spandrel glass) shall be permanently identified by the manufacturer shall be permanently identified with the laminator, overall glass thickness and trade name of the interlayer.
 - a. The identification mark shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.
 - 3. Each pane of laminated glass (except laminated spandrel glass) shall be permanently identified with the laminator, overall glass thickness and trade name of the interlayer.
 - a. The identification mark shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.
 - 4. Each pane of tempered or laminated spandrel glass shall be provided with a removable paper marking by the manufacturer.

2.02 GLASS MATERIALS

- A. General:
- 1. All glass shall float glass complying with ASTM C1036 requirements.
 - 2. Heat-strengthened and tempered glass shall comply with ASTM C1048, and tempered glass shall comply with 16 CFR 1201.
 - 3. Transparent and obscure safety glazing shall conform to ANSI Z97.1.
 - 4. Installed glass shall not be less than Single-Strength B quality, and where edges are

- exposed they shall be seamed or ground.
5. Swinging or sliding doors of glass without a continuous frame shall be of only fully tempered glass not less than 3/8-inch (9.5 mm) in thickness.
 6. The glazing in fixed panels adjacent to paths of egress shall comply with DESIGN AND PERFORMANCE REQUIREMENTS in this Section.
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I (transparent flat), Quality q3 (glazing select); Class 1 (clear) or Class 2 (tinted), as applicable.
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Type I (transparent flat), Quality q3 (glazing select).
 - a. Use horizontal tempering to eliminate tong marks, and install temper direction parallel to floor to minimize visual distortion effect.
- C. Laminated Glass: ASTM C1172, Kind LA (laminated), fabricated from two pieces of float glass laminated together with a clear polyvinyl butyral (PVB) interlayer.
1. Laminated glass shall comply with Glass Design and Performance Requirements for Safety Glazing, Glazed Panel Safeguard, and Glass in Elevator Hoistways.
 2. Fabricate in autoclave with heat, plus pressure, free of foreign substances and air pockets.
 3. Where fully tempered glass is indicated or required, provide glass that has been tempered by the tong-less horizontal method.
- D. Sealed Insulating Glass Units:
1. Sealed Insulating Glass Units shall comply with Glass Design and Performance Requirements for Safety Glazing, Glazed Panel Safeguard, and Energy Conservation.
 2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 3. Edge Spacers: Aluminum, bent and soldered corners.
 4. Edge Seal: Glass to elastomer, with supplementary silicone sealant.
 5. Interpane Space: Purge interpane space with dry hermetic air.

2.03 HEAT STRENGTHENED GLASS

- A. General:
1. Use horizontal tempering to eliminate tong marks, and install temper direction parallel to floor to minimize visual distortion effect.
- B. Glass Type 1CHS - Clear Heat Strengthened Glass: ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
- C. Glass Type 1THS - Tinted Heat Strengthened Glass: ASTM C1048, Kind HS, Condition A, Type I, Class 2, Quality q3.
1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
 2. Tint Color: Emerald green
 - a. Product: "Atlantica" by PPG, or equal.

2.04 FULLY TEMPERED GLASS

- A. General:
 - 1. Use horizontal tempering to eliminate tong marks, and install temper direction parallel to floor to minimize visual distortion effect.
- B. Glass Type 1CFT - Clear Fully Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
 - 1. Thickness: 6 mm (1/4 inch), unless otherwise indicated.
- C. Glass Type 1TFT - Tinted Fully Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 2, Quality q3.
 - 1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
 - 2. Tint Color: Emerald green
 - a. Product: "Atlantica" by PPG, or equal.

2.05 LOW-E COATED GLASS

- A. General:
 - 1. Low Emissivity (Low-E) Coatings: Triple-silver, Magnetic Sputter Vacuum Deposition (MSVD) glass coating designed to provide the best combination of visible light transmittance and solar control, together with clear glass appearance.
 - (1) Product: "Solarban 70XL" by PPG, or equal.
- B. Glass Type 1CHS(E) - Clear Heat-Strengthened Glass with Low-E Coating: Glass Type 1CHS, with Low-E Coating on one surface.
 - 1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
- C. Glass Type 1THS(E) - Tinted Heat-Strengthened Glass with Low-E Coating: Glass Type 1THS, with Low-E Coating on one surface.
 - 1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
- D. Glass Type 1CFT(E) - Clear Fully Tempered Glass with Low-E Coating: Glass Type 1CFT, with Low-E Coating on one surface.
 - 1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).
- E. Glass Type 1TFT(E) - Tinted Fully Tempered Glass with Low-E Coating: Glass Type 1TFT, with Low-E Coating on one surface.
 - 1. Thickness: Thickness as indicated; or if not indicated, provide 6 mm (1/4 inch).

2.06 LAMINATED GLASS ASSEMBLIES

- A. Fabrication:
 - 1. Laminated Glass assemblies shall meet or exceed requirements of ANSI Z97.1 Class A and 16CFR1201 Cat II.
 - 2. Laminated Glass products to be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.
- B. Exterior Laminated Glass Assemblies:
 - 1. Glass Type 2C - Clear Laminated Safety Glass: 9/16 inch thick (nominal) clear laminated glass assembly comprised of the following:
 - a. Inner Ply: Glass Type 1CHS.
 - (1) Thickness: 6 mm (1/4 inch), except as otherwise indicated shall comply with Product Approval.

- b. Interlayer: ASTM C1172, clear, heat and light stable, polyvinyl butyral (PVB) plasticized resin sheeting.
 - c. Outer Ply: Glass Type 1CHS.
 - (1) Thickness: Same as Inner Ply.
2. Glass Type 2T(E) - Tinted Laminated Safety Glass w/ Low-E: 7/16 inch thick (nominal) tinted laminated glass assembly comprised of the following:
- a. Inner Ply: Glass Type 1CHS(E).
 - (1) Thickness: 5 mm (3/16 inch), except as otherwise indicated; shall comply with Product Approval.
 - b. Interlayer: ASTM C1172, clear, heat and light stable, polyvinyl butyral (PVB) plasticized resin sheeting.
 - (1) Thickness: 0.090 inch, except as otherwise indicated; shall comply with Product Approval.
 - c. Outer Ply: Glass Type 1THS(E).
 - (1) Thickness: Same as Inner Ply.
 - d. When incorporated in an IGU, the Low-E coating shall be on No. 4 surface.
- C. Interior Laminated Glass Assemblies:
- 1. Glass Type 2C(1) - Clear Laminated Safety Glass:
 - a. Inner Ply: Glass Type 1CFT.
 - b. Interlayer: ASTM C1172, clear, heat and light stable, polyvinyl butyral (PVB) plasticized resin sheeting; 0.030 inch thickness.
 - c. Outer Ply: Glass Type: 1CFT

2.07 SEALED INSULATING GLASS UNIT (IGU) ASSEMBLIES

A. Fabrication:

- 1. Units shall be certified by the IGCC for compliance with ASTM E2190.
- 2. Overall Thickness Tolerance: The unit overall thickness tolerance shall be -1/16 inch (1.59mm) / +1/32 inch (0.79mm), except as follows:
 - a. Unit constructed with patterned or laminated glass shall be +/-1/16 inch (1.59mm).
- 3. Units shall comply with ASTM E546 and ASTM E576.
- 4. Units shall be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone.
 - a. The minimum thickness of the secondary seal shall be 1/16 inch (1.59mm).
 - b. The target width of the primary seal shall be 5/32 inch (3.97mm).
 - c. There shall be no voids or skips in the primary seal.
 - d. Up to a maximum of 3/32 inch of the air spacer may be visible above the primary polyisobutylene sealant.
 - e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16 inch (1.59mm) by maximum length of 2 inches (51mm) with gaps separated by at least 18 inches (457mm). Continuous contact between the primary seal and the secondary seal is required.
- 5. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.

- B. Glass Type IGU-1 - Tinted Insulated Glass Unit w/ Low-E:
 - 1. Description: 1-1/4 inch (nominal) overall thickness IGU assembly comprised of the following:
 - a. Inner Layer: Glass Type 1CFT; 1/4 inch (nominal) thickness.
 - b. Air Space: 1/2 inch air space, with aluminum spacer.
 - c. Outer Layer: Glass Type 2T(E); 7/16 inch (nominal) thickness
 - d. Low-E coating on No. 4 surface.
 - 2. Performance Requirements:
 - a. Solar Heat Gain Coefficient (SHGC): 0.24.
 - b. Shading Coefficient: 0.28.
 - c. Visible Light Transmittance: 49.3 percent.
 - d. U-Value:
 - (1) Winter, Night-time: 0.28.
 - (2) Summer, Day-time: 0.26.
 - e. Light to Solar Gain (LSG): 2.04.

2.08 GLAZING COMPOUNDS AND ACCESSORIES

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.
- B. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
- C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C864 Option I. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- D. Sealing Tape:
 - 1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
 - 2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
- E. Edge Protection Tape for Laminated Glass: "Scotch Brand Cellopane Tape", manufactured by 3M Company.
- F. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.
- G. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbeted sash without stops.
- H. Glazing Springs and Points: Pure zinc stock, thin, flat, triangular or diamond shaped pieces, 1/4 inch (6 mm) minimum size.

- I. Glazing Gaskets: ASTM C864; compression gaskets, closed cell, neoprene, EPDM or silicone rubber composition designed to provide a water-resistant seal between glass and frame; color to be selected by Architect.
 - 1. Firm dense wedge shape for locking in sash.
 - 2. Soft, closed cell with locking key for sash key.
 - 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- J. Glazing Sealants:
 - 1. Structural Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, uses NT, M, G, A and O, non-staining, non-bleeding, silicone sealant meeting requirements of Product Approval; color to be selected by Architect.
 - 2. Backer Rod: Dow Corning Ethafoam SB polyethelene cord or butyl rubber foam cord.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify that openings for glass and glazing units are of proper size; plumb; square; and level before installation is started.
 - 2. Verify that glazing openings conform to details, dimensions and tolerances indicated on manufacturer's approved shop drawings.
- B. Advise Contractor of conditions that may adversely affect glass and glazing unit installation, prior to commencement of installation.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Verify that wash down of adjacent wall construction (e.g., tilt-up precast concrete) is completed prior to erection of glass and glazing units, to prevent damage to glass and glazing units by cleaning materials.

3.02 PREPARATION

- A. Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA (GM), GANA (SM), IGMA TM-3000, and manufacturer's recommendations.
 - 1. For sealant glazing, prepare glazing surfaces in accordance with GANA (SM).
- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop-fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by pre-construction sealant-substrate testing.

- G. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed.
- H. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with GANA (GM) and GANA (SM), unless specified otherwise.
- B. Glass Cutting: Make cuts clean, only moderately convoluted, with flare or bevel not exceeding 1/8 of glass thickness.
 - 1. Unacceptable defects:
 - a. Impact chips, spalls, or nipped edges.
 - b. Flake chips or shark teeth deeper than 1/4 of glass thickness.
 - c. Serration hackle deeper than 1/8 of glass thickness.
- C. Do not attempt to cut, seam, nip, or abrade glass tempered or heat strengthened.
- D. Remove and replace glass broken, chipped, cracked, abraded, or damaged during construction.
- E. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- F. Set glazing without bending, twisting, or forcing of units.
- G. Do not allow glass to rest on or contact any framing member.
- H. Glaze doors until sealant, glazing compound, or putty has thoroughly set.
- I. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- J. Plastic:
 - 1. Use dry glazing method.
 - 2. Use only neoprene or EPDM gaskets.
- K. Laminated Glass:
 - 1. Tape edges to seal interlayer and protect from glazing sealants.
 - 2. Do not use putty or glazing compounds.

3.04 GLASS SETTING

- A. Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated.
- B. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA (GM), GANA (SM), SIGMA TM-3000, manufacturer's recommendations, and as follows:
 - 1. Glazing methods used for exterior windows, storefronts and storefront entrance doors must conform to applicable Product Approval requirements and installation instructions.

- C. Handle and install glazing materials in accordance with manufacturer's instructions.
- D. Use beads or stops which are furnished with items to be glazed to secure the glass in place.
- E. Verify products are properly installed, connected, and adjusted.
- F. Sheet Glass: Cut and set with the visible lines or waves horizontal.
- G. Sealed Insulating Glass Units:
 1. Do not grind, nip, or cut edges or corners of units after the units have left the factory.
 2. Springing, forcing, or twisting of units during setting will not be permitted.
 3. Handle units so as not to strike frames or other objects.
 4. Installation shall conform to applicable recommendations of IGMA TM-3000.

3.05 REPLACEMENT AND CLEANING

- A. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities, and glass which has been installed improperly shall be removed and replaced with new units.
- B. Remove temporary labels, paint spots, and defacement.
- C. After glass has been inspected and approved, remove labels and wash and polish glass on both faces before the Board's approval of the project.
 1. Comply with glass manufacturer's recommendations for cleaning materials and methods.

3.06 PROTECTION

- A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.07 GLASS & GLAZING SCHEDULE

- A. Exterior:
 1. Vision Lite and Glazing in Hollow Metal Doors and Frames (Section 081113 - Hollow Metal Doors and Frames): Glass Type IGU-2, conforming to window assembly Product Approval.
 2. Glazing in Steel Windows (Section 085123 - Steel Windows): Glass Type IGU-1, conforming to window assembly Product Approval.
 3. Glazing in Steel Doors (Section 085124 - Steel Doors): Glass Type IGU-1, conforming to window assembly Product Approval.
- B. Interior:
 1. Vision Lite in Hollow Metal Doors (Section 081113 - Hollow Metal Doors and Frames): Glass Type ___; shop-glaze per door manufacturer's standard.
 2. Glazing in Hollow Metal Frames (Section 081113 - Hollow Metal Doors and Frames): Glass Type ___; field glaze per demountable partition system manufacturer's installation instructions.
 3. Vision Lite in Wood Doors (Section 081416 - Flush Wood Doors): Glass Type 1CFT; shop-glaze per door manufacturer's standard.

4. Glazing in Aluminum Framed Storefronts (Section 084313 - Aluminum Framed Storefronts): Glass Type 1CFT; field glaze per demountable partition system manufacturer's installation instructions.
5. Glazing in Service/Teller Window (Section 085659 - Service and Teller Window Units): Glass Type 1CFT; shop-glaze per door manufacturer's standard.

END OF SECTION

SECTION 090561

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section applies to all floors indicated to receive the following types of floor coverings:
 - 1. Interior:
 - a. Ceramic tile (porcelain ceramic tile, porcelain mosaic tile).
 - b. Precast terrazzo tile.
 - c. Flexible concrete tile.
 - d. Carpet tile.
 - e. Wood strip and plank flooring.
 - f. Resilient tile.
- B. Preparation of new concrete floor slabs for installation of floor coverings.
- C. Testing of concrete floor slabs for moisture and pH.
- D. Remediation of concrete floor slabs due to unsatisfactory moisture or pH conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 RELATED REQUIREMENTS

- A. Section 017000 - Execution and Closeout Requirements: Cutting and patching requirements.
- B. Section 024100 - Demolition.
- C. Section 033000 - Cast-In-Place Concrete: Concrete slab on grade; elevated concrete slab; concrete topping over precast structural concrete floor.
- D. Section 035400 - Cast Underlayment: Self-leveling cementitious underlayment for applications indicated in the contract documents, or applied as remediation of concrete floor slab due to unsatisfactory surface flatness, levelness or elevation.
- E. Section 093013 - Tiling: Porcelain ceramic tile, porcelain mosaic tile, glazed ceramic tile, ceramic mosaic tile, precast terrazzo tile, and flexible concrete tile floor finishes.
- F. Section 096429 - Wood Strip and Plank Flooring: Wood floor finish.
- G. Section 096500 - Resilient Flooring: Resilient floor finish.
- H. Section 096813 - Tile Carpeting: Tile floor finish.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.

- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C109/C109M -- Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
 - 2. ASTM C472 -- Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
 - 3. ASTM F710 -- Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 4. ASTM F1869 -- Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 5. ASTM F2170 -- Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- C. Resilient Floor Covering Institute (RFCI):
 - 1. RFCI (RWP) -- Recommended Work Practices for Removal of Resilient Floor Coverings.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data:
 - 1. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - a. Moisture and pH limits and test methods.
 - b. Manufacturer's required bond/compatibility test procedure.
 - 2. Remedial Materials Product Literature: Manufacturer's published data on each product to be used for remediation.
 - a. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - b. Manufacturer's installation instructions.
- C. Testing Agency's Report: Include:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and pH test reports.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.
 - 6. Submit report not more than two business days after conclusion of testing.
- D. Adhesive Bond and Compatibility Test Report(s).
- E. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

- A. Moisture and pH testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Contractor may perform adhesive and bond test with his own personnel or hire a testing

agency.

- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 - 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
 - 1. Provide access for and cooperate with testing agency.
 - 2. Confirm date of start of testing at least 10 days prior to actual start.
 - 3. Allow at least 4 business days on site for testing agency activities.
 - 4. Achieve and maintain specified ambient conditions.
 - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- E. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating: Coating intended by its manufacturer to resist water vapor

transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment or with only the addition of a skim coat of patching compound or adhesive.

D. Cementitious Underlayment: Refer to Section 030505 - Cast Underlayment.

PART 3 - EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
1. Preliminary cleaning.
 2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
 3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 4. Acidity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 5. Specified remediation, if required.
 6. Patching, smoothing, and leveling, as required.
 7. Other preparation specified.
 8. Adhesive bond and compatibility test.
 9. Protection.
- B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
 3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.03 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.
- F. Report: Report the information required by the test method.

3.04 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A, and as follows.
 - 1. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
 - 2. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
 - 3. Report: Report the information required by the test method.

3.05 ACIDITY (pH) TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
- C. Use a wide range pH paper, its associated chart, and distilled or deionized water.
- D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.06 PREPARATION - GENERAL

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.

3.09 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Non-structural metal framing.
- B. Gypsum board.
- C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 042000 - Unit Masonry Assemblies: Substrate for furring.
- B. Section 054000 - Cold-Formed Metal Framing: Structural stud framing, including stud framing for exterior walls.
- C. Section 061000 - Rough Carpentry.
- D. Section 072100 - Thermal Insulation.
- E. Section 078400 - Firestopping: Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies.
- F. Section 079005 - Joint Sealers: Caulking of joints between gypsum board and other materials.
- G. Section 093013 - Tiling.
- H. Section 096500 - Resilient Flooring: Attachment of wall base to gypsum board.
- I. Section 099000 - Painting and Coating: Field application of paint on:
 - 1. Exposed surfaces of work included in this Section, including but not limited to gypsum board wall, ceiling, soffit and bulkhead assemblies.
 - 2. Concealed surfaces of fire-rated gypsum board assemblies, per requirements of specified UL Design Assembly.
- J. Division 16 - Electrical: Electrical outlets, cover plates, junction boxes and other electrical devices, to be mounted or installed in drywall partitions.
- K. Division 26 - Electrical: (NOTE: Where Division 26 - Electrical is indicated, refer instead to Division 16 - Electrical).

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Iron and Steel Institute (AISI):
 - 1. AISI SG02-1 -- North American Specification for the Design of Cold-Formed Steel Structural Members; 2001 with 2004 supplement (replaced AISI SG-971).
 - 2. AISI S200 -- North American Standard for Cold-Formed Steel Framing, General

Provisions.

3. AISI S202 -- Code of Standard Practice for Cold-Formed Steel Structural Framing.
- C. American National Standards Institute (ANSI):
1. ANSI A108.11 -- American National Standard for Interior Installation of Cementitious Backer Units.
 2. ANSI A118.9 -- American National Standard Specifications for Cementitious Backer Units.
- D. American Society for Testing and Materials (ASTM):
1. ASTM A525 -- Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 2. ASTM A641 -- Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 3. ASTM A653/A653M -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 4. ASTM C36/C36M -- Standard Specification for Gypsum Wallboard. (Withdrawn; Replaced by ASTM C1396/C1396M-11).
 5. ASTM C423 -- Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 6. ASTM C442 -- Standard Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.
 7. ASTM C473 -- Standard Test Methods for Physical Testing of Gypsum Panel Products.
 8. ASTM C475/C475M -- Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 9. ASTM C645 -- Standard Specification for Nonstructural Steel Framing Members.
 10. ASTM C665 -- Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 11. ASTM C754 -- Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 12. ASTM C834 -- Standard Specification for Latex Sealants.
 13. ASTM C840 -- Standard Specification for Application and Finishing of Gypsum Board.
 14. ASTM C919 -- Standard Practice for Use of Sealants in Acoustical Applications.
 15. 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.
 16. ASTM C1002 -- Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 17. ASTM C1047 -- Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
 18. ASTM C1278/C1278M -- Standard Specification for Fiber-Reinforced Gypsum Panel.
 19. ASTM C1325 -- Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.

20. ASTM C1395 -- (Refer to ASTM C1396/C1396M).
 21. ASTM C1396/C1396M -- Standard Specification for Gypsum Board.
 22. ASTM D638 -- Standard Test Method for Tensile Properties of Plastics.
 23. ASTM D790 -- Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 24. ASTM D3273 -- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 25. ASTM D3678 -- Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Interior-Profile Extrusions.
 26. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 27. ASTM E90 -- Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 28. ASTM E119 -- Standard Test Methods for Fire Tests of Building Construction and Materials.
 29. ASTM E413 -- Classification for Rating Sound Insulation.
- E. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- F. Gypsum Association (GA):
1. GA-214 -- Recommended Levels of Gypsum Board Finish.
 2. GA-216 -- Application and Finishing of Gypsum Board.
 3. GA-226 -- Application of Gypsum Board to Form Curved Surfaces.
 4. GA-600 -- Fire Resistance Design Manual.
- G. International Code Council, Inc. (ICC):
1. ICC Evaluation Service, Inc. (ICC-ES):
 - a. ICC-ES AC38 -- Acceptance Criteria for Water-Resistive Barriers.
- H. National Fire Protection Association (NFPA):
1. NFPA 251 -- Standard Methods of Test of Fire Endurance Building Construction and Materials.
- I. Steel Framing Industry Association (SFIA):
1. SFIA (TG) -- Technical Guide for Cold-Formed Steel Framing Products.
- J. Steel Stud Manufacturers Association (SSMA):
1. SSMA (PTI) -- Product Technical Information.
- K. The Society for Protective Coatings (SSPC):
1. SSPC-Paint 20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- L. Underwriters Laboratories, Inc. (UL):
1. UL (FRD) -- Fire Resistance Directory.
 2. UL 263 -- Fire Tests of Building Construction and Materials.

1.04 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

- A. Fabricate and install systems as indicated but not less than that required to comply with applicable requirements of the governing building code and ASTM C754.

1. In addition, fire-resistance rated assemblies shall conform to requirements of the applicable UL Design as described in the UL (FRD).
- B. Fabricate and install framing assemblies and components of sufficient strength to support the loads and forces encountered, or combinations thereof, without exceeding in any of its structural elements the stresses prescribed the governing building code and referenced standards.
1. Live Loads and Deflection Requirements:
 - a. Stud Framing Assemblies for Interior Partitions: Shall be designed, fabricated and installed to resist all loads to which they are subjected, but not less than uniform live load of 5 PSF (240 Pa) applied perpendicular to the wall.
 - (1) Deflection of stud framing members at this load shall not exceed L/240; except where partition is to be sheathed with plaster or tile wall finish, deflection at this load shall not exceed L/360.
 - b. Interior Suspended Ceilings and Soffits: Shall be designed, fabricated and installed to resist all loads to which they are subjected, but not less than uniform live load of 5 PSF (240 Pa) applied perpendicular to the ceiling/soffit.
 - (1) Deflection of suspended ceiling or soffit framing members at this load shall not exceed L/360 of distance between supports.
 2. Limiting height/span for studs is to be calculated using specified uniform live load (as specified) perpendicular to studs, based on studs alone; the use of composite action with collateral materials (e.g., gypsum wall board) may not be used to achieve minimum requirements. Stress calculations are to be based on capacity of studs alone.
 3. Maximum end bearing reaction load shall be calculated with minimum safety factor of 3.
- C. Fire Resistance Ratings: Where fire resistance classification is indicated, provide materials and application procedures identical to that listed by UL or tested in accordance with ASTM E119 for the type of construction shown.

1.05 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data:
1. Submit properly identified product data for each product specified, including materials specifications, installation recommendations, and other data as may be required to show compliance with specifications.
 - a. For each type of framing and furring system, provide data describing materials and finish, product criteria, charts and tables, and limitations.
 - (1) Limiting Wall Height Charts and Tables for Steel Stud Partition Framing Systems per SFIA (TG) or SSMA (PTI). Indicate stud selections for each stud framing condition, and coordinate with shop drawings.
 - (a) Where height of partition is greater than heights in Charts and Tables, provide engineering design by a qualified Florida-registered engineer,

- and submit design calculations.
 - (2) Limiting Span Charts and Tables for Steel Stud Ceiling Systems per SFIA (TG) or SSMA (PTI). Indicate stud selections for each ceiling framing condition, and coordinate with shop drawings.
 - (a) Where framing system with span greater than 8 feet is proposed, provide engineering design by a qualified Florida-registered engineer, and submit design calculations.
 - (3) Limiting Span Charts and Tables for Suspended Ceiling Grillage Systems. Indicate furring and channel selections for each ceiling framing condition, and coordinate with shop drawings.
 - b. For each type of gypsum board, accessories, joint finishing system, and other board materials, provide manufacturer's data showing compliance with requirements.
 - c. For each type of acoustical insulation and other sound attenuation materials, provide manufacturer's data showing compliance with requirements.
 - d. For each type of head-of-partition system, provide manufacturer's data showing compliance with requirements.
 - e. For each type of anchor plate and backer plate, provide manufacturer's data showing compliance with requirements.
 - f. Provide product data for screws and fasteners.
 - (1) Power-Actuated Fasteners: Include allowable loads, embedment, and spacing criteria.
 - 2. For each type of partition assembly, provide manufacturer's data showing compliance with specified acoustic attenuation and fire resistance rating performance requirements.
 - 3. Test Reports: For all stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
 - 4. Fire-Test-Response Characteristics: Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.
 - a. Both metal framing and wallboard manufacturers must submit written confirmation that they accept the other manufacturer's product as a suitable component in the assembly. Acceptance is as follows:
 - (1) If installation of both products is proper, no adverse effect will result in the performance of one manufacturer's product by the other's product.
 - (2) Combining products can be substantiated by required assembly tests.
- C. Shop Drawings:
- 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing tracks to building structure, and studs to tracks, and for blocking and reinforcement of framing connections.
 - a. Include allowable shear and tension load limits for fasteners and anchors, and calculations showing that they can meet applicable SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS.

3. For each stud framing condition, identify framing member properties using four-part member identification codes per industry standard nomenclature published in AISI S200 (e.g., 362S125-33) and material yield strength (e.g., $F_y = 33$ ksi).
 4. For steel stud ceiling and soffit framing conditions where proposed framing member span exceeds 8 feet, include shop drawings and engineering calculations signed and sealed by a qualified structural engineer licensed in the State of Florida.
 5. For steel stud ceiling and soffit framing conditions where framing members are suspended from building structure above, include shop drawings and engineering calculations signed and sealed by a qualified structural engineer licensed in the State of Florida.
 6. Indicate related work specified in other sections, including but not limited to concealed anchor plates, metal fabrications, backing for wall-mounted items (e.g., cabinets, toilet compartments, surface-mounted toilet accessories, grab bars, or other surface-mounted fittings and accessories) to be attached to stud-framed or furred walls/partitions.
 7. Indicate special details associated with fireproofing, acoustic seals, and draftstopping, fireblocking and firestopping.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. LEED Submittals: Collect and submit data as required for completing the applicable LEED Submittal Template(s).

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Metal Framing Materials Manufacturer: Shall be a firm or company that is currently a full member of the SSMA or SFIA.
 2. Gypsum Board Materials Manufacturer: Obtain each type of gypsum board and related joint treatment material from a single manufacturer.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years documented experience, and approved by manufacturer.
- C. Mock-Up: Provide mock-up of stud wall, ceiling, and soffit assemblies including finish specified in other sections. Coordinate with installation of associated work specified in other sections.
1. Mock-up Size: Full height, minimum 12 feet (3.5 m) long, including corner.
 2. Mock-up may remain as part of the Work.
- D. Contractor shall provide full time quality control over all fabrication and erection to ensure compliance with applicable requirements of the governing building code and regulations of the authority having jurisdiction.
1. Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:

1. Deliver materials to site promptly without undue exposure to weather.
 2. Deliver materials in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- B. Storage:
1. Store materials above ground in dry, ventilated space.
 2. Protect materials from soiling, rusting and damage.
 3. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.
- C. Notify manufacturer of damaged materials received prior to installation.

1.08 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Proceed with installation of gypsum board materials only after building is weather tight.
 - a. Maintain temperature in areas receiving gypsum board materials between 55 degrees and 90 degrees F. during and after installation and provide adequate ventilation.
 2. For finishing of gypsum board, maintain ambient temperature above 55 degrees F from one week prior to joint treatment, and until joint treatment is complete and dry.
- B. Coordinate the placement of components to be installed within stud framing system.
- C. Coordinate layout and installation of suspension system components for suspended ceilings with other work supported by or penetrating through ceiling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing Materials:
1. Allsteel & Gypsum Products Inc.: www.allsteelproducts.com.
 2. Clarkwestern Dietrich Building Systems, LLC: www.clarkdietrich.com.
 3. Marino-Ware: www.marinoware.com.
 4. Phillips Manufacturing Company: www.phillipsmfg.com.
 5. Radius Track Corporation: www.radiustrack.com.
 6. The Steel Network Inc: www.SteelNetwork.com.
 7. Telling Industries, LLC: www.tellingindustries.com.
- B. Board Materials:
1. Georgia-Pacific Gypsum Corporation (G-P): ww.gp.com.
 2. National Gypsum Company (NGC): www.nationalgypsum.com.
 3. United States Gypsum Company (USG): www.usg.com.
 - a. Local Representative: Jennifer Kelly; Tel. 305-609-5455.
- C. Drywall Beads and Trim:
1. Alabama Metal Industries Corporation (Amico): www.amico-online.com.
 2. Clarkwestern Dietrich Building Systems, LLC: www.clarkdietrich.com.
 3. Plastic Components, Inc. (PCI): www.plasticcomponents.com.

4. United States Gypsum Company (USG): www.usg.com.
 - a. Local Representative: Jennifer Kelly; Tel. 305-609-5455.
 5. Vinyl Corporation: www.vinylcorp.com.
- D. Anchorage Devices (for attaching metal framing components to concrete):
1. Hilti North America: www.hhilti.com.
 2. ITW Ramset: www.ramset.com.

2.02 GENERAL

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
1. See PART 3 for finishing requirements.
- B. Steel Studs, Ceiling Supports and Track Runners: Framing assemblies and components of sufficient strength to support the loads and forces encountered, or combinations thereof, without exceeding in any of its structural elements the stresses prescribed the governing building code and referenced standards.
1. Structural properties of studs and runners shall comply with ASTM C645.
 2. The unsupported height of partitions shall comply with the loads and deflections set forth in SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS and FBC-B CHAPTER 16 (HVHZ).
 3. Steel ceiling supports shall comply with FBC-B SECTION 2514.5.
 4. Steel studs, track runners and ceiling supports in walls shall comply with ASTM A525.
- C. Acoustic Attenuation: Where sound rating is indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- D. Fire / Smoke Rated Assemblies: Comply with applicable requirements of the governing building code including but not limited to FBC-B CHAPTER 7, and as indicated on drawings.
1. Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction indicated.

2.03 METAL FRAMING MATERIALS AND COMPONENTS

- A. General: Metal framing materials shall conform to FBC-B SECTIONS 2506, 2508, 2509, 2514, 2517 and 2518.
1. Ceiling Hangers: Type and size as specified in FBC-B SECTION 2514.5 and ASTM C754 for spacing required.
- B. Metal Studs and Runners: ASTM C645, G60 galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing as specified in SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS, except as otherwise indicated.
1. Studs: Extra-Duty, C-shaped steel studs.
 - a. Depth (flange): 1-1/4 inches (35 mm) minimum, except as follows:

- (1) Where stud depth greater than 1-1/4 inches is required per UL Design assembly referenced on Drawings, provide studs of depth specified in the UL (FRD) assembly description for the referenced UL Design assembly.
 - b. Return: Provide 1/4 inch (6 mm) minimum folded back return flange leg at each side of stud, except as follows:
 - (1) Stud Size 2-1/2 Inches Wide or Smaller: Return is not required.
 - c. Size (width): 1-5/8 inches (41 mm), 2-1/2 inches (64 mm), 3-5/8 inches (92 mm), 4 inches (102 mm), or 6 inches (152 mm), as indicated on Drawings.
 - d. Thickness (gage): As required to meet or exceed most stringent requirements as specified in SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS (e.g., load, deflection) and FBC-B CHAPTER 25, except as follows:
 - (1) Where Thickness Is Indicated on Drawings: Minimum thickness to be not less than gage indicated on Drawings.
 - (2) Where Framing is to Receive Cementitious Backer Board: Minimum thickness to be not less than 20 gage (33 mils).
 - (3) Where Framing is to Support Wall-Mounted Cabinets or Equipment: Minimum thickness to be not less than 20 gage (33 mils).
 - e. Yield Strength (Fy): As required to meet or exceed most stringent requirements specified in SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS (e.g., load, deflection) and FBC-B CHAPTER 25, except as follows:
 - (1) Minimum yield strength be not less than 33 ksi.
- 2. Runners / Tracks: U-shaped, sized to match studs.
 - a. Size (width): Sized to match studs.
 - b. Depth: Leg height to be not less than 1-1/4 inches (32 mm).
 - (1) Where greater track depth is required per UL Design Assembly referenced on drawings, provide tracks of depth specified in the UL (FRD) assembly description for the referenced UL Design Assembly.
 - c. Metal Thickness (gage): Same as studs.
- 3. Slotted Deflection Tracks (Partition Head-to-Structure Connections): Provide U-shaped channel with mechanical anchorage devices designed to accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - a. Structural Performance:
 - (1) Maintain lateral load resistance and vertical movement capacity required by applicable requirements of the governing building code, when evaluated in accordance with AISI SG02-1.
 - (2) Allow for vertical deflection of structure of up to 1 inch (1/2 inch up and 1/2 inch down), except as otherwise indicated.
 - b. Fire-Resistance: Provide components certified for use in UL-listed fire-rated head of partition joint systems of fire rating and movement required.
 - c. Material: ASTM A653 steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
 - (1) Thickness: 18 or 20 gauge, as required to comply with manufacturer's published Allowable Lateral Loads criteria; but in no instance shall

- thickness be less than 20 gauge.
- d. Dimensions:
 - (1) Size (width): Sized to match studs.
 - (2) Depth (flange): Leg height to be not less than 2-1/2 inches; with vertical slots 1/4 inch wide x 1-1/2 inches long, spaced at 1 inch o.c.
 - e. Acceptable Products: MAXTRAK SLOTTED DEFLECTION TRACK or BRADY'S SLP-TRK SLOTTED DEFLECTION TRACK by Clarkwestern Dietrich, or equal.
4. Radius Runners (for curved wall framing): Manufactured, hand-bendable, U-shaped runner specifically designed for use in curved drywall assemblies; shall hold its shape once formed.
- a. Minimum Bend Radius Capability: 20 inches.
 - b. Material: ASTM A653 steel sheet, with G60/Z180 hot dipped galvanized coating.
 - c. Size (width): Sized to match studs.
 - d. Metal Thickness (gage): 20 gage (33 mils).
 - e. Product: READY-TRACK by RadiusTrack, or equal.
- C. Furring Systems: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
1. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
 - a. Size (width): 7/8 inch (22 mm) or 1-1/2 inches (38 mm), as indicated on Drawings; if not indicated, provide 7/8 inch (22 mm).
 - b. Metal Thickness (gage): 25 gage or 20 gage, as indicated on drawings, except as follows:
 - (1) Where Thickness is Not Indicated on Drawings: Minimum to be not less than 25 gage.
 - (2) Where Furring is to Receive Cementitious Backer Board: Minimum to be not less than 20 gage (33 mils).
 - (3) Where Furring is to Support Wall-Mounted Cabinets or Equipment: Minimum thickness to be not less than 20 gage (33 mils).
 2. Resilient Furring Channels: Double-leg sections, designed to reduce airborne sound through a partition or ceiling assembly, or to comply with requirements for fire-rated assembly.
 - a. Size (width): 1/2 inch (12 mm).
 - b. Metal Thickness (gage): 25 gage or 20 gage, as indicated on drawings, except as follows:
 - 1) Where Thickness is Not Indicated on Drawings: Minimum to be not less than 25 gage.
 3. Z Furring: Z-shaped sections.
 - a. Size (width): 1 inch (25 mm), 1-1/2 inches (38 mm), 2 inches (51 mm) or 2-1/2 inches (64 mm), as indicated on drawings; if size is not indicated, provide 1-1/2 inch (38 mm).
 - b. Leg Dimensions: 3/4 inch (19 mm) x 1-1/4 inches (32 mm); the 1-1/4 inch (32 mm) leg is to be slightly toed in for a positive grip on the insulation.
 - c. Metal Thickness (gage): 25 gage or 20 gage, as indicated on drawings, except

as follows:

- (1) Where Thickness is Not Indicated on Drawings: Minimum to be not less than 25 gage.
- (2) Where Furring is to Receive Cementitious Backer Board: Minimum to be not less than 20 gage (33 mils).
- (3) Where Furring is to Support Wall-Mounted Cabinets or Equipment: Minimum thickness to be not less than 20 gage (33 mils).

D. Soffit and Ceiling Support Materials: ASTM C645, G60 galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with specified deflection limits.

1. General:

- a. Steel ceiling support shall comply with FBC-B SECTION 2514.5.
- b. Hanger Anchorage Devices: Screws, clips, bolts or other devices compatible with indicated structural anchorage for ceiling hangers and whose suitability has been proven through standard construction practices or by certified test data.
- c. Powder-Actuated Fasteners in Concrete: Fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers and with capability to sustain, without failure, a load equal to 10x calculated loads.
- d. Post-tensioned Concrete Slabs:
 - (1) For inserts placed in post-tensioned concrete work, maintain 3 inch clearance between inserts and prestressing strands.
 - (2) If insert is in conflict with strand, insert must be moved to avoid strand. Do not move strands to avoid inserts.
- e. Hangers:
 - (1) Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
 - (2) Wire: ASTM A641, soft, Class 1 galvanized.
 - (3) Rods and Flats: Mild steel components; Galvanized with G40 hot-dip galvanized coating per ASTM A525.
- f. Framing System:
 - (1) Main Runners: Cold-rolled, "C" shaped steel channels, 16 gauge minimum; galvanized with G40 hot-dip galvanized coating per ASTM A525; form to required radius at curved gypsum board construction (e.g., curved walls, soffits).
 - (2) Cross Furring: Hat-shaped steel furring channels, ASTM C645, 7/8 inch high, 25 gauge, galvanized.
 - (3) Furring Anchorages: 16 gauge galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws recommended by furring manufacturer and complying with ASTM C754.

2. Steel Stud-Framed Ceilings, Braced Soffits, and Soffit Support Systems:

- a. Framing: C-shaped steel studs and runners.
 - (1) Depth (flange): 1-1/4 inches (35 mm) minimum.
 - (2) Return: 1/4 inch (6 mm) minimum folded back return flange leg at each side of studs.
 - (3) Size (width): 1-5/8 inches (41 mm), 2-1/2 inches (64 mm), 3-5/8 inches (92 mm), 4 inches (102 mm), or 6 inches (152 mm), as indicated on

Drawings.

- (4) Metal Thickness (gage): Minimum thickness to be not less than that required to meet or exceed applicable requirements of the governing building code based on span distance, stud spacing, stud size, loads, and deflection criteria, in accordance with Limiting Span Charts and Tables for Steel Stud Ceiling Systems per SFIA (TG) or SSMA (PTI).
3. Suspended Grillage Ceiling Support System:
 - a. Hanger Devices for Concrete: Post-installed, expansion anchor or chemical anchor, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires.
 - (1) Hanger devices shall be capable of sustaining, without failure, a load equal to not less than 10 times that imposed by construction, as determined by testing in accordance with ASTM E488 by a qualified independent testing agency.
 - b. Hangers: Hangers shall comply with FBC-B TABLE 2514.5.4.
 - (1) Hanger Wire: ASTM A 641 galvanized steel wire, pre-straightened; gauge per FBC-B TABLE 2514.5.4.
 - (2) Hanger Rods: Mild steel, zinc coated; size per FBC-B TABLE 2514.5.4.
 - (3) Flat Bar: Mild steel, zinc coated; 1 inch x 3/16 inch.
 - (4) Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0312 inch thick galvanized steel sheet per ASTM A653, G 60 coating, with bolted connections and 5/16 inch diameter bolts.
 - c. Tie Wire: Tie wire shall comply with FBC-B SECTION 2514.5.3.1.
 - (1) Cross furring shall be securely saddle-tied to the main runners by not less than two strands of No. 16 W and M gauge galvanized wire or equivalent approved attachments.
 - (2) Cross furring shall be attached to joists or beams with double No. 14 W and M gauge galvanized wire or equivalent approved attachments.
 - (3) Splices in cross furring shall be lapped 8 inches and tied, each end, with double loops of No. 16-gauge wire.
 - d. Main Carrying Channels (Runners): Main runners or carriers shall be minimum 1-1/2 inch rolled galvanized steel channels of weights not less than set forth in FBC-B TABLE 2514.5.2.
 - e. Cross Furring - Metal Lath and Plaster Ceiling: Cross furring for various spacing of main runners or other supports shall be 3/4-inch galvanized steel channels conforming to FBC-B TABLE 2514.5.3.
 - f. Cross Furring - Gypsum Board Ceiling: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
 - (1) Furring Size (width): 7/8 inch (22 mm) or 1-1/2 inches (38 mm), as indicated on Drawings; if not indicated, provide 7/8 inch (22 mm).
 - (2) Furring Thickness (gage): 25 gage or 20 gage, per ASTM C754 and manufacturer's Limiting Ceiling Span Charts and Tables; if gage is not indicated, provide 20 gage.
 4. Proprietary Suspended Drywall Ceiling Framing System:
 - a. Material: Commercial-quality, cold-rolled steel, hot-dipped galvanized finish.
 - b. Components:

- (1) Main Tees: Fire-rated, heavy-duty classification, with integral reversible splice with knurled face; 1.617 inches high x 144 inches long, with 1-1/2 inches face width.
- (2) Cross Members (Cross Tees): Fire-rated, with knurled face; 1-1/2 inches high x 48 inches long, with 1-1/2 inches face width.
 - (a) Tees must have quick-release cross tee ends to provide positive locking and removability without the need for tools.
- (3) Furring Channel: Fire-rated; 7/8 inches high x 48 inches long, with 1-1/2 inches face width.
- (4) Accessory Cross Tees: Fire-rated, with knurled faces; 1-1/2 inches high x 48 inches long, with 1-1/2 inches face width.
 - (a) Tees must have quick-release cross tee ends to provide positive locking and removability without the need for tools.
- (5) Wall and Channel Moldings: Single web with knurled face.
- c. Accessories: Provide transition clips, splice clips, wall attachment clips, splice plates, drywall clips, and other accessories as necessary for a complete installation.
- d. Trim: Commercial-quality cold-rolled 24-gauge steel; horizontal legs with hems formed for attachment to mounting clip; factory finish.
 - (1) Face Width: As indicated on drawings.
 - (2) Product: Compasso Trim by USG, or equal.
- e. Product: Flat Drywall Suspension System by USG, or equal.

E. Accessories and Fasteners:

- 1. Miscellaneous Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- 2. Metal Angle (for shaftwall construction, corner framing at braced soffits, and other similar applications): Of same material as studs; 24-gage thickness; size 2-1/2 x 2-1/2 inches, unless otherwise indicated; complying with applicable requirements of ASTM C754.
- 3. Fasteners: ASTM C1002 self-piercing tapping screws; shall comply with FBC-B CHAPTER 25, and the following:
 - a. Fasteners for attaching steel studs to steel runners shall be Type S (for 25- and 22-gage) pan head or Type S-12 (for 20-gage or thicker) low profile head.
 - b. Fasteners for attaching steel studs to door frames shall be Type S-12 pan head.
 - c. Fasteners for attaching steel studs to jamb anchors shall be Type S-12 low profile head.
 - d. Fasteners for attaching gypsum board to metal framing shall be Type S bugle-head, or length appropriate for thickness of board(s).
 - e. Fasteners used for attaching cementitious tile backer board to metal studs shall be corrosion-resistant, wafer head type with countersinking ribs, specifically designed to allow for flush seating while preventing strip-outs; length and product per backer board manufacturer's recommendation. Do not use standard drywall screws.
 - f. Powder-driven fasteners are not allowed, except with Owner's written approval.

4. Anchorage Devices:
 - a. Power Actuated Fasteners (PAF): High-quality power-actuated fastener for attaching metal framing components (e.g., drywall runners) to concrete.
 - (1) Embedment: 1 inch, min.
 - (2) Allowable Service Load (based on 1 inch embedment into 4,000 psi concrete):
 - (a) Tension: 90 lbs, min.
 - (b) Shear: 200 lbs, min.
 - (3) Product: X-ZF by Hilti, or equal.
 - b. Concrete/Masonry Screw Anchors: Min. 1/4 inch dia. x 1-3/4 inch length concrete/masonry anchor screw with min. 1/4 inch (hole dia.) x 1.25 inch (OD) galv steel fender washer.
 - (1) Head Type / Dimension (across flat): Hex washer head / 0.630 inch diameter, min.
 - (2) Embedment: 1 inch, min.
 - (3) Allowable Service Load (based on 1 inch embedment into 4,000 psi concrete):
 - (a) Tension: 194 lbs, min.
 - (b) Shear: 310 lbs, min.
 - (4) Product: Tapcon Concrete and Masonry Anchors (with Maxi-Set Hex Washer Head) by ITW, or equal.
5. Tie Wires: Use tie wires not less than 16 gage galvanized annealed wire.

2.04 BOARD MATERIALS

- A. General:
 1. All types of gypsum board materials shall comply with applicable requirements of ASTM C1396 and ASTM C36.
 2. Panel sizes to minimize joints in place; ends square cut, except as otherwise indicated.
- B. Regular Gypsum Board: ASTM C1396 (Section 5), regular type.
 1. Mold and Mildew Resistance (ASTM D3273): Panel score of 10.
 2. Water Absorption (ASTM C473): Average not greater than 5 percent by weight.
 3. Edges: Tapered long edge.
 4. Thickness: Use 5/8 inch thick for all applications, except where otherwise indicated on Drawings.
 5. Acceptable Product: Sheetrock brand Mold Tough Gypsum Panels by USG, or equal.
- C. Fire Rated (Type X) Gypsum Board:
 1. UL-Classified for fire resistance (Type X), surface burning, and non-combustibility.
 2. Mold and Mildew Resistance (ASTM D3273): Panel score of 10.
 3. Edges: Tapered long edge.
 4. Thickness: Use 5/8 inch thick for all applications, except where otherwise indicated on Drawings.
 5. Acceptable Product: Sheetrock brand Mold Tough Firecode Gypsum Panels by

USG, or equal.

- D. Ceiling Gypsum Board: ASTM C1396 (Section 12), non-sag type.
 - 1. Mold and Mildew Resistance (ASTM D3273):
 - a. Non-Wet Areas: N/A.
 - b. Wet Areas (e.g., Toilet/Shower Rooms): Panel score of 10.
 - 2. Thickness: 1/2 inch.
 - 3. Acceptable Product:
 - a. Non-Wet Areas: Sheetrock brand UltraLight gypsum panels by USG, or equal.
 - b. Wet Areas (e.g., Toilet/Shower Rooms): Sheetrock brand Mold Tough Firecode Gypsum Panels by USG, or equal.
- E. Flexible Gypsum Board:
 - 1. Specifically designed for use in curved applications without wetting.
 - a. Minimum Inside (Concave) Dry Bending Radius: 20 inches (widthwise, w/ stud spacing at maximum 9 inches o.c.).
 - 2. Thickness: 1/4 inch.
 - 3. Acceptable Product: Sheetrock brand Flexible Gypsum Panels by USG, or equal.
- F. Cement Backer Board: Aggregated Portland cement backer board with woven glass fiber mesh facing; complying with ANSI A118.9.
 - 1. Thickness: 1/2 inch or 5/8 inch, as indicated on Drawings; if not noted, use 1/2 inch.
 - 2. Acceptable Product: Durock Cement Board by USG, or equal.
 - 3. For additional information, refer to Section 093013 - Tiling.

2.05 JOINT TREATMENT MATERIALS

- A. General:
 - 1. Joint materials shall conform to ASTM C475.
- B. Joint Compounds:
 - 1. All-Purpose Joint Compound: Drying type (ready-mixed) joint compound recommended for embedding, finishing, laminating and skim coating.
 - a. Acceptable Product: Sheetrock brand All Purpose Joint Compound by USG, or equal.
 - 2. Setting-Type Joint Compound: Chemically-hardening joint compound recommended for use with cement backer board and water-resistant gypsum board, and for treating fastener heads in areas to receive tile.
 - a. Acceptable Product: Sheetrock brand Setting-Type Joint Compound by USG, or equal.
- C. Primer Surfacer: Spray-applied vinyl acrylic latex-based coating, designed especially for interior application over Finish Level 4 (GA-214 / ASTM C840) drywall surface in order to achieve Finish Level 5 gypsum board finish.
 - 1. Acceptable Product: Sheetrock brand Tuff-Hide Primer-Surfacer by USG, or equal.
- D. Joint Treatment Tape: Type and width recommended by gypsum board manufacturer

for project conditions.

1. For cement backer board joints, refer to Section 093013 - Tiling.

2.06 BEADS, TRIM AND MOLDINGS

- A. PVC Drywall Beads and Trim: One-piece extruded vinyl trim manufactured of high-impact resistant PVC, and conforming to ASTM D3678 and ASTM C1047; supplied by board manufacturer.
 1. Flanges of PVC trim components shall have punch hole pattern for positive bonding of joint compound and other finishes to surface of gypsum board; PVC material shall have excellent paintability.
 2. Physical Characteristics:
 - a. Tensile Strength / Tensile Modulus, min. (ASTM D638): 6,200 psi / 390,000 psi.
 - b. Flexural Strength / Flexural Modulus, min. (ASTM D790): 11,000 psi / 35,000 psi.
 - c. Flammability (ASTM E84):
 - (1) Flame Spread: 18, maximum.
 - (2) Fuel Contribution: ND.
 - (3) Smoke Density, at 35 mils: 250, maximum.
 - (4) Fire Rating: Class A.
 3. Components:
 - a. "J" Bead (Casing Bead): Tapered face return; back flange 1-3/16 inch; front return 1/2 inch.
 - (1) Product: #200X- series by PCI, or equal; size as appropriate for thickness of gypsum board.
 - b. Fillable "J" Bead: For use in encasing raw edges of drywall so as to prevent moisture from migrating into board; 1-1/16 inch wide perforated flange; back flange 3/8 inch.
 - (1) Product: #201- series by PCI, or equal; size as appropriate for thickness of gypsum board.
 - c. Fillable "L" Bead: For use in creating a clean detail at any point of termination of drywall into windows, doors, etc.; 1-1/16 inch wide perforated flange.
 - (1) Product: #221- series by PCI, or equal; size as appropriate for thickness of gypsum board.
 - d. Shadow Molding ("Z" Molding): For use in creating a reveal or relief detail around windows, doors, etc., and wall to wall details; 1-1/8 inch wide perforated flange; reveal size as indicated on drawings.
 - (1) Product: #202/203/204 series by PCI, or equal; size as appropriate for reveal dimension.
 - e. Corner Bead:
 - (1) Regular Leg: For use on 90 degree outside corners; 1-1/4 inch perforated and striated tapered legs.
 - (a) Product: #209 by PCI, or equal.
 - (2) Long Leg: For use on 90 degree outside corners; 1-5/8 inch perforated and striated tapered legs.
 - (a) Product: #209-XL by PCI, or equal.

- f. Inside Corner Bead: For use on 90 degree inside corners; 1-1/4 inch perforated and striated tapered legs for better adhesion.
 - (1) Product: #209-IC by PCI, or equal.
 - g. Splayed Corner Bead: For use on 120 to 135 degree inside corners; 1-1/4 inch perforated and striated tapered legs for better adhesion.
 - (1) Product: #209-135 by PCI, or equal.
 - h. Drywall Reveal: Perforated flanges with a "U" channel; built-in stops for proper finish thickness.
 - (1) Reveal Dimensions: Width as indicated on drawings x 1/2-inch depth.
 - (2) Product: PCI Drywall Reveal, or equal.
 - i. Control Joint: 1 inch wide perforated flanges with a "V" channel; built-in stops for proper finish thickness.
 - (1) Product:
 - (a) Where Joint Movement Is Not Indicated: #2027-16 by PCI, or equal.
 - (b) Where Joint Movement Is Not Indicated: #PL093-16 by PCI, or equal.
- B. Paper-Faced Metal Drywall Beads and Trim: Products shall comply with ASTM C1047, and shall be type recommended by manufacturer to reinforce architectural edges and corners protecting them from chipping and cracking due to normal building movement and everyday wear-and-tear.
- 1. Materials: Shall be made with a strong, paper tape laminated to a sturdy, rust-resistant metal form, ensuring excellent adhesion of joint compounds, textures, and paints
 - 2. Profiles: Provide suitable trim profile for each edge and corner condition.
 - a. Trims shall be available in a variety of profiles, including 90-degree and offset outside corner bead; 90-degree and offset inside corner bead; "L" shaped tape-on trim; "J" shaped tape-on trim; reveal tape-on trim; tape-on flexible corner; and tape-on flexible outside corner.
 - b. Trims shall conform to profile and dimensions indicated on drawings; or if not indicated, conform to trim profile and dimensions suitable for each applicable condition in accordance with trim manufacturer's recommendations.
 - 3. Product: Sheetrock brand Paper-Faced Metal Bead and Trim by USG, or equal.
- C. Extruded Aluminum Trim and Reveals:
- 1. Conform to profile and dimensions indicated.
 - 2. Material: Extruded aluminum alloy 6063-T5.

2.07 ACOUSTICAL MATERIALS

- A. Acoustical Sealant: A highly elastic, water-based caulking for sound-rated partition and ceiling systems, and sealing exterior walls to reduce infiltration; non-bleeding and non-staining; pumpable; easily applied in beads.
- 1. Shall provide excellent adherence to most surfaces, permanent flexibility and lasting seal.
 - 2. Shall meet or exceed ASTM C919 and ASTM C834.
 - 3. Acceptable Product: Sheetrock brand Acoustical Sealant by USG, or equal.
 - 4. Refer to Section 079005 - Joint Sealers, for additional requirements.

- B. Sound Attenuation Batts/Blankets (SAFB): Paperless, semi-rigid mineral fiber batts designed to improve STC ratings when installed in partitions.
 - 1. Mineral fiber, conforming to ASTM C665, Type I.
 - 2. Surface burning characteristics per ASTM E84:
 - a. Flame spread: 15 or less.
 - b. Smoke developed: 0.
 - 3. Thicknesses: As indicated.
 - 4. Acceptable Product: Thermafiber LLC Sound Attenuation Fire Blankets SAFB (Fire Safety FS-15 Blankets), or equal.
- C. Hanger Wire Sound Isolators: Provide where indicated for sound-rated suspended ceilings.

2.08 CONCEALED BACKING MATERIALS

- A. Concealed Backer Plates:
 - 1. At locations where cabinets, toilet compartments (e.g., toilet compartment wall brackets, urinal screen wall brackets, head rail brackets), surface-mounted toilet accessories (e.g., waste receptacles, mirrors, etc.), or other surface-mounted fittings and accessories are to be attached to stud-framed or furred walls/partitions, provide backer plate(s) as follows:
 - a. Backer plate(s) shall be of sufficient size and strength to provide secure attachment and support for item(s) being attached thereto.
 - b. Material: Galvanized steel sheet, of dimensions as follows:
 - (1) Width: 12 inches.
 - (2) Length: 10 feet.
 - (3) Metal Thickness: 20 gage, minimum.
 - c. Product: Backing Plate (BPE) by Clarkwestern Dietrich, or equal.
 - 2. Failure to provide backer plates for attachment of cabinets, toilet compartments, surface-mounted toilet accessories, or other surface-mounted fittings and accessories to stud framing or furring will not be allowed, regardless of whether or not such backing plates are indicated on the drawings.
 - 3. Direct attachment of cabinets, toilet compartments, surface-mounted toilet accessories, or other surface-mounted fittings and accessories to stud framing or furring will not be allowed, except with written approval by Architect.
- B. Concealed Anchor Plates:
 - 1. At locations where grab bars are to be attached to stud-framed or furred walls/partitions, provide anchor plate(s) as follows:
 - a. Anchor plate(s) shall be of sufficient size and strength to provide secure attachment and support for item(s) being attached thereto.
 - b. Material: Galvanized steel sheet, of dimensions as follows:
 - (1) Width: 3 inches.
 - (2) Length: Varies, depending on item to be attached to wall/partition.
 - (3) Metal Thickness: 12 gage, minimum.
 - c. Product: Bobrick 2562 series Anchor Plate, or equal.
 - 2. Failure to provide anchor plates for attachment of grab bars to stud framing or furring will not be allowed, regardless of whether or not such anchor plates are

indicated on the drawings.

3. Direct attachment of grab bars to stud framing or furring will not be allowed, except with written approval by Architect.

2.09 ACCESSORY MATERIALS

- A. Gypsum Board Screws: Self-drilling, self-tapping steel screws.
 1. For Steel Framing Less Than 0.03 Inch Thick: Comply with ASTM C1002.
 2. For Steel Framing from 0.033 Inch Thick to 0.112 Inch Thick: Comply with ASTM C954.
 3. Provide Type S or Type S-12 screws.
- B. Miscellaneous Accessories: Provide as required for complete installations.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.10 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and adjoining construction and conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION - GENERAL

- A. Install in accordance with most stringent requirements of the governing building code, manufacturer's installation instructions, guidelines and recommendations, and the requirements of this Section.
- B. Metal Framing: ASTM C754.
- C. Gypsum Board and Joint Treatment: ASTM C840.
- D. Tolerances:
 1. Do not exceed 1/8 inch in 8 ft variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
 2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
 3. Shim as required to comply with specified tolerances.
- E. Fire-Rated Assemblies: Install in accordance with specified UL Design as described in the UL (FRD).
- F. Finishing: Perform in accordance with ASTM C840, to achieve finish levels specified in Finish Level Schedule included at end of this Section.

3.03 INSTALLATION - METAL FRAMING

- A. Metal Runners:

1. Align and secure runner tracks accurately to partition layout at both floor and ceiling.
2. Provide fasteners appropriate to substrate construction as recommended by manufacturer.

B. Metal Studs:

1. Position metal studs vertically in the runners, spaced as indicated.
 - a. Install studs at maximum 24 inches on center, except as otherwise indicated on the drawings or where manufacturer's load tables indicate that stud spacing must be less in order to meet specified Design Requirements (e.g., load and deflection criteria).
 - (1) Where 1-5/8 inch studs are installed adjacent to exterior concrete wall, each stud shall be attached to concrete wall with steel angle clip at mid-height of stud, using Tapcon fasteners sized for application.
 - (2) Soffits, Braced: Install studs as indicated on drawings, at maximum 16 inches on center. Unbraced soffits are not allowed.
 - (3) Curved Gypsum Board Construction (e.g., Curved Walls, Soffits): Install studs at maximum 9 inches on center.
 - (4) Shaftwall Partitions: Install studs vertically at 24 inches on center.
 - b. Where manufacturer's load tables indicate that stud spacing must be less than indicated above in order to meet specified SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS (e.g., load and deflection criteria), comply with spacing indicated in manufacturer's load tables.
 - c. Provide double stud at the following locations:
 - (1) Wall openings.
 - (2) Door and window jambs; storefront mullions.
 - (3) Not more than 2 inches from each side of openings.
 - (4) Locations where necessary to provide adequate anchorage, bracing or support for wall-mounted items (e.g., handrail brackets, plumbing fixtures, toilet compartment partitions, wall cabinets, shelving standards, toilet accessories, hardware, etc.).
 - (5) Other locations as indicated on Drawings.
2. Place studs so that flanges face in same direction.
3. Cut studs 1/2 inch short of full height to provide perimeter relief.
4. Align and plumb partition framing accurately.
5. Where partitions abut ceiling or deck construction or vertical structural elements, provide slip or cushion type joint between partition and structure as recommended by stud manufacturer to prevent transfer of structural loads or movements to partitions, and to provide lateral support.
6. Where studs are installed directly against exterior walls, install asphalt felt strips or glass fiber strips between studs and wall.
7. Provide horizontal bracing where necessary for lateral support.
8. Chase Walls:
 - a. Position steel studs on opposite sides of chase directly across from each other.
 - b. Cut cross-bracing from gypsum board 12 inches high by chase wall width.

C. Hat Channel Furring:

1. Attach hat-shaped furring channels either vertically or horizontally with fasteners through alternate wing flanges (staggered).
 2. Space furring channels at 24 inches on center, unless otherwise indicated. Where furring is indicated to receive backer board with ceramic tile, space at 16 inches on center.
 3. Install furring channels within 4 inches of floor line and ceiling line.
- D. Z-Furring:
1. Securely attach narrow flanges of members to wall with concrete stub nails or power-driven fasteners, except as otherwise indicated.
 2. Sequence furring installation with installation of insulation.
- E. Ceiling and Soffit Support Systems (Suspended Ceiling Grillage System):
1. Secure hangers or rods to structural support by connecting directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners indicated.
 2. Space main runners, hangers and furring according to requirements of ASTM C754, except as otherwise indicated.
 3. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
 4. Limitations:
 - a. Steel studs are not designed to carry live loads, mechanical equipment, or material storage.
 - b. Maximum Spacing:
 - (1) 1-1/2 Inch Cold-Rolled Channels and Hangers: 48 inches on center.
 - (2) For single-layer panels, maximum steel stud and furring channel spacing is 24 inches on center for perpendicular application and 16 inches on center for parallel application.
 - (3) For panels used as base for spray-applied ceiling texture finish, maximum frame spacing is 16 inches on center for 1/2 inch thick panels perpendicularly applied (parallel panel application not recommended); 24 inches on center for 5/8 inch thick panels perpendicularly applied, 16 inches on center for parallel application.
 5. Attach directly to structural elements only; do not attach to metal deck. Loop hangers and wire-tie directly or provide anchors or inserts.
 6. Exterior Ceilings and Soffits: Install compression posts, splay wires and other accessories as required to comply with wind load requirements.
 7. Extend runners to within 6 inches of walls.
 8. Wire-tie or clip furring members to main runners and to other structural supports indicated. In fire resistance rated assemblies, wire-tie furring members; do not clip.
 9. Do not permit furring or runners to contact masonry or concrete walls.
 10. Provide 1 inch clearance between furring or runners and abutting walls and partitions.
- F. Steel Stud Ceiling System:
1. Steel stud framed ceilings may be installed at interior spaces not wider than (8)

- eight feet.
2. At spans greater than 8 feet, install Suspended Ceiling Grillage System unless framing members and spacing are specifically designed and recommended by manufacturer for proposed span and loading with specified deflection limits.
 3. Install runner channels around perimeter of ceiling area where steel stud framing is to be installed.
 4. Space main framing members at 16 inches o.c., with cross bracing at 48 inches o.c.
 5. Where 25-gage steel studs are used, stud-end stiffeners are required. Install per manufacturer's installation instructions.

3.04 INSTALLATION - FASTENERS AND ATTACHMENTS

- A. Gypsum wallboard shall be attached to metal members by self-drilling, self-tapping steel screws conforming to requirements of FBC-B and as specified in this section.
- B. Screws used for attaching gypsum wallboard to metal framing members:
 1. Shall be driven below the surface of gypsum wallboard without substantially fracturing the surface paper, and then spotted with finishing joint compound.
 2. Shall be in accordance with FBC-B SECTION 2517.6.4.
 3. Shall be not less than 7/8 inch (22.2 mm) long for 1/2 inch (17.7 mm) wallboard or 1 inch (25.4 mm) long for 5/8 inch (17.1 mm) wallboard.
 - a. Where securing multiple layers of wallboard, use screws of appropriate length in accordance with board manufacturer's instructions.
 - b. At fire-resistance rated assembly, screw type and size shall comply with requirements of applicable UL Design as described in the UL (FRD).
- C. The spacing of screws attaching gypsum wallboard to metal framing members shall comply with board manufacturer's installation instructions, but in no instance shall screw spacing be more than 12 inches (305 mm) on center.
 1. At fire-resistance rated assembly, install in accordance with screw spacing requirements per applicable UL Design as described in the UL (FRD).

3.05 INSTALLATION - BOARD MATERIALS

- A. Single Layer Gypsum Board on Metal Studs:
 1. Loosely butt gypsum board joints together and neatly fit.
 2. Do not place butt ends against tapered edges.
 3. Maximum allowable gap at end joints: 1/8 inch.
 4. Vertical joints to be centered over studs and staggered one stud cavity on opposite sides of studs.
 5. Horizontal joints to be backed by steel framing, unless otherwise recommended by gypsum board manufacturer.
 6. Apply ceiling boards first where gypsum board ceilings and wall occur.
 7. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
 8. Screw board in place securely with screws spaced according to manufacturer's recommendations.

- B. Single Layer Gypsum Board on Furring:
 - 1. Apply gypsum board with long dimension at right angles to furring channel.
 - 2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
 - 3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.
- C. Double Layer Gypsum Board:
 - 1. Both layers to be fastened to studs or furring with screws in accordance with manufacturer's instructions.
 - 2. Offset face-layer joints at least one stud cavity from parallel base-layer joints.
- D. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226 and manufacturer's instructions.

3.06 INSTALLATION - SOUND-RATED CONSTRUCTION

- A. Insulation:
 - 1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
 - 2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.
 - 3. Fit carefully behind electrical outlets and other work penetrating sound-rated construction.
 - 4. Install sound attenuation blankets in gaps between steel deck flutes and tops of sound-rated partitions, which are not fire-rated. Attach blankets in accordance with manufacturer's instructions.
- B. Gypsum Board:
 - 1. Install gypsum board same as for interior partitions and ceilings.
 - 2. Coordinate with installation of perimeter sealants.
- C. Acoustical Sealant:
 - 1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
 - 2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
 - 3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
 - 4. After installation of gypsum board base layers, cut face layer sheets 1/2 inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
 - 5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
 - 6. Seal sides and backs of electrical boxes to completely close off openings and joints.

- D. Sound Flanking Paths:
1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
 2. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.07 INSTALLATION - TRIM AND ACCESSORIES

- A. General: Apply trim and accessories according to manufacturer's instructions. Sand after application of final joint treatment coat and leave surface smooth and ready for work by other trades.
1. Use longest practical lengths.
 2. Place components consistent with lines of building spaces, except as indicated on drawings.
 3. Treat metal accessories with not less than two coats of joint compound in the same manner as joints. Feather joint compound out from 8 to 10 inches on both sides of corners.
 4. Apply trim at intersections where gypsum board abuts other materials, unless detailed otherwise, and at all other locations indicated. Neatly fit and secure corner beads over external corners.
- B. Beads, Trim, and Moldings: Install beads, trim, and moldings in accordance with manufacturer's instructions, and as follows:
1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
 2. Corner Bead: Install corner bead at external corners.
 3. Casing Bead: Install casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, or where shown on the drawings; and at all changes of type of materials including plane changes.
 4. Special Trim: Install as indicated on drawings and in accordance with manufacturer's instructions.
 5. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
 6. Reveals: Install at locations where indicated; match existing.
- C. Control Joints and Expansion Joints: Install control joints and expansion joints in accordance with manufacturer's instructions, and as follows:
1. Install control joints and expansion joints as detailed.
 2. Install at locations where indicated, and as follows:
 - a. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
 - b. Install control joints within long runs of partitions, ceilings or soffits as indicated; if not indicated, then as directed by Architect.
 - c. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level or as directed by Architect.

3.08 FINISHING

- A. Gypsum Board Surfaces:

1. General:
 - a. Joint Compound:
 - (1) After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.
 - (2) Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
 - b. Joint treatment and finishing of fire-rated assemblies shall conform to requirements of specified UL Design Assembly as described in the UL (FRD).
 - c. For gypsum board surfaces designated to be painted, coordinate surface finishing with requirements specified in Section 099000 - Painting and Coating.
2. Level of Finish: Provide levels of gypsum board finish in accordance with GA-214 / ASTM C840.
 - a. Refer to FINISH LEVEL SCHEDULE - GYPSUM BOARD SURFACES at the end of this Section.
3. Prefill:
 - a. Use setting-type joint compound. Mix joint compound according to manufacturer's directions.
 - b. Fill joints between boards flush to top of eased or beveled edge.
 - c. Fill joints of gypsum board above suspended ceilings in fire-rated partitions.
 - d. Wipe off excess compound and allow to harden.
4. Taping (ASTM C840 Level 1):
 - a. Use taping joint compound or all-purpose joint compound.
 - b. Butter taping compound into inside corners and joints.
 - c. Center tape over joints and press down into fresh compound.
 - d. Remove excess compound.
 - e. Tape joints of gypsum board above suspended ceilings.
5. First Coat (ASTM C840 Level 2):
 - a. Use taping joint compound or all-purpose joint compound, or setting-type joint compound.
 - b. Immediately after bedding tape, apply skim coat of compound over body of tape and allow to dry completely in accordance with manufacturer's instructions.
 - c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads; finish level with board surface.
6. Second Coat (ASTM C840 Level 3):
 - a. Use all-purpose joint compound or topping joint compound.
 - b. After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.
7. Third Coat (ASTM C840 Level 4):
 - a. Use all-purpose joint compound or topping joint compound.
 - b. After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.
 - c. Allow third coat to dry. Apply additional compound, and touch-up and sand,

to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.

8. Skim Coat (ASTM C840 Level 5):
 - a. Apply skim coat of all-purpose joint compound or primer surfacer (spray-applied vinyl acrylic latex-based coating) over exposed surfaces of gypsum board.
 - b. After skim coat has dried, touch-up and sand to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
- B. Cementitious Backer Board (substrate for tile wall finish):
 1. Coordinate installation of cementitious backer board with requirements specified in Section 093013 - Tiling.
 2. Prepare and finish joints in accordance with manufacturer's instructions, in manner appropriate for tile installation method specified in Section 093013 - Tiling.
- C. Field Painting: As specified in Section 099000 - Painting and Coating; sheen(s) and color(s) as selected by Architect.

3.09 ADJUSTING

- A. Correct damage and defects which may telegraph through finish work.
- B. Leave work smooth and uniform.

3.10 TOLERANCES

- A. Support Metal and Framing:
 1. Maximum Variation from True Position: 1/8 inch in 10 feet (3 mm in 3 m).
 2. Maximum Variation from Plumb: 1/8 inch in 10 feet (3 mm in 3 m).
 3. Maximum Variation from Level: 1/8 inch in 10 feet (3 mm in 3 m).
 4. Spacing of Studs and Other Framing Members: Variation not to exceed 1/8 inch.
 5. Fastening Surfaces: Variation between adjacent members not to exceed 1/8 inch.
 6. At walls/partitions where tile wall finish is indicated, refer to Section 093013 – Tiling, for additional requirements.
- B. Maximum Variation from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.
 1. Finished Gypsum Board Surface: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.
 2. Cementitious Backer Board Surface (Substrate for Tile Installation): 1/8 inch in 10 feet (3 mm in 3 m) in any direction.
 - a. In addition, surface shall not vary by more than 1/16 inch over 1 foot, nor more than 1/32 inch between adjoining edges.
 - b. For additional requirements, refer to Section 093013 - Tiling.

3.11 FINISH LEVEL SCHEDULE - GYPSUM BOARD SURFACES

- A. Provide levels of gypsum board finish for locations as follows, in accordance with GA-214 / ASTM C840.
 1. Level 1: Gypsum board surfaces within ceiling plenum areas and other concealed areas, except provide higher level of finish as required to comply with fire

- resistance rating or acoustical rating.
2. Level 2: Substrate for tile installation, except remove tool marks and ridges; coordinate with requirements specified in Section 093013 - Tiling.
 3. Level 3:
 - a. Gypsum board surfaces of fire-rated assemblies that are entirely concealed from view; finishing system shall meet requirements of specified UL Design Assembly.
 - b. Gypsum board surfaces designated to receive textured finish or heavy vinyl wall papering.
 4. Level 4: Gypsum board surfaces, except where another finish level is indicated or selected by Architect.
 5. Level 5: Gypsum board surfaces requiring extra smooth surface for critical light, including but not limited to surfaces where semi-gloss or gloss paint finish is designated or selected by Architect.

END OF SECTION

SECTION 092236
METAL LATH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Metal lath for Portland cement plaster / stucco.
- B. Plaster/stucco beads, screeds, joint accessories, and other trim.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete.
- B. Section 042000 - Unit Masonry Assemblies.
- C. Section 061000 - Rough Carpentry: Fire retardant treated plywood sheathing, for use in exterior stud-framed exterior wall assemblies.
- D. Section 061643 - Gypsum Sheathing: Moisture and mold resistant gypsum sheathing, for use in exterior stud-framed exterior wall assemblies.
- E. Section 072500 - Weather Barriers: Water-resistive barrier, installed between metal lath and wall sheathing in stud-framed exterior wall assemblies.
- F. Section 079005 - Joint Sealers: Backing and bond breakers; joint sealers.
- G. Section 092400 - Portland Cement Plastering.
- H. Section 099723 - Acrylic Waterproof Coating System: Surface preparation and repainting of exterior surfaces; crack repair materials for stucco crack repair.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C841 -- Standard Specification for Installation of Interior Lathing and Furring.
 - 2. ASTM C847 -- Standard Specification for Metal Lath.
 - 3. ASTM C933 -- Standard Specification for Welded Wire Lath.
 - 4. ASTM C1063 -- Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- D. The National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM ML/SFA 920 -- Guide Specifications for Metal Lathing and Furring.
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL (FRD) -- Fire Resistance Directory.

1.04 PERFORMANCE REQUIREMENTS

- A. Lathing Assemblies: Furnish and install framing and lath systems to limit deflection of finished assembly as follows:
 - 1. Maximum Deflection of Vertical Assemblies: L/360, under lateral point load of 100 lbs (445 N).
 - 2. Maximum Deflection of Horizontal Assemblies: L/240, under dead loads and wind uplift, except where L/360 is required for compliance with applicable requirements of the governing building code.
- B. Fire Rated Assemblies: Provide components complying with requirements for fire rated assemblies specified in the section where the plaster finish is specified.

1.05 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide data on metal lathing components, structural characteristics, material limitations, and finish.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.07 COORDINATION

- A. Coordinate work with installation of access panels specified in other sections.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lath, Beads, Screeds, Joint Accessories, and Other Trim:
 - 1. Alabama Metal Industries Corporation (Amico): www.amico-online.com.
 - 2. Clark Steel: www.clarksteel.com.
 - 3. Western Metal Lath, Inc: www.wmlinc.com.
- B. PVC Beads, Screeds, Joint Accessories, and Other Trim:
 - 1. Plastic Components, Inc. (PCI): 9051 NW 97 Terrace, Miami, FL 33178; Tel. 305-885-0561.
 - 2. Vinyl Corp.: 8255 NE 70 Street; Miami, FL 33166; Tel. 305-477-6464.

2.02 FRAMING MATERIALS

- A. Regulatory Requirements: Framing materials shall comply with applicable requirements of the governing building code, including but not limited to the following:
 - 1. Main runners or carriers for ceiling framing shall be rolled steel channels not less than the sizes and weights set forth in FBC-B TABLE 2514.5.2.
 - 2. Cross furring, or spacers, for various spacing of main runners or other supports shall be not less than as set forth in FBC-B TABLE 2514.5.3.

3. Hangers supporting suspended ceilings shall be not less than as set forth in FBC-B TABLE 2514.5.4.
- B. Furring Channels: Formed steel, minimum 0.020 inch (0.5 mm) thick, 3/8 inch (10 mm) deep x 7/8 inch (22 mm) high, splicing permitted; galvanized.
- C. Main Ceiling Channels: Formed steel, asphalt coated, minimum 0.05 inch (1.2 mm) thick, 3/4 inch (19 mm) deep x 1-1/2 inch (38 mm) high, single piece, no splicing; galvanized.
- D. Hangers: Steel wire, of size and type to suit application, to support ceiling components in place to deflection limits as indicated.
- E. Ceiling Hangers: Rolled steel sections, of size and type to suit application, to rigidly support ceiling components in place to deflection limits as indicated; galvanized.
- F. Lateral Bracing: Formed steel, minimum 0.060 inch (1.5 mm) thick, size and length as required; galvanized.

2.03 METAL LATH

- A. General: Metal lath shall comply with applicable requirements of the governing building code, including but not limited to the following:
 1. Weight: To suit application, comply with deflection criteria, and as specified in FBC-B TABLE 2514.3.2 for framing spacing.
- B. Diamond Mesh Metal Lath: ASTM C847; galvanized.
- C. Flat Rib Metal Lath: ASTM C847; galvanized; 1/8 inch (3 mm) thick.
- D. Ribbed Metal Lath: ASTM C847; galvanized; 3/8 inch (9 mm) thick.
- E. Welded Wire Lath: ASTM C933; galvanized; with 2 inch (50 mm) square openings, paper or felt backing.
- F. Corner Mesh: Formed sheet steel, minimum 0.018 inch (0.5 mm) thick, expanded flanges shaped to permit complete embedding in plaster, minimum 2 inch (50 mm) size; galvanized.
- G. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch (50 mm) wide x 24 inch (600 mm) long; galvanized.

2.04 PLASTER/STUCCO BEADS, SCREEDS & OTHER TRIM

- A. General:
 1. Depth/ground governed by plaster thickness; maximum possible lengths.
- B. Casing Bead / Base Screed: Solid zinc alloy; square edges; 3 inch expanded metal flange.
 1. Product: Amico X-66 Casing Bead, or equal.
- C. Corner Bead (outside corner): Solid zinc alloy; smooth round nose bead; 3 inch expanded metal flange wings.
 1. Product: Amico X-1 Corner Bead, or equal.

- D. Control Joint: PVC; one-piece accordion profile; 2 inch open grid flange or perforated flange with nailing holes at both sides; overall width 4 inches; furnish with removable tape.
 - 1. Product: Amico M-Type Expansion Joint, or equal.
- E. Soffit Vent: PVC; one-piece soffit vent with 4 inch wide perforated vent area; vent area to be 16 sq. in. per linear foot; 1 inch open grid flange or perforated flange with nailing holes at both sides.
 - 1. Product: PCI # 4300 Soffit Vent, or equal.

2.05 ACCESSORIES

- A. Sealant:
 - 1. For Bedding of Control Joint during Installation over Solid Base: Per control joint manufacturer's recommendations.
 - 2. For Sealing Control Joint After Plastering: Refer to Section 079005 - Joint Sealers.
- B. Fasteners and Anchorage: Tie wire, drive pins, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
 - 1. Fasteners for Attaching Metal Lath to Fire-Retardant Treated Plywood Sheathing: Hot-dipped zinc-coated galvanized steel or stainless steel (FBC-B SECTION 2304.9.5.3); for additional information, refer to Section 061000 - Rough Carpentry.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

- A. Install lath and furring for Portland cement plaster work in accordance with applicable requirements of the governing building code and ASTM C1063.
- B. Unrestrained Ceilings and Soffits: Furred or suspended ceilings and soffits constructed with cement plaster/stucco must be unrestrained.
 - 1. Isolate ceiling lath and plaster from ceiling intersecting vertical surfaces with casing beads, control joints, or similar devices designed to keep the ceiling isolated from the adjacent vertical surfaces (walls, partitions, beams, and columns).
 - 2. Do not use corner reinforcement at the internal angle between the ceiling and the vertical surfaces.
- C. Fire-Resistant Assemblies: Provide materials and installation methods, including but not limited to types and spacing of fasteners, in accordance with UL (FRD) specifications for the UL Design assembly indicated.

D. Access Panels: Install in suspended ceilings and plastered walls at locations indicated.

3.03 INSTALLATION - FRAMING MATERIALS

A. Wall Furring:

1. Install wall furring by directly attaching to masonry and concrete walls.
2. Install furring channels vertically; secure with fasteners on alternate channel flanges at maximum 24 inches (600 mm) on center.
3. Space furring channels maximum 16 inches (400 mm) on center, and not more than 4 inches (100 mm) away from floor and ceiling lines and abutting walls.

B. Ceiling and Soffit Furring and Framing:

1. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
2. Install furring independent of walls, columns, and above-ceiling work.
3. 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.
4. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.
5. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
6. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.
7. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.
8. Laterally brace suspension system.

3.04 INSTALLATION - PLASTER/STUCCO BEADS, SCREEDS & OTHER TRIM

A. General:

1. Install beads, screeds and joint accessories in accordance with manufacturer's recommendations and instructions.

B. Casing Beads:

1. Install casing bead at locations indicated on drawings, and as follows:
 - a. At the edges of plaster which abuts or adjoins an unplastered surface.
 - b. On each surface at the internal angle formed by load bearing and non-loadbearing walls and partitions abutting structural walls, columns, or floor-ceiling slabs.
 - c. On each side of the joint between walls or partitions constructed of dissimilar materials which require plastering.
 - d. At terminations of plaster finish.
2. Butt and align ends.
3. Secure rigidly in place.

C. Corner Beads:

1. Install corner bead at all external corners of plaster/stucco walls, beams and soffits.
2. Butt and align ends.

3. Fill voids formed in corners with plaster/stucco.
4. Fasten at outer edges of lath only.

D. Control Joints:

1. At plaster/stucco ceilings and walls, install control joints in locations indicated on the drawings.
2. When installing control joints over solid base, apply sealant to substrate and embed control joint in sealant; follow control joint manufacturer's instructions.
3. When installing control joint over metal base, terminate metal lath at each side of joint and fasten control joints securely to lath.
4. Butt and align ends.
5. After plaster/stucco has cured, remove tape and seal the joint with type sealant type specified in Section 079005 - Joint Sealers.

3.05 INSTALLATION - ACCESSORIES

A. Access Panels:

1. Install access panels and rigidly secure in place.
2. Install frames plumb and level in opening. Secure rigidly in place.
3. Position to provide convenient access to concealed work requiring access.

3.06 INSTALLATION - METAL LATH

A. General:

1. Install beads, screeds and joint accessories in accordance with manufacturer's recommendations and instructions.

B. Apply metal lath taut, with long dimension perpendicular to supports.

C. Lap ends minimum 1 inch (25 mm). Secure end laps with tie wire where they occur between supports.

D. Lap sides of diamond mesh lath minimum 1-1/2 inches (38 mm).

E. Nest outside ribs of rib lath together.

F. Attachment:

1. Attach metal lath to plywood sheathing using nails at maximum 6 inches (150 mm) on center.
 - a. Metal and wire lath shall be attached to vertical plywood sheathing covered by gypsum sheathing with the equivalent of 6d common nails (hot dip galvanized or stainless steel) driven to a penetration of at least 3/4 inch (19 mm) and bent over to engage not less than three strands of lath.
 - b. Metal and wire lath shall be attached to ceiling joists or other horizontal wood supports with the equivalent of No. 11-gauge, barbed, galvanized nails 1-1/2 inches (38 mm) long having a head not less than 3/8 inch (9.5 mm) in diameter.
2. Attach metal lath to metal supports using screws at maximum 6 inches (150 mm) on center.
 - a. Metal and wire lath shall be attached to horizontal and vertical metal supports with the equivalent of No. 8 galvanized sheet-metal screws.
3. Attach metal lath to concrete and concrete masonry using power-actuated drive

pins, by minimum 1-inch long hand-driven pins with washer, minimum 7/8-inch long hardened flathead concrete nails with washer, or other approved fasteners.

- a. Fastener Pattern: 12 inches on center vertically, and 12 to 16 inches on center horizontally.
- G. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches (75 mm) from corner to form the angle reinforcement; fasten at perimeter edges only.
 1. Do not use corner reinforcement at the internal angle between the ceiling and the vertical surfaces.
- H. Place 4 inch (100 mm) wide strips of metal lath centered over junctions of dissimilar backing materials; secure rigidly in place.
- I. Place lath vertically above each top corner and each side of door frames to 6 inches (150 mm) above ceiling line.
- J. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.07 ERECTION TOLERANCES

- A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from True Position: 1/8 inch (3 mm).

END OF SECTION

SECTION 092400
PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Portland cement plaster (stucco).
- B. Beads, screeds, reveals, control joints, and other plaster accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-In-Place Concrete.
- B. Section 042000 - Unit Masonry Assemblies.
- C. Section 072500 - Weather Barriers: Water-resistive barrier, installed between metal lath and wall sheathing in stud-framed exterior wall assemblies.
- D. Section 079005 - Joint Sealers: Sealant for plaster control joints.
- E. Section 092236 - Metal Lath: Metal furring and lathing for plaster; plaster accessories.
- F. Section 099723 - Acrylic Waterproof Coating System.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C91/C91M -- Standard Specification for Masonry Cement.
 - 2. ASTM C150/C150M -- Standard Specification for Portland Cement.
 - 3. ASTM C206 -- Standard Specification for Finishing Hydrated Lime.
 - 4. ASTM C897 -- Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
 - 5. ASTM C926 -- Standard Specification for Application of Portland Cement-Based Plaster.
 - 6. ASTM C932 -- Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 - 7. ASTM C1042 -- Standard Test Method for Bond Strength of Latex Systems Used With Concrete by Slant Shear.
 - 8. ASTM C1059/C1059M -- Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
 - 9. ASTM C1063 -- Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 - 10. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
 - 11. ASTM C1328 -- Standard Specification for Plastic (Stucco) Cement.
 - 12. ASTM D412 -- Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - 13. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer

Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

14. ASTM D4258 -- Standard Practice for Surface Cleaning Concrete for Coating.
 15. ASTM D4259 -- Standard Practice for Abrading Concrete.
 16. ASTM D4261 -- Standard Practice for Surface Cleaning Concrete Masonry Units for Coating.
 17. ASTM D4262 -- Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
 18. ASTM D4263 -- Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 19. ASTM E96/E96M -- Standard Test Methods for Water Vapor Transmission of Materials.
- C. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- D. Florida Concrete Products Association, Inc. (FCPA):
1. FCPA TB-ST 01 -- Technical Bulletin, Choosing the Right Block for Stucco.
 2. FCPA TB-ST 02 -- Technical Bulletin, Stucco on Block.

1.04 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product data for each product to be used, including but not limited to premixed cement plaster and integral bonding admixture.
1. Include manufacturer's written specifications, proportion mixes, and installation instructions for factory-prepared materials.
 - a. Manufacturer's written specifications shall include physical and performance characteristics, and instructions for storage, handling, and use.
 2. Provide documentation certifying that materials used together are mutually compatible (e.g., integral bonding admixture and premixed cement plaster).
 3. If requested, provide Material Safety Data Sheets.
- C. Samples:
1. For each plaster finish to be applied, submit two samples, each 24 x 24 inch (600 x 600 mm) in size, illustrating finish and texture.
- D. LEED Submittals:
1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit MR 4.1 and Credit MR 4.2:
 - a. For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to:

- (1) a tabulation of each such material, including a description of the material, the manufacturer of the material.
 - (2) the product cost, the pre-consumer and post-consumer recycled content percentages (by weight).
 - (3) the source of the recycled content data.
3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within a 500 mile radius of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to:
- a. Product name for each such material.
 - (1) material manufacturer.
 - (2) total product cost for each such material.
 - (3) percentage of product (by weight) that meets both the extraction and manufacture criteria.
 - (4) distance between the project site and the extraction/harvest/recovery site.
 - (5) distance between the project site and the final manufacturing location.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C926.
- B. Installer/Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.
- C. Contractor shall not change source or manufacturer of cement plaster materials during the course of the work.
- D. Certificates of Compliance:
 1. Aggregate Used in Job-Mixed Plasters: Furnish satisfactory documentation to the Architect certifying that aggregate conforms to requirements of ASTM C897; or where aggregate fails to meet the gradation limits in ASTM C897, furnish satisfactory documentation certifying that the plaster made with the aggregate has an acceptable demonstrated performance record in similar construction and climate conditions.
- E. Warranty: Contractor shall provide a written warranty against defects in material and installation for a period of not less than ten (10) years.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply cement plaster when substrate or ambient air temperature is under 50 degrees F or over 90 degrees F.
- B. Hot Weather Conditions:
 1. Use damp loose sand.
 2. Use cool water for mixing.
 3. Pre-dampen masonry walls prior to application of cement plaster scratch coat.
 4. Prevent the cement plaster from drying out by covering with a plastic sheet, or moist cure at least twice daily for the first 2 to 3 days.

5. Do not allow fresh cement plaster to be subject to hot, dry winds.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all products to the site in original packaging, unopened, and undamaged with manufacturer's name and product identification visible thereon, and manufacturer's instructions and Material Safety Data Sheets.
- B. Store products in a dry location and protect them from dampness following manufacturer's instructions.
- C. Stockpile and handle aggregates in a manner to prevent contamination from foreign materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Integral Bonding Admixture:
 1. BASF Construction Chemicals LLC.
 2. Lambert Corporation.
- B. Underlayment: Refer to Section 072500 - Weather Barriers.

2.02 GENERAL

- A. Comply with applicable requirements of governing building code, including but not limited to the following:
 1. Lathing and plastering materials shall conform to the standards listed in FBC-B TABLE 2507.2 and FBC-B CHAPTER 35 and, where required for fire protection, shall also conform to the provisions of FBC-B CHAPTER 7.
 2. Exterior and interior cement plaster and lathing shall be done with the appropriate materials listed in FBC-B TABLE 2507.2 and FBC-B CHAPTER 35.

2.03 PLASTER MATERIALS

- A. Premixed Plaster for Stucco Scratch, Brown, and Finish Coats: Factory blend of cement, sand and chemical admixtures, complying with material requirements of ASTM C926; designed for superior adhesion and handling properties, extended board life, and resistance to shrinkage and cracking; recommended by manufacturer for both trowel and pump application methods.
 1. Products: AMX 715PP Premium Plus Stucco by Amerimix, an Oldcastle brand (www.amerimix.com), or equal.
- B. Cement, Aggregate, and Other Materials for Job-Mixed Plasters: Provide materials in accordance with ASTM C926 and the following requirements:
 1. Portland Cement: ASTM C150, Type I.
 2. Masonry Cement: ASTM C91, Type S or M.
 3. Lime: ASTM C206, Type S.
 4. Aggregate: Sand conforming to ASTM C897, except as otherwise allowed per ASTM C926.
 - a. Sand for Base Coats: Per ASTM C926, aggregate failing to meet the gradation limits in ASTM C897 may be used, provided the plaster made with the

aggregate has an acceptable demonstrated performance record in similar construction and climate conditions.

- C. Admixtures for Job-Mixed Plasters:
 - 1. Integral Bonding Admixture: Premium acrylic latex bonding agent admixture; designed to increase the adhesion, cohesion and chemical bond of stucco to concrete/CMU base, thus increasing flexural and shear bond strengths.
 - a. Shall comply with requirements of ASTM C932, ASTM C1042, and ASTM C1059/C1059M Type II (non-rewettable type).
 - b. Products: AcrylBond by Lambert Corporation, or equal.
 - 2. Fiber Reinforcement: 1/2-inch fibers meeting the requirements of ASTM C1116/C1116M; alkali-resistant.
- D. Water: Clean, fresh, cool, potable, and free of mineral or organic matter that could adversely affect plaster, and conforming to ASTM C926.
- E. Underlayment: Refer to Section 072500 - Weather Barriers.
- F. Metal Lath: Refer to Section 092236 - Metal Lath.
- G. Beads, Screeds, and Joint Accessories: Refer to Section 092236 - Metal Lath.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. General:
 - 1. Verify the suitability of existing conditions before starting work.
 - 2. Verify that surfaces to receive plaster are straight and true within 1/4 inch in 10 ft (2.1 mm/m).
 - 3. Verify that no substances detrimental to plaster bond (e.g., bituminous or water repellent coatings, form release agents, paint, etc.) exist on concrete or masonry surfaces.
- B. Masonry:
 - 1. Verify surface is ready to receive work of this section.
 - a. Surface shall be Rough or Medium texture per FCPA TB-ST 01, to provide optimal substrate for plaster/stucco adhesion; for additional requirements, refer to Section 042000 - Unit Masonry Assemblies.
 - 2. Verify that joints are cut flush, not tooled or floated.
 - 3. Verify that mortar is fully cured, and carrying its design dead load before plaster is applied.
 - 4. Verify that masonry walls to receive plaster/stucco are constructed in accordance with erection tolerances specified in Section 042000 - Unit Masonry Assemblies.
- C. Concrete:
 - 1. Verify that new concrete has cured for a minimum of 28 days.
 - 2. Verify that surfaces are flat, honeycomb areas are filled flush, and surfaces are ready to receive work of this section.
 - 3. Form ties or other obstructions shall be removed or trimmed back even with the surface of concrete.

4. Concrete surface shall have suction and surface roughness to provide optimal substrate for plaster/stucco adhesion.

D. Metal Lath and Plaster Accessories:

1. Verify lath is flat, properly secured to substrate/framing, and joint and surface perimeter accessories are in place.
2. Verify that lath is properly installed in accordance with ASTM C1063 and applicable requirements of the governing building code, including but not limited to FBC-B SECTION 2514.

3.02 PREPARATION - SOLID BASE SURFACES TO RECEIVE PLASTER/STUCCO

A. General:

1. Fill holes, cracks and similar small voids flush with Portland cement plaster to provide uniform substrate within the specified tolerance.
2. Smooth or non-absorbent solid surfaces shall be prepared to receive plaster as follows:
 - a. Roughen the surface by means of sandblasting, wire brushing, or chipping, or a combination thereof, as required to provide optimal substrate for plaster/stucco adhesion.
 - b. Add a dash-bond coat applied forcefully against the surface, left untroweled, undisturbed, and moist cured for at least 24 hours, as required to provide optimal substrate for plaster/stucco adhesion.
3. Where optimal substrate for plaster/stucco adhesion cannot be obtained over the entire surface to receive plaster by one or more of the methods outlined above, or where total plaster thickness will exceed the thickness specified in ASTM C926 Table 1 for types of solid base, furred or self-furring metal lath shall be installed in accordance with ASTM C1063.
4. Remove projections or other elements which would interfere with bonding.
 - a. Form ties shall be removed.

B. Concrete: Clean concrete surfaces of foreign matter. Clean surfaces using solvents or detergents; then wash surfaces with clean water.

1. Refer to ASTM D4258, ASTM D4259, ASTM D4262 and ASTM D4263 for the recommended practice for cleaning and preparation of concrete surfaces.

C. Concrete Masonry: Clean concrete masonry surfaces of foreign matter; then wash surfaces with clean water.

1. Refer to ASTM D4261 for the recommended practice for cleaning and preparation of concrete unit masonry surfaces.
2. Prior to application of plaster, dampen masonry surfaces to reduce excessive suction.

3.03 PLASTER PROPORTIONS & MIXING

A. General:

1. All plaster work shall be three-coat application, mixed and proportioned in accordance with ASTM C926 and applicable requirements of the governing building code.
 - a. Portland cement plaster shall be mixed and proportioned in accordance with

Tables 1, 2, 3 and 4 and accompanying requirements of ASTM C926, using measuring devices of known volume with successive batches proportioned alike.

- 1) Admixtures shall be proportioned, mixed and applied in accordance with printed directions of the admixture manufacturer.
 - b. All plaster shall be prepared in a mechanical mixer, using sufficient water to produce a workable consistency.
 2. Mix only as much cement plaster as can be used prior to initial set.
 - a. Size mixer to produce batches that will be applied within maximum of 1-1/2 hours after mixing.
 3. Accurately proportion materials for initial cement plaster mixture using measuring devices or known volume.
 - a. Shovels of sand can be used after mixer is calibrated with known volumes of materials, including water.
 4. Use damp, loose sand.
 5. Mix materials dry, to uniform consistency, before adding bonding admix/water mixing liquid.
 6. Add specified admixtures to batch in accordance with manufacturer's recommendations; mix slowly to avoid entrapping air.
 7. Protect cement plaster mixture from contamination and excessive evaporation.
 8. Do not re-temper mixes after initial set has occurred.
 - a. First coat (base coat) plaster that has stiffened because of evaporation of water may be re-tempered one time only to restore the required consistency. Plaster not used within 1.5 hours from start of initial mixing shall be discarded.
 - b. Third coat (finish coat) plaster shall not be re-tempered.
- B. Bonding Admix/Water Mixing for Job-Mixed Plasters: Mix in accordance with integral bonding admixture manufacturer's instructions.
1. Where increased physical and chemical resistance are required, increase the bonding admix content in the mixing liquid in accordance with manufacturer's instructions.
- C. Mechanical Mixing:
1. Mix each batch separately.
 - a. Double batching with single batch discharge shall not be permitted.
 2. Maintain mixer in clean condition before, during, and after cement plaster preparation.
 - a. Remove partially set and hardened cement plaster from mixer drum before next batch.
 - b. If mixer has been previously used in preparing gypsum plaster, thoroughly clean prior to use to prepare cement plaster.
 3. Maintain mixer in continuous operation while charging mixer.
 - a. Add water to bring cement plaster to desired consistency.
 - b. Continue mixing for 3 to 5 minutes after all ingredients have been added to the mixer.
 4. Do not over-mix, aerate, or mix at a high speed.

5. Premixed Plaster: Mix factory-prepared cement plaster in accordance with manufacturer's recommendations.
- D. Mix Proportions for Job-Mixed Plasters:
1. Scratch Coat and Brown Coat: Plaster Mix "MS" per ASTM C926 Table 3.
 - a. Add fiber and integral bonding admixtures per manufacturer's recommendations.
 2. Finish Coat: Plaster Mix "FMS" per ASTM C926 Table 4, or equivalent factory-prepared mixture with water as recommended by manufacturer.
 3. Dash-bond Coat: 1 part of Portland cement and maximum 2 parts of sand, proportioned by volume and mixed to a consistency that will permit application as specified in ASTM C926.

3.04 PLASTERING

- A. Comply with applicable requirements of the governing building code, including but not limited to the following:
1. Minimum thickness of plaster shall conform to the requirements specified in FBC-B TABLE 1405.2.
 2. Cement plaster applied to exterior walls shall conform to the requirements specified in FBC-B CHAPTER 25.
 3. Portland cement-based plaster shall be applied in accordance with ASTM C926, excluding Table 4 of that standard.
 4. The second coat shall be brought out to proper thickness, rodded and floated sufficiently rough to provide adequate bond for the finish coat. The second coat shall have no variation greater than 1/4 inch (6.4 mm) in any direction under a 5-foot (1524 mm) straight edge.
 5. First and second coats of cement plaster shall be applied and moist cured as set forth in ASTM C 926 and FBC-B TABLE 2512.6.
- B. Plaster Thickness:
1. Three-Coat Application over Metal Lath:
 - a. Apply each coat in accordance with thickness requirements specified in ASTM C926 Table 1.
 - b. Minimum overall thickness of plaster shall conform to the requirements specified in FBC-B TABLE 1405.2.
 2. Three-Coat Application over Solid Base:
 - a. Apply each coat in accordance with thickness requirements specified in ASTM C926 Table 1.
 - b. Minimum overall thickness of plaster shall conform to the requirements specified in FBC-B TABLE 1405.2.
- C. Finishing:
1. Finish Texture:
 - a. Vertical Surfaces (e.g., walls): Textured finish to match existing, except as otherwise indicated.
 - b. Horizontal Surfaces (e.g., soffits): Smooth.
 2. Avoid excessive working of surface. Delay troweling as long as possible to avoid

drawing excess fines to surface.

D. Curing:

1. Moist cure first and second coats of cement plaster.
 - a. After curing, dampen previous coat prior to applying next coat.
 - b. Cure second coat for a minimum of 5 days before start of finish coat application.
2. Moist cure finish coat for minimum period of 48 hours.

3.05 PLASTER DETAILS

A. Relief from Stresses:

1. Installation of control joints and perimeter relief shall conform to ASTM C926, ASTM C1063, and manufacturer's instructions.
2. Control Joints:
 - a. Install prefabricated control joint members prior to the application of plaster, using longest practical lengths. Where splicing is required, provide matching prefabricated connector clips designed to align control joint and provide a surface area for sealing butt joints. At spliced connections, fully embed control joint ends in sealant.
 - b. Fasten prefabricated control joint members to wall substrate in accordance with manufacturer's instructions. Embed control joint ends and butts in sealant at time of installation.
 - c. On exterior walls to be finished with plaster, provide continuous control joint at locations indicated on the drawings (e.g., at interface between new and existing plaster).
 - 1) Control joint shall be true and straight.
 - d. After plastering work is completed, clean excess material from the joint area, remove protective tape, and apply joint sealant along full length of the joint. For joint sealant information, refer to Section 079005 - Joint Sealers.
3. Dissimilar Base Materials: At locations where dissimilar base materials abut and are to receive a continuous coat of plaster, the juncture shall be covered with a 6-inch wide strip of Diamond Mesh Metal Lath extending 3 inches on either side of the juncture.

B. Joints at Wall Openings:

- a. To reduce spalling at locations where plaster work abuts a metal frame within a wall opening (e.g., door frame, fixed wall louver frame), use one of the following methods:
 - 1) The abutting edge of plaster shall be tooled through the second and finish coats, to produce a continuous small V-groove joint of uniform depth and width, OR
 - 2) The abutting edge of plaster shall be finished with a continuous Casing Bead to produce a 1/4 inch (nominal) wide continuous joint of uniform depth. Casing Bead must be installed prior to the application of plaster, using longest practical lengths.
- b. Provide sealant at joints, V-grooves, exposed ends and edges of plaster panels to prevent entry of water. For joint sealant information, refer to Section 079005 -

Joint Sealers..

- C. Sills at Wall Openings: At horizontal surface of sill in wall openings (e.g., fixed wall louver), finished surface of plaster shall be sloped at uniform pitch of 1/4 inch per foot to drain and prevent accumulation of water.
- D. Drip Edge: Where vertical and horizontal exterior plaster surfaces meet (e.g., face of roof overhang to underside of roof overhang), provide a continuous Drip Screed Reveal to form a continuous drip edge. Drip Screed Reveal must be installed prior to the application of plaster, using longest practical lengths.

3.06 ADJUSTING, CLEANING AND PROTECTION

- A. Adjusting:
 - 1. Point-up cement plaster around trim and other locations where cement plaster abuts dissimilar materials.
 - 2. Remove defective and damaged cement plaster by cutting it out.
 - 3. Replace removed cement plaster using specified cement plaster brought to desired texture consistent with surrounding area.
- B. Provide temporary covering to minimize spattering of cement plaster on adjacent work.
- C. Remove cement plaster materials from door frames, windows, and other surfaces which are not to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged.
- D. Remove protective tape from control joint accessories after application of cement plaster finish coat.

3.07 ERECTION TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 092410

PORTLAND CEMENT PLASTER REPAIRING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Portland cement plaster (stucco).
 - 1. Inspection and evaluation of all existing exterior cement plaster work, and documentation of damaged or defective areas.
 - 2. Patching and repair of damaged or defective cement plaster work, including but not limited to the following:
 - a. Cracking.
 - b. Delamination.
 - c. Impact damage.
 - d. Rusted or damaged beads.
- B. Repair mortar.
- C. Metal lath.
- D. Beads, screeds, reveals, control joints, and other plaster accessories.

1.02 RELATED REQUIREMENTS

- A. Section 039300 - Externally Bonded Carbon Fiber Reinforced Polymer Strengthening: Bonded carbon fiber reinforced polymer (CFRP) system to strengthen steel reinforced concrete.
- B. Section 079005 - Joint Sealers: Removal and replacement of joint sealers, backing and bond breakers; joint sealer for stucco crack repair.
- C. Section 092400 - Portland Cement Plastering.
- D. Section 099000 - Paints and Coatings: Surface preparation and repainting of exterior surfaces; crack repair materials for stucco crack repair.
- E. Section 099723 - Acrylic Waterproof Coating System.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Concrete Institute (ACI):
 - 1. ACI 524 -- Guide to Portland Cement Plastering.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM C91 -- Standard Specification for Masonry Cement.
 - 2. ASTM C150 -- Standard Specification for Portland Cement
 - 3. ASTM C847 -- Standard Specification for Metal Lath.
 - 4. ASTM C897 -- Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.

5. ASTM C926 -- Standard Specification for Application of Portland Cement-Based Plaster.
 6. ASTM C932 -- Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 7. ASTM C1063 -- Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 8. ASTM C1116 -- Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
 9. ASTM C1328 -- Specification for Plastic (Stucco) Cement.
 10. ASTM D1784 -- Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 11. ASTM D4216 -- Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds.
- D. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- E. Portland Cement Association (PCA):
1. PCA EB049 -- Portland Cement Plaster/Stucco Manual.
- F. The Society for Protective Coatings (SSPC):
1. SSPC-SP 2 -- Hand Tool Cleaning.
 2. SSPC-SP 3 -- Power Tool Cleaning.

1.04 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product data for each product to be used, including but not limited to premixed cement plaster and patching stucco/cement plaster, integral bonding admixture, lath and plaster accessories.
1. Include manufacturer's written specifications, proportion mixes, and installation instructions for factory-prepared materials.
 - a. Manufacturer's written specifications shall include physical and performance characteristics, and instructions for storage, handling, and use.
 2. Provide documentation certifying that materials used together are mutually compatible (e.g., integral bonding admixture and premixed cement plaster).
 3. If requested, provide Material Safety Data Sheets.

1.05 QUALITY ASSURANCE

- A. Installer/Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.
- B. Contractor shall not change source or manufacturer of cement plaster materials during the course of the work.

- C. Warranty: Contractor shall provide a written warranty against defects in material and installation for a period of not less than ten (10) years.

1.06 MOCK-UPS

A. General:

1. Contractor shall prepare mock-up installations illustrating each type of cement plaster repair work to be performed.
 - a. Special tooling and texturing necessary to match existing finish is to be included.
 - b. If cleaning tests are also to take place, test panels should be prepared on the same area as mock-up.
2. Where mock-up is deemed by Architect to be not in conformance with design intent, Contractor shall prepare additional mock-up(s) at no additional cost to Owner as necessary to achieve Architect's approval.
3. Locate mock-ups where directed or as approved by Architect.
 - a. Mock-ups should not be undertaken on highly visible surfaces, except as authorized by Architect.
4. Accepted mock-up(s) shall become part of the Work, and shall serve as the quality standard for subsequent Work.

B. Mock-up No. 1 – Fine Fissure (hairline) Crack Repair: Construct mock-up of exterior fine fissure repair, 2 ft long, illustrating crack concealment and surface finish match to existing.

C. Mock-up No. 2 – Linear Static Crack Repair: Construct mock-up of exterior linear static crack repair, 2 ft long, illustrating crack concealment and surface finish match to existing.

D. Mock-up No. 3 – Large Dynamic Crack Repair: Construct mock-up of exterior wall large dynamic crack repair, 2 ft long, illustrating crack concealment and surface finish match to existing.

E. Mock-up No. 4 – Delamination Repair: Construct mock-up of exterior wall delamination repair, 2 ft long by 2 feet wide, illustrating surface finish match to existing, and edge interface between new and existing cement plaster.

F. Mock-up No. 5 - Externally Bonded CFRP Strengthening Patch Repair: Construct mock-up of exterior wall patch repair to cover externally bonded CFRP strengthening, full length of strengthening assembly, illustrating adhesive bond to CFRP strengthening materials, concealment of strengthening installation, and surface finish match to existing.

G. Mock-up No. 6 – Corner Bead Repair: Construct mock-up of exterior wall corner repair, 2 ft long, illustrating corner finishing, surface finish match to existing, and edge interface between new and existing cement plaster.

H. Mock-up No. 7 – Reveal Bead Repair: Construct mock-up of exterior wall reveal repair, 2 ft long, illustrating reveal finishing, surface finish(es) match to existing, and edge interface between new and existing cement plaster.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all products to the site in original packaging, unopened, and undamaged with

manufacturer's name and product identification visible thereon, and manufacturer's instructions and Material Safety Data Sheets.

- B. Store products in a dry location and protect them from dampness following manufacturer's instructions.
- C. Stockpile and handle aggregates in a manner to prevent contamination from foreign materials.

1.08 FIELD CONDITIONS

- A. Do not apply cement plaster when substrate or ambient air temperature is under 50 degrees F or over 90 degrees F.
- B. Hot Weather Conditions:
 - 1. Use damp loose sand.
 - 2. Use cool water for mixing.
 - 3. Pre-dampen masonry walls prior to application of cement plaster scratch coat.
 - 4. Prevent the cement plaster from drying out by covering with a plastic sheet, or moist cure at least twice daily for the first 2 to 3 days.
 - 5. Do not allow fresh cement plaster to be subject to hot, dry winds.
- C. Protect existing adjacent materials and surfaces during the execution of the work; provide all necessary protection and follow all necessary work procedures to avoid damage to existing material assemblies not a part of the work in the Section:
 - 1. Minimize levels of dust during cement plaster removal and repair operations.
 - 2. Protect open joints and other vulnerable areas from water penetration to prevent leakage during the course of the work. Open areas shall not be left exposed overnight or when inclement weather is predicted.
 - 3. Temporarily remove and store surface-mounted appurtenances (e.g., light fixtures, signs, etc.) during cement plaster and sealant repair work.
 - 4. Protect windows during repair of cement plaster in close proximity to window openings.
 - 5. Protect existing roof surface from damage during the course of the cement plaster rehabilitation work. Repair all damage to roofing, flashings, etc., to the satisfaction of, and at no additional cost to, the Owner.
 - 6. Protect adjacent work from moisture deterioration and soiling due to cement plaster application operations. Provide temporary coverings as required to minimize spattering of cement plaster on other materials.
- D. Provide visible barriers and/or warning tape around the perimeter of the work area for visitor protection and shall provide that nearby vehicles and adjacent structures and foliage are protected from damage during the course of the work.
- E. Coordinate cement plaster work with the other trades involved in exterior rehabilitation work, including but not limited to cleaning, sealing, and painting.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Comply with applicable requirements of governing building code, including but not limited to the following:
 - 1. Lathing and plastering materials shall conform to the standards listed in FBC-B TABLE 2507.2 and FBC-B CHAPTER 35 and, where required for fire protection, shall also conform to the provisions of FBC-B CHAPTER 7.
 - 2. Cement plaster and lathing shall be done with the appropriate materials listed in FBC-B TABLE 2507.2 and FBC-B CHAPTER 35.
- B. Manufacturers:
 - 1. Cement Plaster Materials:
 - a. Titan America LLC; 11000 NW 121 Way; Medley, FL 33178; Tel. 800-226-2057.
 - 2. Integral Bonding Admixture:
 - a. BASF Construction Chemicals LLC.
 - b. Lambert Corporation.
 - 3. Metal Lath:
 - a. Alabama Metal Industries Corporation: www.amico-online.com.
 - b. Clark Steel: www.clarksteel.com.
 - c. Western Metal Lath, Inc: www.wmlinc.com.
 - 4. Plaster Beads, Screeds, Reveals and Other Accessories:
 - a. Alabama Metal Industries Corporation: www.amico-online.com.
 - b. Plastic Components, Inc. (PCI): 9051 NW 97 Terrace, Miami, FL 33178; Tel. 305-885-0561.
 - c. Vinyl Corp.: 8255 NE 70 Street; Miami, FL 33166; Tel. 305-477-6464.

2.02 STUCCO MATERIALS

- A. Portland Cement Plaster: In accordance with ASTM C926 and applicable requirements of the governing building code.
 - 1. Cement:
 - a. Portland Cement: ASTM C150, Type I.
 - b. Masonry Cement: ASTM C81, Type S.
 - c. Stucco Cement: ASTM C1328, Type S.
 - 2. Aggregate:
 - a. Base Coats: ASTM C897, natural or manufactured sand.
 - b. Finish Coat: Natural or manufactured sand graded to pass the No. 16 (1.18 mm) mesh sieve, light colored.
 - 3. Water: Clean, fresh, cool, potable and free of mineral or organic impurities which can affect cement plaster or metal in the system.
- B. Admixtures:
 - 1. Integral Bonding Admixture: Acrylic-polymer emulsion or ethyl-vinyl acetate (EVA) admix designed to enhance the physical properties, adhesion to substrate, and durability of cement plaster.
 - a. Do not use Integral Bonding Admixture in a plaster mix that already has air entrained.

- b. Do not use Integral Bonding Admixture as a surface-applied external bonding agent or as a primer.
- c. Products: One of the following:
 - (1) "MasterEmaco A660" (formerly "Acryl 60") manufactured by BASF.
 - (2) "Lambco Primer" manufactured by Lambert Products.
- 2. Fibers: 1/2-inch fibers meeting the requirements of ASTM C1116; alkali-resistant.

2.03 RELATED MATERIALS

- A. Crack Repair Materials:
 - 1. Patching Material Type 1 or 2, as appropriate for application; for additional information, refer to Section 099000 - Painting and Coating.
 - 2. Patching Material Type 3: Joint Sealant Type S-5; for additional information, refer to Section 079005 - Joint Sealers.
- B. Repair Mortar (Patching Material Type 4): Non-sag, lightweight, one-component, high-strength, polymer-modified, silica-fume-enhanced repair mortar with integral corrosion inhibitor for vertical and overhead applications.
 - 1. Performance Characteristics:
 - a. Compressive Strength (ASTM C109): 6,750 psi (46.5 MPa) at 28 days.
 - b. Modulus of Elasticity (ASTM C215): 5.6×10^5 psi (3,861 MPa).
 - c. Splitting Tensile Strength (ASTM C496): 610 psi (4.2 MPa) at 28 days.
 - d. Flexural Strength (ASTM C348): 1,110 psi (7.7 MPa) at 28 days.
 - e. Bond Strength (ASTM C882, mortar scrubbed into substrate): 450 psi (16.9 MPa) at 28 days.
 - f. Water Absorption (ASTM C642): 4 percent.
 - g. Chloride Permeability (AASHTO T-277, according to ASTM C1202 Table 1): Very low range.
 - h. Length Change, wet cure (ASTM C157): +0.034 percent.
 - i. Length Change, dry cure (ASTM C157): -0.15 percent.
 - 2. Product: "MasterEmaco N425" (formerly "Gel Patch") by BASF.
- C. Lath: Shall conform to applicable requirements of ASTM C1063 and the governing building code, including but not limited to FBC-B CHAPTER 25.
 - 1. Metal Lath: ASTM C847, minimum G60 galvanized; self-furring
 - a. Weight: To suit application, comply with deflection criteria, and as specified in FBC-B TABLE 2514.3.2 for framing spacing.
 - 2. Strip Lath: Same as Metal Lath, except 6 inch (300 mm) wide strip.
 - 3. Welded Wire Lath: ASTM C933; galvanized; with 2 inch (50 mm) square openings, paper or felt backing, of weight to suit application and as specified in FBC-B TABLE 2514.3.2 for framing spacing.
- D. Corner Mesh: Formed sheet steel, minimum 0.018 inch (0.5 mm) thick, expanded flanges shaped to permit complete embedding in cement plaster, minimum 2 inch (50 mm) size; minimum G60 galvanized..
- E. Beads, Screeds, Reveals, Control Joints, and Other Plaster Accessories:
 - 1. General:
 - a. Material: PVC, open grid flanges or perforated with nailing holes.

- b. Depth/ground governed by cement plaster thickness; maximum possible lengths.
- 2. Casing Beads: Bevelled edges.
- 3. Corner Beads: Radiused corners.
- 4. Base Screeds: Bevelled edges.
- 5. Control Joints: Use one of the follow, as indicated on Drawings; if not indicated, per A/E's direction.
 - a. One-piece accordion profile with 2 inch (50 mm) flange at both sides; overall width 4 inches (100 mm); furnish with removable tape.
 - b. Back-to-back casing beads, each with 2 inch (50 mm) flange; overall width 4 inches (100 mm).
- 6. Soffit Vents: Match existing.
- F. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
- G. Fasteners: ASTM C1002 self-piercing tapping screws.
- H. Tie Wire: Annealed galvanized steel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. General:
 - 1. Prior to beginning operations, all exterior cement plaster surfaces shall be inspected to determine locations and extent of defects in cement plaster work, and to identify scope of patching and repair required.
 - 2. Verify that substrates to receive cement plaster conform to the requirements of ASTM C926.
- B. Existing Conditions Survey and Analysis:
 - 1. Comprehensive evaluation of all exterior cement plaster areas shall be conducted by qualified persons experienced cement plaster analysis and repairs.
 - a. All cement plaster surfaces to be visually inspected for defects/damage, including but not limited to the following:
 - (1) Efflorescence: White crystalline deposits on wall surface; white streaks.
 - (2) Craze Cracking: Short, fine lines on the surface of cement plaster; typically about one-eighth (1/8) inch to about one-half (1/2) inch in length.
 - (3) Fine Fissures: Fine, tight fissures in the cement plaster.
 - (4) Linear Cracks: Fissures / fractures in cement plaster, such as dimensional cracks, angular cracks, corner cracks, and door and window cracks; indicate whether cracking is static or dynamic in nature.
 - (5) Delamination: Failure of the bond between cement plaster and substrate.
 - (6) Damage: Chipped or broken cement plaster and/or plaster accessory (e.g., corner bead).
 - b. Sounding: At locations where delamination of cement plaster is suspected (e.g., cracking, discoloration, unevenness in finished surface), conduct

"soundings" to identify areas of delamination.

- c. Bond Strength Tests: At locations where delamination of cement plaster has been identified by soundings, conduct bond strength testing to determine the extent of defective cement plaster and to identify sound cement plaster.
 - (1) Bond strength test procedure shall include a pull-out test conducted on existing cement plaster surfaces.
 - (2) Test machine shall be any type that is of sufficient capacity and capable of applying the load continuously and without shock at the rate of 0.05 in. (1.27 mm) per minute, with provision for adjustment of the rate of loading.
 - (3) Cement plaster areas where testing indicates that bond strength is less than the minimum acceptable values specified in ASTM C932 (i.e., 150 psi) shall be deemed to be defective.
- d. The edges of each area where delamination has been identified by soundings and/or bond strength testing shall be marked for removal.

3.02 PREPARATION

A. General:

1. Pressure clean all existing cement plaster surfaces, using minimum 3000 psi, 3 gal per minute equipment.
 - a. Areas where mildew is present or suspected must be pre-treated with mildewcide prior to pressure cleaning.
2. Prior to application of cement plaster to masonry or concrete substrate surfaces:
 - a. Clean concrete and masonry substrate surfaces of foreign matter. Wash surfaces with clean water.
 - b. Wet cast-in-place concrete and unit masonry bases with fine water spray to produce a uniformly damp surface and to reduce excessive suction.

B. At each area where efflorescence is identified in the Existing Stucco Inspection and Evaluation Report: Remove efflorescence from cement plaster surface.

C. At each area where cracking is identified in the Existing Stucco Inspection and Evaluation Report:

1. Craze Cracking or Fine Fissure Cracking (hairline cracks caused by plastic or drying shrinkage): Remove loose materials and foreign matter that could impair adhesion of crack repair materials to be used for repair; coordinate with preparation requirements specified in Section 099000 - Painting and Coating.
2. Linear Static Cracking (1/32-inch to 1/4-inch wide): Remove loose materials and foreign matter that could impair adhesion of crack repair materials to be used for repair; coordinate with preparation requirements specified in Section 099000 - Painting and Coating.
3. Large Dynamic Cracking (1/4-inch wide or wider): Rout out the crack to form a continuous slot, 1/4 inch W x 1/4 inch D. Remove loose materials and foreign matter that could impair adhesion of crack repair materials to be used for repair.
 - a. The edges of the routed slot shall be undercut where possible; if undercut is not possible, then slot shall have square edges. Edges shall be suitable for installation of bond breaker and joint sealer.

- b. Coordinate joint design (including edge slope) with joint sealant requirements specified in Section 079005 - Joint Sealers, and with preparation requirements specified in Section 099000 - Painting and Coating.
- D. At each area where delaminated cement plaster is identified in the Existing Stucco Inspection and Evaluation Report:
 1. Sound cement plaster to determine the extent of delaminated material.
 2. Remove unsound cement plaster material; profile base substrate by mechanical means.
 - a. Where unsound cement plaster material is to be removed, sawcut an edge line over sound cement plaster at least 2 inches beyond extent of unsound cement plaster material; sawcuts shall be same depth as cement plaster thickness, and shall not extend into substrate. The angle of sawcuts shall be slightly greater than 90 degrees, to provide optimal edge for mating of new cement plaster to existing; featheredging is not allowed.
 3. Remove paint from sound cement plaster a minimum of 12 inches surrounding area to be repaired.
- E. At each area where damage (e.g., rusted metal bead) is identified in the Existing Stucco Inspection and Evaluation Report:
 1. Remove sections of metal plaster bead which are rusted plus minimum 6 inches of sound (free of rust) metal at each end of rusted portion.
 2. Remove unsound cement plaster material and all cement plaster covering the legs of bead sections being removed; profile base substrate by mechanical means.
 - a. Where unsound cement plaster material is to be removed, sawcut an edge line over sound cement plaster at least 2 inches beyond extent of unsound cement plaster material; sawcuts shall be same depth as cement plaster thickness, and shall not extend into substrate. The angle of sawcuts shall be slightly greater than 90 degrees, to provide optimal edge for mating of new repair mortar or cement plaster to existing; featheredging is not allowed.
 3. Remove paint from sound cement plaster a minimum of 12 inches surrounding area to be repaired.
- F. At each area where cast-in-place concrete is exposed due to removal of delaminated or damaged cement plaster, the exposed concrete surface shall be prepared to receive new cement plaster by:
 1. Sandblasting, wire brushing, or chipping, or a combination thereof; and
 2. Application of a dash-bond coat of cement plaster, applied forcefully against the surface, left untroweled, undisturbed, and moist cured for at least 24 hours.

3.03 MIXING - CEMENT PLASTER

- A. General:
 1. Mix only as much cement plaster as can be used prior to initial set.
 - a. Size mixer to produce batches that will be applied within maximum of 1-1/2 hours after mixing.
 2. Accurately proportion materials for initial cement plaster mixture using measuring devices or known volume.

- a. Shovels of sand can be used after mixer is calibrated with known volumes of materials, including water.
 3. Use damp, loose sand.
 4. Mix materials dry, to uniform consistency, before adding bonding admix/water mixing liquid.
 5. Add specified admixtures to batch in accordance with manufacturer's recommendations; mix slowly to avoid entrapping air.
 6. Retempering of base-coat cement plaster is permitted one time only after initial mixing.
 - a. Cement plaster not used within 1-1/2 hours of initial mixing shall be discarded.
 7. Retempering of finish-coat cement plaster is not permitted.
 8. Protect cement plaster mixture from contamination and excessive evaporation.
- B. Bonding Admix/Water Mixing: Mix in accordance with integral bonding admixture manufacturer's instructions.
1. Where increased physical and chemical resistance are required, increase the bonding admix content in the mixing liquid in accordance with manufacturer's instructions.
 2. Do not use integral bonding admixture in a plaster mix that already has air entrained.
- C. Mechanical Mixing:
1. Mix each batch separately.
 - a. Double batching with single batch discharge shall not be permitted.
 2. Maintain mixer in clean condition before, during, and after cement plaster preparation.
 - a. Remove partially set and hardened cement plaster from mixer drum before next batch.
 - b. If mixer has been previously used in preparing gypsum plaster, thoroughly clean prior to use to prepare cement plaster.
 3. Maintain mixer in continuous operation while charging mixer.
 - a. Add water to bring cement plaster to desired consistency.
 - b. Continue mixing for 3 to 5 minutes after all ingredients have been added to the mixer.
 4. Mix factory-prepared cement plaster in accordance with manufacturer's recommendations.
 5. Do not over-mix, aerate, or mix at a high speed.
- D. Hand Mixing:
1. Hand mixing will be allowed only when authorized by Architect/Engineer.
 2. Provide waterproof protection around mixing tub and water barrels when mixing inside the building.
- E. Mix Proportions:
1. Dash-bond Coat: 1 part of Portland cement and maximum 2 parts of sand, proportioned by volume and mixed to a consistency that will permit application as specified in ASTM C926.
 2. Base Coat(s): Plaster Mix "MS" per ASTM C926 Table 3.
 - a. Add fiber and integral bonding admixtures per manufactures' recommendations.

3. Finish Coat: Plaster Mix “FMS” per ASTM C926 Table 4, or equivalent factory-prepared mixture with water as recommended by manufacturer.

3.04 STUCCO REPAIRS

A. General:

1. Defective or damaged cement plaster and related plaster accessories shall be removed.
2. After application of finish coating system, patched and repaired cement plaster cracks, areas, beads and edges shall not be distinguishable in the finished cement plaster work.

B. Repair of Cracks in Cement Plaster:

1. General:

- a. Prepare surfaces and install crack repair materials in accordance with manufacturer’s application instructions.
- b. Crack shall be free from dirt, grease, or other contaminants. Blow cracks clean with compressed air, not to exceed 150 psi.
- c. If substrate appears chalky after cleaning or if other conditions warrant, apply primer in accordance with manufacturer’s application instructions.
2. Craze Cracking and Fine Fissure (Hairline) Cracks: After surface preparation, fill crack with appropriate crack repair materials.
3. Linear Static Cracks: Fill crack with appropriate crack repair materials.
4. Large Dynamic Cracks: After surface preparation, install bond breaker at bottom of new routed slot and install joint sealant.
 - a. The edges of the crack shall be undercut where possible. Brush cracks clean of loose debris with a soft brush.

C. Repair of Delaminated or Damaged Stucco:

1. Cut, patch, repair, and point-up cement plaster as necessary to restore uniform cement plaster (stucco) finish, and to prepare such finish for coating application.
2. Repair cracks and intended surfaces by moistening cement plaster and filling with new cement plaster, troweled or tamped flush with adjoining surfaces.
3. Point-up finish surfaces around items which are built into or penetrate cement plaster surfaces.

D. Plaster Bead Repairs at Corners and Reveals:

1. At locations where existing metal bead is rusted through or damaged, cut and remove rusted or damaged bead and adjacent cement plaster. Then patch and repair the cement plaster to match adjacent corner/reveal detail, using slip-form method without a bead.
2. At locations where existing metal bead has minor rust, solvent clean; then remove loose rust, loose mill scale, and other foreign substances using hand tools according to SSPC-SP 2 or power tools according to SSPC-SP 3. Then coat metal with rust-inhibitive primer recommended by top coat manufacturer (refer to Section 099000 - Painting and Coating), and patch and repair the cement plaster to match adjacent corner/reveal detail.

3.05 CEMENT PLASTER APPLICATION

- A. General:
 - 1. Apply premixed cement plaster in accordance with manufacturer's instructions.
 - 2. Apply cement plaster in accordance with ASTM C926.
 - 3. Moist cure base coats.
 - 4. Apply second coat immediately following initial set of first coat.
 - 5. After curing, dampen previous coat prior to applying finish coat.
 - 6. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
 - 7. Where cement plaster is applied to horizontal surfaces, provide slope to prevent water from accumulating or standing.
 - 8. Where cement plaster abuts aluminum, protect metal from contact with such cement plaster.
 - 9. Where dissimilar base materials abut and are to receive a continuous coat of cement plaster, the juncture shall be covered with a 6-inch wide strip lath extending 3 inches on either side of the juncture.
 - 10. Do not use integral bonding admixture as a surface-applied external bonding agent or as a primer.
- B. Apply cement plaster with complete embedment into bases and all accessories. Fill all corner beads with each coat.
- C. At each cement plaster area to be patched, apply cement plaster with interruptions occurring only at junctures of cement plaster planes, openings, or control joints.
- D. At locations where cement plaster repair work is over metal base (e.g., metal lath), install cement plaster in accordance with the requirements of ASTM C926 for the application of three-coat cement plaster on metal plaster bases.
 - 1. Cement plaster thickness for patching and repairs shall match existing.
- E. At locations where cement plaster repair work is over solid base (e.g., concrete, concrete masonry), install cement plaster in accordance with the requirements of ASTM C926 for the application of three-coat cement plaster on solid bases.
 - 1. Cement plaster thickness for patching and repairs shall match existing.
 - 2. Where total cement plaster thickness will exceed the total thickness specified in ASTM C926 Table 1 for three-coat work over unit masonry or cast-in-place concrete, self-furring metal lath shall be installed in accordance with ASTM C1063.
- F. Delay application of brown coat until scratch coat has attained sufficient rigidity to resist cracking or other physical damage when the next coat is applied.
 - 1. Use a long rod or slicker to densify each coat.
- G. Curing and Interval:
 - 1. First and second coats of cement plaster shall be applied and moist cured as set forth in ASTM C926 and FBC-B TABLE 2512.6.
 - a. The base coat shall be damp cured for a period of not less than 24 hours as set forth in FBC-B SECTION 2516.1.6.6.
 - 2. Cement plaster finish coats shall be applied over base coats that have been in place for the time periods set forth in ASTM C926 and FBC-B SECTION 2516.1.6.8.

- a. The third or finish coat shall be applied with sufficient material and pressure to bond and to cover the brown coat, and shall be of sufficient thickness to conceal the brown coat; additional coats shall be applied as necessary to meet the finished thickness specified or to flush with adjacent cement plaster surfaces.
3. Cement plaster shall be kept damp for a period of not less than 48 hours after application of the finish coat.

H. Finish Texture:

1. Finish texture of new cement plaster used for patching and repairs shall match finish of existing cement plaster on adjacent surfaces, to provide a uniform and consistent overall appearance; for reference, use the following finishes in the locations indicated:
 - a. Vertical Surfaces (e.g., walls; columns): Smooth or textured finish (as indicated on drawings and verified in the field), to match existing finish on adjacent cement plaster.
 - b. Horizontal Surfaces (e.g., ceilings; soffits): Smooth finish, to match existing finish on adjacent cement plaster.
 2. Patched and repaired cement plaster work shall not be distinguishable in the finished cement plaster work.
- I. Tolerance: Complete cement plaster work such that the deviation from true plane (exclusive of texture) is no greater than 1/4 in. (6 mm) as measured from line of a 10-ft (3.5-m) straightedge placed at any location on surface.

3.06 ADJUSTING, CLEANING AND PROTECTION

A. Adjusting:

1. Point-up cement plaster around trim and other locations where cement plaster abuts dissimilar materials.
 2. Remove defective and damaged cement plaster by cutting it out.
 3. Replace removed cement plaster using specified cement plaster brought to desired texture consistent with surrounding area.
- B. Provide temporary covering to minimize spattering of cement plaster on adjacent work.
- C. Remove cement plaster materials from door frames, windows, and other surfaces which are not to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged.
- D. Remove protective tape from control joint accessories after application of cement plaster finish coat.

END OF SECTION

SECTION 093013

TILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Porcelain ceramic mosaic floor tile and glazed ceramic wall tile for interior applications.
- B. Flexible concrete tile for elevator car floor applications.
- C. Precast cement terrazzo floor tile for interior applications.
- D. Mortar, grout and membrane materials.
- E. Joint sealant (for movement joints).
- F. Non-ceramic trim.
- G. Grout sealer.
- H. Patching and leveling compounds, and underlayment materials.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-In-Place Concrete: Substrate for floor tile installation.
- B. Section 042000 - Unit Masonry Assemblies: Substrate for wall and base tile installation.
- C. Section 055100 - Metal Stairs: Installation of porcelain tile over concrete treads in steel stair assemblies.
- D. Section 079005 - Joint Sealers.
- E. Section 090561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.
- F. Section 092116 - Gypsum Board Assemblies: Cement Backer Board Units (CBU) as substrate for wall and base tile installation; backer plate for attachment of toilet accessories; anchor plate for attachment of grab bars.
- G. Section 102800 - Toilet Accessories.
- H. Section 142010 - Passenger Elevators: Installation of tile flooring finish in elevator cars.
- I. Division 22 - Plumbing: Fixtures; floor drains. (NOTE: Where Division 22 - Plumbing is indicated, refer instead to Division 15 - Mechanical).

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American National Standards Institute (ANSI):
 - 1. ANSI A108 Series/A118 Series/A136.1 -- American National Standard

Specifications for the Installation of Ceramic Tile (Compendium).

- a. ANSI A108.1 -- American National Standard for Installation of Ceramic Tile.
 - (1) ANSI A108.1a -- American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
 - (2) 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.
 - (3) ANSI A108.1c -- Specifications for Contractors 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 Bed with Dry-Set or Latex Portland Cement Mortar.
 - b. ANSI A108.10 -- American National Standard Specifications for Installation of Grout in Tilework.
 - c. ANSI A108.11 -- American National Standard for Interior Installation of Cementitious Backer Units.
 - d. ANSI A108.12 -- American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar.
 - e. ANSI A108.13 -- American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
 - f. ANSI A118.3 -- American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.
 - g. ANSI A118.4 -- American National Standard Specifications for Latex-Portland Cement Mortar.
 - h. ANSI A118.6 -- American National Standard Specifications for Standard Cement Grouts for Tile Installation.
 - i. ANSI A118.9 -- American National Standard Specifications for Cementitious Backer Units.
 - j. ANSI A118.10 -- American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile And Dimension Stone Installation.
 - k. ANSI A118.12 -- American National Standard for Crack Isolation Membranes for Thin Set Ceramic Tile and Dimension Stone Installations.
 - l. ANSI A136.1 -- American National Standard for Organic Adhesives for Installation of Ceramic Tile.
 2. ANSI A137.1 -- American National Standard Specifications for Ceramic Tile.
 3. ANSI A138.1 -- Green Squared American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles, and Tile Installation Materials.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A82 -- Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 2. ASTM A185 -- Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 3. ASTM A653 -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized)

- or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM C109 -- Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
 5. ASTM C309 -- Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 6. ASTM C348 -- Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
 7. ASTM C373 -- Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.
 8. ASTM C482 -- Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
 9. ASTM C484 -- Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile.
 10. ASTM C501 -- Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
 11. ASTM C609 -- Standard Test Method for Measurement of Light Reflectance Value and Small Color Differences Between Pieces of Ceramic Tile.
 12. ASTM C627 -- Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
 13. ASTM C648 -- Standard Test Method for Breaking Strength of Ceramic Tile.
 14. ASTM C650 -- Standard Test Method for Resistance of Ceramic Tile to Chemical Substances.
 15. ASTM C794 -- Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
 16. ASTM C920 -- Standard Specification for Elastomeric Joint Sealants.
 17. ASTM 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.
 18. ASTM C1243 -- Standard Test Method for Relative Resistance to Deep Abrasive Wear of Unglazed Ceramic Tile by Rotating Disc.
 19. ASTM C1378 -- Standard Test Method for Determination of Resistance to Staining.
 20. ASTM D737 -- Standard Test Method for Air Permeability of Textile Fabrics.
 21. ASTM D751 -- Standard Test Methods for Coated Fabric.
 22. ASTM D1117 -- Standard Guide for Evaluating Nonwoven Fabrics.
 23. ASTM D3776 -- Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
 24. ASTM D4068 -- Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane.
 25. ASTM D4397 -- Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
 26. ASTM D4551 -- Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.
 27. ASTM D5034 -- Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
 28. ASTM D5957 -- Standard Guide for Flood Testing Horizontal Waterproofing Installations.

29. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 30. ASTM E96 -- Standard Test Methods for Water Vapor Transmission of Materials.
 31. ASTM E970 -- Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.
- D. Florida Building Code, 2010 edition (FBC):
 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-A -- Florida Building Code, Accessibility; 2012 edition.
 - E. International Association of Plumbing and Mechanical Officials (IAPMO).
 - F. International Organization for Standardization (ISO):
 1. ISO 13007 -- Standards for Adhesives and Grouts.
 - F. The National Terrazzo and Mosaic Association, Inc. (NTMA):
 1. NTMA (SPECS) -- Terrazzo Specifications.
 - G. Tile Council of North America, Inc. (TCNA):
 1. TCNA (HB) -- TCNA Handbook for Ceramic Tile Installation.
 - H. Underwriters Laboratories, Inc. (UL):
 1. UL 410 -- Slip Resistance of Floor Surface Materials.

1.04 SUBMITTALS

- A. General:
 1. For submittal procedures and additional requirements, refer to Section 007200 - General Conditions, and Section 013000 - Administrative Requirements.
 2. Submittals for this section are to be coordinated with submittals required in Section 092116 - Gypsum Board Assemblies and Section 102800 - Toilet Accessories.
- B. Product Data: Provide manufacturers' product data sheets and installation instructions for each of the following:
 1. Tile (including Porcelain Ceramic Mosaic Floor Tile, Glazed Ceramic Wall Tile, Flexible Concrete Tile, and Precast Terrazzo Tile): Include physical and performance characteristics for each product to be used.
 - a. Mark to identify each type, size, and shape required.
 2. Flexible Concrete Tile: Include data describing methods, specifications, joint widths, materials and tolerances applicable to precision waterjet cutting and custom printing of tile (to be used for creating the custom image/graphic design at the center).
 3. Precast Terrazzo Tile:
 - a. Include NTMA maintenance literature.
 - b. Include manufacturer's Quality Assurance Program and performance test reports.
 4. Mortar and Grout Materials: Include manufacturer's instructions for mixing and installing.
 - b. Indicate ISO 13007 classification for each type grout and mortar to be used; coordinate with shop drawings to indicate which product will be used in each designated application.
 5. Joint sealer and backer materials for use in movement joints.

6. Cement backer board materials.
7. Membranes and associated products.
8. Terrazzo cleaner and terrazzo sealer products.

C. Shop Drawings:

1. Shop drawings for this section are to be coordinated with submittals required in Section 055100 - Metal Stairs, Section 092116 - Gypsum Board Assemblies, and Section 142010 - Passenger Elevators.
 - a. Provide elevator manufacturer with elevator cab floor recess depth dimension required for tile floor installation, and weight (dead load) of tile floor assembly.
2. Indicate field-verified dimensions for all surfaces to receive tile; coordinate with tile layout.
3. For each type installation, indicate applicable TCNA tile installation method.
 - a. Indicate compliance with specified reference standards for materials and installation specifications.
 - b. Where installation method includes options or alternatives, indicate selected options and alternatives.
 - c. Indicate thickness of setting materials, and coordination with related components (e.g., door threshold, floor drain, etc.).
 - d. Indicate ISO 13007 classification for grout and mortar to be used in each designated application.
4. Indicate accessory materials, including but not limited to patching and leveling compound, waterproofing, cement backer units, joint sealer, grout, etc.
5. Indicate tile layout, patterns, color arrangement, perimeter conditions, junction with dissimilar materials, movement joints, and setting details.
 - a. Indicate alignment of floor, base and wall joints.
6. Indicate interface between materials specified in this section and materials specified elsewhere, including but not limited to sheet metal flashing, floor drains, and door thresholds.
7. Graphic Design Image/Pattern at Elevator Floor: Provide detailed shop drawings for custom graphic design image/pattern.
 - a. Indicate joint widths and tolerances for precision waterjet cut tiles.

D. Samples:

1. Selection Samples:
 - a. Tile: For each type of tile (except tile for which color and finish is specified), submit manufacturer's complete range of color samples (including samples of all Price/Color Groups), for Architect's initial selection.
 - b. Grout: For each type of grout, submit manufacturer's complete set of color samples for Architect's initial selection.
2. Verification Samples: Mount selected tile and apply selected grout on plywood panels; each sample panel to be 24 x 24 inches (600 x 600 mm) in size, illustrating tile pattern, color variations, and grout joint size variations for each of the following conditions:
 - a. Panel A: Wall tile installation, with Tile Type GWT-1.
 - b. Panel B: Floor tile installation, with Tile Type MFT-1.
 - c. Panel C: Floor tile installation, with Tile Type CFT-1.

e. Panel D: Floor tile installation, with Tile Type TFT-1.

E. LEED Submittals:

1. General:

a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).

2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer recycled content percentages (by weight), and the source of the recycled content data.

3. Product Data for Credit MR 5.1 and Credit MR 5.2: For building materials and products that are extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site, submit documentation required to complete the regional materials calculation table in the LEED Submittal Template, including but not limited to: product name for each such material; material manufacturer; total product cost for each such material; percentage of product (by weight) that meets both the extraction and manufacture criteria; distance between the project site and the extraction/harvest/recovery site; distance between the project site and the final manufacturing location.

4. Product Data for Credit EQ 4.1: Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for each indoor adhesive, sealant and sealant primer product used.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.05 QUALITY ASSURANCE

A. Maintain one copy of TCNA (HB) and ANSI A108 Series/A118 Series/A136.1 on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten (10) years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of ten (10) years of documented experience.

D. Certifications:

1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

2. Recycled Content Certification: Provide third-party (e.g., Scientific Certification Systems) certification to verify recycled content claims.

E. Comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 2103, 2121 and 2520.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be stored and protected from damage in accordance with manufacturer's delivery, storage and handling instructions.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of mortar materials in accordance with mortar manufacturer's recommended instructions.

1.08 WARRANTIES

- A. Manufacturer's Warranties: Manufacturer shall warrant that its product(s) or system will be free from defects and will not fail under normal usage for the applicable warranty period.
 - 1. Acceptable Exclusions: Structural failure; damages caused by Acts of God, including, but not limited to hurricane, flooding, earthquake or other types of natural disaster; acts of negligence, or product misuse or abuse; subfloor moisture or water damage; normal wear and tear resulting from usage; cracking due to structural movement, excessive deflection or other failure of the substrate.
 - 2. Remedy: Replacement or repair of defective products.
- B. Warranty Period:
 - 1. General:
 - a. Warranty period shall commence on the effective date of Substantial Completion.
 - 2. Membrane, Mortar and Grout Materials (Waterproof Membrane / Crack Suppression Membrane; Mortar; Grout; Joint Sealer):
 - a. Manufacturer's Product Warranties: 5 years.
 - b. Manufacturer's Commercial System Warranty: 15 years.
 - 3. Shower Pan Liner: Life of original installation.
 - 4. Tile: 1 year.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General: All products of each type shall be by the same manufacturer.
- B. Porcelain Ceramic Mosaic Floor Tile and Ceramic Wall Tile:
 - 1. DalTile: www.daltile.com (Local Mfr Rep: Alexandra Stefan (alexandra.stefan@daltile.com); Tel. 305-477-8216).
 - 2. American Olean: www.americanolean.com (Local Mfr Rep: Carole Schafmeister (carole@dbtile); Tel. 954-907-3226)).
 - 3. Crossville, Inc.: www.crossvilleinc.com (Local Mfr Rep: Carole Schafmeister (carole@dbtile); Tel. 954-907-3226)).
- C. Flexible Concrete Tile:
 - 1. Basis of Design: PolyCem LLC; 950 Taylor Ave Ste 210; Grand Haven, MI 49417 (Local Mfr Rep: Carole Schafmeister (carole@dbtile); Tel. 954-907-3226)).
 - 2. Other Manufacturers: Equivalent products manufactured by other manufacturers may be submitted for consideration.

- D. Precast Terrazzo Tile:
 - 1. Basis of Design: Wausau Tile, Inc.; 9001 Business Hwy 51; Rothschild, WI. 54474; www.wausautile.com
 - 2. Other Manufacturers: Equivalent products manufactured by other manufacturers may be submitted for consideration
- E. Membrane, Mortar and Grout Materials:
 - 1. Basis of Design: Mapei Corporation: www.mapei.us.
 - 2. Other Manufacturers: Equivalent products manufactured by one of the following may be submitted for consideration:
 - a. Bonsal American, Inc. (an Oldcastle company): www.prospec.com.
 - b. Laticrete International, Inc.: www.laticrete.com.
 - c. Southern Grouts & Mortars, Inc. (SGM): www.sgm.cc.
- F. Shower Pan Liner:
 - 1. Compotite Corporation: www.compotite.com.
 - 2. Noble Company: www.noblecompny.com.
- G. Joint Sealant:
 - 1. Basis of Design: Mapei Corporation: www.mapei.us.
 - 2. Other Manufacturers: Equivalent products manufactured by one of the following may be submitted for consideration:
 - a. BASF.
 - b. Laticrete International, Inc.: www.laticrete.com.
 - c. Tremco.
- H. Patching and Leveling Compound, and Underlayment Materials: Same as Waterproofing Membrane, Mortar and Grout Materials manufacturer.
- I. Non-Ceramic Trim:
 - 1. Basis of Design: Schlüter Systems, LP: 194 Pleasant Ridge Road; Pittsburgh, NY 12901-5841; Tel. 800-477-9783.
- J. Substitutions: See Section 007200 - General Conditions and Section 016000 - Product Requirements.

2.02 UNGLAZED PORCELAIN CERAMIC MOSAIC FLOOR TILE

- A. General:
 - 1. All mosaic floor tile products shall be by the same manufacturer.
 - 2. Tile shall be as defined in, and shall conform to the requirements of, ANSI A137.1.
 - 3. Slip Resistance: Tile flooring surfaces shall be stable, firm, and slip resistant; and shall comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 1003 and 1028 and FBC-A SECTION 302.
 - a. In addition, tile flooring surfaces in wet areas (e.g., toilet rooms, locker rooms, showers, etc.) shall have minimum Wet DCOF AcuTest (ANSI A137.1, Section 9.6) value of 0.42.
- B. Mosaic Floor Tile (Type MFT-1, and Type MFT-2):
 - 1. Dimensions: 1 inch hexagon (non-abrasive), nominal (15/16 x 15/16 inch, actual); 1/4 inch thick.

2. Performance Requirements:
 - a. Breaking Strength (ASTM C648): 300 lbf, min.
 - b. Water Absorption (ASTM C373): 0.5 percent, max.
 - c. Scratch Hardness (MOH's Scale): 7, min.
 - d. Slip Resistance (Floor Tile):
 - (1) DCOF AcuTest Value (ANSI A137.1, Section 9.6):
 - (a) Type MFT-1: 0.42, min.
 - (b) Type MFT-2: Greater than 0.42.
 - (2) Static Coefficient of Friction - Dry (ASTM C1028):
 - (a) Type MFT-1: 0.7, min.
 - (b) Type MFT-2: 0.8, min.
 - (3) Static Coefficient of Friction - Wet (ASTM C1028):
 - (a) Type MFT-1: 0.6, min.
 - (b) Type MFT-2: 0.7, min.
3. Product: "Unglazed ColorBody Porcelain Mosaics" by American-Olean, or accepted equal.
 - a. Matching Trim Units: N/A.
 - b. Surface Finish:
 - (1) Type MFT-1 (for use at all locations where Mosaic Floor Tile is indicated, except showers): Slip resistant; American-Olean "non-abrasive", or equal.
 - (2) Type MFT-2 (for use at shower floors): Slip resistant; American-Olean "abrasive", or equal.
 - c. Color(s): American-Olean "Ice White A25", or equivalent color.

2.03 GLAZED CERAMIC WALL TILE

- A. General:
 1. All ceramic wall tile products shall be by the same manufacturer.
 2. Tile shall be as defined in, and shall conform to the requirements of, ANSI A137.1.
- B. Glazed Wall Tile (Type GWT-1):
 1. Dimensions: 3 x 6 inch (7.6 x 15.2 cm); 5/16 inch thick.
 2. Matching Trim Units: Bullnose, bullnose corner, cove, and cove base outcorner; dimensions to match field tile.
 3. Surface Finish: Semi-gloss.
 4. Shade Variation:
 - a. Solid Color: V1.
 - b. Speckled Color: V3.
 5. Performance Requirements:
 - a. Breaking Strength (ASTM C648): 230 lbf, min.
 - b. Water Absorption (ASTM C373): Over 7.0 but less than 20.0 percent.
 - c. Scratch Hardness (MOH's Scale): 6.5, min.
 - d. Shade Variation: V1.
 6. Product: "Rittenhouse Square 36MOD1PA" by Dal-Tile, or approved equivalent product.
 - a. Color(s): "Arctic White 0190".

2.04 FLEXIBLE CONCRETE FLOOR TILE

- A. General:

1. Description: Concrete composite tiles produced with a blend of polymers, recycled content, and concrete materials.
 2. All flexible concrete tile products shall be by the same manufacturer.
 3. Tile shall be as defined in, and shall conform to the requirements of, ANSI A137.1.
 4. Slip Resistance: Tile flooring surfaces shall be stable, firm, and slip resistant; and shall comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 1003 and 1028 and FBC-A SECTION 302.
- B. Concrete Floor Tile (Type CFT-1):
1. Dimensions:
 - a. Type CFT-1: 18 x 18 inches (nominal, 1/16 inch grout joint), square; 0.220 inch thick.
 2. Performance Requirements:
 - a. Abrasive Wear (S-42 Taber Wheel): Minimum 1,300 cycles.
 - b. Water Absorption (ASTM C373): Maximum 3.17 percent.
 - c. Resistance to Thermal Shock (ASTM C484): No visual defects.
 - d. Static Coefficient of Friction (ASTM C1028):
 - (1) Wet: 0.85, min.
 - (2) Dry: 0.76, min.
 - e. Compressive Strength (ASTM C109): Minimum 3,000 psi.
 - f. Static Load Limit (ASTM F970): Maximum 0.002 inch.
 - g. Flammability (ASTM E84): Class A.
 - h. Stain Resistance (ASTM C1378): Not visually affected.
 - i. Color Uniformity (ASTM C609): V2/V3 - Slight Variation.
 3. Product: Betona Flexible Concrete Tile by PolyCem LLC, or equal.
 1. Color(s): Three colors, to be selected by Architect from manufacturer's complete range.
 2. Surface Finish: Clear, protective coating shall provide a low-maintenance, abrasion-resistant surface.
 3. Graphic Design Image/Pattern at Elevator Floor: The tile floor is to include a custom graphic design image/pattern at the center.
 - a. Tile shapes used in the custom graphic design image/pattern are to be created by precision waterjet cutting method, with minimal tolerances.
 - b. Artwork for custom graphic design image/pattern to be furnished by Architect.

2.05 PRECAST CEMENT TERRAZZO FLOOR TILE

- A. General:
1. Materials:
 1. Portland Cement: ASTM C150.
 2. Aggregate: ASTM C33, ASTM C131; natural, sound, crushed marble, stone, recycled glass or recycled porcelain chips without excessive flats or flakes, complying with NTMA requirements
 3. Coloring / Matrix Pigments: Pure mineral or synthetic pigments, resistant to alkalis and non-fading, conforming to manufacturer's recommendations.
 4. Tile Protection: Manufactured units shall be provided with a factory-applied initial protectant.

2. Mixes: Manufactured terrazzo units shall have 70 percent coverage of the tile face with marble, stone, recycled glass or recycled porcelain aggregate.
 3. Fabrication:
 - a. Mechanically vibrated in molds.
 - b. Hydraulically pressed by 900-ton/3250 psi press.
 - c. Steam-cured with 100 percent humidity for 18 hours at 140 deg F.
 - d. Factory Finish: In-line grinding.
 - e. Factory applied initial protectant.
 4. Finishes (Surfaces and Edges):
 - a. All exposed edges to be ground and polished with a minimum of 1/16 inch bevel.
 - b. All finished surfaces to be ground and polished, free of holes and to have overall uniformity in matrix and aggregate.
 - c. Surfaces to be uniform in appearance.
 - d. All precast terrazzo finished surfaces to be sealed with a sealer approved by manufacturer.
 5. Colors:
 - a. TZ 22
 - b. TZ 90
 6. Performance Requirements:
 - a. Compressive Strength: 4000 psi, min.
 - b. Water Absorption (ASTM C373): Pass.
 - c. Bond Strength (ASTM C482): 376 psi, min.
 - d. Color Uniformity (ASTM C609): V1 to V4.
 - e. Breaking Strength (ASTM C648): 981 lbf, min.
 - f. Resistance to Chemical Substance (ASTM C650): No affect.
 - g. Flexural Properties (ASTM C674): 1995 psi, min.
 - h. Deep Abrasion Wear (ASTM C1243): Pass; shall meet p3 standards.
 - i. Resistance to Staining (ASTM C1378): No affect.
 - j. Slip Resistance: Precast cement terrazzo tile flooring surfaces shall be stable, firm, and slip resistant; and shall comply with applicable requirements of the governing building code, including but not limited to FBC-B SECTIONS 1003 and 1028 and FBC-A SECTION 302.
 7. Source Quality Control:
 - a. Quality Control Testing: Quality control testing shall be completed on the first day's production, and on every 5,000 square feet thereafter. Perform testing on the seventh day after the tile has been pressed, and on the twenty-eighth day after the tile has been pressed.
 - (1) Provide documented inspection of terrazzo tile quality control tests.
- B. Terrazzo Floor Tile (Type TFT-1):
1. Manufactured Units:
 - a. Size:
 - (1) Type TFT-1: 12 x 24 inches, nominal (11-13/16 x 23-13/16 inches, actual), x 5/8 inch thick.
 2. Dimensional Tolerances:
 - a. Size (ASTM C499): Range of 0.029 in.

- s. Thickness (ASTM C499): Range of 0.029 in.
 - d. Warpage (ASTM C485):
 - (1) Edge: +/- 0.001 percent or 0.002 in, max.
 - (2) Diagonal: +/- 0.003 percent or 0.010 in, max.
 - d. Wedging (ASTM C502): +/- 0.023 percent or 0.028 in, max.
2. Product: Wausau Tile Terrazzo Tile, or equal.

2.06 PORCELAIN CERAMIC TILE

A. General:

1. All porcelain ceramic tile products shall be by the same manufacturer.
2. Porcelain ceramic tile shall be as defined in, and shall conform to the requirements of, ANSI A137.1.
3. Performance Requirements:
 - a. Breaking Strength (ASTM C648): Minimum 350 lbf.
 - b. Bond Strength (ASTM C482): Minimum 200 psi.
 - c. Water Absorption (ASTM C373): Maximum 0.10 percent.
 - d. Abrasion Wear (ASTM C501): Minimum 270 lbf.
 - e. Chemical Resistance (ASTM C650): Resistant (unaffected).
 - f. Scratch Hardness (MOH's Scale): 6.

B. Porcelain Ceramic (Type PCFT-1):

1. Product: "Fabrique ColorBody Porcelain " by Dal Tile, or accepted equal.
2. Size and Shape: 12 x 24 inches (nominal), 11-3/4 inches x 23-9/16 inches
3. Thickness: 3/8 inch.
4. Edges: Square.
5. Surface Finish: Unpolished
6. Coefficient of Friction (ASTM C1028):
 - (1) Dry: 0.7, minimum.
 - (2) Wet: 0.60, minimum
7. Colors: Two colors, to be selected by Architect from manufacturer's complete range.

2.06 MORTAR & SETTING MATERIALS

A. General:

1. Shall contain anti-microbial protection to inhibit the growth of stain-causing mold and mildew in the substrate.
2. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.
3. Mortar materials shall conform to specified warranty requirements.

B. Mortar Type 1: Factory-blended mixture of finely graded sand and latex-modified Portland cement, designed for use as thick-bed mortar (3/8 inch to 3 inch), complying with ANSI A108.1a and as follows:

1. General:
 - a. Shall be compatible with mortar bond coat materials.
 - b. Suitable for bonded or unbounded, screeded or sloped, and interior or exterior applications.
 - c. Consistency of Mix: Screed mortar.
2. Performance Requirements (28 days):

- a. Compressive Strength (ANSI A118.4 and ASTM C109): 4,000 psi, min.
 - b. Flexural Strength (ASTM C348): 1,100 psi, min.
 - c. Pull-out: 300 psi, min.
- 3. Product: MAPEI 4-to-1 Mortar Mix gauged with MAPEI Planicrete AC, or equal.
- C. Mortar Type 2: High-performance, flexible, thin-set / bond coat mortar, complying with ANSI A118.4 and ISO 13007 Classification C2FS2P2.
 - 1. General:
 - a. Shall be compatible with applicable substrate materials, including but not limited to thick bed mortar, concrete, CMU, and cement backer board.
 - 2. Product: MAPEI Granirapid Premium Rapid-Setting Flexible Thin Mortar, or equal.
- D. Mortar Type 3: 100-percent solids, high-strength, chemical-resistant, non-sagging, epoxy setting mortar, complying with ANSI A118.3 and ISO 13007 Classification R2.
 - 1. Product: MAPEI Kerapoxy 410, or equal.

2.07 GROUT MATERIALS

- A. General:
 - 1. Shall contain anti-microbial protection to inhibit the growth of stain-causing mold and mildew or mildew.
 - 2. Grout materials shall conform to specified warranty requirements.
- B. Grout Type 1: Premium-grade, pre-blended, fast-setting, polymer-modified, color-consistent, non-shrinking, efflorescence-free, sanded portland-cement tile grout, complying with ANSI A118.6 and ISO 13007 Classification CG2WAF.
 - 1. General:
 - a. Shall be recommended by manufacturer for joint widths from 1/16 inch to 1 inch in wet- or dry-area applications.
 - 2. Performance Requirements:
 - a. Compressive Strength (28 days): 5,000 psi, min.
 - b. Flexural Strength (7 days): 1,000 psi, min.
 - 3. Acceptable Product: MAPEI Ultracolor Plus, or equal.
 - 4. Color(s): Up to three colors, as selected by Architect from manufacturer's complete range of colors.
- C. Grout Type 2: Premium-grade, water-cleanable, 100-percent solids, high-strength, chemical-resistant, non-sagging, stain-free, reaction resin grout for joints in wet-area applications, complying with ANSI A118.3 and ISO 13007 Classification R2T/RG.
 - 1. Product: MAPEI Kerapoxy, or equal.
- D. Grout Type 3: Premium-grade water-based styrene acrylic co-polymer with a proprietary admixture package using coated quartz aggregate technology.
 - 1. Product: MAPEI Flexcolor CQ
 - 2. Note: this product can be used for grouting of all specified tile in this project.

2.08 MEMBRANE MATERIALS

- A. General:
 - 1. Membrane materials shall conform to specified warranty requirements, and shall be

compatible with other materials used in the assembly.

- B. Waterproof Membrane / Crack Suppression Membrane: Thin, flexible, seamless load-bearing waterproofing and crack isolation membrane formed from a single component, self-curing, liquid rubber polymer with embedded reinforcing fabric.
1. General:
 - a. Shall provide a thin, continuous barrier to protect adjacent rooms and floors below from water damage, and to provide in-plane crack isolation over hairline cracking or spider-webbing in the substrate, and over shrinkage and other nonstructural cracks up to 1/8 inch in width.
 - b. Shall be compatible with applicable substrate materials, including but not limited to thick bed mortar, thin-set / bond coat mortar, concrete, CMU, cement backer board, and reinforcing fabric.
 2. Physical and Performance Requirements:
 - a. Shall meet or exceed requirements of ANSI A108.10 and ANSI A108.12 standards.
 - b. Shall be IAPMO-listed for use as a shower pan liner.
 - c. Service Rating (ASTM C627): Extra Heavy.
 3. Final Dry Thickness (2 coats): 20 mils, nom.
 4. Acceptable Product: MAPEI Mapelastic AquaDefense, or equal.
- C. Reinforcing Fabric (for use with Waterproof Membrane / Crack Suppression Membrane): Ready-to-use, thin, flexible, alkali-resistant, nonwoven polyester fabric.
1. General:
 - a. Provide reinforcing fabric at locations where recommended by manufacturer, including but not limited to cracks, coves, corners and areas around drains, to provide a durable, reliable barrier to water migration into adjacent areas.
 - b. Shall be compatible with liquid rubber polymer membrane materials.
 2. Physical and Performance Requirements:
 - a. Fabric Weight (ASTM D3776): 2.06 oz per sq yd.
 - b. Grab Tensile Strength (ASTM D5034): MD 57.3 lbf / TD 52.8 lbf.
 - c. Grab Tensile Elongation (ASTM D5034): MD 50 percent / TD 55 percent.
 - d. Trapezoidal Tear (ASTM D1117): 24.7 lbf.
 - e. Thickness (ASTM D1117): 13.6 mils.
 - f. Air Permeability (ASTM D737): 670 cfm.
 3. Product: MAPEI Reinforcing Fabric, or equal.
- D. Cleavage Membrane: Minimum 4.0 mils (0.1 mm) thick polyethylene plastic film complying with requirements of ASTM D4397.
- E. Shower Pan Liner: Sheet membrane waterproofing, specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Shower pan liner shall comply with applicable requirements of the governing building code, including but not limited to FBC-P SECTION 417.5.2.
 2. Material: Floors under shower compartments shall be lined and made water tight utilizing one of the following materials:
 - a. Plasticized polyvinyl chloride (PVC) sheets shall be a minimum of 0.040 inch (1.02 mm) thick, and shall meet the requirements of ASTM D4551. Sheets

- shall be joined by solvent welding in accordance with the manufacturer's installation instructions.
- b. Non-plasticized chlorinated polyethylene sheet shall be a minimum 0.040 inch (1.02 mm) thick, and shall meet the requirements of ASTM D4068. The liner shall be joined in accordance with the manufacturer's installation instructions.
- 3. Physical and performance properties shall comply with the following standards:
 - a. Water Vapor Transmission Rate (ASTM E96): 0.045 inch, max.
- 4. Product: Subject to compliance with requirements, provide one of the following:
 - a. Camposeal Blue Vinyl Shower Pan manufactured by Campotite.
 - b. Chloraloy sheet membrane manufactured by Noble Company.
- F. Vapor Retarder Membrane at Walls: Minimum 6-mils thick polyethylene plastic film complying with ASTM D4397 is required behind cement backer board.
 - 1. To be installed between face of metal studs/furring and cement backer board.
 - 2. To be tied into the floor waterproofing membrane in order to establish continuous seal at interface between floor membrane and wall membrane.
 - 3. Tile installer to coordinate installation.

2.09 MOVEMENT JOINT MATERIALS

- A. General:
 - 1. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
 - 2. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- C. Backup Strip: A flexible and compressible type of closed cell foam polyethylene, butyl rubber, or open cell and closed cell polyurethane, rounded to contact sealant, as shown in TCNA (HB) Method EJ171 details, and as recommended by sealant manufacturer.
 - 1. Backup strip must fit neatly into the joint without compacting and to such a height to allow a sealant depth of 1/2 the width of the joint.
 - 2. Sealant must not bond to the backup material.
- D. Joint Sealant: High-performance, one-component, neutral-cure, 100-percent silicone sealant designed for ceramic tile applications, conforming to ASTM C920, Type S, Grade NS, Class 25, Uses NT, I, M, and G.
 - 1. Adhesion: Shall conform to ASTM C794.
 - 2. Shall be equipped with fungicides to resist mold and mildew growth.
 - 3. Shall be resistant to pool chemicals.
 - 4. Colors: To be selected by Architect from manufacturer's complete range.
 - 5. Product: MAPEI Mapesil, or equal.

2.10 ACCESSORY MATERIALS

- A. Water: Clean, fresh, potable and free of mineral or organic matter that could adversely affect mortar or grout mix.
- B. Tile Setting Accessories:

1. Joint Spacers: Plastic; size specified in manufacturer's printed installation instructions for tile thicknesses and joint widths indicated.
 2. Tile Edge: Stainless steel angle, leg length equal to depth of tile or panel and setting bed.
 3. Miscellaneous Accessories: Supply additional components specified in ANSI and TCNA specifications for indicated installations.
- C. Patching and Leveling Compound, and Underlayment: Latex-portland mortar complying with ANSI A118.4 and designed for screeds, patching and leveling beds, and scratch/plaster coats; suitable for repairing subfloors in commercial and institutional applications.
1. General:
 - a. Products containing gypsum are not acceptable.
 2. Patching and Leveling Compound: Engineered, polymer-modified, fiber-reinforced, cement-based, skimcoating and patching compound.
 - a. Thickness: Featheredge to 1/2-inch.
 - b. Performance Requirements (28 days):
 - (1) Compressive Strength (ASTM C109): 3,500 psi, min.
 - c. Acceptable Products: MAPEI Mapecem Quickpatch, or equal.
 3. Self-leveling Underlayment: High-strength, self-leveling, cement-based underlayment and repair mix.
 - a. Thickness: Featheredge to 1-1/2 inches.
 - b. Performance Requirements (28 days):
 - (1) Compressive Strength (ASTM C109): 4,400 psi, min.
 - (2) Flexural Strength (ASTM C348): 1,100 psi, min.
 - c. Acceptable Products: MAPEI Ultraplan 1 Plus, or equal.
- D. Reinforcing:
1. Wire Reinforcing Mesh: 2 inch x 2 inch (50 x 50 mm) x 16 ASW gauge or 0.0625 inch (1.6mm) diameter galvanized steel welded wire mesh complying with ASTM A185 and ASTM A82.
 2. Glass Fiber Mesh Tape: 2-inch (50 mm) wide self-adhesive fiberglass mesh tape.
- E. Grout Sealer: Water-based grout sealer designed to resist water, oil and acid-based contaminants, and to simplify maintenance.
1. General:
 - a. Shall not change the appearance of the grout.
 - b. Shall allow moisture vapor transmission.
 - c. Suitable for cementitious sanded or unsanded grout joints, interior and exterior applications, and walls or floors.
 - d. Expected Wear Duration: 5 years, minimum.
 2. Product: As recommended by grout manufacturer.
- F. Cement Backer Board Units (CBU): Refer to Section 092116 - Gypsum Board Assemblies.
- G. Fasteners (for attaching Cement Backer Board panels to stud framing): Non-corrosive and non-oxidizing, hot-dipped galvanized fasteners conforming to ASTM A653.
1. Refer to Section 092116 - Gypsum Board Assemblies for additional requirements.

- H. Non-Ceramic Trim: Metal, style and dimensions to suit application, for setting using tile mortar.
 - 1. Movement and Control Joint Profiles:
 - a. Product: Schluter Dilex-EDP Stainless Steel Movement Joint.
- H. Terrazzo Cleaner: Liquid, neutral-pH, chemical cleaner, of formulation recommended by sealer manufacture for type of precast terrazzo used, and complying with NTMA requirements.
 - 1. Shall be approved by precast terrazzo products manufacturer for type of precast terrazzo used.
- I. Terrazzo Sealer: Colorless, neutral-pH, slip-resistant, stain-resistant, penetrating sealer that will not affect color or physical properties of precast terrazzo surface.
 - 1. Film Color: Clear; non-yellowing.
 - 2. Slip Resistance (UL 410): Shall be UL Classified for slip resistance.
 - 3. Shall meet requirements of ASTM C309.
 - 4. Shall be approved by precast terrazzo products manufacturer for type of precast terrazzo used.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Subsurface/Substrate Tolerances: Contractor shall provide tile substrates complying with TCNA (HB) guidelines for “Subsurface Tolerance” and the following criteria, whichever is the most stringent:
 - 1. Concrete Sub-floor (Substrate for Floor Tile):
 - a. Finish slab free from small hollows or bumps and graded to the elevations called for, with depressions in floors between high spots not greater than 1/8 inch below a 10-foot straightedge in accordance with ACI 302 Surface Finish Tolerance, and not more than 1/4 inch between opposite exterior walls, unless otherwise called for on the Drawings.
 - b. Subsurface shall not vary by more than 1/16 inch over 1 foot, nor more than 1/32 inch between adjoining edges.
 - 2. CMU/Concrete Wall (Substrate for Wall Tile / Wall Base Tile):
 - a. Variation from required plane of the backer board surface shall not exceed 1/8 inch in 10 feet.
 - b. Subsurface shall not vary by more than 1/16 inch over 1 foot, nor more than 1/32 inch between adjoining edges.
 - 3. Cement Backer Board (Substrate for Wall Tile / Wall Base Tile):
 - a. Variation from required plane of the backer board surface shall not exceed 1/8 inch in 10 feet.
 - b. Subsurface shall not vary by more than 1/16 inch over 1 foot, nor more than 1/32 inch between adjoining edges.
- B. Sub-floor Surfaces:
 - 1. Verify that sub-floor surfaces are:
 - a. Smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
 - b. Dust-free and free of substances which would impair bonding of setting

materials to sub-floor surfaces.

2. Verify that required floor-mounted utilities are in correct location.

C. Wall Substrate Surfaces:

1. Solid Substrate: Verify that wall substrate surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
2. Stud Framing: Verify that support metal and framing systems are installed to meet the tolerances specified in Section 092116 - Gypsum Board Assemblies as well as in this section, whichever are the most stringent; and ready for installation of cement backer board.
 - a. Metal studs shall be well braced; minimum 20 gage; minimum 3-5/8 inch depth; maximum stud spacing 16 inches on center.

3.02 PREPARATION

A. General:

1. Protect surrounding work from damage.
2. Vacuum clean surfaces and damp clean.
3. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
4. Provide full waterproofing membrane under all bathroom and janitor closet room floor prior to tile system installation.
5. Prepare substrate surfaces in accordance with Waterproofing Membrane, Mortar and Grout Materials manufacturer's recommendations.

B. Concrete Floor Slab Substrate:

1. Bondability:
 - a. Where tile is to be installed, concrete slabs should not have air entrainment or other additives in the mix, nor sealers or curing compounds applied without specific approval of mortar and grout manufacturer.
 - b. Slabs should have steel trowel and fine broom finish and be free of laitance.
 - c. In case of any question on condition of slab, it should be tested for bondability with a Dillon Dynamometer, and show a tensile bond of not less than 300 psi.
2. Cleaning:
 - a. Where sealer, curing compound, bond breaker, densifier/hardener, adhesive or other surface coating has been applied to concrete substrate, it must be removed.
 - b. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding.
 - (1) Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete substrates where ceramic tile will be installed directly on concrete surface with thin-set materials.
 - (2) Steam cleaning or the use of acids and solvents for cleaning will not be permitted.
3. Levelness:
 - a. General:

- (1) Before tile is applied, test structural floor for levelness or uniformity of slope by water. Fill, level, and retest areas as required to meet tolerances specified in Section A-3 of ANSI A108.1 and retest.
 - (2) When specified levelness or uniformity of slope is obtained, prepare floors for setting bed in accordance with ANSI A108.1.
- b. Patching and Leveling:
- (1) Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
 - (2) Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
 - (a) Thickness of compound as required to bring finish tile system to elevation shown.
 - (b) Float finish, except finish smooth for elastomeric waterproofing.
 - (c) At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
 - (3) Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
 - (4) Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
5. Refer to Section 090561 - Common Work Results for Flooring Preparation for additional requirements.
- C. Concrete and Masonry Substrate:
1. Cleaning:
 - a. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.
 - b. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete substrates where ceramic tile will be installed directly on concrete surface with thin-set materials.
 - c. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.
 2. Concrete / CMU Walls:
 - a. Concrete / masonry to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.
 - b. At concrete walls, use self-contained power blast cleaning systems to remove steel trowel finish and establish Concrete Surface Profile (CSP) per mortar manufacturer's recommendations.
- D. Cement Backer Board Substrate:
1. Prior to installation of Cement Backer Board, install Vapor Retarder Membrane at Walls over entire wall area where Cement Backer Board Unit is to be installed.
 - a. Install in accordance with manufacturer's installation instructions.
 2. Install Cement Backer Board Units in accordance with ANSI A108.11, Cement Backer Board manufacturer's instructions, and applicable requirements of the Florida Building Code.
 3. Install Cement Backer Board Units horizontally or vertically to minimize joints,

with end joints over framing members.

- a. Cement Backer Board Units with rounded edges: Face rounded edge away from studs, to form a V-joint for joint treatment.
4. Secure Cement Backer Board Units to each framing member with screws spaced not more than 8 inches (200 mm) on center and not closer than 1/2 inch (13 mm) from the edge of the Cement Backer Board Units, or as recommended by Cement Backer Board manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.
5. Where Cement Backer Board Unit joins waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.
6. Remove polyethylene wrapping from Cement Backer Board Units and separate to allow for air circulation.
 - a. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.
7. Joint Treatment:
 - a. Horizontal Joints: 1/8-inch spacing, filled solid with latex-portland cement mortar and taped with 2-inch alkali-resistant glass fiber mesh tape.
 - b. Vertical Joints: Filled solid with latex-portland cement mortar and taped with 2-inch alkali-resistant glass fiber mesh tape.
 - c. Corners: Leave space between backer board units. Tape joints with skim coat of latex-portland cement mortar, but don't fill.

E. Shower Pan Liner:

1. Before installing shower pan liner:
 - a. Subfloor shall be free of projections (e.g., edges of aggregate).
 - b. Drain shall be a bolt-down, clamping-ring type with weepholes, installed so the lip of the subdrain is flush with sub-floor.
2. Floors under shower compartments shall be lined and made water tight utilizing a shower pan liner, as follows:
 - a. The floor of each individual shower, the shower-area portion of combination shower and drying room, and the entire shower and drying room where the two are not separated by curb or partition, shall be made watertight with a shower pan fabricated in place.
 - b. Liner shall turn up on all sides at least 2 inches (51 mm) above the finished shower curb/threshold level.
 - c. Liner shall be recessed and fastened to an approved backing so as not to occupy the space required for wall covering, and shall not be nailed or perforated at any point less than 1 inch (25 mm) above the finished shower curb/threshold level; also, no nails or screws through shower pan liner at horizontal surfaces (e.g., curb).
 - d. Liner shall be pitched one-fourth unit vertical in 12 units horizontal (2-percent slope) and shall be sloped toward the fixture drains and be securely fastened to the waste outlet at the seepage entrance, making a water-tight joint between the liner and the outlet.
 - e. Coordinate installation of shower pan liner with installation of floor drain specified in Division 22 - Plumbing. Shower pans shall be clamped to drains

- with the drain clamping ring.
3. Form slope for shower pan with reinforced mortar bed, per TCNA (HB) recommendations.
 4. Flood Testing: Shower pan liners and floor drains are components of the plumbing system, and shall be tested and inspected in accordance with ASTM D5957, manufacturer's recommendations, and applicable requirements of governing building code, prior to installation of tile.
 - a. Shower pan liner and floor drain shall not be covered, concealed or put into use until it has been tested, inspected and approved by the authority having jurisdiction.
- F. Elevator Cab Floor: Prepare steel substrate in accordance with mortar manufacturer's instructions.
1. Inspect steel for any signs of rust or corrosion. Clean, remove, passivate steel in accord with steel manufacturer's guidelines to ensure that rust / corrosion is completely removed prior to tiling.
 2. Ensure that surfaces to be tiled are sound, clean and free of dust, dirt, oil, grease, sealers, curing compounds, laitance, efflorescence, form oil, loose plaster, paint, and any other bond breaking material or debris. Clean metal surfaces with a strong detergent to ensure that all manufacturing oils are removed, rinse completely and allow it to dry.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated; if not indicated, request tile pattern. Do not interrupt tile pattern through openings.
- C. Sound tile after setting. Replace hollow sounding units.
- D. Workmanship:
 1. Lay-out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
 2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
 3. Form intersections and returns accurately.
 4. Form internal angles square and external angles bullnosed, except as otherwise indicated.
 5. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints.
 6. Cut and drill tile neatly without marring surface.
 7. Cut edges of tile abutting penetrations, finish, or built-in items:
 - a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
 - b. Seal tile joints water tight, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place; for additional information, refer to Section 079005 – Joint Sealers.
 - c. Completed work shall be free from hollow sounding areas and loose, cracked

- or defective tile.
 - d. Remove and reset tiles that are out of plane or misaligned.
 - e. Floors:
 - (1) Extend floor tile beneath casework and equipment, except built-in casework units mounted in wall recesses.
 - (2) In areas where floor drains occur, slope to drains where shown.
 - (3) Shove and vibrate tiles over 8 inches (200 mm) square to achieve full support of bond coat.
 - f. Walls:
 - (1) Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights shown with tile.
 - (2) Finish reveals of openings with tile, except where other finish materials are shown or specified.
 - (3) At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.
 - (4) Finish wall surfaces behind and at sides of casework and cabinets, toilet accessories and mirrors, and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
- E. Tile Joints:
1. Keep all joints in line, straight, level, perpendicular and of even width, unless shown otherwise.
 2. Joint Width:
 - a. Grout Joints:
 - (1) Porcelain Mosaic Floor Tile (Types MFT-1 and MFT-2): 1/8 inch (3 mm), except as otherwise indicated.
 - (2) Glazed Ceramic Wall Tile (Types GWT-1): 1/16 inch (1.6 mm), except as otherwise indicated.
 - (3) Concrete Floor Tile (Type CFT-1): 1/16 inch (1.6 mm).
 - (4) Precast Cement Terrazzo Floor Tile (Type TFT-1): 3/16 inch (5 mm)
 - (5) Porcelain Ceramic Floor Tile (Type PCFT-1): 3/16 inch (5 mm)
 - b. Movement Joints (Sealant): 1/4 inch (6 mm), except as otherwise indicated.
 3. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
 4. Grouting
 - a. Preparation:
 - (1) Cure set tile 72 hours before grouting when temperature is low or humidity is high; 48 hours before grouting when hot, dry conditions exist.
 - (2) Check mortar bond strength of installed tile before grouting.
 - (3) Clean sanding water, dust, and foreign substances from joints to be grouted.
 - (4) Clean and dry tile surfaces.
 - b. Grout joints in accordance with manufacturer's instructions and ANSI A108.10.
 - c. Remove grout from tile surfaces while still plastic, as grouting progresses.
 - d. After grouting, promptly remove all grout residue.
 5. Keep movement joints free of mortar, grout and other materials prior to application

of joint sealant and backer materials.

3.04 INSTALLATION - TILE

- A. Interior Dry Areas: Install in accordance with designated TCNA (HB) installation method, as follows:
1. Floor:
 - a. General:
 - (1) Service Rating (ASTM C627): Heavy, or Extra Heavy.
 - (2) Environmental Classification: Com2, min.
 - b. Concrete Slab-On-Grade: N/A.
 - c. Elevated Concrete Slab without Recess for Mortar Bed: Installation Method F113A.
 - (a) Membrane 1: Crack Suppression Membrane
 - (b) Mortar Bond Coat: Mortar Type 2.
 - (c) Tile: Type PCFT-1, as indicated on drawings.
 - (d) Grout: Grout Type 1 or 3, with Grout Sealer.
 2. Wall and Wall Base: Wood; refer to Section 062000 - Finish Carpentry.
 3. Finish: All finished surfaces to be cleaned with Porcelain Ceramic Tile Cleaner and sealed with Tile Sealer.
- B. Interior Wet Areas (except Shower): Install in accordance with designated TCNA (HB) installation method, as follows:
1. Floor, Interior:
 - a. General:
 - (1) Service Rating: Heavy or Extra Heavy.
 - (2) Environmental Classification: Com3.
 - b. Concrete Slab-On-Grade: N/A.
 - c. Elevated Concrete Slab:
 - (1) Slab with Recess for Mortar Bed: Installation Method F121.
 - (a) Membrane 1: Cleavage Membrane; unbonded, below the mortar bed.
 - (b) Mortar Bed: Mortar Type 1.
 - (c) Reinforcing: Wire Reinforcing Mesh.
 - (d) Membrane 2: Waterproof Membrane / Crack Suppression Membrane; bonded to top of mortar bed.
 - (e) Mortar Bond Coat: Mortar Type 2.
 - (f) Tile: Type MFT-1, as indicated on drawings.
 - (g) Grout: Grout Type 1 or 3 with Grout Sealer.
 - (2) Slab without Recess for Mortar Bed: N/A
 2. Wall and Base:
 - b. Concrete / CMU Wall: Installation Method W202I.
 - (1) Concrete / CMU Wall.
 - (2) Mortar Bond Coat: Mortar Type 2.
 - (3) Tile: Porcelain Mosaic Tile.
 - (4) Grout: Grout Type 1, with Grout Sealer.
 - b. Stud Framed Wall: Install in accordance with Installation Method W244C.
 - (1) Metal Studs: Minimum 20 gage metal studs at maximum 16 inches on center; refer to Section 092216 - Gypsum Board Assemblies for additional information.

- (2) Membrane 1: Vapor Retarder Membrane, installed between Cement Backer Board and stud framing.
 - (3) Cement Backer Board.
 - (4) Mortar Bond Coat: Mortar Type 2.
 - (5) Tile: Type GWT-1, as indicated on drawings.
 - (a) Cove Base Tile at base.
 - (6) Grout: Grout Type 1 or 3 with Grout Sealer.
- C. Interior Wet Areas, Shower: Install in accordance with designated TCNA (HB) installation method, as follows:
- 1. General:
 - a. Service Rating: Heavy or Extra Heavy.
 - b. Environmental Classification: Com4.
 - 2. Receptor Floor: Install in accordance with Installation Method B415.
 - a. Interior Patching and Leveling Compound: Slope to drain.
 - b. Shower Pan Liner: Slope to drain.
 - c. Mortar Bed: Mortar Type 1, with Wire Reinforcing Mesh; slope to drain.
 - d. Mortar Bond Coat: Mortar Type 2.
 - e. Tile: Type MFT-2, as indicated on drawings; slope to drain.
 - f. Grout: Grout Type 1 with Grout Sealer.
 - 3. Receptor Curb: Install in accordance with Installation Method B417, or current equivalent.
 - a. Membrane 1: Vapor Retarder Membrane, installed between Cement Backer Board and curb framing.
 - b. Cement Backer Board.
 - c. Shower Pan Liner, to turn up and over top of curb, per manufacturer's installation instructions; slope liner at top of curb 1:48 toward shower; no fasteners through liner at top or within receptor.
 - (1) Coordinate with Waterproof Membrane at shower walls.
 - d. Mortar Bed: Mortar Type 1, with Wire Reinforcing; slope top of curb 1:48 toward shower.
 - e. Mortar Bond Coat: Mortar Type 2; slope top of curb 1:48 toward shower.
 - f. Tile: Type MFT-1 at sides and top of curb; slope top of curb 1:48 toward shower.
 - (1) Cove Base Tile at base of curb.
 - g. Grout: Grout Type 1 or 3, with Grout Sealer.
 - 4. Wall and Base:
 - b. Concrete / CMU Wall: Installation Method W202I.
 - (1) Concrete / CMU Wall.
 - (2) Membrane 1: Waterproof Membrane / Crack Suppression Membrane; provide complete waterproofing, including base flashing and treatment at other termination points; coordinate with shower pan liner at shower receptor.
 - (3) Mortar Bond Coat: Mortar Type 2.
 - (4) Tile: Type GWT-1.
 - (4) Grout: Grout Type 1, with Grout Sealer.
 - b. Stud Framed Wall: Install in accordance with Installation Method W244C.

- (1) Metal Studs: Minimum 20 gage metal studs at maximum 16 inches on center; for additional information, refer to Section 092216 - Gypsum Board Assemblies.
 - (2) Membrane 1: Vapor Retarder Membrane, installed between Cement Backer Board and stud framing.
 - (3) Cement Backer Board.
 - (4) Membrane 2: Waterproof Membrane / Crack Suppression Membrane; provide complete waterproofing, including base flashing and treatment at other termination points; coordinate with shower pan liner at shower receptor.
 - (5) Mortar Bond Coat: Mortar Type 2.
 - (6) Tile: Type GWT-1.
 - (a) Cove Base Tile at base.
 - (7) Grout: Grout Type 1 or 3, with Grout Sealer.
- D. Elevator: Install in accordance with designated TCNA (HB) installation method, as follows:
1. Floor: Install in accordance with tile and mortar manufacturers' instructions.
 - a. Mortar Bond Coat: Mortar Type 3.
 - (1) Provide mortar thickness as necessary to establish overall tile floor system installation equal to depth of elevator cab floor recess (i.e., mortar thickness shall equal elevator cab floor recess depth less tile thickness).
 - b. Tile: Type CFT-1, with custom graphic image/pattern design.
 - c. Grout: Grout Type 2 or 3.
 2. Wall: Refer to Section 142010 - Passenger Elevators.
 3. Wall Base: Refer to Section 142010 - Passenger Elevators.

3.05 INSTALLATION - PORCELAIN TILE ON STAIR TREADS

- A. Setting:
1. Set accurately as shown on approved shop drawings, using thin setting method as indicated on the drawings.
 2. Alignment of tiles to metal stair tread shall be straight and true to all dimensions.
 - a. Alignment may not vary more than 1/8 inch in length, height or width.
 3. Mortar: Type 2 (thinset)
 4. Grout: Grout Type 3.
- B. Finish: All finished surfaces to be cleaned with Porcelain Tile Cleaner and sealed with Porcelain Tile Sealer.

3.06 INSTALLATION - MOVEMENT JOINTS

- A. Provide continuous movement joints in accordance with TCNA (HB) Method EJ171 at each of the following locations:
1. Where tile work abuts restraining surfaces (e.g., perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings), and where changes occur in backing materials.
 2. Where joints occur at changes in plane of tile work, including but not limited to the following:
 - a. Joints at junctions between adjacent walls (e.g., inside corner where wall tile meets wall tile).

- b. Joints between walls and floors (e.g., where bottom of cove base tile meets floor tile).
 - c. Joints between columns, walls and floors.
 - d. Expansion and control joints.
 - 3. All expansion, control, construction, and cold joints in the construction shall continue through the tile work, including such joints at vertical surfaces.
 - a. Joints through tile work directly over structural joints must not be narrower than the structural joint.
- B. Installation:
 - 1. Movement joints shall be located over all cold joints and saw-cut control joints.
 - 2. To insure that location of joints in tile work align with existing joints in substrate, joints in tile work should be constructed during installation of mortar beds and/or tile, rather than saw-cutting joints after installation.
 - 3. Keep movement joint cavities open and free of dirt, debris, grout, mortar, and setting materials.
 - 4. Set compressible back-up strip when mortar is placed or utilize removable wood strip to provide space for backup after mortar has cured.
 - 5. Install sealant after tile work and grout are dry. Follow sealant manufacturer's recommendations.
- C. Joint Width:
 - 1. Porcelain Ceramic Floor Tile: 3/16 inch, unless otherwise indicated.
 - 2. Porcelain Mosaic Floor Tile: 1/8 inch, unless otherwise indicated.
 - 3. Glazed Ceramic Wall Tile: 1/16 inch, unless otherwise indicated.
 - 4. Flexible Concrete Tile: 1/16 inch, unless otherwise indicated.
 - 5. Precast Concrete Terrazzo Tile: 3/16 inch, unless otherwise indicated.

3.07 CLEANING AND PROTECTION OF FINISHED WORK

- A. Clean stair treads, and tile and grout surfaces.
- B. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective work.
- C. When recommended by tile manufacturer, apply protective coat of neutral protective cleaner to completed stair treads, and tile walls and floors.
- D. Protect installed stair treads and tile work in accordance with ANSI specifications and manufacturer's instructions; use Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
 - 1. Do not permit traffic over finished floor surface or stair treads for four (4) days after installation.
- E. Remove protective coverings and rinse neutral cleaner from stair treads and tile surfaces not more than 24 hours before final inspection.

END OF SECTION

SECTION 095100
SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Metal grid ceiling suspension system.
- B. Acoustical units.
- C. Perimeter trim system.

1.02 RELATED REQUIREMENTS

- A. Section 211313 - Wet-Pipe Sprinkler Systems: Sprinkler heads.
- B. Section 233713 - Diffusers, Registers, and Grilles: Ceiling-grid-mounted air diffusers.
- C. Section 265113 - Incandescent Interior Lighting: Ceiling-grid-mounted luminaires.
- D. Section 265116 - Fluorescent Interior Lighting: Ceiling-grid-mounted luminaires.
- E. Section 265119 - LED Interior Lighting: Ceiling-grid-mounted luminaires.
- F. Section 265219 - Emergency and Exit Lighting: Ceiling-grid-mounted luminaires.
- G. Section 283111 - Digital, Addressable Fire-Alarm System: Ceiling-mounted fire alarm components.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C635 -- Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 2. ASTM C636/C636M -- Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 3. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E1264 -- Standard Classification for Acoustical Ceiling Products.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
 - 1. Include details and locations of ceiling access identification marks; indicate type of

equipment.

- C. Product Data: Provide data on suspension system components, acoustical units, and perimeter trim system.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. For additional provisions, see Section 016000 - Product Requirements.
 - 2. Extra Acoustical Units: Quantity equal to 2 percent of total installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. USG Corporation: www.usg.com.
- B. Armstrong World Industries, Inc: www.armstrong.com.
- C. Substitutions: See Section 016000 - Product Requirements.

2.02 ACOUSTICAL UNITS

- A. General:
 - 1. Manufacturer: Acoustical units shall be by same manufacturer as suspension system and perimeter trim system.
- B. Acoustical Panel - Type 1:
 - 1. Classification (ASTM E1264): Class A
 - 2. Light Reflectance: 0.90, min.
 - 3. Acoustical Performance:
 - a. NRC (NRC): 0.60, min.
 - b. Ceiling Attenuation Class (CAC): 40, min.
 - c. Product to have UL acoustical compliance.
 - 4. Surface Burning Characteristics (ASTM E84): Class A.
 - a. Flame Spread: 25, max.
 - b. Smoke Developed: 50, max.
 - 5. Panel Dimensions:
 - a. Size: 24 x 24 inches.
 - b. Thickness: 3/4 inch.
 - 6. Edge: Beveled Tegular.
 - 7. Surface Color: White.
 - 8. Surface Pattern: Fine texture.
 - 9. Recycled Content: 35 percent, min.
 - 10. Product:
 - a. "Ultima Tegular", Fine Texture, Item No. 1951 by Armstrong.
 - b. "Halcyon ClimaPlus" by USG Corporation.

2.03 SUSPENSION SYSTEM(S)

- A. General:

1. Manufacturer: Acoustical Panels shall be by same manufacturer as suspension system and perimeter trim system.
- B. Exposed Suspension System: ASTM C635; commercial quality, cold-rolled galvanized steel ceiling suspension system, including die-cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
1. Suspension System Components:
 - a. Main Tees: UL Classified Intermediate Duty Classification; double-web design; 1-1/2 inches high; rectangular top bulb; 15/16-inch exposed flange with roll-formed steel cap; cross tee holes and hanger wire holes at 6 inches o.c.; convenience holes at approximately 2 inches o.c.; integral reversible splices.
 - b. Cross Tees: 1-1/2 inches high; roll-formed into double-web design with rectangular bulb; 15/16-inch exposed flange with pre-painted steel cap; high-tensile steel end clips clenched to web.
 - 1) Main tees and cross tees shall be positively locked, yet shall be removable without the use of tools.
 - c. Finish: Manufacturer's standard corrosion-resistant enamel paint finish; color: Flat White.
 2. Suspension System Attachment Devices:
 - a. Hanger Wire: Galvanized carbon steel; soft temper; pre-stretched; yield stress load at least three times the design load but not less than 12-gauge
 3. Wall Moldings:
 - a. General:
 - (1) Edges: Hemmed.
 - (2) Finish: Exposed surface pre-finished to match suspension system components.
 - b. Angle Molding: Angle shape.
 - (1) Dimensions:
 - (a) Flange: 7/8 inch.
 - (b) Height: 7/8 inch.
 - c. Shadow Molding: Angle shape with reveal.
 - (1) Dimensions:
 - (a) Flange: 3/4 inch.
 - (b) Height: 15/16 inch.
 - (c) Reveal: 3/4 inch.
 4. Product:
 - a. "Prelude" by Armstrong.
 - b. "DONN DX/DXL" by USG Corporation.

2.04 PERIMETER TRIM SYSTEM

- A. Description: Strong, durable and long-lasting perimeter fascia trim system designed for use as finished "floating" edge for suspended acoustical ceiling system.
1. Shall be fully compatible with suspended acoustical ceiling system; all fasteners and attachments to be fully-concealed.
 2. Shall be pre-engineered and made to order, including radius "free-form" trim

components.

3. Manufacturer: Same as the suspension system manufacturer.
- B. Material: Painted steel.
- C. Components:
1. Trim:
 - a. Profile: "C" channel.
 - b. Size: 6 inches (150 mm) x 9/16-inch (14 mm).
 2. Splice Plates: Manufacturer's standard splice plates, sized to fit trim profile.
 3. Attachment Clips: Manufacturer's standard clips, designed for fully concealed attachment of ceiling suspension components to trim profile.
- D. Finish: Trim profile finish and color shall match suspension system finish and color.
- E. Product: "Compasso Standard" by USG, or equal.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Ceiling Access Identification Marks: Provide printed labels for ceiling access identification marks to identify controls, valves, and other equipment located within in ceiling plenum areas.
- C. 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 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. Locate system on room axis according to reflected plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. 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.
- F. 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.

- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.

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. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.

3.04 INSTALLATION - PERIMETER TRIM SYSTEM

- A. Install perimeter trim system at perimeter floating edge of suspended acoustical ceilings (i.e., locations where the edge of a suspended acoustical ceiling system does not abut a wall), in accordance with manufacturer's installation instructions and approved shop drawings.
- B. Use longest practical lengths.
- C. Splice adjacent lengths of trim profile pieces using manufacturer's standard concealed splice plate, and secure so as to achieve hairline joint; corners to be mitered, with splice plate bent to appropriate angle.

3.05 IDENTIFICATION OF EQUIPMENT LOCATED ABOVE CEILING

- A. Provide ceiling access identification marks to identify controls, valves, and other equipment located within in ceiling plenum areas. Equipment that requires ceiling access identification marks includes, but is not limited to the following:
 - 1. Isolation valves.
 - 2. Flow valves.
 - 3. VAV controls.
 - 4. Damper controls.
 - 5. Remote electrical lighting ballasts.
 - 6. Control dampers.

7. Fire control dampers.
 8. HVAC equipment.
 9. Remote transformers.
- B. Coordinate location and design of ceiling access identification marks with Owner's representative.

3.06 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 096429
WOOD STRIP AND PLANK FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wood strip and plank flooring, nailed.
- B. Plywood Subflooring.
- C. Sleepers.
- D. Sheet vapor retarder.
- E. Surface finishing.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 033000 - Cast-in-Place Concrete: concrete subfloor surface.
- C. Section 035400 - Cast Underlayment.
- D. Section 061000 - Rough Carpentry: Wood sleepers and plywood subflooring.
- E. Section 061100 - Reclamation of Historic Lumber: Reclaimed lumber for use in wood plank flooring.
- F. Section 090561 - Common Work Results for Flooring Preparation.
- G. Section 099000 - Painting and Coating: Surface finish to flooring.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. The Engineered Wood Association (APA):
 - 1. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445).
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM F1869 -- Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 2. ASTM F2170 -- Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- D. National Wood Flooring Association (NWFA):
 - 1. NWFA/NOFMA (IN) -- Installation Guidelines and Methods.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 -

Administrative Requirements.

2. Coordinate submittals required in this section with submittals required in Section 061000 - Rough Carpentry, Section 061100 - Reclamation of Historic Lumber, and Section 099000 - Painting and Coating.
- B. Shop Drawings: Indicate floor joint pattern and termination details.
1. Indicate provisions for expansion and contraction, including expansion space dimensions determined in accordance with NWFA/NOFMA (IN) and NWFA Certified Professional Installer's recommendations.
- C. Samples: Submit four sample assemblies, two without applied transparent finish and two with applied transparent finish. Each sample assembly to be comprised of four wood planks attached to specified plywood subflooring, and fabricated using actual remilled and sanded planks 12 inches (300 mm) in length.
1. Samples without applied transparent finish shall illustrate dimensional tolerances, quality of tongue and groove jointing, and sanded finish ready for application of transparent finish.
 2. Samples with applied transparent finish shall illustrate appearance characteristics and quality of finished flooring.
- D. Test Reports: Showing compliance with specified characteristics, including the following:
1. Concrete Substrate:
 - a. Moisture Emission Rate (ASTM F1869).
 - b. In-situ Relative Humidity (ASTM F2170).
 2. Wood Flooring:
 - a. Slip Resistance:
 - (1) Static Coefficient of Friction (SCOF).
- E. Installation Instructions: Indicate standard and special installation procedures, perimeter conditions requiring special attention, and manufacturer's recommendations for accessory products.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and a suggested schedule for cleaning.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. For additional provisions, see Section 016000 - Product Requirements.
 2. Extra Flooring Material: 10 square yards (9 sq m) matching installed flooring.
- H. LEED Submittals: Collect and submit data as required for completing the applicable LEED Submittal Template(s).

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with NWFA/NOFMA (IN).
1. Maintain one copy of document on site.
- B. 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 this section with minimum five years experience.
 - 1. Shall be a NWFA Certified Professional Installer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in protective containers.
- B. Store products under cover and elevated above grade, in accordance with NWFA/NOFMA (IN) recommendations.
- C. Cartons of wood should be stored in dry, well ventilated storage areas or warehouses. Never store cartons of flooring outdoors.

1.07 FIELD CONDITIONS

- A. Provide permanent HVAC and permanent lighting prior to installation.
 - 1. Permanent HVAC shall be in operation at least two weeks prior to flooring installation.
 - 2. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain room temperature and relative humidity prior to, during and after installation, in accordance with NWFA/NOFMA (IN) recommendations.
 - 1. Do not install flooring until all other significant construction work is complete. Moisture producing activities such as drywall, concrete, masonry, painting and grouting must be complete and cured.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wood Strip and Plank Flooring: Reclaimed wood strips or wood planks, as selected by Architect during salvage and remilling of reclaimed lumber.
 - 1. Species: Long Leaf Southern Yellow Pine (Antique Heart Pine); refer to Section 061100 - Reclamation of Historic Lumber.
 - 2. Moisture Content: 7 to 9 percent.
 - 3. Actual Thickness: 1-1/8 inch (28 mm).
 - 4. Edge: Tongue and Groove.
 - 5. End: End matched.
 - 6. Length: Random, 6 ft, 8 ft and 10 ft.
 - 7. Width: Wood strips or wood planks, as selected by Architect during salvage and remilling of reclaimed lumber.
 - a. Wood Strip: 3 inches.
 - b. Wood Plank: 4 inches.
- B. Flooring Nails: Type recommended by flooring manufacturer.
- C. Wood Sleepers and Shims: Reclaimed 2x6 (nominal) Old Growth Southern Yellow

Pine.

- D. Plywood Subflooring: APA PRP-108 Rated Sheathing, sanded, preservative treated; for additional requirements, refer to Section 061000 - Rough Carpentry.
- E. Vapor Retarder: Black polyethylene sheet, 8 mil (0.2 mm) thick; 2 inch (50 mm) wide tape for joint sealing.

2.02 ACCESSORIES

- A. Wood Base: Same species as flooring; profile as indicated.
- B. Ventilating Base: Molded rubber, ventilating type, as indicated on drawings; with adhesives and accessories, black.
- C. Floor Finish: Surface preparation and field applied coating shall be as specified in Section 099000 - Painting and Coating.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet (6 mm in 3 m).
- C. Verify that required floor-mounted utilities are in correct location.
- D. Verify that flooring materials are in satisfactory condition for installation. Do not install scratched or otherwise damaged materials.
- E. Verify that flooring has been stored unwrapped at ambient temperature and humidity of the space in which it is to be installed for at least 7 days prior to installation.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers for achieving the best result for the substrate under the project conditions, and in accordance with Section 090561 - Common Work Results for Flooring Preparation.
- B. Coordinate work with that of other trades prior to installation so that no discrepancies may exist with installation of doors, frames, saddles, floor drains or any materials that would interfere in any other way.
- C. Notify Architect of test results for concrete moisture emission rate (ASTM F1869) and in-situ relative humidity (ASTM F2170), and of any unsatisfactory conditions.
 - 1. Do not begin installation until unsatisfactory conditions have been corrected.
- D. Patch cracks in substrate with approved patching compound.
 - 1. Use Portland cement-based patching compound to patch saw-cut control joints (score marks in concrete), cold/construction seams(concrete), cracks, holes, voids, low spots, depressions, grooves, indentations and defects of small areas.
 - a. Fill level with the surrounding surface.
 - (1) Sand and/or scour patched areas smooth after Patching Compound material is fully cured according to manufacturer's instructions.

2. Use self-leveling cementitious underlayment for leveling large areas where necessary to comply with flooring manufacturer's substrate requirements for flatness.
 - a. For additional requirements, refer to Section 035400 - Cast Underlayment.
 3. DO NOT skim coat large areas with extremely thin layers of patching compound.
- E. Clean substrate surfaces thoroughly prior to installation.
- F. Vapor Retarder:
1. Place vapor retarder over sleepers, lapping edges and ends minimum 6 inches (150 mm) and tape seal; spot glue in place.
- G. Sleepers and Shims:
1. Place sleepers over concrete slab; space sleepers at 12 inches (300 mm) on center.
 2. Shim underside of sleepers to achieve level line of plus or minus 1/4 inch in 10 feet (6 mm in 3 m).
 3. Attach sleepers to concrete substrate by laying a peel-n-stick continuous isolation crack strip.
- H. Plywood Subflooring: Place one layer plywood subflooring over sleepers.
1. Lay the first layer perpendicular to the sleepers, with end joints over sleepers, and nail at 12 inches (300 mm) on center.

3.03 INSTALLATION

- A. Wood Flooring:
1. Install in accordance with NOFMA instructions; predrill and blind nail to sleepers.
 2. Lay flooring in patterns indicated on drawings. Verify alignment as work progresses.
 3. Arrange flooring with square ends set flush and tight.
 4. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar; provide divider strips and transition strips in accordance with flooring manufacturer's recommendations and as indicated..
 5. Install edge strips at unprotected or exposed edges, and where flooring terminates.
 6. Secure edge strips before installation of flooring with stainless steel screws.
 7. Install flooring tight to floor access covers.
 8. Provide expansion space at fixed walls and other interruptions; expansion space dimensions shall conform to approved shop drawings, based on NWFA/NOFMA (IN) and NWFA Certified Professional Installer's recommendations.
- B. Install base at floor perimeter to cover expansion space. Miter inside and outside corners.
- C. Install floor sockets, inserts, and cover plates to a depth sufficient to ensure flush top surface with floor surface.
- D. Finishing:
1. Mask off adjacent surfaces before beginning sanding.
 2. Sand flooring to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.
 3. Apply finish in accordance with floor finish manufacturer's instructions.

4. Apply first coat, allow to dry, then buff lightly with steel wool to remove irregularities. Vacuum clean and wipe with damp cloth before applying succeeding coat.
5. Lightly buff between coats with steel wool and vacuum clean before applying succeeding coat.
6. Apply last coat of finish.
7. For additional requirements, refer to Section 099000 - Painting and Coating.

3.04 CLEANING

- A. Clean and polish floor surfaces in accordance with NWFA/NOFMA (IN) instructions, and with Section 099000 - Painting and Coating.

3.05 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
- C. Section 090561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Association of Textile Chemists & Colorists (AATCC):
 - 1. AATCC 16E -- Test Method for Textiles -- Colorfastness to Light: Water-cooled Xenon-Arc Lamp, Continuous Light.
 - 2. AATCC 134 -- Electrostatic Propensity of Carpets.
 - 3. AATCC 165 -- Colorfastness to Crocking: Textile Floor Coverings, Crockmeter Method.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM C109/C109M -- Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
 - 2. ASTM C348 -- Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
 - 3. ASTM D6859 -- Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings.
 - 4. ASTM E648 -- Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 5. ASTM E662 -- Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. Carpet and Rug Institute (CRI):
 - 1. CRI (CIS) -- Carpet Installation Standard.
 - 2. CRI (GLP) -- Green Label Plus Carpet Testing Program, Approved Products
- E. Deutsches Institut für Normung E.V. (DIN):
 - 1. DIN Std 54318 -- Determination of the Resistance of Fabrics to Displacement, Testing of Textiles.
- F. National Fire Protection Association (NFPA):

1. NFPA 253 -- Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
 2. NFPA 258 -- Standard Research Test Method for Determining Smoke Generation of Solid Materials.
- G. U.S. Code of Federal Regulations (CFR):
1. 16 CFR 1630 -- Standard for the Surface Flammability of Carpets and Rugs.
- H. U.S. Department of Commerce (DOC):
1. DOC FF-1-70 -- (Refer to 16 CFR 1630).

1.04 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. LEED Report: Submit data documenting that VOC content of carpet tile and adhesives and current CRI (GLP) Listing is acceptable.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. For additional provisions, see Section 016000 - Product Requirements.
 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 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 approved by manufacturer.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.07 WARRANTY

A. Manufacturer's Commercial Modular Carpet Warranty:

1. General:
 - a. Definitions:
 - (1) Lifetime of the Carpet: The period of time that the Owner chooses to keep the carpet on the floor at the original installation site.
 - b. Remedy for Losses or Damages: Owner's remedy for losses or damages resulting from defective carpet shall be the repair or replacement of the carpet in the affected area, as determined by carpet manufacturer.
 - c. Warranty Period: Lifetime of the carpet, except as otherwise indicated.
2. Antimicrobial Protection: Carpet manufacturer shall warrant that the carpet will not generate static shock greater than 3.5 kilovolts during warranty period.
3. Floor Compatibility: Carpet manufacturer shall warrant that the carpet will not cause a reactivation of old adhesives due to plasticizer migration during warranty period.
4. Antistatic: Carpet manufacturer shall warrant that the carpet will not generate static shock greater than 3.5 kilovolts during warranty period.
5. Floor Release: Carpet manufacturer shall warrant that the initial installation of the carpet will release from the floor during the warranty period.
6. Color Pattern Permanency: Carpet manufacturer shall warrant that the carpet will exhibit no pattern loss during the Lifetime of the carpet. If the carpet is installed on stairs this warranty will be limited to five years
7. Moisture Resistance: Carpet manufacturer shall warrant that the carpet will resist moisture penetration during warranty period. This warranty does not include moisture penetration at the seams of carpet.
8. Cushion Resiliency: Carpet manufacturer shall warrant that the carpet with attached cushion will retain 90 percent of its cushion resiliency during warranty period.
9. Staining/Soiling: Carpet manufacturer shall warrant that carpet which is treated with StainSmart will resist staining and soiling during warranty period.
10. Delamination of Backing: Carpet manufacturer shall warrant that the backing of the carpet will not delaminate during warranty period.
11. Tuft Bind: Carpet manufacturer shall warrant that the carpet will maintain its tuft bind integrity during warranty period.
12. Dimensional Stability: Carpet manufacturer shall warrant that the carpet will maintain its dimensional stability during warranty period.
13. Flammability: Carpet manufacturer shall warrant that at the time of shipment the carpet will comply with the applicable provisions of the Federal Flammable Fabrics Act for carpet used as floor covering in commercial installations.
14. Edge Ravel: Carpet manufacturer shall warrant that the carpet will exhibit no edge ravel or "zippering" during warranty period.
15. Face Fiber Wear: Carpet manufacturer shall warrant that the carpet will lose no more than ten (10) percent of its face fiber by weight during warranty period.
 - a. Warranty Period: Lifetime of the carpet, except five (5) years if carpet is installed on stairs.

- B. Manufacturer's Sustainable Image Assurance Warranty: In order to maintain the long term integrity of DCP graphic images on modular carpet used in this project, carpet manufacturer will use its state-of-the-art technology to provide continuity of design and color by providing a visual equivalent of the original carpet selection during warranty period.
1. Carpet manufacturer is authorized to employ the latest dye, fiber and construction technologies to produce the replacement carpet.
 - a. It is understood that exact color matches of aged fibers and dyes are not guaranteed, which is consistent with current industry practices.
 2. Carpet manufacturer shall provide, at no charge to Owner, appropriate "mockup" samples prior to manufacturing each succeeding order.
 - a. Carpet will be manufactured following Owner approval of provided samples.
 3. Warranty Period: Ten (10) years, following the initial purchase date of the carpet.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Modular Carpet (Carpet Tile):
1. Basis of Design:
 - a. Milliken & Company; www.milliken.com.
 2. Other Acceptable Manufacturers:
 - a. Interface, Inc: www.interfaceinc.com.
 - b. Lees Carpets: www.leescarpets.com.
- B. Concrete Patching and Leveling Compounds:
1. Basis of Design:
 - a. Mapei Corporation: 1144 East Newport Center Drive; Deerfield Beach, FL 33442; Tel. 888-876-2734; www.mapei.us.
 2. Other Acceptable Manufacturers:
 - a. Ardex Americas: Tel. 888-512-7339; www.ardexamericas.com.
 - b. W.W. Henry: Tel. 800-232-4832; www.henry.com.

2.02 MATERIALS

- A. Modular Carpet (Carpet Tile):
1. Construction: Tufted, loop/tip shear.
 - a. Face Fiber: 100 percent nylon Type 6, 6.
 - b. Dye Method: Digital Color Placement (DCP).
 - c. Total Weight: 111 oz/sq yd (3,763.7 g/sq m).
 - d. Tufted Face Weight: 27 oz/sq yd (915.5 g/sq m).
 - e. Tufts: 144/sq in (2,230.2/100 sq cm).
 - f. Finished Pile Height (ASTM D6859): 0.17 inch (4.3 mm).
 - g. Average Density (Finished): 5,718.
 - h. Dimensions:
 - (1) Size: 39.4 x 39.4 inch (1 x 1 m), nominal.
 - (2) Thickness: 0.37 inch (9.4 mm).
 - i. Backing: High-performance cushion backing system; non-reactive; containing no P.V.C. or plasticizers.

- (1) Features:
 - (a) Performance pre-coat, for maximum tuft bind.
 - (b) Adhesive laminate, for superior delamination strength and moisture barrier.
 - (c) Totally stable synthetic primary backing plus fiberglass mat stabilizing layer.
 - (d) High-density attached polyurethane foam, for comfort underfoot.
 - (e) Releasable secondary backing, for easy removal from installation adhesive.
 - (2) Nominal Weight (of backing materials): 83 oz/sq yd.
 - (3) Thickness (of cushion): 0.10 in. min.
 - (4) Foam Density: 15 lbs/sq ft, min.
 - (5) Moisture Barrier (24-Hour British Spill Test): Pass.
 - (6) Dynamic Impact Test: Pass.
 - (7) Indoor Air Quality: Shall meet all criteria for CRI (GLP) testing program.
2. Performance Requirements:
 - a. Flammability:
 - (1) Critical Radiant Flux (ASTM E648 or NFPA 253): 0.45 watts/sq cm, min.; Class I.
 - (2) Smoke Density (ASTM E662 or NFPA 258): 450, max.
 - (3) Methenamine "Pill Test" (DOC FF-1-70): Pass.
 - b. Lightfastness (AATCC 16E): 4.0 (at 80 hrs), min.
 - c. Crocking (AATCC 165): 4.0 wet or dry, min.
 - d. Electrostatic Charge (AATCC 134): 3.5 kV (at 20 percent RH and 70 deg F), max.
 - e. Dimensional Stability, Aachener Test (DIN Std 54318): 0.2 percent, max.
 - f. Texture Appearance Retention Rating (TARR): Heavy traffic end-use applications.
 - g. Indoor Air Quality: Provide CRI (GLP) certified product, Category 5Y (Post-dyed Nylon with Polyurethane Backing).
 3. Product: "Art Media" manufactured by Milliken & Company, or equal by one of the other acceptable manufacturers.
 - a. General:
 - (1) Each color/pattern to be manufactured in a single color dye lot.
 - c. Color / Pattern:
 - (2) Type CT-1: "Charcoal"; 4-tile precision set pattern repeat.
 - (3) Type CT-2: "Chalk".
 - (4) Type CT-3: "Graphite"; random multi-tile repeat.
- B. Edge Strips: Vinyl, color as selected.
 - C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC content as specified in Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
 - D. Concrete Patching and Leveling Compounds:
 1. General:

- a. Products shall be mold and mildew resistant.
- b. Products containing gypsum are not acceptable.
- 2. Patching Compound Type 1: Fast-drying, polymer-modified, cement-based concrete patching compound that rapidly develops high compressive strength; designed for skim coating unfinished, rough-textured concrete, and for filling minor voids, holes and cracks in concrete.
 - a. Thickness: Featheredge to 1/4-inch.
 - b. Product: "Planipatch" by Mapei, or equal by one of the other listed manufacturers.
- 3. Patching Compound Type 2: High-performance, high-flow, fast-drying, polymer-modified, cement-based, concrete patching compound; designed for patching interior/exterior concrete surfaces.
 - a. Thickness: Featheredge to 3-inch.
 - b. Performance Requirements (28 days):
 - (1) Compressive Strength (ASTM C109/C109M): 4,000 psi, min.
 - (2) Flexural Strength (ASTM C348): 1,200 psi, min.
 - c. Product: "Mapecem Quickpatch" by Mapei, or equal by one of the other listed manufacturers.
- 4. Leveling Compound: Refer to Section 030505 - Cast Underlayment.
- E. Water: Clean, fresh, potable and free of mineral or organic matter that could adversely affect concrete patching / leveling compound mix.

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 Section 090561 - Common Work Results for Flooring Preparation.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. General:
 - 1. Preparation, testing for moisture and pH, and remediation of concrete subfloor due to unsatisfactory moisture or pH conditions shall be performed in accordance with carpet manufacturer's preparation and installation requirements and with Section 090561 - Common Work Results for Flooring Preparation.
- B. Concrete subfloor must be structurally-sound, clean, dust-free, smooth and level.

1. Voids, holes and cracks in excess of 1/8 inch (3.2 mm) should be filled with appropriate Concrete Patching and Leveling Compound material.
2. Floor must be flat (not undulating) to within 1/4 inch in 12 ft (6.4 mm in 3.66 m), with no abrupt changes.
 - a. Abrupt changes and protruding objects must be removed.
- C. Concrete subfloor shall be properly cured (90 days minimum), with steel trowel finish.
 1. Sealing or other post treatment of concrete floors may be used at the discretion of the installation contractor, provided that sealing/treatment product is compatible with carpet and adhesive products and acceptable to carpet manufacturer.
- D. Prior to and during installation, carpet shall be stored between 40 deg F and 100 deg F (4 deg C to 38 deg C), and must be conditioned to between 60 deg F and 90 deg F (15 deg C and 32 deg C).

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI (CIS).
- 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 patterns indicated on drawings, 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

SECTION 098414

ACOUSTIC WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabric-covered fiberglass core panels and mounting accessories.

1.02 RELATED SECTIONS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 092116 - Gypsum Board Assemblies: Substrate for installation of acoustic wall panels.
- C. Section 079005 - Joint Sealers
- D. Section 099000 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C423 -- Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E795 -- Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation. Indicate panel type (i.e., Type 1 or Type 2) and dimensions for each panel to be installed.
- D. Samples:
 - 1. Selection Samples: Manufacturer's color charts for fabric covering,

indicating full range of fabrics, colors, and patterns available.

2. Verification Samples: Fabricated samples of each type of panel specified; 12 x 12 in (305 x 305 mm), showing construction, edge details, and fabric covering.

E. Certificates:

1. Submit test data from an independent testing agency, acceptable to authorities having jurisdiction, evidencing that systems components comply with requirements indicated for fire performance characteristics.
2. Submit test data from NVLAP accredited independent acoustical testing agencies showing that system complies with the specified requirements for acoustical and thermal performance characteristics.:

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.
2. For additional provisions, see Section 016000 - Product Requirements.

G. LEED Submittals:

1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s) on LEED On-line.
2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Credit EQ 4.1: Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for each interior adhesive and sealant used.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with not less than 5 years of experience in manufacturing acoustical products similar to those specified.
- B. Installer Qualifications: Firm with not less than 5 years of documented experience in installing manufactured acoustical panel systems of the type specified, and approved by the manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with not less than 5 years of experience in manufacturing acoustical products similar to those specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.
- B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.
- C. Protect panel edges from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustical Panels:
 - 1. Decoustics; <http://www.decoustics.com>
 - 2. Essi Acoustical Products Company: www.essiacoustical.com.
 - 3. Armstrong World Industries, Inc: www.armstrong.com.
 - 4. CertainTeed Ceilings (formerly BPB): www.certainteed.com.
 - 5. USG: www.usg.com.
- B. Substitutions: See Section 016000 - Product Requirements.
- C. Provide all acoustical panels by one manufacturer.

2.02 ACOUSTICAL WALL PANELS

- A. Basis of Design: "AP" panel by Decoustics, or equal.
- B. Panels: Prefinished, factory assembled fabric-covered 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 E 84.
- C. Fiberglass Core Panels:
 - 1. Noise Reduction Coefficient (NRC): 0.85 when tested in accordance with ASTM C 423 for Type A mounting, per ASTM E 795.
 - 2. Panel Width: As detailed.
 - 3. Panel Height: As detailed.
 - 4. Panel Thickness: 1 and 2 inches, where indicated on drawings
 - 5. Edges: As detailed.
 - 6. Corners: Beveled.
 - 7. Mounting: Back mounting with concealed clips.
- D. Fabric Covering: Custom fabric selection, seamless across panels, stretched flat and smooth and wrinkle-free, returned 1-inch on panel back.
 - 1. Fabric: Woven polyester.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Patterns: Where fabric with directional or repeating patterns or fabric with

directional weave is used, mark for installation in same direction.

2.03 UNFACED ACOUSTIC BLANKET FIBERGLASS

- A. Basis of Design: "Select Sound" Black Acoustic Blanket Fiber Glass, by Owens Corning, or equal.
 - 1. Blanket Width: 72 inches
 - 3. Blanket Length: 50 ft.
 - 4. Panel Thickness: 2-inches
- B. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E 84.

2.04 FIBERGLASS DUCT LINER

- A. Basis of Design: "Linacoustic RC" Fiber Glass Duct Liner with Reinforced coating system, by Johns Manville, or equal.
 - 1. Roll Width: 48 inches
 - 3. Roll Length: 50 ft.
 - 4. Panel Thickness: 2-inches
- B. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E 84.

2.03 FABRICATION

- A. General: Fabricate panels to sizes and configurations indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 in (1.6 mm) for thickness, overall length and width, and squareness from corner to corner.

2.04 ACCESSORIES

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
 - 1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prior to installation of panels, the entire surface of each wall designated to receive acoustical panels shall be finished in accordance with Joint Treatment and Finishing criteria specified in Section 092116 'Gypsum Board Assemblies', and

then painted.

1. Portions of wall surface to be covered by acoustical wall panels shall be finished to same level per ASTM C 840 as surfaces that will remain exposed (e.g., ASTM C 840, Level 5); refer to Section 092116 'Gypsum Board Assemblies' for additional information
2. Portions of wall surface to be covered by acoustical wall panels shall be painted using same paint system and color as surfaces that will remain exposed (e.g., Paint GI-OP-3A-G5); refer to Section 099000 'Painting and Coating' for additional information.

3.03 INSTALLATION

- A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- B. Install panels to construction tolerances of plus or minus 1/16 in (1.6 mm) for the following:
 1. Plumb and level.
 2. Flatness.
 3. Width of joints.

3.04 CLEANING

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- B. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.05 PROTECTION OF FINISHED WORK

- A. Provide protection of installed acoustical panels until completion of the Work.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099000
PAINTING AND COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so 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. Floors, unless specifically so indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Removal and replacement of joint sealers, backing and bond breakers; joint sealer for stucco crack repair.
- B. Section 092410 - Portland Cement Plaster Repairing: Patching and repair of damaged or defective cement plaster work.
- C. Section 099610 - High Performance Coatings for Steel: High-performance coating systems for historic replica fire escapes and AESS solar parking structures.
- D. Section 099610 - High Performance Coatings for Cisterns: High-performance coating systems for interior surfaces of concrete rain water storage tanks.
- E. Section 099723 - Acrylic Waterproof Coating System: High-build acrylic waterproof coating system over exterior cement plaster (stucco).
- F. Section 210553 - Identification for Fire Suppression Piping and Equipment.
- G. Section 220553 - Identification for Plumbing Piping and Equipment.
- H. Section 230553 - Identification for HVAC Piping and Equipment.
- I. Section 260553 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D235 -- Standard Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent).
 - 2. ASTM D522 -- Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
 - 3. ASTM D562 -- Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
 - 4. ASTM D1308 -- Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 5. ASTM D1475 -- Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
 - 6. ASTM D3273 -- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 7. ASTM D3359 -- Standard Test Methods for Measuring Adhesion by Tape Test.
 - 8. ASTM D3960 -- Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 - 9. ASTM D4214 -- Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
 - 10. ASTM D5201 -- Standard Practice for Calculating Formulation Physical Constants of Paints and Coatings.
 - 11. ASTM D6904 -- Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry.
- C. Florida Building Code (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- D. Master Painters Institute, Master Painters and Decorators Association (MPI):
 - 1. MPI (APL) -- Master Painters Institute Approved Products List.
 - 2. MPI (APSM) -- Master Painters Institute Architectural Painting Specification Manual.
- E. The Society for Protective Coatings (SSPC).
 - 1. SSPC (PM1) -- Good Painting Practice: SSPC Painting Manual, Vol. 1.
 - 2. SSPC-SP 1 -- Solvent Cleaning.
 - 3. SSPC-SP 2 -- Hand Tool Cleaning.
 - 4. SSPC-SP 3 -- Power Tool Cleaning.
- F. U.S. Code of Federal Regulations (CFR):
 - 1. U.S. Environmental Protection Agency:
 - a. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings.

1.04 SUBMITTALS

- A. General:

1. For submittal procedures, see General Conditions, Supplementary Conditions, and Section 013000 - Administrative Requirements.
- 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 paint system(s) product is to be used in; include description of each system.
 4. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- C. Samples:
 1. Selection Samples: Submit three sets of paper "draw down" samples, illustrating range of colors available for each top coat product specified.
 - a. Where sheen is specified, submit samples in only that sheen.
 2. Verification Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded.
 - a. Submit on aluminum sheet, 12 x 12 inch (300 x 300 mm) in size.
- D. LEED Submittals:
 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 2. Product Data for Credit EQ 4.2: Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for each interior paint or coating product actually used.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- B. Maintain one copy of relevant portions of MPI (APSM) on project site at all times.
- C. Mock-Up:
 1. For general requirements for mock-up, see Section 014000 - Quality Requirements.
 2. Provide interior wall panel, 10 feet (3 m) long by 10 feet (3 m) wide, illustrating coating color, texture, and finish.
 - a. If requested by Architect, provide additional mock-ups for color and sheen selection.
 3. Provide exterior wood trim assembly, 10 feet (3 m) long, illustrating coating color, texture, and finish.
 - a. If requested by Architect, provide additional mock-ups for color and sheen

- selection.
4. Provide one interior and one exterior door and frame assembly illustrating coating color, texture, and finish.
 - a. If requested by Architect, provide additional mock-ups for color and sheen selection.
 5. Locate mock-ups where directed.
 6. Approved mock-ups 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 EXTRA MATERIALS

- A. Supply 1 gallon (4 L) of each paint type, color and sheen used; store where directed.
 1. Label each container with color in addition to the manufacturer's label.
- B. For additional provisions, see Section 016000 - Product Requirements.

1.08 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 coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

1.09 WARRANTY

- A. Labor and Material Warranty: Submit manufacturer's ten (10) year labor and material warranty for specified systems. Approval of warranty period and confirmation of system compatibility with substrates and joint sealants is required prior to system application.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

- B. Provide all paint and coating products from the same manufacturer.
 - 1. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- C. Paints:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com.
- D. Primers and Block Fillers: Same manufacturer as top coats.

2.02 PAINTS AND COATINGS - GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoaters, and finish-coat 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.
 - 1. Patching materials used in conjunction with coating system shall be compatible with such coating system.
- B. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Where MPI paint numbers are specified, provide products listed in MPI (APL) for specified MPI categories, except as otherwise indicated.
 - 2. Provide Premium Grade systems (2 top coats) as defined in MPI (APSM), except as otherwise indicated.
 - a. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
 - 3. Provide paints and coatings 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.
 - 4. 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.
 - 5. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 6. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- C. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- D. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings 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.
 - 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.

- E. Flammability: Comply with applicable code for surface burning characteristics.
- F. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- G. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Concrete / Cement Plaster (Stucco) / CMU: High-build acrylic waterproof coating system; refer to Section 099723 - Acrylic Waterproof Coating System.
- B. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats, over one coat of latex primer sealer.
 - 3. Top Coat(s): MPI #311 (Latex, Exterior, High Performance Architectural, Semi-Gloss, MPI Gloss Level 5), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Mildew Resistance (ASTM D3273): Pass; no growth.
 - c. Flexibility (ASTM D522): Pass; no cracking.
 - d. Alkali Resistance (ASTM D1308): Pass.
 - e. Wind Driven Rain Resistance (ASTM D6904): Pass.
 - f. Product: Benjamin Moore Regal® Select Exterior High Build, or equal.
 - 4. Primer(s): As recommended by manufacturer of top coat product.
- C. Paint WE-TR-VS - Wood, Transparent, Varnish, Stain: N/A.
- D. Paint ME-OP-3L - Ferrous Metals, Latex, 3 Coat:
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat(s): MPI #311 (Latex, Exterior, High Performance Architectural, Semi-Gloss, MPI Gloss Level 5), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Mildew Resistance (ASTM D3273): Pass; no growth.
 - c. Flexibility (ASTM D522): Pass; no cracking.
 - d. Alkali Resistance (ASTM D1308): Pass.
 - e. Wind Driven Rain Resistance (ASTM D6904): Pass.
 - f. Product: Benjamin Moore Regal® Select Exterior High Build, or equal.
 - 4. Primer(s): As recommended by manufacturer of top coat product.
- C. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats and one coat primer.

3. Top Coat(s): MPI #311 (Latex, Exterior, Gloss, MPI Gloss Level 6), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Mildew Resistance (ASTM D3273): Pass; no growth.
 - c. Flexibility (ASTM D522): Pass; no cracking.
 - d. Alkali Resistance (ASTM D1308): Pass.
 - e. Wind Driven Rain Resistance (ASTM D6904): Pass.
 - f. Product: Benjamin Moore Regal® Select Exterior High Build, or equal.
4. Primer(s): As recommended by manufacturer of top coat product.

2.04 PAINT SYSTEMS - INTERIOR

- A. Paint CI-OP-3L - Concrete / Concrete Masonry / Cement Plaster (Stucco), Latex, 3 Coat:
 1. Preparation as specified by paint manufacturer.
 2. Two top coats and one coat primer.
 3. Top Coat(s): MPI #140 (Latex, Interior, High Performance Architectural, MPI Gloss Level 4), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Product: Benjamin Moore Regal® Select Premium Interior Paint & Primer Pearl Finish, or equal.
 4. Primer(s): As recommended by manufacturer of top coat product.
- B. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
 1. Preparation as specified by paint manufacturer.
 2. Two top coats, over one coat of latex primer sealer.
 3. Top Coat(s): MPI #140 (Latex, Interior, High Performance Architectural, MPI Gloss Level 4), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Product: Benjamin Moore Regal® Select Premium Interior Paint & Primer Pearl Finish, or equal.
 4. Primer(s): As recommended by manufacturer of top coat product.
- C. Paint WI-TR-VS - Wood (except Wood Floors), Transparent, Varnish, Stain: N/A.
- D. Paint WI-TR-VS - Wood Floors, Transparent, Varnish, Stain:
 1. Preparation as specified by paint manufacturer.
 2. Two coats of varnish, over stain and sealer.
 3. Top Coat(s): MPI #___ (Varnish, Water-Based, Clear, Satin), meeting the following criteria:
 - a. Vehicle Type: Water-based polyurethane resin.
 - b. VOC: Less than 250 g/L (2.08 lbs./gal.).
 - c. Shall meet MPI Green Performance Standard (GPS-1).
 - d. Product: _____, or equal.
 4. Stain: MPI #___ (Stain, Interior, Water-Based, Semi-Transparent), meeting the following criteria:
 - a. Vehicle Type: _____.
 - b. VOC: Less than 250 g/L (2.08 lbs./gal.).

- c. Shall meet MPI Green Performance Standard (GPS-1).
 - b. Product: _____, or equal.
 - 5. Sealer: MPI #___ (____), meeting the following criteria:
 - a. Vehicle Type: _____.
 - b. VOC: Less than 250 g/L (2.08 lbs./gal.).
 - c. Shall meet MPI Green Performance Standard (GPS-1).
 - b. Product: _____, or equal.
- E. Paint MI-OP-3L - Ferrous Metals, Latex, 3 Coat:
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat(s): MPI #140 (Latex, Interior, High Performance Architectural, MPI Gloss Level 4), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Product: Benjamin Moore Regal® Select Premium Interior Paint & Primer Pearl Finish, or equal.
 - 4. Primer(s): As recommended by manufacturer of top coat product.
- F. Paint MgI-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat(s): MPI #140 (Latex, Interior, High Performance Architectural, MPI Gloss Level 4), meeting the following criteria:
 - a. Vehicle Type: 100-percent acrylic latex.
 - b. Product: Benjamin Moore Regal® Select Premium Interior Paint & Primer Pearl Finish, or equal.
 - 4. Primer(s): As recommended by manufacturer of top coat product.
- G. Paint I-OP-FL - Opaque Finish on Concrete Floors.
 - 1. Preparation as specified by paint manufacturer.
 - 2. Two top coats and one coat primer; or if self-priming, then two top coats only.
 - 3. Top Coat(s): MPI #60 (Floor Paint, Latex, Low Gloss), meeting the following criteria:
 - a. Vehicle Type: Epoxy-modified acrylic latex.
 - b. Product: Benjamin Moore Floor & Patio® Latex Floor & Patio Low Sheen Enamel, or equal.
 - 4. Primer(s): As recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Materials (for repairing cracks and other defects in exterior cement plaster/stucco):
 - 1. Patching Material Type 1 (for static hairline cracks caused by plastic or drying shrinkage): Type suitable for application, as recommended by coating manufacturer.

2. Patching Material Type 2 (for static cracks hairline to 1/4-inch in width): Water-based, acrylic elastomeric crack filler for repairing cracks.
 - a. Performance Characteristics:
 - (1) Tensile Strength (ASTM D412): 100 psi (0.7 MPa).
 - (2) Ultimate Elongation at Break (ASTM D412): 275 percent.
 - b. Product:
 - (1) Smooth: "Sonocoat Acrylic Patching Compound 748" by BASF.
 - (2) Textured: "Sonocoat Acrylic Patching Compound 746T" by BASF.
 3. Patching Material Type 3 (for patching dynamic cracks more than 1/4-inch in width): Joint Sealant Type S-5; for additional requirements, refer to Section 079005.
 4. Patching Material Type 4 (for repair/replacement of small areas of damaged cement plaster/stucco): Repair Mortar; for additional requirements, refer to Section 092400 - Portland Cement Plastering.
 5. Patching Material Type 5 (for repair/replacement of large areas of damaged or delaminated cement plaster/stucco): Cement plaster (stucco); for additional requirements, refer to Section 092400 - Portland Cement Plastering.
 6. Primer / Surface Conditioner: As recommended by Patching Material manufacturer.
- B. Fastener Head Cover Material: Use Patching Material Type 2.

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 affect proper application.
 1. Patched/repaired cement plaster/stucco substrates must be fully cured in accordance with recommendations of paint/coating manufacturer.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter.
 1. Do not apply finishes unless moisture content of surfaces is within acceptable tolerances recommended by the coating manufacturer.
- E. Check adhesion of old paint using ASTM D3359, measuring adhesion by Tape Method A.

3.02 PREPARATION

- A. General:
 1. Clean surfaces thoroughly and correct defects prior to coating application.
 2. Prepare surfaces using the methods recommended by the coating manufacturer for achieving the best result for the substrate under the project conditions.
 3. Remove or repair existing coatings that exhibit surface defects.

4. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
 5. Seal surfaces that might cause bleed through or staining of topcoat.
 6. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
 7. Concrete and Unit Masonry Surfaces to be Painted:
 - a. Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
 - b. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry.
 - c. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
 8. Cement Plaster (Stucco) Surfaces to be Painted:
 - a. Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces.
 - b. Wash and neutralize high alkali surfaces.
 9. Asphalt, Creosote, or Bituminous Surfaces to be Painted:
 - a. Remove foreign particles to permit adhesion of finishing materials.
 - b. Apply latex based sealer or primer.
 10. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
 11. Concrete Floors to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
 12. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
 13. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 or SSPC-SP 3, followed by SSPC-SP 1.
 14. Uncorroded Uncoated Steel and Iron Surfaces to be Painted:
 - a. Remove grease, mill scale, weld splatter, dirt, and rust.
 - b. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent.
 - c. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned.
 4. Prime paint entire surface; spot prime after repairs.
 15. Shop-Primed Steel Surfaces to be Finish Painted:
 - a. Sand and scrape to remove loose primer and rust.
 - a. Feather edges to make touch-up patches inconspicuous.
 - b. Clean surfaces with solvent.
 - c. Prime bare steel surfaces.
 - d. Re-prime entire shop-primed item.
- B. Additional Requirements for Surfaces with Existing Coatings:
1. Before application of new coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:
 - a. Sand existing glossy surfaces to be painted to reduce gloss.

- (1) Brush, and wipe clean with a damp cloth to remove dust.
- b. Previously painted surfaces specified to be repainted or damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.
- c. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed.
- d. Chalk shall be removed so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.
- e. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.
- f. Edges of chipped paint shall be feather edged and sanded smooth.
- g. Rusty metal surfaces shall be cleaned in accordance with SSPC requirements.
 - (1) Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting.
- h. New, proposed coatings shall be compatible with existing coatings.
- 2. Existing Coated Surfaces with Minor Defects:
 - a. Sand, spackle, and treat surfaces with minor defects (i.e., scratches, nicks, cracks, gouges, spalls, alligating, chalking, or irregularities due to partial peeling of previous coating) as necessary to render such surfaces to a uniform smooth finish.
 - b. Remove chalking by sanding or blasting so that when tested in accordance with ASTM D4214, the chalk rating is not less than 8.
- 3. Removal of Existing Coatings: Remove existing coatings from the following:
 - a. Surfaces containing large areas of minor defects.
 - b. Surfaces containing more than 20 percent peeling area.
 - c. Surfaces where rust is visible/apparent through existing coating.
- 4. Cement Plaster (Stucco) Substrate Repairs:
 - a. Repair cracks, holes, spalled/delaminated areas, and other defects in existing cement plaster/stucco surfaces using appropriate repair materials; verify compatibility of repair materials with coating system prior to use.
 - b. Remove any protruding concrete accessories and patch to smooth out any irregularities.
 - c. For additional requirements, refer to Section 092410 - Portland Cement Plaster Repairing.
- 5. Other Substrate Repairs:
 - a. Repair substrate surface damaged during coating removal.
 - b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal.
 - c. Clean and prime the substrate as specified.
- C. Additional Requirements for New (Previously Uncoated) Surfaces:
 - 1. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
 - 2. Surfaces:
 - a. Correct defects and clean surfaces that affect work of this section.

- b. Remove or repair existing coatings that exhibit surface defects.
- c. Mask surfaces that are not to be finished, or that are to be finished at a later time.
- 3. Marks: Seal with shellac that which may bleed through surface finishes.
- 4. Impervious Surfaces:
 - a. Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach.
 - b. Rinse with clean water and allow surface to dry.
- 5. New Cement Plaster (Stucco) Surfaces to be Painted:
 - a. Fill hairline cracks, small holes, and imperfections with same patching materials used for similar repairs to existing plaster; for additional requirements, refer to Section 092400 - Portland Cement Plastering.
 - b. Make smooth and flush with adjacent surfaces.
 - c. Wash and neutralize high alkali surfaces.
- 6. Galvanized Surfaces to be Painted:
 - a. Remove surface contamination and oils and wash with solvent.
 - b. Apply coat of etching primer.

3.03 APPLICATION

A. General:

- 1. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- 2. Apply products in accordance with manufacturer's instructions.
- 3. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- 4. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- 5. Apply each coat to uniform appearance.
- 6. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- 7. Sand wood and metal surfaces lightly between coats to achieve required finish.
- 8. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- 9. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

B. Additional Requirements for Cement Plaster (Stucco):

- 1. For uniformity of color, texture and sheen, use consistent application techniques throughout the Project.
- 2. Apply coating material in two (2) coats; total dry film thickness (DFT) per manufacturer's requirements for 10-year warranty, but not less than 12 mils.
- 3. Multiple coats may be required when color difference between existing and new coatings is significant.
- 4. Maintain proper wet film thickness (WFT) during application, to ensure performance characteristics desired.
- 5. Work to natural break in surfaces before stopping work.

6. Work from wet edge with 50 percent overlap.
7. Use sufficient material to obtain pinhole-free, consistent film build on treated surfaces.
8. Priming:
 - a. Apply primer to all previously unpainted plaster/stucco, and to previously painted plaster/stucco that are chalking or friable (powdery) after power washing.
 - b. Fill porous surfaces with primer, and back-roll to eliminate pinholes. Apply by working material into pores, crevices and joints. Allow primer to dry before proceeding (typically 24 to 48 hours).
 - c. Apply finish coats after primer has dried, and in accordance with manufacturer's instructions.
9. Application:
 - a. By Brush:
 - (1) Application by brush is recommended only for small inaccessible areas such as touch-ups.
 - (2) Use only nylon brushes.
 - b. By Roller:
 - (1) Use a 3/4 inch to 1-1/4 inch (12/5 mm to 32 mm) nap roller cover (lamb's wool)
 - (2) Completely saturate roller and keep it loaded with coating to building required thickness
 - (3) Roll coating in consistent fan-like pattern, to achieve uniform coating thickness.
 - (4) Cross-roll to achieve uniform thickness and maintain wet edge. Back-roll material in one direction, as stroke variations may result in uneven color and texture.
 - c. By Spray:
 - (1) Smooth Texture: Use airless equipment.
 - (2) Fine or Coarse Texture: Use heavy-duty sprayer designed for application of coatings that contain sand particles, with gun pressure of approximately 30 psi (0.21 MPa).
 - (3) Back-rolling after spray application is strongly recommended, to achieve uniform coating thickness and texture.

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 finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 099610
HIGH-PERFORMANCE COATINGS FOR STEEL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. High-performance coating systems for historic replica fire escapes and related metal components.
- B. High-performance coating systems for field application on galvanized steel in AESS solar parking structures.

1.02 RELATED REQUIREMENTS

- A. Section 051213 - Architecturally-Exposed Structural Steel Framing: Solar parking structures
- B. Section 055120 - Historic Replica Fire Escapes: Custom fabricated steel replicas of existing historic fire escapes.
- C. Section 085123 - Steel Windows.
- D. Section 099000 - Painting and Coating: Field-applied coatings.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Association of State and Highway Transportation Officials (AASHTO):
 - 1. AASHTO M300 -- Standard Specification for Inorganic Zinc-Rich Primer
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM B117 -- Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM D520 -- Standard Specification for Zinc Dust Pigment.
 - 3. ASTM D522 -- Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
 - 4. ASTM D2247 -- Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 - 5. ASTM D2697 -- Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings.
 - 6. ASTM D2794 -- Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 - 7. ASTM D3363 -- Standard Test Method for Film Hardness by Pencil Test.
 - 8. ASTM D4060 -- Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 9. ASTM D4541 -- Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 10. ASTM D6386 -- Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

11. ASTM E84. -- Standard Test Method for Surface Burning Characteristics of Building Materials.
 12. ASTM G53 -- Standard Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.
- D. American Water Works Association (AWWA):
1. AWWA D102 -- AWWA Standard for Coating Steel Water-Storage Tanks.
- E. National Association of Corrosion Engineers (NACE):
1. NACE TM-01-69 -- Laboratory Corrosion Testing of Metals.
- F. National Fire Protection Association (NFPA).
- G. Research Council on Structural Connections (RCSC):
1. RCSC 16.2 -- Specification for Structural Joints Using High-Strength Bolts.
- H. The Society for Protective Coatings (SSPC):
1. SSPC QP1 -- Certification Program, Field Application to Complex Industrial and Marine Structures.
 2. SSPC QP3 -- Certification Program, Shop Painting Certification Program.
 3. SSPC Paint-20 -- Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
 4. SSPC SP-10 -- Near-White Blast Cleaning.
 5. SSPC Paint-20 -- Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).
 6. SSPC Paint-36 -- Two-Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based.

1.04 SUBMITTALS

- A. General:
1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements..
- B. Product Data: Provide manufacturer's product data for each product indicated.
1. Include manufacturer's technical information with label analysis and instructions for handling, storing, and application.
 2. Include coating manufacturer's written recommendations for surface preparation and coating application, directions and limitations for use, and application information.
 3. Provide product information and test data showing compliance with specified physical and performance requirements.
- C. Samples:
1. Selection Samples: Submit two paper chip samples, 3 x 3 inches (75 x 75 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
 2. Verification Samples: Submit two coated samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, 12 x 12 inch (300 x 300 mm) in size.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - 1. Provide certification from each manufacturer of components of the coating system, primer, intermediate coat(s), and topcoat(s), that the supplied coating material is suitable for use in the specified coating system. Each manufacturer shall identify the specific products, including manufacturer's name, which their product may be used with. The certification shall provide the name of the manufacturer that will provide technical support for the entire system.
 - a. When all coating materials are manufactured by one manufacturer, this certification is not required.
- B. Applicator Qualifications: Company specializing in surface preparation for and application of high performance coatings on Architecturally Exposed Structural Steel (AESS), approved by the coating manufacturer, and meeting at least one of the following:
 - 1. Acceptable Applicators:
 - a. Champion Painting: 130 SW 22 Street; Fort Lauderdale, FL 33315; Tel. 954-462-9079 (Contact: Kyle Hough, 954-462-9079).
 - b. Exceletech Coating and Applications, LLC; 901 12th St, Clermont, FL 34711; Tel. 352-394-2155 (Contact: Larry Muzla, 407-832-8970).
 - c. Service Painting of Florida: 12140 Metro Parkway, Suite K; Fort Myers, FL 33966; Tel. 239-939-1543 (Contact: Brad Ervans, 239-822-6736).
 - 2. If not listed under "Acceptable Applicators", then applicator shall be a contractor/subcontractor that is certified by the SSPC to the requirements of SSPC QP1 or QP3 prior to contract award, and shall remain certified while providing any surface preparation and coating application work specified in this Section.

1.06 DELIVERY, STORAGE & HANDLING

- A. If materials are approaching shelf life expiration and an extension is desired, samples may be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer may issue an extension, referencing the product evaluation and the review of storage records. Products may not be extended longer than allowed in the product specification.

1.07 PROJECT CONDITIONS

- A. Apply coating materials only when temperature is at least 55 degrees F but not more than 90 degrees F, except with coating manufacturer's written approval. Maintain temperatures within this range for at least 24 hours before, during, and 72 hours after application.
- B. Do not apply coating materials when work is exposed to rain, fog or mist; when relative humidity exceeds 85 percent, or when temperature is less than 5 degrees F above the dew point; or to damp or wet surfaces.
- C. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Warranty shall include coverage for coating system adhesion to substrate and color retention.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. PPG Architectural Finishes, Inc: www.ppgaf.com.
- B. Other Manufacturers:
 - 1. Carboline Company: www.carboline.com.
 - 2. Rust-oleum: www.rust-oleum.com.
 - 3. Tnemec Company, Inc: www.tnemec.com.

2.02 COATING MATERIALS

- A. General:
 - 1. Material Compatibility: Provide primer and finish coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and experience.
 - 2. Material Quality: Provide manufacturer's highest grade of the various high performance coating materials specified. Materials not displaying manufacturer's product identification are not acceptable.
- B. Inorganic-Zinc Silicate Primer: SSPC Paint-20, Type IC, Level 1, two-component heavy-duty inorganic-zinc silicate primer designed for use as a fast-dry shop primer for shop fabricated steel.
 - 1. Physical Characteristics and Properties:
 - a. 85 percent zinc in dry film, min.
 - b. Shall provide excellent corrosion resistance.
 - c. Shall be abrasion resistant.
 - d. Dry Temperature Resistance: Continuous, 750 deg F.
 - e. Volume Solids (ASTM D2697): 62 percent (+/- 4 percent), min.
 - f. Shall comply with requirements of RCSC 16.2.
 - g. Zinc dust shall meet ASTM D520 Type 2 standards.
 - h. Shall comply with requirements of AASHTO M300.
 - 2. Recommended for the following conditions:
 - a. ISO 12944 Classification C5I: Industrial areas with high humidity and aggressive atmospheres.
 - b. ISO 12944 Classification C5M: Marine, offshore, estuaries, coastal areas with high salinity.
 - 3. Finish: Flat.
 - 4. Product: PPG Amercoat D-9 Series, or equivalent product by one of the other listed manufacturers.

- C. High Solids Epoxy Coating: Two-component, high-performance general maintenance coating.
 - 1. Physical Characteristics and Properties:
 - a. Volume Solids (ASTM D2697): 85 percent (+/- 3 percent).
 - b. Shall provide exceptional corrosion protection in industrial and marine corrosive environments.
 - c. Shall provide good chemical resistance to splash/spillage, fumes and immersion in neutral, fresh and salt water.
 - 2. Recommended for the following conditions:
 - a. To protect steel structures in industrial facilities, bridges, tank exteriors, marine weathering, offshore, oil tanks, piping, roofs, water towers and other exposures.
 - 4. Finish: Semi-gloss.
 - 5. Product: PPG Amerlock 2 / 400, or equivalent product by one of the other listed manufacturers.

- D. Polysiloxane Coating: SSPC Paint-36, Level 3, two-component high-performance engineered siloxane coating with exceptional gloss retention, corrosion resistance, and abrasion resistance, and designed for use as topcoat over bare steel, coated steel and inorganic-zinc silicate coated surfaces.
 - 1. Physical Characteristics and Properties:
 - a. Volume Solids (ASTM D2697): 90 percent (+/- 3 percent), min.
 - b. Shall be abrasion resistant.
 - c. Shall meet requirements of AWWA D102.
 - 2. Recommended for the following conditions:
 - a. ISO 12944 Classification C3: Urban and industrial atmospheres; moderate sulfur dioxide levels; production areas with high humidity.
 - 3. Finish: High gloss.
 - 4. Product: PPG Amercoat PSX 700 Series, or equivalent product by one of the other listed manufacturers.

2.03 HIGH-PERFORMANCE COATING SYSTEMS

- A. General:
 - 1. Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated.
 - 2. Performance Requirements: Provide coating system that meets the following minimum performance criteria, unless more stringent criteria are specified:
 - a. Abrasion Resistance (ASTM D4060, Taber abraser): No more than 53 mg average after 100 cycles w/ CS-17 wheels and 1000 g load.
 - b. Adhesion (ASTM D4541, elcometer): Pull-off strength to be no less than 2700 psi (average of 3 readings).
 - c. Elongation (ASTM D522): Minimum 14 percent.
 - d. Impact Resistance (ASTM D2794), Direct / Reverse: 38 inch-lbs / 8 inch-lbs.
 - e. Pencil Hardness (ASTM D3363), Gouge Resistance Rating / Scratch Resistance Rating: Not less than 5H / H.

- f. Salt Spray (fog) Resistance (ASTM B117): No blistering, cracking, softening or delamination of film, and no face corrosion or blistering at 5500 hours.
 - g. Water Resistance (ASTM D2247, 100 percent humidity): No face corrosion or blistering at 5500 hours.
 - h. QUV Weathering (ASTM G53): No blistering, cracking, or delamination of film, and not less than 50 percent gloss retention at 26 weeks.
 - i. Exterior Sever Weathering (South Florida Marine Exposure, exposed 45 degrees facing east): No blistering, cracking or delamination of film. No face rusting after 18 months exposure. Minimum 90.1 percent gloss retention after 18 months exposure.
 - j. Flame Spread Rating / Smoke Developed Rating (ASTM E84): Maximum 10 / 15; NFPA Class A.
3. Dry Film Thickness: DFT per coat of primer and top coat products shall comply with manufacturer's recommendation, based on coating system design.
- B. Coating System Type 1: Shop-applied, multi-coat system comprised of the following:
- 1. Primer: One coat of Inorganic-Zinc Silicate Primer.
 - 2. Top Coat(s): One or two coats (per coating manufacturer's recommendation) of Polysiloxane Coating.
 - a. Color: Black, to match color of finish on new window frames.
 - (1) Provide custom color formulation based on coating manufacturer's advanced color matching system, to match designated color of finish on new window frames specified in Section 085123 - Steel Windows.
- C. Coating System Type 2: Field-applied, multi-coat system comprised of the following:
- 1. Primer: One coat of High Solids Epoxy Coating.
 - 2. Top Coat(s): One or two coats (per coating manufacturer's recommendation) of Polysiloxane Coating.
 - a. Color: To be selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- 1. With applicator present, examine substrates and conditions under which high performance coating systems will be applied, for compliance with surface preparation and coating application requirements.
 - a. Commence surface preparation and coating application only after unsatisfactory conditions have been corrected and surfaces are acceptable.
 - 2. Review work specified in other sections in which primers or other coatings are provided by others, to ensure compatibility of total systems for various substrates. Upon request, furnish information on characteristics of specified finish materials to ensure compatible primers.
 - a. Notify Architect about anticipated problems before applying the coatings specified in this section over substrates primed or coated by others.
 - 3. Coordinate requirements of this section with contractor responsible for fabrication of steel members specified in Section 055000 - Metal Fabrications, to ensure that

substrate is ready to receive work of this section.

- B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer.
 - 1. Obtain and follow manufacturer's instructions for examination and testing of substrates.

3.02 SURFACE PREPARATION

- A. General:
 - 1. Coating performance, in general, is proportional to the degree of surface preparation.
 - 2. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - a. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
 - 3. Cleaning:
 - a. Clean surfaces of dust, contaminants and loose foreign matter.
 - b. Remove substances that would bleed through finished coatings or adversely affect adhesive bond of primer or coating materials.
 - 4. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
 - 5. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
- B. Metal Surfaces Designated to Receive Coating System Type 1: Prepare surfaces in shop, using methods recommended in writing by coating manufacturer, and as follows:
 - 1. Surfaces must be clean, dry and free of all contaminants., and shall be suitable for maximizing coating system adhesion and quality of finish.
 - 2. Prepare surfaces using blast cleaning method in accordance with SSPC SP-10.
 - a. Blast to achieve a 1- to 2-mil (25- to 50-micron) profile as indicated by a Keane-Tator Surface Profile Comparator or similar device.
 - 3. After blast cleaning, protect surfaces from corrosion or contamination until coated.
 - a. Keep moisture, oil, grease or other organic matter off surface before coating.
 - b. Spot blast to remove any contamination; solvent-wiping is not satisfactory.
 - 4. Apply primer as soon as possible to prevent steel surfaces from rusting.
- C. Metal Surfaces Designated to Receive Coating System Type 2: Prepare surfaces in field, using methods recommended in writing by coating manufacturer, and as follows:
 - 1. General:
 - a. Prepare all galvanized surfaces to receive high performance coating in accordance with ASTM D6386, coating system manufacturer's specifications, and this section. Provide a clean and suitable surface that maximizes coating system adhesion and uniform finished appearance.
 - (1) Measure the thickness of the zinc coating after completion of surface preparation using a magnetic thickness gage in accordance with ASTM A123. Ensure sufficient galvanizing (i.e., zinc coating layer) remains on

the substrate to meet the requirements of ASTM A123 and the Contract Documents.

- (2) Correct any deficient areas to the satisfaction of the Consultant at no additional cost to Owner.
 - b. Surfaces must be clean, dry and free of all contaminants., and shall be suitable for maximizing coating system adhesion and quality of finish.
 - c. Apply primer as soon as possible to prevent steel surfaces from rusting.
2. Surface Smoothing: Zinc high spots and rough edges shall be removed by cleaning with hand or power tools, as specified in SSPC SP-2 or SP-3. Use caution to avoid removing the zinc coating layer.
3. Surface Cleaning: Remove oil and grease using solvent cleaning method, as specified in SSPC SP-1.
4. Hand- or Power-Tool Cleaning (if there is visible evidence of wet storage stain on the galvanized surface): Remove light deposits of zinc reaction by-products (e.g., wet storage stain) using hand- or power-tool cleaning methods, as specified in SSPC SP-2 or SP-3.
5. Light Sweep Blasting of Galvanized Surfaces: Remove surface layer of zinc oxide and zinc hydroxide and lightly roughen galvanized surface profile using abrasive sweep or brush blast in accordance with procedures specified in ASTM D6386.
 - a. Abrasive media shall be chosen with care to provide a stripping action without removing zinc coating layer.
 - b. Care must be taken to leave zinc layers intact. The purpose of sweep blasting is to deform, not remove the galvanized metal.
 - c. Following abrasive blast cleaning, surfaces shall be blown down with clean, compressed air.
6. Repair of Damaged Coating (if there is visible damage to the zinc coating layer):
 - a. The maximum area to be repaired is defined in accordance with ASTM A123 Section 6.2.
 - (1) The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.
 - b. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16 inch (4.8 mm) in width. Minimum thickness requirements for the repair are those described in ASTM A123 Section 6.2.

3.03 COATING SYSTEM APPLICATION

- A. Pre-Application Testing for Surface Contamination and Surface Cleanliness:
 1. Ensure surfaces are free of contamination.
 2. Apply primer and coatings to dust free surfaces. To test surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust or other contaminant. Reject contaminated surfaces and retest. Provide two additional tests for each failed test or questionable test.
- B. Application of Primer: Apply primer to all properly prepared surfaces.
 1. Apply primer in accordance with coating manufacturer's instructions.

2. Apply primer as soon as possible to prevent steel surfaces from rusting.
- C. Application of Topcoat: Apply top coat(s) to all properly primed surfaces.
1. Apply coating in accordance with manufacturer's written instructions.
 2. 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. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
 4. Apply coating to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- C. Coating System Type 2:
1. Application of Primer: Field apply High Solids Epoxy Coating to all properly prepared surfaces.
 - a. Apply primer in accordance with coating manufacturer's instructions.
 - b. Apply primer as soon as possible to prevent steel surfaces from rusting.
 2. Application of Topcoat: Field apply Polysiloxane Coating to all properly primed surfaces.
 - a. Apply coating in accordance with manufacturer's written instructions.
 - 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.
 - c. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
 - d. Apply coating to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 CLEANING AND PROTECTION

- 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.
- D. Protect finished work from damage.

3.05 SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 1. Items fully factory-finished unless specifically noted.
 2. Stainless steel items.
 3. Surfaces indicated to be painted in other sections.
- B. The following surfaces are to be prepared and finished in accordance with this Section:
 1. Historic Replica Fire Escapes: Coating System Type 1.

- a. Color: Black, to match color of finish on new window frames.
- 2. AESS Solar Parking Structures: Coating System Type 2.
 - a. Color: As selected by Architect.

END OF SECTION

SECTION 099620

HIGH PERFORMANCE COATING FOR CISTERNS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Painting of interior surfaces of concrete rain water storage tanks (cisterns).

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 030100 - Maintenance of Concrete: Repair of exposed structural, shrinkage, and settlement cracks; resurfacing of concrete surfaces having spalled areas and other damage; repair of deteriorated concrete; repair of internal concrete reinforcement.
- B. Section 033000 - Cast-In-Place Concrete: Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishing.
- C. Division 22 - Plumbing: Rain water collection, distribution, and disinfection systems.
- D. Section 328400 - Irrigation: Landscape irrigation system.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D4259 -- Standard Practice for Abrading Concrete.
 - 2. ASTM D4263 -- Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- C. American Water Works Association (AWWA):
 - 1. AWWA C210 -- Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
 - 2. AWWA D102 -- Coating Steel Water Storage Tanks.
- D. National Sanitation Foundation International (NSF):
 - 1. ANSI/NSF 61 -- Drinking Water System Components - Health Effects.
- E. United States Department of Agriculture (USDA):
- F. U.S. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910 -- Occupational Safety and Health Standards.
 - 2. 40 CFR 59, Subpart D -- National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- G. U.S. Military Specifications and Standards (MIL):
 - 1. MIL-PRF-23236D -- Performance Specification: Coating Systems for Ship Structures.

1.04 SUBMITTALS

- A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's current product data for each product to be used.
 1. Include manufacturer's name, brand name of product, manufacturer's identifying number (if applicable), color, formula analysis and percent by weight, flash point, surface preparation instructions, reducing and application instructions.
- C. Samples: Furnish color chart with manufacturer's complete range of colors, for selection by Architect.

1.05 QUALITY ASSURANCE

- A. Provide materials for each system type from a single manufacturer.
- B. Coating systems shall conform to all current AWWA Standards and carry appropriate NSF approval in accordance with ANSI/NSF 61 for Coatings and Linings.
- C. Volatile Organic Compound (VOC) Content:
 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D.
 - b. Architectural coatings VOC limits of State of Florida.
 - c. USGBC LEED-NC; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Site in original, new and sealed containers bearing the manufacturer's label.
 1. Do not use coating and paint materials until the Architect has inspected the contents and has obtained data from information on the containers or label.
 2. Materials exceeding storage life recommended by the manufacturer will be rejected.
- B. Store coatings and paints where directed to protect them from weather and excessive heat or cold.
 1. Store flammable coatings and paint in conformance with applicable State and Federal safety codes for flammable coating and paint materials.
 2. Protect coatings and paints from freezing.
- C. Keep storage areas clean and restricted to coating and paint materials and related equipment.

1.07 PROJECT CONDITIONS

- A. Maintain, by means of temporary dehumidification and temperature control equipment, temperature and humidity requirements in full compliance with the coating manufacturer's specified printed recommendations.
- B. Provide a temporary containment structure appropriate for the prevention of work related dust, dirt, paint chips, wash water or debris from contaminating the surrounding area.
- C. In locations where flammable vapors may be present, take positive action to prevent ignition by eliminating and controlling sources of ignition.
 - 1. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.
- D. Provide mechanical ventilation adequate to remove flammable vapors to a safe location and to confine and control combustible residues so that life or property is not endangered.
 - 1. Equipment used to control hazardous exposure shall be explosion-proof.
 - 2. Keep mechanical ventilation in operation at all times while coating or painting operations are being conducted and for a sufficient time thereafter to allow flammable vapors from drying coatings or paints to be exhausted. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. The exhaust discharge point of fumes shall be not less than ten feet from any combustible exterior wall or roof nor shall the discharge be in the direction of any combustible construction or unprotected opening in any non-combustible exterior wall within 50 feet.
- E. Provide adequate illumination while work is in progress, including explosion-proof lights and electrical equipment.
 - 1. When directed by the Architect, provide additional illumination and necessary supports to cover all areas to be inspected.
 - 2. The level of illumination for inspection purposes shall be determined by the Architect.
- F. Comply fully with the manufacturer's recommendations as to environmental conditions under which the coating and coating systems can be applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Coating Materials:
 - 1. PPG Protective & Marine Coatings (PPG PMC), a division of PPG Industries: www.ppgamercoatus.ppgpmc.com.
 - 2. Tnemec Company, Inc.
 - 3. Carboline.
 - 4. M.A.B. Industrial Paints.
 - 5. Wasser Corporation.

2.02 MATERIALS

- A. General:
 - 1. Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated.
 - a. Thickness: Per manufacturer's recommendations, and as suitable for the applications indicated.
- B. Primer Sealer: Solvent-free, two-component, penetrating epoxy primer sealer, compatible with damp surfaces, surface tolerant for applications where abrasive blasting is not an option, recommended for direct application to concrete.
 - a. Solids (by volume): 100 percent.
 - b. Product: AMERLOCK Sealer by PPG PMC, or equal.
- C. Filler Compound: two-component, epoxy filler/fairing compound, with excellent chemical resistance characteristics, suitable for direct application to concrete and recommended for application over specified primer sealer, and meeting the following criteria:
 - a. Product Qualifications:
 - (1) Shall comply with USDA requirements for Incidental Food Contact Materials.
 - (2) NFPA Flame Spread and Smoke Developed Classification: Class A.
 - b. Solids (by volume): 100 percent.
 - c. Product: AMERCOAT 114A by PPG PMC, or equal.
- D. Tank Lining: Solvent-free, two-component, cycloaliphatic amine tank lining, with excellent chemical, solvent and water-immersion resistance characteristics, recommended for application over specified filler compound, and meeting the following criteria:
 - a. Product Qualifications:
 - (1) MIL-PRF-23236D, Type VII, Classes 5, 7 and 9, Grade C.
 - (2) ANSI/NSF 61 qualified for tanks, pipes, valves and fittings.
 - (3) AWWA C210.
 - (4) AWWA D102.
 - b. Solids (by volume): 98 percent (+/- 2 percent).
 - c. Product: AMERCOAT 333 by PPG PMC, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. 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.

3.02 PREPARATION

- A. General:
 - 1. Protection from Toxic and Hazardous Chemical Agents: During tank cleaning, cleanup, surface preparation, and lining application phases, ensure that employees and public are adequately protected from toxic and hazardous chemical agents in accordance with 29 CFR 1910.

2. The tank must be empty before Work is started on any interior surface.
 - a. Remove all water and any silt from the tank by pumping through the access manhole.
 - b. Dispose of this material as directed.
 3. Clean and abrasive blast concrete surfaces to be lined, and free them from dust and contamination.
 - a. Completely remove entire existing lining from previously lined tanks.
 4. Moisture Transmission Testing: After completion of blast cleaning, surface shall be checked for moisture transmission in accordance with ASTM F1869 (calcium chloride test) or by ASTM D4253 (plastic sheet test).
 - a. Maximum moisture transmission rate must not exceed coating manufacturer's requirements.
- B. Blast Cleaning: Surfaces designated to receive coating shall be prepared in accordance with coating manufacturer's recommendations, and as follows:
1. Concrete surfaces must be free of any oil, grease, embedded chemicals, laitance, water repellents, previous sealants, form release compounds, and efflorescence.
 2. After tank has been emptied, perform abrasive blast cleaning in accordance with ASTM D4259, to achieve uniform surface texture exposing fine aggregate and resembling coarse sandpaper.
- C. Concrete Repairs:
1. Carefully inspect concrete surfaces for defects.
 2. Remove loose or unsound concrete by chipping back to clean solid concrete; feather edges to smooth transitions.
 3. Grind-off fins, sharp offsets, and other concrete surface projections.
 4. Fill surface voids in accordance with manufacturer's instructions, and as follows:
 - a. For surface voids up to 1 inch (25 mm) width: Fill using specified Filler Compound.
 - b. For surface voids more than 1 inch (25 mm) width: Refer to concrete repair requirements specified in Section 030100 - Maintenance of Concrete.
 5. Apply additional Filler Compound as fairing to achieve uniform substrate suitable for coating system application, per manufacturer's recommendations.
- D. Cove and Corner Chamfering:
1. Provide cove at the bottom ring joint (i.e., where tank wall meets tank bottom), using specified Filler Compound.
 - a. Remove existing cove material and clean joint until sides expose fresh original concrete.
 - b. Flush thoroughly exposed concrete and bottom of joint with water, and blow loose particles out of joint with compressed air.
 - c. Repack joint with specified Filler Compound, and form a cove of mortar between floor and wall.
 - d. Cove shall have a rounded face and minimum 1 inch (25 mm) sides.
 2. Provide cove at intersection of columns and base, base and floor, and inside corners of sumps, using same criteria as specified for cove at bottom ring joint.
 3. Provide cove around pipes, sleeves, and manholes passing through tank wall or floor, using same criteria as specified for cove at bottom ring joint.

4. Chamfer inverse corners to a minimum radius of 1/2 inch (12 mm).

3.02 COATING SYSTEM APPLICATION

A. General:

1. Mix and apply coatings in strict accordance with the manufacturer's printed instructions for each type.
2. Apply each coat of Primer Sealer and Tank Lining evenly, free of brush marks, sags, runs, and with no evidence of poor workmanship.
 - a. Finished surfaces shall be free from defects or blemishes.
3. Where multiple coats are being applied, each coat shall be a contrasting color to act as an indicator of coverage.

B. Apply coating system to all interior surfaces of rain water storage tank (cistern) in accordance with manufacturer's application instructions.

1. Apply a preliminary stripe coat of Primer Sealer over all coves, chamfers, corners, concrete repairs, and other similar conditions, using brush application method.
2. Apply uniform coating of Primer Sealer over all interior surfaces of rain water storage tank (cistern).
3. Apply two coats of Tank Lining over Primer Sealer.

3.03 FIELD QUALITY CONTROL

A. Following curing of the interior tank coating system, test the tank for water tightness.

1. Fill the tank in the presence of the Architect and allow it to remain full for 24 hours. If no leak appears during this period of time, the tank will be considered watertight.
2. If leakage appears, drain the tank, repair the leaking area, recoat the repaired area, and repeat the test until successful.

3.04 RELATED REQUIREMENTS

A. Following successful water tightness testing, install plumbing and irrigation system components (e.g., water level sensing equipment, alarm devices and corrosion protection devices) specified in other sections.

B. Disinfect the tank in accordance with AWWA C652.

3.05 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 099723

ACRYLIC WATERPROOF COATING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation and field application of high-build acrylic waterproof coating system over exterior cement plaster (stucco) substrates.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Removal and replacement of joint sealers, backing and bond breakers; joint sealer for cement plaster (stucco) crack repair.
- B. Section 092400 - Portland Cement Plastering: Cement plaster (stucco) for installation over metal lath, masonry, concrete, and solid surfaces.
- C. Section 092410 - Portland Cement Plaster Repairing: Patching and repair of damaged or defective cement plaster (stucco) work.
- D. Section 099000 - Painting and Coating: Surface preparation and field application of paints, stains, varnishes, and other coatings.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D235 -- Standard Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent).
 - 2. ASTM D562 -- Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
 - 3. ASTM D1475 -- Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
 - 4. ASTM D3960 -- Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 - 5. ASTM D4214 -- Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
 - 6. ASTM D5201 -- Standard Practice for Calculating Formulation Physical Constants of Paints and Coatings.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
- D. Master Painters Institute, Master Painters and Decorators Association (MPI):
 - 1. MPI (APSM) -- Master Painters Institute Architectural Painting Specification Manual.
- E. The Society for Protective Coatings (SSPC).
 - 1. SSPC (PM1) -- Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for

- Protective Coatings.
- 2. SSPC-SP 2 -- Hand Tool Cleaning; Society for Protective Coatings.
- 3. SSPC-SP 3 -- Power Tool Cleaning; Society for Protective Coatings.
- F. U.S. Code of Federal Regulations (CFR):
 - 1. U.S. Environmental Protection Agency:
 - a. 40 CFR 59, Subpart D -- National Volatile Organic Compound Emission Standards for Architectural Coatings.

1.04 SUBMITTALS

- A. Product Data: Provide data on all finishing products, including VOC content and Gloss Level.
 - 1. Include manufacturer's instructions for surface preparation, application, storage, tinting, film thickness (wet and dry), general cautions, and warranty requirements.
- B. Samples:
 - 1. Verification Samples: For each surface to be painted, submit two painted samples illustrating field-verified existing color. Include a Color Schedule, indicating applicable locations where each color is to be used.
- C. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- B. Source Limitations: Obtain block fillers, primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Safety during construction and the protection of adjacent public and private properties shall conform to applicable requirements of the following:
 - 1. The governing building code, including but not limited to FBC-B CHAPTER 13.
 - 2. Industrial Health and Safety Regulations (current edition), issued by the authorities having jurisdiction.
 - 3. Local, State and Federal regulations.
- D. Flame and smoke rating requirements for products and finishes shall conform to applicable requirements of the governing building code.
- E. Mock-Ups
 - 1. General:
 - a. For general requirements for mock-up, see Section 014000 - Quality Requirements,.
 - b. Locate where directed.
 - c. Mock-ups may remain as part of the Work.
 - 2. Plaster Walls: Provide panel, 10 feet (3 m) long by 10 feet (3 m) wide, illustrating

- coating color, sheen, and finish.
3. Steel Doors and Frames: Provide door and frame assembly illustrating paint coating color, sheen, and finish.
- F. Field Quality Control: Provide Manufacturer's Field Service consisting of a minimum of one weekly site visit by manufacturer's representative or its distributor's representative, for observation of coating system application.
1. Owner reserves the right to complete recommended testing required by the manufacturer at completion of work, to assure that warranty and contract requirements are met.
 2. Submit copies of Manufacturer's Field Service Reports, indicating observation before, during and after application of coating system.

1.06 DELIVERY, STORAGE, AND PROTECTION

- 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.
- D. Storage, mixing, application and disposal of all paint and related waste materials shall conform to requirements of local authorities having jurisdiction.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Paints:
 1. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 degrees F (10 and 32 degrees C).
 2. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 degrees F (7.2 and 35 degrees C).
 3. Do not apply paint in rain, fog or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
 - a. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and within temperature limits specified by manufacturer during application and drying periods.
- D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

1. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be painted.
 2. Adequate lighting facilities shall be provided by the Contractor.
- E. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- F. Concrete surfaces must be installed at least 28 days prior to painting and decorating work, and must be visually dry on both sides.

1.08 WASTE MANAGEMENT AND DISPOSAL

- A. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable government authorities having jurisdiction.
- B. All waste materials shall be separated and recycled. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- C. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- D. To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
1. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 2. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 3. Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 4. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 5. Empty paint cans are to be dry prior to disposal or recycling (where available).
 6. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- E. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.09 WARRANTY

- A. Submit manufacturer's ten (10) year labor and material warranty for specified systems. Approval of warranty period and confirmation of system compatibility with substrates and joint sealants is required prior to system application.

1.10 EXTRA MATERIALS

- A. For additional provisions, see Section 016000 - Product Requirements.

- B. Supply 1 gallon (4 L) of each color, type, and surface texture; store where directed.
- C. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Paints (for use on surfaces other than exterior cement plaster/stucco, masonry, or concrete): Refer to Section 099000 - Painting and Coating.
- B. Acrylic Waterproof Coating System (for use on exterior cement plaster/stucco and concrete surfaces):
 - 1. Basis of Design: BASF.
 - 2. Substitutions: Not allowed, except with written approval by Architect.
- C. Patching Materials:
 - 1. Basis of Design: BASF.
 - 2. Patching materials used in conjunction with coating system shall be compatible with such coating system.

2.02 PAINTS AND COATINGS - GENERAL

- A. Material Compatibility: Provide primers and finish-coat 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.
- B. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
 - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 - 2. For good flow and brushing properties.
 - 3. Capable of drying or curing free of streaks or sags.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D.
 - b. Architectural coatings VOC limits of State of Florida.
 - 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.
- D. Provide Premium Grade systems (2 top coats) as defined in MPI (APSM), except as otherwise indicated.
 - 1. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
- E. Colors: As indicated on Drawings; or if not indicated, then as selected by Architect.

2.03 PRIMER AND COATING MATERIALS

- A. Primer (Acrylic Primer for Use With Acrylic Waterproof Coating System): White-pigmented, acrylic copolymer primer, designed to enhance bond strengths of acrylic coating to substrate (including chalky surfaces).
 - 1. Physical Characteristics:
 - a. Density (ASTM D1475): 9.0 lbs/gal (1.08 kg/L).
 - b. Solids Content (ASTM D5201): 28 percent by weight; 19 percent by volume.
 - c. VOC Content (ASTM D3960): 2.58 lbs/gal (309 g/L).
 - 2. Product: "Thoro Primer 2K" by BASF.

- B. Acrylic Waterproof Coating System: Water-based, high-build, 100-percent acrylic waterproof coating, designed for exterior application over concrete and plaster/stucco surfaces.
 - 1. Texture: Smooth.
 - 2. Physical Characteristics:
 - a. Density (ASTM D1475): 11.4 to 12.4 lbs/gal (1.37 to 1.49 kg/L).
 - b. Solids Content (ASTM D5201): 56.2 percent by weight; 38 percent by volume.
 - c. Viscosity (ASTM D562): 102 to 110 KU.
 - d. VOC Content (ASTM D3960): 0.76 to 0.77 lbs/gal (91 to 92 g/L).
 - 3. Performance Characteristics:
 - a. Resistance to Wind-Driven Rain (FS TT-C-555B): Shall meet requirements; no water penetration.
 - b. Accelerated Weathering (ASTM G23, Type D, 5000 hrs): Pass.
 - c. Visual Color Change (ASTM D1729, 5000 hrs): Pass.
 - d. Water-Vapor Permeance (ASTM D1653): 13 perms.
 - e. Salt Spray (fog) Resistance (ASTM B117, 300 hrs): Pass.
 - f. Flexibility (ASTM D1737, 1-inch mandrel): No cracking.
 - g. Dirt Pick-up (ASTM D3719, 6 month exposure): 92.02; Pass.
 - h. Sand Abrasion Resistance (ASTM D968, Method A): Pass.
 - i. Impact Resistance (ASTM D2794, 30 lbs): Pass.
 - j. Fungus Resistance (ASTM D3273): Shall meet requirement; no growth.
 - k. Mildew Resistance (FS TT-P-29; Fed Std 141, Method 6152 and 6271.1):
 - (1) Aspergillus Oryzae (7 days): No growth.
 - (2) Aspergillus Niger (21 days): No growth.
 - l. Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread: 1.
 - (2) Smoke: 4.
 - (3) Fuel Contributed: 7.
 - m. Flash Point (ASTM D56, Tag Closed Tester): Greater than 200 degrees F (93 degrees C).
 - 4. Product: "MasterProtect HB 400 Smooth" (formerly "Thorocoat Smooth") by BASF.

2.04 ACCESSORY MATERIALS

- A. Patching Materials (for repairing cracks and other defects in exterior cement plaster/stucco):

1. Patching Material Type 1 (for static hairline cracks caused by plastic or drying shrinkage): Use specified Acrylic Waterproof Coating in accordance with manufacturer's instructions.
 2. Patching Material Type 2 (for static cracks hairline to 1/4-inch in width): Water-based, acrylic elastomeric crack filler for repairing cracks.
 - a. Performance Characteristics:
 - (1) Tensile Strength (ASTM D412): 100 psi (0.7 MPa).
 - (2) Ultimate Elongation at Break (ASTM D412): 275 percent.
 - b. Product:
 - (1) Smooth: "MasterProtect FL 748" (formerly "Sonocoat Acrylic Patching Compound 748") by BASF.
 - (2) Textured: "MasterProtect FL 746" (formerly "Sonocoat Acrylic Patching Compound 746T") by BASF.
 3. Patching Material Type 3 (for patching dynamic cracks more than 1/4-inch in width): Joint Sealant Type S-5; for additional requirements, refer to Section 079005 - Joint Sealers.
 4. Patching Material Type 4 (for repair/replacement of small areas of damaged cement plaster/stucco): Repair Mortar; for additional requirements, refer to Section 092410 - Portland Cement Plaster Repairing.
 5. Patching Material Type 5 (for repair/replacement of large areas of damaged or delaminated cement plaster/stucco): Cement plaster (stucco); for additional requirements, refer to Section 092410 - Portland Cement Plaster Repairing.
 6. Primer / Surface Conditioner: As recommended by Patching Material manufacturer.
- B. Fastener Head Cover Material: Use Patching Material Type 2.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrates and surfaces are ready to receive Work in accordance with the paint/coating manufacturer's instructions.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
 1. Patched/repaired cement plaster/stucco substrates must be fully cured in accordance with recommendations of paint/coating manufacturer.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is within acceptable tolerances recommended by the coating manufacturer.

3.02 SURFACE PREPARATION

- A. General:
 1. Surface should be clean and sound. Cement plaster/stucco substrates should be fully cured and be free of all bond-inhibiting contaminants.
 2. For pressure cleaning requirements, refer to Section 092410 - Portland Cement Plaster Repairing.

3. Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments.
 - a. Oil and grease shall be removed prior to mechanical cleaning.
 - b. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.
 4. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.
 5. Remove any blisters or delaminated areas and sand edges to smooth rough areas and provide transition to old paint areas.
 6. Check adhesion of old paint using ASTM D3359, measuring adhesion by Tape Method A.
- B. Additional Requirements for Surfaces with Existing Coatings:
1. Before application of new coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:
 - a. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D235.
 - (1) Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
 - b. Sand existing glossy surfaces to be painted to reduce gloss.
 - (1) Brush, and wipe clean with a damp cloth to remove dust.
 - c. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer.
 - d. Previously painted surfaces specified to be repainted or damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.
 - e. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed.
 - f. Chalk shall be removed so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.
 - g. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.
 - h. Edges of chipped paint shall be feather edged and sanded smooth.
 - i. Rusty metal surfaces shall be cleaned as per SSPC requirements.
 - (1) Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting.
 - j. New, proposed coatings shall be compatible with existing coatings.
 2. Existing Coated Surfaces with Minor Defects:
 - a. Sand, spackle, and treat minor defects to render them smooth.
 - (1) Minor defects are defined as scratches, nicks, cracks, gouges, spalls,

- alligatoring, chalking, and irregularities due to partial peeling of previous coatings.
 - b. Remove chalking by sanding or blasting so that when tested in accordance with ASTM D4214, the chalk rating is not less than 8.
 - 3. Removal of Existing Coatings: Remove existing coatings from the following surfaces:
 - a. Surfaces containing large areas of minor defects.
 - b. Surfaces containing more than 20 percent peeling area.
 - c. Surfaces designated by the Architect, such as surfaces where rust shows through existing coatings.
 - 4. Cement Plaster/Stucco Substrate Repairs:
 - a. Repair cracks, holes, spalled/delaminated areas, and other defects in existing cement plaster/stucco surfaces using appropriate repair materials; verify compatibility of repair materials with coating system prior to use. Remove any protruding concrete accessories and smooth out any irregularities.
 - b. For additional requirements, refer to Section 092410 - Portland Cement Plaster Repairing.
- C. Additional Requirements for New (Previously Uncoated) Surfaces:
1. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
 2. Surfaces:
 - a. Correct defects and clean surfaces that affect work of this section.
 - b. Remove or repair existing coatings that exhibit surface defects.
 - c. Mask surfaces that are not to be finished, or that are to be finished at a later time.
 3. Marks: Seal with shellac that which may bleed through surface finishes.
 4. Impervious Surfaces:
 - a. Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach.
 - b. Rinse with clean water and allow surface to dry.
 5. New Cement Plaster Surfaces to be Painted:
 - a. Fill hairline cracks, small holes, and imperfections with same patching materials used for similar repairs to existing plaster; for additional requirements, refer to Section 092410 - Portland Cement Plaster Repairing.
 - b. Make smooth and flush with adjacent surfaces.
 - c. Wash and neutralize high alkali surfaces.

3.03 APPLICATION

- A. General:
1. Apply products in accordance with manufacturer's instructions and recommendations as indicated in Product Data.
 - a. Primer and coating application shall conform to manufacturer's film thickness recommendations.
 2. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

3. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
 4. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- B. Additional Requirements for Cement Plaster (Stucco):
1. For uniformity of color, texture and sheen, use consistent application techniques throughout the Project.
 2. Apply coating material in two (2) coats; total dry film thickness (DFT) per manufacturer's requirements for 10-year warranty, but not less than 12 mils.
 3. Multiple coats may be required when color difference between existing and new coatings is significant.
 4. Maintain proper wet film thickness (WFT) during application, to ensure performance characteristics desired.
 5. Work to natural break in surfaces before stopping work.
 6. Work from wet edge with 50 percent overlap.
 7. Use sufficient material to obtain pinhole-free, consistent film build on treated surfaces.
 8. Priming:
 - a. Apply primer to all previously unpainted plaster/stucco, and to previously painted plaster/stucco that are chalking or friable (powdery) after power washing.
 - b. Fill porous surfaces with primer, and back-roll to eliminate pinholes. Apply by working material into pores, crevices and joints. Allow primer to dry before proceeding (typically 24 to 48 hours).
 - c. Apply finish coats after primer has dried, and in accordance with manufacturer's instructions.
 9. Application:
 - a. By Brush:
 - (1) Application by brush is recommended only for small inaccessible areas such as touch-ups.
 - (2) Use only nylon brushes.
 - b. By Roller:
 - (1) Use a 3/4 inch to 1-1/4 inch (12/5 mm to 32 mm) nap roller cover (lamb's wool)
 - (2) Completely saturate roller and keep it loaded with coating to building required thickness
 - (3) Roll coating in consistent fan-like pattern, to achieve uniform coating thickness.
 - (4) Cross-roll to achieve uniform thickness and maintain wet edge. Back-roll material in one direction, as stroke variations may result in uneven color and texture.
 - c. By Spray:
 - (1) Smooth Texture: Use airless equipment.
 - (2) Fine or Coarse Texture: Use heavy-duty sprayer designed for application of coatings that contain sand particles, with gun pressure of approximately

- 30 psi (0.21 MPa).
- (3) Back-rolling after spray application is strongly recommended, to achieve uniform coating thickness and texture.

3.04 CLEANING

- A. Collect waste material that may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 SURFACES TO BE FINISHED

- A. Paint the surfaces as specified in the Painting Schedule at end of this Section.
- B. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished (e.g., aluminum window frames and storefronts, fixed wall louvers, etc.), unless specifically noted.
 2. Fire rating labels, equipment serial number and capacity labels.
 3. Stainless steel items.
 4. Interior surfaces, except as follows:
 - a. Interior surfaces of exterior steel doors and frames shall be painted to match exterior surfaces.

3.06 PAINTING SCHEDULE

- A. Exterior Cement Plaster (Stucco) Surfaces:
1. Primer: One coat of Primer (Acrylic Primer for Use With Acrylic Waterproof Coating System).
 2. Intermediate and Finish Coats: Two (2) coats of Acrylic Waterproof Coating System.
 - a. Total Dry Film Thickness (DFT): Per manufacturer's requirements for 10-year warranty, but not less than 12 mils.

END OF SECTION

SECTION 102113
STONE TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Marble toilet compartments, urinal screens, privacy screens including required fittings, hardware, and accessories.
- B. Furnish and install supplementary blocking and accessories as shown in drawings for a complete and secure installation.

1.02 RELATED SECTIONS

- A. Section 062000 - Finish Carpentry: Wood door panels for toilet compartments.
- B. Section 092116 - Gypsum Board Assemblies: Concealed backer plates for attachment of panel brackets to stud-framed partitions.
- C. Section 108213 - Toilet Accessories: Toilet accessories attached to toilet compartments.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A666 -- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 2. ASTM C119 -- Terminology Relating to Dimension Stone
 - 3. ASTM E84 -- Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Submit product data, specifications and manufacturer's installation instructions.
 - 1. Test Data: Include a summary of testing conducted verifying partition panel performance characteristics.
- C. Shop Drawings: Submit shop drawings for Architect's review and approval prior to fabrication, including pertinent details for installation, showing layout plan, sizes, attachments, supports and adaptation of system to specific project.
- D. Samples:
 - 1. Selection Samples: Submit two manufacturer's stone type selection sheets showing available marble varieties, for initial selection by Architect.
 - 2. Verification Samples: Submit two samples of each initial marble variety selected, each 6 x 6 inches in size, for final selection by Architect.

- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Source: Provide marble partitions which are the products of one manufacturer.

1.06 FIELD CONDITIONS

- A. Field Measurements: Installer shall verify that field measurements are as indicated on shop drawings. Advise of any changes before fabrication and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate location and quantity of any concealed in wall blocking.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages.
- B. Store products in manufacturer's unopened packaging until ready for installation, in a clean dry area protected from weather, moisture and damage; store units upright and not stacked unless permitted by manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Basis of Design: StonePly Co.; 4400 Oneal St, Greenville, TX 75401; Tel. 903-454-0904; Fax. 903-454-3642; Email: sales@stoneply.com.
- B. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 MATERIALS AND PRODUCTS

- A. Stone Variety and Source:
 - 1. Stone: White "Georgia" Marble by StonePly Co., or equal.
 - 2. Shall be quarried in the U.S.
- B. Stone Finish: Polished
- C. All reinforced stone partition panels and doors shall have the following properties.
 - 1. Thickness: 1 inch or 1-1/4 inch, to match standard of design.
 - 2. Facing: 1/4 inch thickness of natural marble, as selected
 - 3. All exposed edges of panel shall be natural stone.
 - 4. Reinforcing: 1/2 inch or 3/4 inch aluminum honeycomb composite, bonded with high strength epoxy.
 - 5. Average Weight: 4.5 lbs. per sq. ft.
 - 6. Dimensional Tolerance:
 - a. Plus or minus 1/8 inch (3.2mm) in all directions.
 - b. Plus or minus 1/8 inch (3.2mm) diagonally.

2.03 PERFORMANCE REQUIREMENTS

- A. Stone panel performance shall meet or exceed the following properties.
 - 1. Absorption: 0.1 to 0.2 percent, max.

2. Acid-Freeze-Thaw: Loss in flexural strength shall not exceed 20 percent after 100 freeze thaw cycles +170 degrees F to -10 degrees F immersed in dilute sulfuric acid.
3. Large Missile Impact test: Missile impact panel with a solid wood stud, nominal 2 x 4, #2 surface dry, Southern Pine of not less than 102 inches. in length and 9 lbs. in weight at a velocity between 50 and 52 ft./sec. without defined specimen failure.
4. Tension Bond Capacity: Shall exceed the tensile strength of the stone selected or 320 psi following accelerated aging by rapid freeze thaw temperature cycling from -20 degrees F to +130 degrees F.
5. Flammability (ASTM E84):
 - a. Flame Spread: 0.
 - b. Maximum Smoke Development: 5.
 - c. Maximum Fuel Contribution: 0.

2.04 ACCESSORIES

- A. Brackets: Stirrup Type: U-brackets,
 1. Material: Stainless steel.
- B. Hardware and Accessories:
 1. General: Manufacturer's standard design hardware and accessories.
 - a. Material: Stainless steel, except as otherwise indicated on drawings.
 2. Door Hardware:
 - a. Hinges: Self-closing type, adjustable to hold doors open at angle up to 90 degrees.
 - b. Latch and Keeper: Latch unit designed for emergency access with door strike and keeper.
 - c. Coat Hook: Combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 - d. Door Bumper: Rubber-tipped bumper at out-swinging doors.
 - e. Door Pull: Door pulls complying with accessibility requirements at out-swinging doors.
 - (1) Provide units on both sides of doors at accessible compartments.
 3. Head Rails: If indicated on drawings, provide hollow anodized aluminum, 1 x 1-1/2 inch (25 x 38 mm) size, with anti-grip profile and cast socket wall brackets.
 4. Pilaster Shoes: If indicated on drawings, provide formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 in (75 mm) high, concealing floor fastenings.
 - a. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- C. Fasteners: Manufacturer's exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware.
 1. Provide theft-resistant-type heads.
 2. Provide through-bolt applications.

2.05 FABRICATION

- A. Toilet Compartments: Factory-fabricated doors, pilasters, and divider panels made of marble with uniformly machined edges; floor-mounted.
 1. General:

- a. Shall comply with FBC-P SECTION 310.4.
- 2. Doors:
 - a. Thickness: As indicated on drawings; or if not indicated, then as per approved shop drawings.
 - b. Width:
 - (1) Standard Toilet Compartments: 24 inches (610 mm), in-swinging.
 - (2) Toilet Compartments Indicated to be ADA Accessible: 36 inches (915 mm), out-swinging; min. 32 inches clear opening when door is open to 90 degrees.
 - c. Height: As indicated on drawings.
- 3. Panels:
 - a. Thickness: As indicated on drawings; or if not indicated, then as per approved shop drawings.
 - d. Height: As indicated on drawings.
- 4. Pilasters:
 - a. Thickness: As indicated on drawings; or if not indicated, then as per approved shop drawings.
 - b. Width: As required to fit space; minimum 3 inches (76 mm).
- B. Urinal Screens: Factory-fabricated screens made of solid marble with uniformly machined edges; mounted to wall with continuous panel brackets.
 - 1. General:
 - a. Shall comply with FBC-P SECTION 310.5.
 - 2. Thickness: As indicated on drawings; or if not indicated, then as per approved shop drawings.
 - 3. Height: As indicated on drawings.
 - 4. Depth: As indicated on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as instructed by the manufacturer.
- C. Verify correct spacing of and between plumbing fixtures.
- D. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install in accordance with applicable code requirements.
- B. Install partitions secure, rigid, plumb, level, and true to line, in accordance with manufacturer's instructions.
- C. Attach panels and pilasters to brackets with tamper-resistant thru-bolted screws.
- C. All panels shall be installed in proper alignment in accordance with the approved Shop Drawings.

- B. Maintain 3/8 to 1/2 inch (9 to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 ADJUSTMENT

- A. Adjust doors to work smoothly and correctly.
- B. Adjust and align hardware to uniform clearance at vertical edge of doors.
- C. Adjust hinges to locate in swing doors in partial open position and out swing doors in closed position when unlatched.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/4 inch (6 mm).
- B. Maximum Variation from Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust doors to work smoothly and correctly.
- C. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- D. Adjust adjacent components for consistency of line or plane.

3.05 CLEANING

- A. Clean all dirt and marks from stone partition panels using water or a stone cleaner appropriate for the type of stone and per manufacturer's recommendations.

END OF SECTION

SECTION 102813
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Accessories for toilet rooms, showers and janitor closets.
- B. Grab bars.
- C. Concealed anchor plates, fasteners.
- D. ADA piping protection systems.
- E. Framed mirrors.

1.02 RELATED SECTIONS

- A. Section 055000 - Metal Fabrications: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.
- B. Section 079005 - Joint Sealers.
- C. Section 092116 - Gypsum Board Assemblies: Concealed metal backing plates for attachment and support of toilet accessories and grab bars to stud-framed or furred walls/partitions.
- D. Section 093000 - Tiling.
- E. Section 102113 - Marble Toilet Compartments.
- F. Division 22 - Plumbing: Plumbing fixtures.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123/A123M -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A269 -- Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 3. ASTM A653/A653M -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM A666 -- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. ASTM B456 -- Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - 6. ASTM F446 -- Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
 - 7. ASTM G21 -- Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

8. ASTM G22 -- Standard Practice for Determining Resistance of Plastics to Bacteria.
- C. Florida Building Code, 2010 edition (FBC):
 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-A -- Florida Building Code, Accessibility (2012 edition).
- D. Glass Association of North America (GANA).

1.04 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data:
 1. General: Provide data on accessories describing size, finish, details of function, attachment methods.
 2. Mirror Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 3. ADA Piping Protection Systems: Provide data describing product specifications, materials, colors, accessories, extensions, and code compliances.
- C. Shop Drawings: Provide complete shop drawings for toilet accessories and grab bars attached to walls, partitions, or toilet compartment panels.
 1. Plans: Locate each specified unit in project.
 2. Elevations: Indicate mounting height of each specified unit in project.
 3. Details: Indicate anchoring and fastening details, required locations and types of anchors and reinforcement, and materials required for correct installation of specified products not supplied by manufacturer of products of this section.
 4. Coordinate with applicable substrate and framing conditions. Include load calculations confirming adequacy of wall/partition framing, internal wall reinforcement, concealed supports, and backing plate details, based on specified design loads.
- D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Accessibility Requirements:
 1. Conform to applicable regulatory requirements for accessibility, including FBC-A.
 2. Operating Force: Soap dispensers shall operate with a maximum five-pound operating force.
 3. Wall Mounted Grab Bars, Shower Seats, and related fasteners and mounting devices:
 - a. Grab Bars and Shower Seats shall comply with the 2012 Florida Accessibility Code For Building Construction, Section 608.3.
 - b. Grab bars shall comply with the length and positioning requirements shown in

2012 Florida Accessibility Code For Building Construction figures 604.5.1, and 604.5.2.

- (1) Grab bars shall have a gripping surface at the locations shown and do not obstruct the required clear floor area.
- c. The diameter or width of the gripping surfaces of grab bars shall be 1-1/4 in. to 1-1/2 in. (32 mm to 38 mm). Where grab bars are mounted adjacent to a wall, the space between the wall and the grab bar shall be 1-1/2 in. (38 mm).
- d. The structural strength of Grab Bars and Shower Seats, and related fasteners and mounting devices shall meet the specifications of FBC-B SECTION 11-4.26.3, and as follows:
 - (1) Bending stress induced by the maximum bending moment from the application of 250 lbf (1112N) shall be less than the allowable stress for the material of the assembly.
 - (2) Shear stress induced by the application of 250 lbf (1112N) shall be less than the allowable shear stress for the assembly. If the connection between the assembly and its mounting bracket or other support is considered to be fully restrained, then direct and torsional shear stresses shall be totaled for the combined shear stress, which shall not exceed the allowable shear stress for the material.
 - (3) Bending stress induced by the maximum bending moment from the application of 250 lbf (1112N) shall be less than the allowable stress for the material of the assembly.
 - (4) Shear force induced in a fastener or mounting device from the application of 250 lbf (1112N) shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.
 - (5) Tensile force induced in a fastener by a direct tension force of 250 lbf (1112N) plus the maximum moment from the application of 250 lbf (1112N) shall be less than the allowable withdrawal load between the fastener and the supporting structure.
 - (6) Grab bars shall not rotate within their fittings.
4. Toilet Paper Dispensers:
 - a. All toilet paper dispensers shall meet the requirement to be free spinning. Dispensers that control delivery, or that do not permit continuous paper flow, shall not be used.
 - b. All dual roll toilet paper dispensers shall be fully automatic and shall not require the end user to perform any function to obtain the second roll.
5. Mirrors: Mirrors shall be mounted with the bottom edge of the reflecting surface no higher than 40 inches (1015 mm) above the finish floor.

1.06 COORDINATION

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.
 1. Provide concealed mounting plates, backplates, anchor plates, or other approved reinforcement for support of accessories to be anchored to stud wall, furred wall, or

other hollow wall assembly.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Toilet Room Accessories and Grab Bars:
 - 1. Basis of Design Manufacturer:
 - a. Bobrick Washroom Equipment: Products specified in this Section to be manufactured by Bobrick Washroom Equipment, Inc.; model numbers have been cited to establish type of accessory and acceptable level of quality, performance, function and appearance.
 - 2. Other Manufacturers:
 - a. Equivalent products by other manufacturers listed herein may be submitted for consideration, provided that such products are equal in quality, performance, function and appearance; however, manufacturer's literature and samples for each unit proposed as equal shall be submitted for review and approval by Consultant.
 - b. Other Manufacturers:
 - (1) A & J Washroom Accessories Inc: www.ajwashroom.com.
 - (2) American Specialties, Inc: www.americanspecialties.com.
 - (3) Bradley Corporation: www.bradleycorp.com.
- B. ADA Protection Systems:
 - 1. Basis of Design Manufacturer: TrueBro, Inc.; 7 Main Street, Ellington, CT 06029; Tel. 860-875-2868 or 800-340-5969; Fax. 860-872-0300; internet: www.truebro.com.
- C. All items of each type to be made by the same manufacturer.

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. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide three keys for each accessory to Owner; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653, with G90/Z275 coating.
- F. Adhesive: Two-component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- H. Manufacturer's identification logo must be permanently stamped into each accessory to

provide positive identification to end user for replacement or matching equipment in the future. Such stamping shall be no larger than 1 x 1 inch, and shall be unobtrusively located on accessory. Lavatory mounted soap dispensers shall have the manufacturer's name permanently molded into the container. Adhesive slickers shall not be acceptable.

2.03 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.
- C. Baked Enamel: Pre-treat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- D. Galvanizing for Items Other than Sheet: Comply with ASTM A123; galvanize ferrous metal and fastening devices.
- E. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.
- F. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 TOILET ROOM ACCESSORIES

- A. Toilet Tissue Dispenser:
 - 1. Type: Surface wall-mounted Twin-Jumbo-roll toilet tissue dispenser.
 - 2. Material: 20-gauge, stainless steel sheet, Type 304.
 - 3. Capacity: Two toilet tissue rolls up to 10 inch (255mm) diameter with a 3-inch(75mm) diameter core (horizontally).
 - 4. Product: Bobrick B-2892, or equal.
 - 5. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Toilet Tissue Dispenser to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.
 - b. Attachment to Toilet Compartment Panel: Secure in accordance with manufacturer's recommended installation method.
- B. Soap Dispenser - Type 1:
 - 1. Type: Surface wall-mounted soap dispenser.
 - 2. Material: 22-gauge stainless steel sheet with satin finish.
 - 3. Capacity: 40 fl oz (1.2 L).
 - 4. Product: Bobrick 2112, or equal.
 - 5. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Soap Dispenser to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer;

screws shall extend through wall finish and concealed backing plate.

C. Soap Dispenser - Type 2:

1. Type: Lavatory-mounted soap dispenser.
2. Material:
 - a. Piston, Spout and Top Cover: Type 304 stainless steel, with bright polished finish.
 - b. Cover Spacer: Rigid, impact-resistant polyester.
 - c. Escutcheon: Chrome plated, high-impact resistant ABS with bright polished finish; concealed locking mechanism.
 - d. Body and Shank: High impact resistant plastic.
 - e. Valve: ABS cylinder; stainless steel spring.
 - f. Container: Translucent, shatter-resistant polyethylene.
3. Capacity: 34 fl oz (1.0 L).
4. Product: Bobrick B-8226, or equal.
5. Installation Method: Mount Soap Dispenser in unused faucet hole on lavatory, in accordance with manufacturer's recommended installation method.

D. Stainless Steel Channel Framed Mirror - Type 1:

1. Type: Snap locking design.
2. Materials:
 - a. Frame: Mirror shall have one-piece, polished stainless steel 1/2 inch x 1/2 inch x 1/2 inch (13 x 13 x 13 mm) channel frame. Mirror frame shall have 90-degree uniform corners; open or uneven mitered corners are not acceptable.
 - b. Mirror: No. 1 quality, 1/4 inch (6-mm) float/plate glass. All mirror edges shall be protected by filler strips. Mirror back shall be protected by full-size shock absorbing, water-resistant, non-abrasive 1/8 inch (3-mm) thick polyethylene padding. Galvanized steel back with formed edges for additional strength shall have integral hanging brackets for mounting on concealed one-piece rectangular wall hanger(s).
3. Size (Width x Height): 18 x 30 inches.
4. Product: Bobrick B-165 1830.
5. Installation Method: Mount wall hanger on wall, then hang mirror on wall hanger; locking device to automatically secure mirror to wall hanger when it is lowered into final position.
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Mirror to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.

E. Stainless Steel Channel Framed Mirror - Type 2:

1. Type: Screw locking design.
2. Materials:
 - a. Frame: Mirror shall have one-piece, polished stainless steel 1/2 inch x 1/2 inch x 1/2 inch (13 x 13 x 13 mm) channel frame. Mirror frame shall have 90-degree uniform corners; open or uneven mitered corners are not acceptable.

- b. Mirror: No. 1 quality, 1/4 inch (6-mm) float/plate glass. All mirror edges shall be protected by filler strips. Mirror back shall be protected by full-size shock absorbing, water-resistant, non-abrasive 1/8 inch (3-mm) thick polyethylene padding. Galvanized steel back with formed edges for additional strength shall have integral hanging brackets for mounting on concealed one-piece rectangular wall hanger(s).
 - 3. Size (Width x Height): 18 x 30 inches.
 - 4. Product: Bobrick B-165 1830.
 - 5. Installation Method: Mount wall hanger on wall, then hang mirror on wall hanger; lower mirror into final position and lock it to wall hanger by tightening Phillips-head locking screws that are concealed in the bottom of the frame.
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Mirror to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.
- F. Surface Mounted Paper Towel Dispenser - Type 1
- 1. Type: All welded construction
 - 2. Materials: 18-8 S, type-304, 22-gauge (0.8mm) stainless steel.
 - 3. Size: 10-3/4in x 4in
 - 4. Product: Bobrick B-262
 - 5. Operation: Unit dispenses C-fold and multifold paper towels 3-1/8" to 3-13/16" (79–97mm) deep. Slots in sides of cabinet indicate refill time. Capacity: 400 C-fold or 525 multifold paper towels.
- G. Sanitary Napkin Disposal - Type 1:
- 1. Type: Surface-mounted sanitary napkin disposal.
 - 2. Material: 22-gauge stainless steel sheet; exposed surfaces to have satin finish.
 - a. Service Access Door: Secured to cabinet with full-length stainless steel piano hinge and be equipped with a tumbler lock.
 - b. Disposal Door: Unit shall have a self-closing panel covering disposal opening. Panel shall be secured to door with spring-loaded, full-length stainless steel piano hinge and be equipped with international graphic symbol identifying usage.
 - c. Receptacle: Napkin disposal shall be furnished with a removable, leak-proof, molded polyethylene receptacle.
 - (1) Capacity: 1.2 gal. (4.6 liters).
 - 3. Product: Bobrick B-254.
 - 4. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Napkin Disposal to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.
 - b. Attachment to Toilet Compartment Panel: Secure in accordance with

manufacturer's recommended installation method.

H. Sanitary Napkin Disposal - Type 2:

1. Type: Partition-mounted sanitary napkin disposal, designed to serve two toilet compartments.
2. Material: 22-gauge stainless steel sheet; exposed surfaces to have satin finish.
 - a. Service Access Door: Secured to cabinet with full-length stainless steel piano hinge and be equipped with a tumbler lock.
 - b. Disposal Panels (2): Unit shall have two self-closing panels covering disposal opening. Panel shall be secured to door with spring-loaded, full-length stainless steel piano hinge and be equipped with international graphic symbol identifying usage.
 - c. Receptacle: Napkin disposal shall be furnished with a removable, leak-proof, molded polyethylene receptacle.
 - (1) Capacity: 1.2 gal. (4.6 liters).
3. Product: Bobrick B-354.
4. Installation Method: Mount in toilet partition, centered through 11 inch W x 15-1/2 inch H (280 x 395mm) cutout, using through-bolting method of attachment.

I. Single Robe Hook:

1. Material: Type-305 stainless steel; polished finish.
 - a. Flange shall be 22 gauge (0.8mm) and equipped with concealed, 16-gauge (1.6mm) mounting bracket that is secured to concealed, 16-gauge (1.6mm) wall plate with a stainless steel setscrew.
 - b. Cap shall be 10 gauge (3.6mm), welded to support arm.
2. Product: Bobrick B-671.
3. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Robe Hook to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate
 - b. Attachment to Toilet Compartment Panel: Secure in accordance with manufacturer's recommended installation method.

2.05 SHOWER ACCESSORIES

A. Folding Shower Seat:

1. Type: Folding shower seat with padded cushion.
2. Materials:
 - a. Seat: 2-inch (51mm) thick overall with 1-1/2 inch (38mm) thick, closed-cell polyurethane foam padding mounted on 1/2-inch (13mm) thick plywood; covered in white water-resistant reinforced vinyl fabric (e.g., Naugahyde).
 - b. Frame: Stainless steel sheet with satin finish; 16-gauge (1.6mm), 1-1/4 inch (32mm) square members; 18-gauge (1.2mm), 1-inch (25mm) diameter tubing.
 - c. Mounting Flanges (2): 3/16-inch (5mm) thick stainless steel with satin finish; 3-inch (76mm) diameter with three mounting screw holes.
 - d. Baseplate: Heavy-gauge stainless steel sheet.

- e. Spring: 17-7, type-301, 24-gauge (0.6mm) stainless steel sheet; spot-welded to baseplate.
 - f. Guide Bracket: 16-gauge (1.6mm) stainless steel sheet with satin finish.
 - 3. Product: Bobrick B-517 (right) / B-518 (left).
 - 4. Installation Method: Secure unit to wall at points designated by manufacturer, with two mounting flanges at top and the baseplate and guide bracket below.
 - a. Furred CMU/Concrete Wall: Provide solid blocking between furring, and centered on mounting flanges and baseplate, and secure seat mounting flanges and baseplate to wall with stainless steel sleeve type expansion anchors w/ minimum 2 inches embedment into CMU/concrete.
 - b. Stud-Framed Wall/Partition: Ensure that studs supporting seat are spaced no more than 12 inches on center. Provide concealed backing secured to studs, and secure seat mounting flanges and baseplate to wall with stainless steel toggle bolts.
- B. Shower Curtain Rod:
- 1. Material: Extra Heavy Duty, Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness min., satin-finished, with 2.50 inch square, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
 - 2. Product: Bobrick B-6047.
 - 3. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure Curtain Rod flanges to wall with #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.
- C. Shower Curtain:
- 1. Material: Vinyl .008 inch (0.2mm) thick.
 - 2. Size: 42 inch W x 72 inch H (1070 x 1830 mm), hemmed edges.
 - 3. Grommets: Nickel-plated brass grommets along top hem on 6 inch (150 mm) centers.
 - 4. Color: Opaque Matte white
 - 5. Shower Curtain Hooks: Stainless steel spring wire designed for snap closure.
- D. Wall-Mounted Soap Dish:
- 1. Material: Heavy duty, seamless stainless steel, 22 gauge, surface-mounted with drain holes, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
 - 2. Product: Bobrick B-6807.
 - 3. Installation Method:
 - a. Attachment to Stud-Framed or Furred Partition: Provide concealed metal backing plate per Section 092116 - Gypsum Board Assemblies, then secure #10 x 2 inch (M4.8 x 50mm) Phillips oval-head, stainless steel, sheet-metal screws, at points designated by manufacturer; screws shall extend through wall finish and concealed backing plate.

2.06 GRAB BARS

- A. General:
 - 1. Grab Bars:
 - a. Material/Fabrication: Type 304, 18-8 S alloy, 18-gage, stainless steel with satin finish; 1-1/4 inches (32 mm) outside diameter; minimum 0.05 inch (1.3 mm) wall thickness; non-slip grasping surface finish; concealed flange mounting.
 - (1) Ends to be heliarc welded to exposed mounting flanges.
 - b. Fabricate and install to:
 - (1) Provide 1.50 inches (38 mm) clearance between wall and inside of grab bar.
 - (2) Comply with ASTM F446, and to withstand a 900-pound (4 000 N) force.
 - 2. Anchor/Backing Plates:
 - a. Each grab bar attached to stud-framed or furred wall/partition shall be provided with concealed anchor plate(s) and fastening system, as recommended by manufacturer for each applicable condition and as required to meet design load requirements.
 - b. Each grab bar attached to toilet compartment panel shall be provided with backing plates and fastening system, as recommended by manufacturer for each applicable condition and as required to meet design load requirements.
- B. Grab Bars:
 - 1. Straight Grab Bar, 36 Inches:
 - a. Product: Bobrick B-6806 x 36, or equal.
 - b. Concealed Anchor Plate(s): Bobrick 2562-36.
 - c. Refer to Accessories Legend on drawings, Item "E".
 - 2. Straight Grab Bar, 42 Inches:
 - a. Product: Bobrick B-6806 x 42, or equal.
 - b. Concealed Anchor Plate(s): Bobrick 2562-0; two per grab bar.
 - c. Backing Plate(s): Bobrick 2583; two per grab bar.
 - d. Refer to Accessories Legend on drawings, Item "F".
 - 3. Horizontal Two-Wall Grab Bar, 36 x 36 Inches:
 - a. Product: Bobrick B-6861, or equal.
 - b. Concealed Anchor Plate(s): Bobrick 2562-0; three per grab bar.
 - c. Refer to Accessories Legend on drawings, Item "G".
- C. Anchor/Backing Plates:
 - 1. Concealed Anchor Plate (for attachment of grab bar to stud-framed or furred wall/partition): 3 inches (75 mm) x 12-gage galvanized steel plate with 1/4-20 (6 mm) threaded holes extruded and tapped to give minimum 0.200 inch (5 mm) of usable thread per hole; length of anchor plate to be per manufacturer's standard for grab bar length.
 - a. Screws: 1/4-20 round-head stainless steel machine screws; minimum three per flange.
 - b. Product: Bobrick 2562- series, or equal.
- D. Installation Method:
 - 1. Concealed Anchor Plate: Install concealed anchor plate in accordance with

- manufacturer's installation instructions (e.g., Bobrick TB-49).
2. Backing Plate: Install backing plate in accordance with manufacturer's installation instructions; coordinate with toilet compartment panel installation and support.
 3. Grab Bar: Install grab bar in accordance with manufacturer's installation instructions; coordinate with requirements for anchor/backing plate(s) installation.

2.07 ADA PIPING PROTECTION SYSTEMS

A. Undersink Piping Protective Covers:

1. General: Comply with requirements of FBC-A, and as follows:
 - a. Lavatory P-traps and angle valve assemblies shall be covered with undersink protective pipe cover assemblies.
 - (1) Cover assemblies shall include P-trap cover, two angle valve covers, offset grid drain cover, tailpiece cover, and extensions as necessary to cover all undersink piping and valves.
 - b. Covers shall be secured with snap-clip flush reusable fasteners, and angle stop shall have locking access cover. Cable ties or baggie tie fasteners are not acceptable.
 - c. Covers shall be installable and removable without requiring disassembly of P-trap or angle stop.
 - d. Covers shall allow for emergency and maintenance access to the plumbing P-trap clean-out and angle stop valve without removing piping covers.
2. Specifications:
 - a. Material: Molded closed cell vinyl.
 - b. Nominal Wall Thickness: 1/8 inch.
 - c. Durometer: 60 - 70 Shore A.
 - d. Finish: Smooth, high gloss.
 - e. UV Protection: Will not fade or discolor.
 - f. Durability: Virtually indestructible.
 - g. Fasteners: Reusable snap clips.
 - h. Color: White.
 - i. Compatibility: Shall fit all 1.25 to 1.50 inch cast brass or tubular P-trap assemblies and 3/8 to 1/2 inch angle stop assemblies. Coordinate with specified plumbing fixtures.
 - j. Flame Characteristics (ASTM D635): ATB, 0 sec.; AEB, 0 mm.
 - k. Thermal Conductivity: K value of 1.17 plus dead air space.
 - l. Bacteria/Fungus Resistance (ASTM G21 and G22): Anti-microbial vinyl formula; Result 0.
3. Product: TrueBro Lav-Guard Undersink Protective Pipe Covers, or equal.

2.08 UTILITY ROOM / JANITOR CLOSET ACCESSORIES

- ### A. Combination Utility Shelf/Mop, Broom Holder and Hooks: 0.05 inch thick stainless steel, Type 304 stainless steel, with 1/2 inch returned edges, 0.06 inch steel wall brackets. Mount securely to back wall, and extend the shelf around the other two sides of the closet with heavy-duty supports.
1. Drying rod: Stainless steel, 1/4-inch diameter.
 2. Hooks: Two 0.06-inch stainless steel rag hooks at shelf front.

3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
4. Length: 30 inches; manufacturer's standard length for number of holders/hooks.
5. Product: Bobrick B-239x34, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.
- C. Coordinate placement and installation of blocking, reinforcement plates, and concealed anchors required for installation of accessories, with construction of related work specified in other sections.

3.03 INSTALLATION

- A. Install accessories, grab bars, and ADA piping protection systems in accordance with manufacturers' instructions and as indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:
 1. Toilet Tissue Dispensers: Except as otherwise indicated, top of dispenser to be mounted at 31.0 inches above finish floor.
 - a. Mount toilet tissue dispenser so that top of dispenser is at 3.0 inches below top of grab bar; clearance between bottom of grab bar and tissue dispenser to be not less than 1.5 inches.
- D. Mirrors:
 1. Install mirrors in accordance with GANA recommendations and manufacturers' instructions.
 2. Set mirrors plumb and level, free of optical distortion.
 3. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.04 ADJUSTMENT AND CLEANING

- A. After installation, remove all traces of protective coating paper, and clean accessories in manner not to damage finish.
- B. Adjust accessories for proper operation. Test mechanisms, hinges, locks, and latches and where necessary adjust and lubricate.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguisher cabinets.
- B. Fire extinguishers.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Roughed-in wall openings; concealed backer plates for attachment of wall-mounted extinguisher brackets to stud-framed or furred walls/partitions.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM E814 -- Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- C. Florida Building Code, 2010 edition (FBC):
 - 1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 - 2. FBC-A -- Florida Building Code, Accessibility; 2012 edition.
- D. Florida Fire Prevention Code, 2010 edition (FFPC).
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 10 -- Standard for Portable Fire Extinguishers.
- F. Underwriters Laboratories Inc. (UL):
 - 1. UL (FPED) -- Fire Protection Equipment Directory.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.
- C. Product Data: Provide fire extinguisher operational features, color and finish, and anchorage details.
- D. Samples: Provide samples of manufacturer's complete range of colors for Architect's selection.

- E. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguisher Cabinets and Accessories:
 - 1. JL Industries, Inc.: 4450 West 78th St Circle, Bloomington, MN 55435-5416; Tel. 800-554-6077; Fax. 952-835-2218; Email: sales@jlindustries.com; www.activarcpg.com
 - 2. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - 3. Potter-Roemer: www.potterroemer.com.
- B. Fire Extinguishers:
 - 1. Ansul, Inc: www.ansul.com.
 - 2. JL Industries, Inc: www.jlindustries.com.
 - 3. Pyro-Chem: www.pyrochem.com.

2.02 FIRE EXTINGUISHER CABINETS

- A. Materials:
 - 1. Tub: Cold-rolled steel.
 - 2. Door and Trim: Aluminum.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Sized to accommodate Multi-Purpose Fire Extinguisher and accessories.
 - 2. Door: Flush fully-glazed cabinet door with handle and lock, attached to cabinet by a continuous hinge.
 - a. Handle: Chrome-plated pull.
 - b. Lock: Theft-deterrent feature with keyed cylinder lock and replaceable plastic cam. The lock mechanism shall be designed such that a sharp pull on the handle will break the replaceable plastic cam, thus allowing the door to be opened.
 - 3. Trim: Square; returned to wall surface, with 2-1/4 inch (51 mm) projection, 1-3/4 inch (44 mm) wide face.
- C. Door Glazing: Glass, clear, 1/8 inch (3 mm) thick, fully tempered. Set in resilient channel gasket glazing.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, application and conditions of use, per manufacturer's recommendations. Pre-drill for anchors.
- E. Weld, fill, and grind components smooth.
- F. Finishes:
 - 1. Tub Interior: White powder coat.
 - 2. Door and Trim Exterior: Clear anodized.
- G. Fire-Rating: At locations where semi-recessed cabinet is indicated in a fire-rated wall/partition assembly, the following shall apply:

1. Cabinet shall be fabricated in accordance with UL or Warnock Hersey label for one and two hour combustible and non-combustible wall assembly, in accordance with applicable requirements of the FBC and FFPC.
 - a. Fire testing shall have met the requirement of ASTM E814 for membrane and penetration firestops.
2. Manufacturer's installation instructions must be strictly adhered to in order to obtain the applicable fire rating.

G. Products:

1. Semi-Recessed Cabinets in Non-Fire-Rated Walls/Partitions: "Academy" Model 1720G17 by J.L. Industries, or equal.
2. Semi-Recessed Cabinets in Fire-Rated Walls/Partitions: "Academy" Model 1720G17FX by J.L. Industries, or equal.

2.03 FIRE EXTINGUISHERS

A. General:

1. Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
2. Provide fire extinguishers labeled by UL for the purpose specified and indicated.
3. Coordinate fire extinguisher with fire extinguisher cabinet, to ensure proper fit.

B. Fire Extinguisher:

1. General:
 - a. Stored Pressure Operated: Deep drawn.
 - b. Class: A:B:C.
 - c. Finish: Baked polyester powder coat, red color.
 - d. Temperature range: -65 degrees F (-54 degrees C) to 120 degrees F (49 degrees C).
2. Multi-Purpose Fire Extinguisher: Dry chemical type; carbon steel tank, with pressure gage.
 - a. UL Rating: 3-A:40-B:C.
 - a. Size: 5 pound (2.27 kg).
3. Product: "Cosmic 5E" Model MB818C by J.L. Industries, or equal.

2.04 ACCESSORIES

- A. Wall-Mounted Fire Extinguisher Brackets: Formed steel hook with integral latching strap, chrome-plated; designed for surface attachment to wall assembly.
1. Sized to accommodate Multi-Purpose Fire Extinguisher.
 2. Bracket shall be provided with appropriate fasteners suitable for attaching bracket to wall assembly.
 3. Product: Model MB818C by J.L. Industries, or equal.
- B. Concealed Backer Plate: Refer to Section 092116 - Gypsum Board Assemblies.
- C. Cabinet Equipment Identification: Cabinets shall be identified in an approved manner by a permanently attached sign with letters not less than 2 inches (51 mm) high in a color that contrasts with the background color, indicating the equipment contained in the cabinet.

1. Exceptions: As allowed in FBC-B SECTION 905.7.

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. General:
 1. Install in accordance with manufacturer's instructions.
- B. Fire Extinguisher Cabinets: Install cabinets plumb and level at 47 inches (1200 mm) from finished floor to cabinet door pull or fire extinguisher handle, whichever is the highest.
 1. Comply with applicable requirements of governing building code, including but not limited to FBC-A SECTIONS 309.3 and 404.2.7.
 2. Secure rigidly in place in accordance with manufacturer's instructions.
 3. Position cabinet signage as indicated on drawings; if not indicated, as directed by Architect.
 4. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
- C. Wall-Mounted Fire Extinguisher Brackets: Install wall mounted brackets plumb and level at 47 inches (1200 mm) from finished floor to extinguisher handle.
 1. In each location where the drawings indicate a fire extinguisher without a fire extinguisher cabinet install in the wall/partition a concealed backer plate of sufficient size and strength to provide secure attachment and support for fire extinguisher, regardless of whether or not such backer plate are indicated on the Drawings.
 - a. For additional requirements, refer to Section 0926116 - Gypsum Board Assemblies.
 2. Attach bracket to wall and secure rigidly in place using sheet metal screws extending through the gypsum board and the concealed backer plate.
- D. Fire Extinguishers:
 1. In each location where the drawings indicate a fire extinguisher cabinet, place one Multi-Purpose Fire Extinguisher in the fire extinguisher cabinet.
 2. In each location where the drawings indicate a fire extinguisher without a fire extinguisher cabinet, place one Multi-Purpose Fire Extinguisher on wall-mounted bracket.
- E. Position cabinet signage as indicated on drawings; if not indicated, as directed by Architect.

END OF SECTION

SECTION 105100

LOCKERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Phenolic lockers.

1.02 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 1. ASTM D570 -- Standard Test Method for Water Absorption of Plastics
 2. ASTM D1037 -- Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
 3. ASTM D2197 -- Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion
 4. ASTM D2794 -- Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 5. ASTM D6578/D6578M -- Standard Practice for Determination of Graffiti Resistance
 6. ASTM E84 -- Standard Test Method for Surface Burning Characteristics of Building Materials

1.03 SUBMITTALS

- A. General:
 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's published data on locker materials, fabrication and construction, sizes, accessories, and installation. Include catalog cuts of anchors, hardware, fasteners and accessories.
- C. Shop Drawings: Furnish shop drawings for fabrication and installation of specified lockers. Include plans, elevations, sections, colors, details (including but not limited to doors, shelves, base, sloped top, and end panels), and anchorage/attachment to other work.
- D. Samples:
 1. Selection Samples: Submit samples of color chart with manufacturer's complete range of available colors.
 2. Verification Samples: Submit two samples 6 x 6 inches (150 x 150 mm) in size of each color and finish selected.
- E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

- A. Manufacturer's Warranty: Provide a manufacturer's 20-year warranty against breakage, corrosion, delamination and defects in workmanship of phenolic components. In the event of a material or workmanship defect, remedy shall include replacement by manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Phenolic Lockers:
 - 1. Accu Tec Manufacturing, Inc.: www.accutecmfg.com.
 - 2. Columbia Lockers, a division of PSiSC: www.psis.com.

2.02 LOCKER APPLICATIONS

- A. Wardrobe Lockers: Two tier phenolic lockers, wall mounted with matching closed base.
 - 1. Width: 12 inches (300 mm).
 - 2. Depth: 12 inches (300 mm).
 - 3. Height: 72 inches (1,830 m).
 - 4. Fittings: Hat shelf, 2 coat hooks.
 - 5. Locking: Padlock hasps, for padlocks provided by Owner.
 - 6. Provide sloped top.

2.03 PHENOLIC LOCKERS

- A. Materials:
 - 1. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
- B. Physical and Performance Requirements:
 - 1. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread Index: 75 or less.
 - b. Smoke Developed Index: 450 or less.
 - 2. Graffiti Resistance Requirements (ASTM D6578/D6578M): Locker materials shall be resistant to all chemicals tested for a period of 1 to 10 minutes, and shall leave no mar or blemish on the surface when cleaned.
 - a. Locker materials shall have guaranteed surface clean ability from permanent markers and shall have non-ghosting properties.
 - 3. Scratch Resistance Requirements (ASTM D2197): Locker materials shall be scratch resistant when tested with maximum load value of at least 10 kilograms.
 - 4. Impact Resistance Requirements (ASTM D2794): Locker materials shall withstand an impact force value of at least 45 inch-lbs.
 - 5. Screw Holding Strength (ASTM D1037, Direct Screw Withdrawal Test): Locker materials shall withstand a direct pull force of at least 2,500 lbs per fastener.
 - 6. Tensile Strength: Locker materials shall have a modulus of elasticity of at least 1.55 million psi.

7. Shear Strength: 2,000 psi, minimum.
 8. Compression Strength: 24,000 psi, minimum.
 9. Water Absorption Requirements (ASTM D570): Less than 0.37 percent.
- C. Fabrication: Lockers to be factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
1. Doors: Full overlay, covering full width and height of locker body; square edges.
 2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
 3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
 4. Locker Shelves: Each locker tier shall have a shelf, mortised into side walls of the locker body at location determined by Architect.
 5. Ventilation: By holes drilled in tops, bottoms, and intermediate shelves, and by open space between the back of door and locker body.
 6. Door Color: To be selected by Architect.
 7. Body Color: Manufacturer's standard white or light color.
 8. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
 9. Thicknesses:
 - a. Doors: 1/2 inch (13 mm), minimum.
 - b. Locker Body: One of the following combinations:
 - (1) Tops, bottoms, and shelves 3/8 inch (10 mm); sides and backs 5/16 inch (8 mm); minimum.
 - (2) Tops, bottoms, and shelves 1/2 inch (13 mm); sides 3/8 inch (10 mm); backs 1/4 inch (6 mm); minimum.
 - c. End Panels and Filler Panels: 1/2 inch (13 mm), minimum thickness.
 - d. Sloped Tops: 1/2 inch (13 mm), minimum.
 - e. Toe Kick Plates: 1/2 inch (13 mm), minimum thickness.
- D. Hinges: Stainless steel, satin finish; minimum of 90 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with tamperproof screws, or completely concealed cabinet style hinge attached with tamperproof screws.
- E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.
- F. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.
- G. Lock Strike: Stainless steel strike plate attached to locker body with through bolts.
- H. Product: "Columbia Solid Phenolic 5811L" by Columbia Lockers, or equivalent product by other listed manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb (445 N).
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 113100
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

- A. Section 064100 - Architectural Wood Casework.
- B. Section 066100 - Quartz Surface Fabrications: Countertops.
- C. Division 21 - Plumbing: Plumbing connections for appliances.
- D. Division 26 - Electrical: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. National Electrical Manufacturers Association (NEMA).
- C. Underwriters Laboratories Inc. (UL):
 - 1. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that 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 not less than three years of documented experience.
 - 1. All kitchen appliances shall be by one manufacturer, except water cooler may be by a different manufacturer.
- B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.06 WARRANTY

- A. For additional warranty requirements, see Section 017800 - Closeout Submittals.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. GE Appliances: www.geappliances.com.
- B. Frigidaire Home Products: www.frigidaire.com.
- C. Interpure, a division of Pure Health Solutions, Inc.: 950 Corporate Woods Parkway; Vernon Hills, IL 60061; Tel. 800-265-5167; www.interpure.com.
- D. Whirlpool Corp.: www.whirlpool.com.

2.02 KITCHEN APPLIANCES

- A. Refrigerator: Free-standing, bottom-mounted freezer, frost-free.
 - 1. Capacity: Total minimum storage of 20 cubic ft (0.56 cu m); minimum 15 percent freezer capacity.
 - 2. Dimensions:
 - a. Height:
 - (1) Top of Hinge: 66-1/2 inches.
 - (2) Top of Case: 65-3/4 inches.
 - b. Depth:
 - (1) Case Depth (without door): 28-1/4 inches.
 - (2) Case Depth (without door handle): 32-1/2 inches.
 - (3) Case Depth (with door handle): 34-5/8 inches.
 - (4) Case + Door Open 90 Degrees: 59-3/4 inches.
 - c. Width:
 - (1) Door Closed: 29-3/4 inches.
 - (2) Door Open 90 Degrees (including door handle): 33-1/4 inches.
 - d. Air Clearance Requirements:
 - (1) Each Side: 1/8 inch.
 - (2) Top: 1 inch.
 - (3) Back: 2 inches.
 - 3. Features: Include glass shelves, automatic icemaker, light in freezer compartment, and Energy Star certified.
 - 5. Finish: Stainless steel.
 - 6. Product: Model GDE20ESESS by GE Appliances, or equivalent product by one of the other listed manufacturers.
- B. Microwave: Countertop.
 - 1. Capacity: 1.5 cubic ft (0.042 cu m).
 - 2. Dimensions:
 - a. Height: 14-3/4 inches.
 - b. Depth: 20 inches.
 - c. Width: 22-5/8 inches.
 - 3. Power (IEC-705): 1000 watts.

4. Features: Include turntable and removable oven rack.
 5. Finish: Stainless steel.
 6. Product: Model PEB9159SFSS by GE Appliances, or equivalent product by one of the other listed manufacturers.
- C. Dishwasher: Undercounter.
1. Dimensions:
 - a. Height (including adjustable feet): 32-1/2 max.
 - (1) Installed height of dishwasher shall be coordinated with cabinet and countertop installation, to comply with ADA countertop height requirement of 34 inches.
 - b. Depth: 22-1/2 inches.
 - (1) Allow 3 inches clearance between back of dishwasher panel and face of back wall, for electrical, drain and water supply connections.
 - c. Width: 17-5/8 to 18 inches.
 2. Controls: Solid state electronic.
 3. Electrical Rating: 120 V / 60 Hz.
 - a. Total Connected Load Amperage: 90.
 - b. Heater Watts, Max.: 550.
 4. Wash Levels: 4.
 5. Cycles: 7, including the following.
 - a. Normal Wash
 - b. Rinse Only
 - c. Heavy Wash
 - d. Light Wash
 - e. Glasses
 - f. Air Dry
 6. Features: Include "Quiet Package" (60 dBA), stainless steel interior, 24-hour delay start, 3-stage manual clean filtration system, and ADA-compliant.
 7. Finish: Stainless steel.
 8. Product: Model PDW1860NSS by GE Appliances, or equivalent product by one of the other listed manufacturers.
- D. Water Cooler: Countertop; hot/cold micro-filtration drinking water system designed to dispense pure, clean drinking water.
1. Dimensions:
 - a. Height: 17-1/4 inches.
 - b. Depth: 14-2/3 inches.
 - c. Width: 13 inches.
 - d. Weight: 52 lbs.
 2. Electrical Rating: 120 V / 60 Hz / 3.8 A.
 3. Features: Include microprocessor control, hot/cold temperature settings, ultraviolet disinfection, filter change indicator, leak detection, large dispensing area (for large containers), large drip tray with removable screen.
 4. Finish: Powder coat, color Black/Silver.
 5. Product: Model IPCIU by Interpure; no substitution.

- E. Coffee Maker: Countertop.
 - 1. Capacity: 12-cup.
 - 2. Features: Include programmable brew-start timer, water level indicator, charcoal filter/filter holder.
 - 3. Finish: Manufacturer's standard.
 - 4. Product: Model 169209 by GE Appliances, or equivalent product by one of the other listed manufacturers.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust operating equipment to efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

END OF SECTION

SECTION 115213
PROJECTION SCREENS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes: Ceiling mounted electrically operated recessed screens, fittings and accessories, mounting brackets, anchorage and control cable with wall mounted control switch.
- B. Definition of Terms:
 - 1. The term "Owner" shall refer to the City of Key West.
 - 2. The term "Owner's Representative" shall refer to: Bender and Associates
 - 3. The term "Consultant" shall refer to: Kensella – Marsh Group
 - 4. The term "AV Contractor" shall refer to the Audiovisual Systems subcontractor who has been awarded the subcontract for the subject job and who has responsibility for performance of the work specified herein.
 - 5. The term "Specified elsewhere" shall refer to material and work which is related to this Contract and for which the Contractor is not responsible except as otherwise detailed herein. Some or all of these items may be included in the overall electrical contract.
 - 6. The term "shall" is mandatory; the term "will" is informative; the term "should" is advisory; and the term "provide" means furnish and install.
 - 7. The term "custom" indicates systems or components that shall be fabricated by the Contractor based on the drawings and specifications.
 - 8. The term "future" indicates equipment that will be added to the systems by the Owner later. Provisions shall be made for this equipment.
 - 9. The term "or equal" indicates equal in materials, size, color, design, function, efficiency of specified, and conforming with the specified manufacturer/model.

1.03 RELATED WORK

- A. Contractor shall coordinate with Electrical Contractor on wiring methods, cable testing methods, and conduit/junction box locations for audiovisual equipment and routing of audio, video, control, and power cables/conduits from terminal and pull boxes to system equipment rack(s).

1.04 SUBMITTALS

- A. Product data: Copies of manufacturer's catalog cuts, specifications and installation instructions.

1.05 DELIVERY AND HANDLING

- A. Deliver projection screens when building is enclosed and ready for screen installation.

Protect screens from damage during delivery, handling and installation.

1.06 STANDARDS

- A. Codes: Work shall be done according to applicable requirements of governing codes, rules and regulations including the following minimum standards, whether statutory or not:
 - 1. National Electric Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. Federal communications Commission (FCC)
 - 4. City and other local codes and requirements
- B. Standards: Equipment and materials specified shall conform to the current edition of the following standards where applicable:
 - 1. UL - Underwriters Laboratories
 - 2. ASTM-American Society for Testing Materials
 - 3. SMPTE-Society of Motion Picture and Television Engineers
 - a. SMPTE RP 94-2000 Gain Determination of Front Projection Screens.

1.07 ALTERNATE EQUIPMENT

- A. Refer to Division 1 – specifications for procedures related to submitting alternate equipment.

PART 2 – PRODUCTS

2.01 ELECTRICALLY OPERATED PROJECTION SCREENS

- A. Wall or Ceiling Mounted Electrically Operated Projection Screen Systems.
 - 1. Screen Operation: Electrically operated, UL and ULC listed, retractable, with rigid metal roller and tab guide cable screen tensioning.
 - 2. Motor: Housed inside metal roller. Includes automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting, and preset, adjustable limit switches to automatically stop viewing surface in the UP or DOWN positions.
 - a. Type: 3-wire, permanently lubricated, reversal type designed for mounting inside roller and to suit project requirements.
 - b. Voltage, Frequency: 115 V, 60 Hz.
 - c. Amperage: 2.4 amps maximum.
 - 3. Electric Controls: Wall mounted switch with integral junction box incorporated into screen housing.
 - a. Voltage, Frequency: Low voltage contacts.
 - b. Switch: 3 position type with cover plate for UP, DOWN and STOP functions.
 - 4. Screen Mounting: Ceiling.
 - a. Include mounting hardware and roller mounting brackets that adjust to allow centering or offsetting of the screen within the case.
 - 5. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
 - a. Material: Extruded aluminum.

- b. Design: 2-piece with curved contour flat-backed style with heavy-duty end caps concealing roller ends.
 - c. Length: 181.25 inches.
 - d. Finish: Powder coated black front.
- 6. Screen Size:
 - a. Viewing Area: H 90 inches × W 160 inches.
- 7. Acceptable Material: Da-Lite Screen Company, Inc. Tensioned Contour Electrol Projection Screen.
 - a. Tab Guide Cable Tensioned Screen Material:
 - i. Front projection, flame retardant, mildew resistant vinyl, [with] [without] black backing and [with] [without] standard black borders, easily cleaned with mild soap and water solution.
 - ii. Include tab and cable guide on each side of fabric to maintain even, lateral tension and hold viewing surface flat.
 - iii. Bottom end of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.
 - iv. Slat ends to be protected by heavy-duty plastic caps enclosing a preset adjustable mechanism for screen tensioning.
 - v. Seamless in all sizes.
 - b. Gain: To SMPTE RP 94-2000, 1.0.
 - c. Viewing Angle 45.
 - d. Format HDTV - 1.78:1.
 - e. Acceptable Viewing Surface: Da-Lite Screen Company, Inc.:
 - i. ReAct MS1000V.

2.02 ACCESSORIES

- A. Screen Drop: Extra drop of 24 inches black.
- B. Low Voltage Control (LVC) System:
 - 1. Single Motor Low Voltage Control (LVC) System: Internal.

2.03 PRODUCT SUBSTITUTIONS

- A. Substitutions: In accordance with Section 01 25 13 - Product Substitution Procedures

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install projection screen units and accessories at locations shown, in accordance with manufacturer's instructions. Install level, plumb, secure and at proper height.
- B. Cooperate with other trades for securing projection screen units.

3.02 COORDINATION WITH ELECTRICAL DRAWINGS

- A. Refer to Electrical drawings for service voltage, power feed, control and interlock wiring for equipment specified under this section. Assume full responsibility for the following items of work:
 - 1. If additional electrical services are required over and above what is indicated on

Electrical drawings and specified in Division 26, such as more control interlock conductors, larger feeder, separate 120V control power source, include in this section the furnishing and installation of such services.

2. Prior to proceeding with installation of any additional electrical work, submit detailed drawings indicating exact scope of any such additional electrical work for review.

3.03 WORKMANSHIP

- A. The finished installations shall be free from damage, flaws, blemishes or other defects detrimental to appearance. Doors and acoustical overlay at doors shall align with adjacent surfaces.
- B. Provide protection as required to ensure satisfactory operation and appearance at completion of project.

END OF SECTION

SECTION 122400
WINDOW SHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Roller type window shades and accessories.
- B. Manual controls.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.
- B. Section 092116 - Gypsum Board Assemblies: Substrate for window shade systems.
- C. Section 095100 - Suspended Acoustical Ceilings: Shade pockets, pocket closures and accessories.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D4674 -- Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments.
 - 2. ASTM G21 -- Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 2. NFPA 701 -- Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- D. Window Covering Manufacturers Association (WCMA):
 - 1. WCMA A100.1 -- Safety of Corded Window Covering Products. (ANSI/WCMA A101.1)

1.04 SYSTEM DESCRIPTION

- A. Roller Shade System: Manually operated roller shades.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.06 SUBMITTALS

- A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings:
 1. 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.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Samples:
 1. Selection Samples: Include fabric samples in full range of available colors and patterns.
 2. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
 1. Assign responsibility for design, engineering, installation, and performance of window shade system to single manufacturer and their qualified dealers and installers.
 2. Furnish shading system and electrical control equipment for complete installation and single source responsibility of shading and lighting control.
 3. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.
 1. Qualified to install and commission specified products by prior factory training, experience, demonstrated performance, and acceptance of any requirement of the manufacturer, subsidiary of the manufacturer, or licensed agent.

1.08 MOCK-UP

- A. Mock-Up: Provide full size mockup of window shade complete with selected shade fabric including sample of seam when applicable.
 - 1. Full-sized mock-up may become part of the final installation.

1.09 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.

1.10 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

- A. Provide manufacturer's eight (8) year warranty providing for repair or replacement of defective equipment.

1.12 MAINTENANCE

- A. Make ordering of new equipment for expansions, replacements, and spare parts available to qualified dealer or installer.
- B. Make replacement parts available for minimum of ten years after date of manufacture.
- C. Provide on-site service support within 24 hours.
- D. Offer renewable service contract on yearly basis to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system startup completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Window Shades, Motors and Motor Controls:
 - 1. Basis of Design: Lutron Electronics Co., Inc.: www.lutron.com.
 - 2. Other Manufacturers: Equivalent products by the following manufacturers:
 - a. Skyco Shading Systems, Inc.: www.skycoshade.com.
 - b. Nysan Solar Control, Inc., division of Hunter Douglas: www.nysan.com.
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 WINDOW SHADE APPLICATIONS

- A. Type WT1 Window Shade: Manually operated dual roller shades blackout and shear shades.
 - 1. Type: Roller shades.
 - 2. Fabric:
 - a. Sheer Fabric (Roller 1):

- a. Composition: 35 percent fiberglass, 65 percent vinyl on fiberglass.
- b. Fire Rating: NFPA 701, M1.
- c. Openness Factor: 10 percent.
- d. Usable Roll Width: 96 in., min.
- e. Color: Charcoal/Gray.
- f. Product: Lutron "Classico Sheer BasketWeave 90" (SV22-90-10), or equal.
- b. Blackout Fabric (Roller 2):
 - a. Composition: 100 percent polyester with acrylic foamed backing.
 - b. Fire Rating: NFPA 701, M1.
 - c. Openness Factor: 0 percent.
 - d. Usable Roll Width: 108 in., min.
 - e. Color: Khaki.
 - f. Product: Lutron "Classico Blackout Dual-Sided Avila" (BA-0015-0), or equal.
- 3. Mounting: Ceiling pocket mount, except as otherwise indicated.
- 4. Operation: Manual, in locations indicated.
- 5. Product: Lutron manually-operated double roller shades, or equal.
- B. Type WT2 Window Shade: Manually-operated single roller shade.
 - 1. Type: Roller shades.
 - 2. Fabric:
 - a. Composition: 35 percent fiberglass, 65 percent vinyl on fiberglass.
 - b. Fire Rating: NFPA 701, M1.
 - c. Openness Factor: 10 percent.
 - d. Usable Roll Width: 96 in., min.
 - e. Color: Charcoal/Gray.
 - f. Product: Lutron "Classico - BasketWeave 90" (SV22-90-10), or equal.
 - 3. Mounting: Ceiling pocket mount, except as otherwise indicated.
 - 4. Operation: Manual, in locations indicated.
 - 5. Product: Lutron manually-operated single roller shades, or equal.

2.03 ROLLER SHADES

- A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled.
 - 1. Drop: Regular roll.
 - 2. Size: As indicated on drawings.
- B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Sheer Shades: Reduce glare yet still reveal considerable details to the outside; no privacy; Openness Factor greater than 1 percent.
 - 2. Blackout Shades: Block virtually all the light; Openness Factor equal to zero (0).
 - 3. Flammability: Pass NFPA 701 large and small tests.
 - 4. No growth, tested to ASTM G21 for ATCC9642, ATCC9348, and ATCC9645.
- C. Roller Tube: As required for type of operation, extruded aluminum with end caps.

1. Dimensions: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
 2. Fabric Attachment: Utilize double sided adhesive tape with minimum of one turn of fabric on roller before working section of fabric starts.
 3. Finish: Clear anodized.
- D. Hembars and Hembar Pockets: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
1. Style: Thermally sealed fabric pocket covering rectangular aluminum hembar.
- E. Manual Operation: Clutch operated continuous loop; beaded ball chain meeting WCMA A100.1.
1. System must be capable of smoothly raising and lowering the shade to any desired height and maintaining that position without slippage.
 2. The shade shall not be operable by any other means other than the chain. Pulling on the hem bar shall not disengage the clutch.
 3. The system shall provide a maximum fabric gap of 0.75 inch per side.

2.04 ACCESSORIES

- A. Fascias: Size as required to conceal shade mounting.
1. Style: As selected by Architect from shade manufacturer's full selection.
 2. Material and Color: To match shade.
- B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.
- C. Number Plates: Number each opening and shade. Provide aluminum number plates for each shade unit and each opening. Fasten shade plate to the back of roller. Fasten opening plate on unexposed surface of the opening.
- D. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.06 FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window sill, except as otherwise indicated.
 2. Horizontal Dimensions:
 - a. Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 0.75 inches (19.05 mm) total.
 - b. Outside Mounting: Extend blind 2 inches (50 mm) beyond jambs on each side.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

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. Installation Tolerances:
 - 1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch (1.5 mm).
 - 2. Maximum Offset From Level: 1/16 inch (1.5 mm).
- C. Replace blinds that exceed specified dimensional tolerances at no extra cost to Owner.
- D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure shades for smooth 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.
- C. For additional requirements, see Section 017419 - Construction Waste Management.

3.05 CLOSEOUT ACTIVITIES

- A. For closeout submittal requirements, see Section 017800 - Closeout Submittals.
- B. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 126125

RENOVATION OF HISTORIC AUDITORIUM SEATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Clean and Renovate approximately 100 fixed historic auditorium chairs with fully finished curved plywood seats, fully finished curved plywood backs, and aisle and center standards.
- B. Reinstall renovated historic auditorium chairs in locations indicated on the drawings.

1.02 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.

1.03 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings: Fabrication and installation details, chair layouts and dimensions.
 - 1. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.
- C. Samples:
 - 1. Verification Sample: Provide a Sample Chair renovated by the renovation manufacturer, illustrating all finishes and workmanship to be expected in the finished Work.
 - a. Approved sample may be incorporated into the finished Work.
- D. Renovation Manufacturer Qualifications Documentation: Submit evidence showing that the proposed renovation manufacturer meets specified Renovation Manufacturer Qualifications.

1.04 QUALITY ASSURANCE

- A. General:
 - 1. Preparation and Planning:
 - a. Prepare a detailed survey of chairs from contract drawings and detailed site measurements, including individual chair sizes, floor-slope designations of standards, accessory locations, aisle widths, and row curvatures.
 - 2. Renovate chairs according to these specifications.
 - 3. Whenever possible, limit the amount of restoration work to cleaning and wiping of all exposed surfaces, and tightening all components so chairs can be put back into use.
 - 4. When replacement parts are needed but are not available, use similar parts, if available, from renovation manufacturer's stock as necessary to fulfill the contract.

- b. Should the replacement of any broken or damaged parts not be possible due to the unique nature of those parts, new molds may be required for each part.
 - c. The additional cost for these molds would then need to be added to the cost of the project.
 - 4. Re-install renovated chairs in layout indicated on the drawings and according to contract drawings.
 - a. Employ a trained installation sub-contractor capable of demonstrating certification for installation by the renovation manufacturer.
 - 5. Arrange auditorium chairs in locations indicated on the drawings, to comply with applicable requirements of FBC-A.
- B. Renovation Contractor Qualifications: Renovation Contractor shall be a qualified craftsman with not less than five years experience in restoration of historic furniture, and possessing demonstrable capability of the following performance:
 - 1. Metal Stripping, Re-Finishing and Coating Capability (when needed): Submit detailed equipment and machinery log.
 - 2. Metal Fabrication (when needed): Submit detailed press log, welder capability, and machinery list.
 - 3. Woodworking and Finishing (when needed): Submit summary of operations routinely performed.
- C. Installer Qualifications: Same as Renovation Manufacturer; or an experienced installer certified in writing by the Renovation Manufacturer to be qualified for installation of renovated seating.

1.05 DELIVERY, STORAGE, AND REINSTALLATION

- A. Deliver and store materials in re-manufacturer's original packaging. All materials will be stored in a secure, dry location. Do not open packaging until parts are required for installation.
- B. Install renovated seating following completion of space renovation, if any; after wet work in space is complete and dry, finishes, including painting are complete, and work above ceilings is complete.

1.06 WARRANTY

- A. Provide a manufacturer's warranty covering new materials furnished (if any), and workmanship, including installation, for a period of one year from date of final acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cast Iron: ASTM A48/A48M, Class 25A minimum, free of air holes and casting imperfections, all edges ground smooth.
- B. Sheet Steel: ASTM A879/A879M, Commercial Steel (CS) or Drawing Steel (DS) electro-galvanized sheet, 04Z (12G) coating class on both surfaces; chemically treated for baked enamel finish.

- C. Hardwood Plywood: HPVA HP-1; face veneers for exposed surfaces Grade A, specie to match existing, with no visible defects.

2.02 FABRICATION AND FINISHES

- A. Steel: Newly manufactured steel structural components, when so needed, shall be die-formed according to modern manufacturing methods, and assembled by means of state-of-the-art MIG welding processes. All steel shall have smooth surfaces and be of sufficient gauge thickness and designed to withstand strains of normal use and abuse.
- B. Cast Iron: Shall be Grey cast iron conforming to ASTM A48/A48M-03 Class 25 (25,000 PSI) minimum strength, and shall be free of blow holes and hot checks with parting lines ground smooth and shall be free of inordinately rough surfaces. Provide notarized certification that cast iron is 25,000 PSI tensile strength.
- C. Finishes:
 - 1. Metal Parts: All new exposed metal parts when provided, shall be powder coated with an epoxy powder coat finish to match existing chairs.
 - a. The powder coat finish shall be applied by electrostatic means to a thickness of 2-2.5 mils, and shall provide a durable coating having a 2H pencil hardness.
 - b. Prior to powder coating, metal parts shall be treated with a three-stage bonderization process for superior finish adhesion, and after coating shall be oven baked to cause proper flow of the epoxy powder to result in a smooth, durable finish.
 - c. Manufacturer's standard color range shall be used.
 - 2. Wood Parts: All new exposed surfaces, when provided, shall be stained to color selected, then coated with lacquer of sufficient film depth to afford wear resistance of institutional quality, and oven baked, to match existing chair finish.
 - 3. Hardware: All new assembly hardware, when provided, shall be rust resistant, black zinc plated, except floor anchors shall be bright zinc plated.

2.03 RENOVATED FIXED AUDIENCE SEATING

- A. Restoration work shall include, but is not limited to, the following:
 - 1. Clean and lubricate all metal parts and wood armrests.
 - 2. Clean and refurbish all existing plywood back panels and plywood seat panels.
 - 3. Lubricate all moving/mating parts.
 - 4. Install renovated chairs with new anchors.
 - 5. Install chairs utilizing black zinc plated hardware.
 - 6. Patch, replace or repair all damage to adjacent surfaces that occurs as a result of this work.
 - 7. Clean all chairs and adjust their operation at the completion of the installation. All chairs shall be operating properly prior to final acceptance.
- B. Accessories shall be provided as follows for the renovated chairs:
 - 1. Re-identify all seats using new bronze-anodized aluminum number and letter plates.

2.04 FABRICATION

- A. Refinishing Metal Parts (when needed):

1. All metal parts which require stripping of existing finish shall be done by one of the following methods:
 - a. One hundred-fifty degree Fahrenheit caustic soda bath followed by a high pressure spray rinse.
 - b. A 700-800 degree Fahrenheit pyrolysis burn, followed by a water only high pressure wash.

NOTE: Sand or shot blasting is not acceptable.

2. After stripping, metal parts shall be thoroughly cleaned and prepared for the decorative finish by a 3-stage bonderization process and dry off oven.
3. Metal parts shall be electrostatically coated with a decorative powder coat finish. Coating shall be thermosetting, hybrid epoxy / polyester / polyurethane powder coat, electrostatically applied, and baked at 350 deg F as new metal parts.

B. Refinishing Wood Parts (when needed):

1. All renovated wood parts shall have all lacquer, varnish, and foreign materials removed without damaging the wood.
2. Wood parts that have delaminated or are otherwise damaged shall be repaired where possible.
 - a. If not repairable, new parts shall be manufactured to match the renovated existing parts.
3. Parts shall be sanded smooth, removing graffiti, gouges and scratches.
 - a. Sanding dust shall be removed prior to dying.
4. Wood shall be stained with color selected by Architect.
5. After air drying in a dust free environment, two sealer coats shall be applied.
 - a. After each application of sealer has dried, it shall be sanded with a 320 grit or finer sand paper.
6. Two coats of lacquer shall be applied.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of renovated chairs. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with renovation manufacturer's instructions for installation and approved shop drawings.
- B. The renovated chairs shall be re-assembled and attached to floor with new anchors to fit the new layout as indicated on the approved shop drawings.
- B. Anchor support standards securely to substrate with at least two anchoring devices recommended by renovation manufacturer.
 1. Floor mount chairs shall be attached with minimum 1/4 inch expansion anchor bolts with not less than 2 inches embedment in concrete; two bolts per standard.

3.03 ADJUSTING

- A. Adjust seat mechanisms to ensure that seats are aligned when unoccupied.

- B. Repair minor abrasions and imperfections in painted finishes with a coating that matches factory-applied finish; replace units that cannot be repaired to unblemished appearance.

3.04 CLEANING

- A. Remove all debris caused by this work from the premises.

END OF SECTION

SECTION 129313
BICYCLE RACKS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Exterior bicycle racks.

1.02 RELATED SECTIONS

- A. Section 033000 - Cast-In-Place Concrete: Concrete mix / non-shrink cementitious grout, for in-ground anchor installation.
- B. Section 321313 - Portland Cement Concrete Paving: Mounting surface for bicycle racks.
- C. Section 321413 - Precast Concrete Unit Paving: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A312/A312M - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

1.04 SUBMITTALS

- A. General:
 - 1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - 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: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions. Include plans, elevations and installation details.
- D. LEED Submittals:
 - 1. General:
 - a. Collect and submit data as required for completing the applicable LEED Submittal Template(s).
 - 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, submit documentation required to complete the recycled content calculation table in the LEED Submittal Template, including but not limited to: a tabulation of each such material, including a description of the material, the manufacturer of the material, the product cost, the pre-consumer and post-consumer

recycled content percentages (by weight), and the source of the recycled content data.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Landscape Forms, Inc.: 431 Lawndale Avenue, Kalamazoo, MI 49048; Tel. 800-521-2546; Fax. 269-381-3455; www.landscapefloms.com.
- B. Other Manufacturers; Equivalent products by one of the following:
 - 1. AAA Ribbon Rack Co.: www.ribbonrack.com.
 - 2. Columbia Cascade Company: www.timberform.com.
 - 3. Creative Pipe, Inc.: www.creativepipe.com.
 - 4. Highland Products Group, LLC: www.indoorbikeracks.net.
 - 5. Huntco Supply, LLC: www.huntco.com.

2.02 BICYCLE RACKS

- A. Exterior Bicycle Racks:
 - 1. Style: Inverted horseshoe rack formed by one u-shaped bend of round pipe.
 - 2. Mounting, Ground: In-ground anchor.
 - 3. Accessories: In-ground grout cover.
- B. Materials:
 - 1. Pipe: Stainless steel, ASTM A312/A312M, Type 304, Schedule 40S.
 - a. Size: 1-1/2 inch diameter, minimum.
 - b. Recycled Material Content:
 - (1) Post-Consumer: 50 percent, minimum.
 - (2) Pre-Consumer: 15 percent, minimum.
 - 2. Non-Shrink Cementitious Grout: Refer to Section 033000 - Cast-In-Place Concrete.
- C. Fabrication:
 - 1. Pipe: Hydraulically-bent with a mandrel.
- D. Finish:
 - 1. Pipe: Non-directional satin brushed or electro-polish.
- E. Accessories: In-ground grout cover.
- F. Product: Model "Biola" as manufactured by Landscape Forms, or equal by one of the other listed manufacturers.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive bicycle racks.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Do not begin installation until unsatisfactory substrates have been properly repaired.

3.02 PREPARATION

- A. Ensure surfaces to receive bicycle racks are clean, flat, and level.
- B. Where metal surfaces will be in contact with concrete, coat metal with bituminous coating prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place in locations shown on drawings.
- C. Install bicycle racks level, plumb, square, and correctly located as indicated on the drawings.
- D. Anchor securely in place.

3.04 CLEANING AND PROTECTION

- A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 142010
PASSENGER ELEVATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Complete elevator systems, including but not limited to:
 - 1. Pre-engineered holeless hydraulic passenger elevators.
 - 2. Elevator car enclosures, entrances, signal equipment and finishes.
 - 3. Hoistway entrances and signal equipment.
 - 4. Jack(s).
 - 5. Operation and control systems.
 - 6. Accessibility provisions for physically disabled persons.
 - 7. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 - 8. Materials and accessories as required to complete the elevator installation.
- B. Elevator maintenance.

1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls: Temporary power supply.
- B. Section 033000 - Cast-in-Place Concrete: Elevator machine foundation, enclosed hoistway, and pit; installation of inserts, sleeves and anchors in concrete; and waterstops.
- C. Section 042000 - Unit Masonry: Masonry hoistway enclosure; building-in hoistway door frames; and installation of inserts, sleeves and anchors in masonry.
- D. Section 051200 - Structural Steel Framing: Overhead hoist beams.
- E. Section 055000 - Metal Fabrications: Pit ladder; sill supports; and auxiliary steel components for supporting guide rail brackets.
- F. Section 071713 - Bentonite Panel Waterproofing: Waterproofing of elevator pit walls and floor.
- G. Section 093013 - Tiling: Flexible concrete tile floor finish in elevator cars.
- H. Section 104400 - Fire Protection Specialties: Fire extinguisher in elevator machine room.
- I. Division 21 - Fire Suppression: Sprinkler heads in hoistway.
- J. Division 22 - Plumbing: Pit sump and pump.
- K. Division 26 - Electrical:
 - 1. Empty conduit to elevator equipment devices remote from elevator machine room or hoistway.
 - 2. Electrical service to main disconnect in elevator machine room.
 - 3. Emergency power transfer cabinet.

4. Electrical power for elevator installation and testing.
 5. Electrical disconnecting device to elevator equipment prior to activation of sprinkler system.
 6. Electrical service for machine room, machine room convenience outlets, and pit.
 7. Lighting in elevator pit.
 8. Empty conduit for telephone service to machine room.
- L. Division 28 - Electronic Safety and Security:
1. Fire and smoke detectors and interconnecting devices.
 2. Fire alarm signal lines to elevator controller cabinet.
- M. Division 31 - Earthwork: Excavation and backfilling for hydraulic lines between cylinder and remote machine room.

1.03 REFERENCE STANDARDS

- A. For requirements relating to reference standards, see Section 014219 - Reference Standards.
- B. American Institute of Steel Construction, Inc. (AISC):
1. AISC 360 -- Specification for Structural Steel Buildings.
- C. The American Society of Mechanical Engineers (ASME):
1. ASME A17.1 -- Safety Code for Elevators and Escalators.
 2. ASME A17.2 -- Guide for Inspection of Elevators, Escalators, and Moving Walks.
- D. American Welding Society (AWS):
1. AWS D1.1/D1.1M -- Structural Welding Code - Steel.
- E. Florida Building Code, 2010 edition (FBC):
1. FBC-B -- Florida Building Code, Building (including 2012 Supplement).
 2. FBC-A -- Florida Building Code, Accessibility (2012 edition).
- F. Intertek Testing Services NA, Inc. (ITS).
- G. National Electrical Manufacturers Association (NEMA).
- H. National Fire Protection Association (NFPA):
1. NFPA 70 -- National Electrical Code.
 2. NFPA 80 -- Standard for Fire Doors and Other Opening Protectives.
- I. Underwriters Laboratories Inc. (UL):
1. UL (ECMD) -- Electrical Construction Materials Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene a meeting one week prior to starting work.
1. Review schedule of installation, installation procedures and conditions, and coordination with related work.
- B. Construction Use of Elevator: Not permitted.

1.05 SUBMITTALS

- A. General:

1. For submittal procedures, refer to Section 007200 - General Conditions (AIA A201 - 2007SP, including but not limited to Section 3.12) and Section 013000 - Administrative Requirements.
- B. Shop Drawings:
1. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 - a. Show equipment arrangement in the machine room/control space, pit and hoistway.
 - b. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 - c. Show bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - d. Show locations in hoistway and machine room of traveling cables and connections for car light and telephone.
 - e. Show locations and sizes of access doors, doors, and frames.
 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 3. Indicate electrical power requirements and branch circuit protection device recommendations.
 4. Indicate expected heat dissipation of elevator equipment in machine room.
 5. Indicate electrical characteristics and connection requirements, including but not limited to interface with standby power, fire/smoke alarm, and building security systems.
- C. Product Data: Provide data on the following items:
1. Signal and operating fixtures, operating panels, and indicators.
 2. Car design, dimensions, layout, components and finishes.
 3. Car and hoistway door and frame details.
 4. Electrical characteristics and connection requirements.
- D. Samples: Submit two samples, 12 x 12 inch (300 x 300 mm) in size illustrating car floor material, car interior finishes, car and hoistway door and frame finishes, and handrail material and finish.
- E. Maintenance Contract.
- F. Maintenance Data: Include:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 2. Technical information for servicing operating equipment.
 3. Legible schematic of hydraulic piping and wiring diagrams of installed electrical equipment and changes made in the Work. List symbols corresponding to identity or markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with applicable code and ASME A17.1 and as supplemented in this section.

- B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360, Specification for Structural Steel Buildings.
- D. Perform welding of steel in accordance with AWS D1.1.
- E. Fabricate and install door and frame assemblies in accordance with NFPA 80.
- F. Perform electrical work in accordance with NFPA 70.
- G. Elevator Equipment Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum fifteen years satisfactory experience in manufacturing, installing and servicing elevators of the type required for this project.
 - 1. Must be the manufacturer of the power unit, controller, signal fixtures, door operators car, entrances, and all other major parts of the elevator operating equipment.
- H. Elevator Installer (Elevator Contractor) Qualifications: Elevator equipment manufacturer or an authorized agent of the manufacturer with not less than fifteen (15) years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- I. Products Requiring Fire Resistance Rating:
 - 1. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with NFPA 80.
 - a. Provide entrance assembly units bearing Class B or 1-1/2 hour label, listed and classified by an approved, established and nationally recognized testing agency acceptable to the authority having jurisdiction.
- J. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- K. Inspection and Testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - 1. Arrange for inspections and make required tests.
 - 2. Deliver to the Owner upon completion and acceptance of elevator work.

1.07 WARRANTY

- A. Manufacturer's Warranty: Provide one year manufacturer warranty for elevator systems and components, including but not limited to operating equipment and devices.
 - 1. Manufacturer shall agree to repair, restore or replace defective elevator materials and workmanship during warranty period of not less than 12 months from date of Substantial Completion.
- B. For additional warranty requirements, see Section 017800 - Closeout Submittals.

1.08 MAINTENANCE SERVICE

- A. Furnish maintenance and call back service for each elevator.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. ThyssenKrupp Elevator: www.thyssenkruppelevator.com.
- B. Other Manufacturers: Equivalent products by one of the following:
 - 1. Otis Elevator Co: www.otis.com.
 - 2. Schindler Elevator Corp: www.us.schindler.com.
- C. All components to be manufactured by same entity, unless otherwise indicated.

2.02 MATERIALS

- A. General:
 - 1. Sheet Metal - Finished Units: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.
 - 2. Colors, Patterns, and Finishes: As selected by the Architect from manufacturer's complete range of colors, patterns, and finishes.
- B. Plastic Laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050 inch thickness.
- C. Aluminum:
 - 1. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.
 - 2. Aluminum Tube: Minimum wall thickness of 0.127 inch (3.2 mm); ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.
 - 3. Solid Bars and Flats: ASTM B211 (ASTM B211M).
 - 2. Aluminum Sheet: ASTM B209209M, 5005-H32 minimum; alloy and temper recommended by aluminum producer and finisher for use and finish indicated.
- D. Steel:
 - 1. Steel Shapes and Bars: ASTM A36.
 - 2. Steel Sheet: ASTM A1008/A1008M; uncoated, cold rolled commercial steel, exposed or ASTM A879/A 879M electrolytic zinc coating over ASTM A1008/A1008M, steel sheet substrate.
 - 3. Galvanized Steel Sheet: ASTM A653/A653M; G90 (Z275) coating.
- E. Stainless Steel:
 - 1. Stainless Steel Sheet: ASTM A666, Type 304; stretcher-leveled.
- F. Anchors, Clips and Accessories:
 - 1. Interior Locations: Carbon steel, zinc-coated in accordance with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5.
 - 2. Exterior Locations, or in Contact with Stainless Steel:
 - a. Bolts: Stainless steel; ASTM F593, Group 1 (A1).

- b. Nuts: Stainless steel; ASTM F594.
- 3. Structural Anchors: Provide anchors where work is indicated to comply with design loads.
 - a. Type: Provide chemical or torque-controlled expansion anchors.
 - b. Capacity: When tested according to ASTM E488; six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete.
- 4. Nonstructural Anchors: Provide metal expansion sleeve anchors where work is not indicated to comply with design loads. Provide size and number required for load, installation and as recommended by manufacturer, unless indicated otherwise.
- G. Fasteners - General: Same basic metal and alloy as formed metal sheet unless indicated otherwise. Do not use metals incompatible with the materials joined.

2.03 ELEVATORS - GENERAL

- A. Description: Passenger, holeless hydraulic type with cylinder in hoistway.
 - 1. Rated Net Capacity: 2,100 lbs.
 - 2. Rated Speed: 110 ft/min.
 - 3. Operation and Controls: Two-stop automatic.
 - a. Products:
 - (1) Operation System: ThyssenKrupp "TAC32", or equal.
 - (2) Fixture and Button Style: ThyssenKrupp "Sigma-4", or equal.
 - 4. Travel Distance: As indicated on drawings.
 - 5. Number of Stops: 2.
 - 6. Number of Openings:
 - a. Front: 2.
 - b. Rear: 0.
 - 7. Hoistway and Car Entrance Frame Opening Size: 36 in. W x 84 in. H.
 - 8. Hoistway Doors and Frames: Stainless steel.
 - 9. Hoistway Dimensions: As indicated on drawings.
 - 10. Door Type: Single speed.
 - 11. Car Door Location: Side (off-center).
 - 12. Car Dimensions:
 - a. Clear Inside Width: 68 in., min.
 - b. Clear Inside Depth (back wall to front return / back wall to inside face of door): 51 in., min. / 54 in., min.
 - c. Car Height: 108 inches (extended cab height).
 - 13. Protection Pads: Provide protection pads and buttons at each car.
 - 14. Hydraulic Motor and Pump Location: As indicated on drawings.
 - 15. Electrical Characteristics: 208 volts, 3-phase, 60 Hz; 20 HP.
 - 16. Seismic Requirements: Zone 1.
 - 17. Product: ThyssenKrupp "Endura" Twinpost Above-Ground 2-stage, or equal.

2.04 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor.

1. Underside of the platform shall be fireproofed.
 2. Car platform shall be designed and fabricated to support one-piece loads weighing up to 25 percent of the rated capacity.
- B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit.
1. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor.
 2. Provide extensions if required by project conditions.
- F. Jack:
1. Jack Assembly Type: Twin post holeless telescopic 2-stage.
 - a. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly.
 - b. Each jack section shall be guided from within the casing or the plunger assembly used to house the section.
 - c. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation.
 - d. Each jack assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position.
 - f. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor.
 - g. Each jack section shall have a bleeder valve to discharge any air trapped in the section.
 2. Jack unit shall be of sufficient size to lift the gross load the height specified.
 3. Use of brittle materials (e.g., gray cast iron) in the jack construction are prohibited.
 4. Jack assembly shall be factory tested to insure adequate strength and freedom from leakage.
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for over-travel or under-travel.
1. Self-leveling shall, within its zone, be automatic and independent of the operating device.
 2. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with NFPA 70.
1. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit.
 2. Provide proper grade readily biodegradable oil as specified by the manufacturer of the power unit.

2.05 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
 - 1. Oil reservoir with tank cover.
 - 2. An oil hydraulic pump.
 - 3. An electric motor.
 - 4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service.
 - 1. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation.
 - 2. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service.
 - 1. Duty rating shall be selected for specified speed and load.
- D. Control System: Shall be microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.
- E. Oil Control Unit:
 - 1. The following components shall be built into a single housing.
 - a. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 - b. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 - c. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 - d. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
 - 2. Welded manifolds with separate valves to accomplish each function are not acceptable.
 - 3. Adjustments shall be accessible and be made without removing the assembly from the oil line.
- F. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
- G. Oil Type: Ultra-low toxicity, readily biodegradable, energy-efficient, high-performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-

passivating additives; specially formulated for operating in environmentally sensitive areas.

1. Shall be USDA certified bio-based product, per ASTM D6866 (minimum 90 percent bio-based content).

2.06 HOISTWAY ENTRANCES

- A. Doors and Frames: Equip each hoistway entrance opening with a complete hollow metal type hoistway entrance.
 1. Material / Finish: Stainless steel panels, with non-directional #4 satin finish.
 2. Frame shall be fully-welded type; weld joints shall be ground and polished to match finish of adjacent surface areas; bolted, knock-down construction is not permitted.
 3. Include hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
- B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by governing building code and ASME A17.1.
 1. Provide door restriction devices as required by governing building code and ASME A17.1.
- C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- D. Hoistway Sills: Extruded aluminum, with groove(s) in top surface; mill finish.

2.07 CAR ENCLOSURE

- A. Car Enclosure:
 1. Walls: Reinforced, cold-rolled steel, with applied vertical wood core panels.
 - a. Finishes:
 - (1) Wall Panel Finish: 5WL patterned stainless steel.
 - (2) Base, Reveals and Frieze Finish: Powder coat paint; color to be selected by Architect.
 2. Canopy: Cold-rolled steel with hinged exit panel.
 3. Ceiling: Downlight type, metal pans with suspended LED downlights.
 - a. Finish: Powder coat paint; color to match Base, Reveals and Frieze Finish.
 4. Car Fronts, Return, Transom, Soffit and Strike: Stainless steel panels, with #4 brushed finish.
 - a. Front Return Design: Full-width wrap around.
 - b. Signal Fixtures: Vandal-resistant type.
 5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Materials:
 - (1) Doors: Stainless steel panels, with #4 brushed finish.

- (2) Sills: Extruded aluminum; mill finish.
 - 6. Floor Finish: Flexible concrete tile; for additional information, refer to Section 093013 - Tiling.
 - 7. Handrail: 2 inch flat metal bar on side and rear walls on front opening cars.
 - a. Material: Stainless steel, with #4 brushed finish.
 - 8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
 - 9. Product: ThyssenKrupp Model TKAP, or equal.
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "Emergency Stop" switch, and constant pressure "Up" and "Down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.08 DOOR OPERATION

- A. Door Operation:
- 1. Provide a direct current (DC) motor-driven heavy-duty operator designed to operate the car and hoistway doors simultaneously.
 - a. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure.
 - b. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing.
 - c. Closed-loop, microprocessor-controlled motor-driven linear door operator, with adjustable torque limits, are acceptable.
 - d. AC-controlled units with oil checks or other deviations are not acceptable.
 - 2. No Unnecessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position, or selected as a dispatch car.
 - 3. Door Open Time Saver: If a car is stopping in response to a car call assignment only (i.e., no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 - 4. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
 - 5. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening.
 - a. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed.
 - b. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.

6. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
 7. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
 8. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
 9. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Devices: Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.09 CAR OPERATING STATION

- A. General:
1. The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate.
 - a. Swing return shall be stainless steel panel, with #4 brushed finish.
 2. The main car operating panel shall be mounted in the return and comply with handicap requirements.
 3. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per governing code.
 4. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system shall be provided.
- C. Auxiliary Operating Panel: N/A.
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator car and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
- E. Special Equipment: N/A.

2.10 CONTROL SYSTEMS

- A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "Up" and "Down" push buttons at each intermediate landings and "Call" push buttons at terminal landings.
1. Interconnect elevator control system with building fire alarm and smoke alarm systems.

- B. Automatic Light and Fan Shut Down: The control system shall evaluate the system activity and automatically turn off the car lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- C. Special Operation: N/A.
- D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power shall be available on the same wires as the normal power supply.
 - 1. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened.
 - 2. After passengers have exited the elevator, the doors are closed and the car is shut down.
 - 3. When normal power is restored, the elevator automatically shall resume normal operation.

2.11 HALL STATIONS

- A. Hall Stations, General: Provide buttons with red-illuminating LED halos to indicate that a call has been registered at that floor for the indicated direction.
 - 1. Provide one set of pushbutton risers.
 - 2. Provide one pushbutton riser with stainless steel faceplates having #4 brushed finish.
 - 3. Phase I "Firefighter's Operation" key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor.
 - 1. Jamb pads shall comply with applicable requirements of FBC-A and Americans with Disabilities Act (ADA).
- C. Hall Position Indicator: N/A.
- D. Hall Lanterns: N/A.
- E. Special Equipment: N/A.

2.12 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that hoistway, hoistway openings, pits, and machine rooms 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 the correct characteristics.

3.02 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components.
- B. Excavate for hydraulic lines between plunger(s) and remote machine room in accordance with Division 31 - Earthwork.
- C. Elevator hoist beam shall be provided at top of elevator hoistway.
- D. Hoistway shall be clear and plumb with variations not to exceed 1/2 inch at any point.
- E. Provide rail bracket supports at pit, each floor and roof.
- F. Pit floor shall be level and free of debris.
- G. Provide formed openings through machine room floor and elevator pit wall, for oil line and wiring duct (between machine room and hoistway); coordinate with elevator contractor at the building site. Formed opening dimensions and location shall conform to elevator manufacturer's requirements, and shall include provisions for continuous waterstop at perimeter, grouting and waterproofing.
- H. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
- I. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
- J. All walls and sill supports must be plumb where openings occur.
- K. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

3.03 INSTALLATION

- A. Install system components. Connect equipment to building utilities.
- B. Provide conduit, boxes, wiring, and accessories.
- C. Install hydraulic piping between cylinder and pump unit.
- D. Mount machines, motors, and pumps on vibration and acoustic isolators, on bed plate and concrete pad. Place on structural supports and bearing plates. Securely fasten to building supports. Prevent lateral displacement.
- E. Accommodate equipment in space indicated.
- F. Install guide rails using threaded bolts with metal shims and lock washers under nuts. Compensate for expansion and contraction movement of guide rails.
- G. Accurately machine and align guide rails. Form smooth joints with machined splice plates.

- H. Bolt brackets to inserts placed in concrete form work that will perform to four times the rated pull-out load.
- I. Coordinate installation of hoistway wall construction.
- J. Install hoistway door sills, frames, and headers in hoistway walls. Grout sills in place. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.
- K. Fill hoistway door frames solid with grout in accordance with Section 042000.
- L. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- M. Machine Room Components: Clean and degrease; prime one coat, finish with two coats of enamel.
- N. Adjust equipment for smooth and quiet operation.

3.04 ERECTION TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1.
- B. Car Movement on Aligned Guide Rails: Smooth movement, with no objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

- A. 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 required to perform tests.
 - 3. Document regulatory agency tests and inspections in accordance with the requirements of Section 014000.
 - 4. Perform tests required by regulatory agencies.
 - 5. Furnish test and approval certificates issued by authorities having jurisdiction.
- B. Perform testing and inspection in accordance with requirements of Section 014000.
 - 1. Perform tests as required by ASME A17.2.
 - 2. Provide two weeks written notice of date and time of tests.
 - 3. Supply instruments and execute specific tests.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- B. Adjust automatic floor leveling feature at each floor to achieve 1/4 inch (6 mm) from flush.

3.07 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components ready for inspection.

3.08 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until project completion.
- C. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

3.09 MAINTENANCE SERVICE

- A. For additional requirements relating to maintenance service, see Section 007200 - General Conditions, Section 007300 - Supplementary Conditions, and Section 017000 - Execution Requirements,.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Perform maintenance work using competent and qualified service personnel under the supervision and in the direct employ of the elevator manufacturer.
- D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Owner.
- E. Provide service and maintenance of elevator system and components for one year from Date of Substantial Completion.
- F. Examine system components monthly. Clean, adjust, and lubricate equipment.
- G. Include systematic examination, adjustment, and lubrication of elevator equipment. Maintain hydraulic fluid levels. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment.
- H. Perform work without removing cars during peak traffic periods.
- I. Provide emergency call back service during working hours for this maintenance period.
- J. Service office shall maintain an adequate stock of parts for replacement or emergency purposes locally, near the place of the Work (within a 100-mile radius).

END OF SECTION

SECTION 210517

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.
- E. Max. VOC content = 65g/L.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079005 "Joint Sealers."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.
 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION 210517

SECTION 210518

ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish with setscrew, spring or other device to hold them securely in place.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
- b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
- c. Insulated Piping: One-piece, stamped-steel type.
- d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

- 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 210523

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Iron butterfly valves with indicators.
2. Check valves.
3. Iron OS&Y gate valves.
4. NRS gate valves.
5. Indicator posts.
6. Trim and drain valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - 1) Level 3: HLUG - Ball Valves, System Control.
 - 2) Level 3: HLXS - Butterfly Valves.
 - 3) Level 3: HMER - Check Valves.
 - 4) Level 3: HMRZ - Gate Valves.
2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim and Drain.

- B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
 - 1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves.
 - 1) Gate valves.
 - 2) Check valves.
 - a) Single check valves.
 - 3) Miscellaneous valves.
- C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.
- D. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B1.20.1 for threads for threaded-end valves.
 - 3. ASME B31.9 for building services piping valves.
- E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- F. NFPA Compliance: Comply with NFPA 24 for valves.
- G. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.
- H. Valve Sizes: Same as upstream piping unless otherwise indicated.
- I. Valve Actuator Types:
 - 1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
 - 2. Handwheel: For other than quarter-turn trim and drain valves.
 - 3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

2.2 IRON BUTTERFLY VALVES WITH INDICATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Milwaukee Valve Company.

- d. NIBCO INC.
- e. Tyco Fire & Building Products LP.
- f. Victaulic Company.

B. Description:

- 1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
- 2. Minimum Pressure Rating: 175 psig.
- 3. Body Material: Cast or ductile iron.
- 4. Supervisory Switch: Internal or external.
- 5. Body Design: Lug or wafer Grooved-end connections.

2.3 CHECK VALVES

A. Description:

- 1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
- 2. Minimum Pressure Rating: 300 psiga.
- 3. Type: Single swing check.
- 4. Body Material: Cast iron.
- 5. End Connections: Flanged, grooved, or threaded.

2.4 IRON OS&Y GATE VALVES

A. Description:

- 1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
- 2. Minimum Pressure Rating: 175 psig.
- 3. Body and Bonnet Material: Cast or ductile iron.
- 4. Supervisory Switch: External.
- 5. End Connections: Flanged Grooved Threaded.

2.5 NRS GATE VALVES

A. Description:

- 1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
- 2. Minimum Pressure Rating: 175 psig.
- 3. Body and Bonnet Material: Cast or ductile iron.
- 4. Supervisory Switch: External.
- 5. End Connections: Flanged Grooved Threaded.

2.6 INDICATOR POSTS

A. Description:

1. Standard: UL 789 and FM Global standard for indicator posts.
2. Type: Underground.
3. Base Barrel Material: Cast or ductile iron.
4. Extension Barrel: Cast or ductile iron.
5. Cap: Cast or ductile iron.
6. Operation: Wrench.

2.7 TRIM AND DRAIN VALVES

A. Angle Valves:

1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Material: Brass or bronze.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

- A. Comply with requirements in the following Sections for specific valve installation requirements and applications:
 1. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the pipe center.

- F. Install valves in position to allow full stem movement.
- G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.
- H. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.
- I. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

END OF SECTION 210523

SECTION 210548.13

VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

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. Elastomeric isolation pads.
 - 2. Elastomeric isolation mounts.
 - 3. Restrained elastomeric isolation mounts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each vibration isolation device.
 - 1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads:
 - 1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 - 2. Size: Factory or field cut to match requirements of supported equipment.
 - 3. Pad Material: Oil and water resistant with elastomeric properties.
 - 4. Surface Pattern: Ribbed pattern.
 - 5. Infused nonwoven cotton or synthetic fibers.
 - 6. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 210548.13

SECTION 210553

IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

1.3 LEED Submittals:

- A. General:
 - 1. Collect and submit data as required for completing the applicable LEED Submittal template(s).
- B. Product Data for Credit EQ 4.1: Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standards, for proposed contact adhesive, and any other sealant or adhesive specified under this section.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: stainless steel, 0.025 inch thick, with predrilled holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate. Max. VOC of 80g/L.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
2. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate without exceeding VOC 80g/L.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 LABEL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install or permanently fasten labels on each major item of mechanical equipment.
- D. Locate equipment labels where accessible and visible.
- E. Piping: Painting of piping is specified in Section 099000 "Painting and Coating."
- F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit a view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 210553

SECTION 211119

FIRE-DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-type fire-department connections.
2. Flush-type fire-department connections.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

A. Standard: UL 405.

B. Type: Exposed, projecting, for wall mounting.

C. Pressure Rating: 175 psig minimum.

D. Body Material: Corrosion-resistant metal.

E. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.

F. Caps: Brass, lugged type, with gasket and chain.

G. Escutcheon Plate: Round, brass, wall type.

H. Outlet: Back, with pipe threads.

I. Number of Inlets: Two.

- J. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
- K. Finish: Rough brass or bronze.
- L. Outlet Size: NPS 6.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

SECTION 211313

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Cover system for sprinkler piping.
3. Specialty valves.
4. Sprinklers.
5. Manual control stations.
6. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For solvent cements, adhesive primers, pipe thread cleaners and sealants applied with the building envelope.
2. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed solvent cements, adhesive primers, pipe thread cleaners and sealants, and any other sealant or adhesive specified under this section.

C. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

- D. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.
- B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13.

- B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
 - 1. Sprinkler system design shall be approved by authorities having jurisdiction.
 - a. Margin of Safety for Available Water Flow and Pressure: 10 PSI including losses through water-service piping, valves, and backflow preventers.
 - b. Sprinkler Occupancy Hazard Classifications: refer to drawings.
 - c. Minimum Density for Automatic-Sprinklers Piping Design: refer to drawings.
 - 2. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
 - b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - 3. Maximum Protection Area per Sprinkler: According to UL listing.
 - 4. Maximum Protection Area per Sprinkler:
 - a. Residential Areas: 400 sq. ft..
 - b. Office Spaces: 120 sq. ft..
 - c. Storage Areas: 130 sq. ft..
 - d. Mechanical Equipment Rooms: 130 sq. ft..
 - e. Electrical Equipment Rooms: 130 sq. ft..
 - f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized when exposed to outdoors or in non air conditioned spaces- and Black-Steel Schedule 40 Pipe : ASTM A 53/A 53M, Pipe ends may be factory or field formed to match joining method. Use threaded for 2" and smaller and groove with mechanical joints for 2-1/2" and larger pipes
- B. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 - 1. Pipe-Flange Gasket Materials:
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
- C. Grooved-Joint, Steel-Pipe Appurtenances:

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. Tyco Fire & Building Products LP.
 - b. Victaulic Company.
 - c. Anvil Star Piping Inc.
 2. Pressure Rating: 175 psig unless otherwise noted.
 3. Galvanized and Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
- D. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

2.3 COVER SYSTEM FOR SPRINKLER PIPING

- A. Description: System of support brackets and covers made to protect sprinkler piping.
- B. Brackets: Glass-reinforced nylon.
- C. Covers: Extruded-PVC sections of length, shape, and size required for size and routing of CPVC piping.

2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Specialty Valves Pressure Rating: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Alarm Valves:
 1. Standard: UL 193.
 2. Design: For horizontal or vertical installation.

3. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
4. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
5. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

G. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175-psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-tee and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

2. Pressure Rating: 175-psig minimum.
 3. Body Material: Cast- or ductile-iron housing with sight glass.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded.
- E. Adjustable Drop Nipples:
1. Standard: UL 1474.
 2. Pressure Rating: 250-psig minimum.
 3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
 4. Size: Same as connected piping.
 5. Length: Adjustable.
 6. Inlet and Outlet: Threaded.
- F. Flexible Sprinkler Hose Fittings:
1. Standard: UL 1474.
 2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 3. Pressure Rating: 175-psig minimum.
 4. Size: Same as connected piping, for sprinkler.

2.6 SPRINKLERS

- 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. Reliable Automatic Sprinkler Co., Inc.
 2. Tyco Fire & Building Products LP.
 3. Victaulic Company.
 4. Viking Corporation.
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- E. Automatic Sprinklers with Heat-Responsive Element:
1. Early-Suppression, Fast-Response Applications: UL 1767.
 2. Nonresidential Applications: UL 199.
 3. Residential Applications: UL 1626.
 4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

- F. Sprinkler Finishes: Chrome plated.
- G. Special Coatings: Teflon or epoxy.
- H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel.
 - 2. Sidewall Mounting: Chrome-plated steel.
- I. Sprinkler Guards:
 - 1. Standard: UL 199.
 - 2. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.8 PRESSURE GAGES

- A. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- B. Pressure Gage Range: 0- to 250-psig minimum.
- C. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building.
- B. Retain one of two paragraphs below. Backflow preventers are recommended and are usually required by authorities having jurisdiction.
- C. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.
- D. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 21054813 "Vibration Controls for Fire-Suppression Piping and Equipment."
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and

with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

- N. Fill sprinkler system piping with water.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and NFPA 13 or NFPA 13R for supports.

3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
 - 3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

- B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Coordinate with fire-pump tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends, cast-iron threaded fittings, and threaded joints.

- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints when exposed to weather.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:
 - 1. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 2. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints when exposed to weather.

3.11 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Special Applications: Extended-coverage, flow-control, high temperature heads over all places of unusual high temperatures. Use Corrosion resistant heads in areas where corrosive conditions occur or salt air environment.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Concealed Sprinklers: Rough brass, with factory-painted cover plate. (Color to be selected by Architect)
 - 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
 - 3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
 - 4. Residential Sprinklers: Dull chrome.
 - 5. Upright Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 212200

CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

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. Piping and piping specialties.
2. Extinguishing-agent containers.
3. Extinguishing agent.
4. Detection and alarm devices.
5. Control and alarm panels.
6. Accessories.
7. Connection devices for and wiring between system components.
8. Connection devices for power and integration into building's fire-alarm system.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. EPO: Emergency Power Off.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 1. Product Data for Credit EA 4: Documentation indicating that clean agents comply.
- C. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer.
 1. Include plans, elevations, sections, details, and attachments to other work.

2. Include design calculations.
 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 4. Wiring Diagrams: For power, signal, and control wiring.
- D. Delegated-Design Submittal: For clean-agent fire-extinguishing system signed and sealed by the qualified professional engineer.
1. Indicate compliance with performance requirements and design criteria, including analysis data.
 2. Include design calculations for weight, volume, and concentration of extinguishing agent required for each hazard area.
 3. Indicate the Following on Reflected Ceiling Plans:
 - a. Ceiling penetrations and ceiling-mounted items.
 - b. Extinguishing-agent containers if mounted above floor, piping and discharge nozzles, detectors, and accessories.
 - c. Method of attaching hangers to building structure.
 - d. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 4. Indicate the Following on Occupied Work Area Plans:
 - a. Controls and alarms.
 - b. Extinguishing-agent containers, piping and discharge nozzles if mounted in space, detectors, and accessories.
 - c. Equipment and furnishings.
 5. Indicate the Following on Access Floor Space Plans:
 - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
 - b. Method of supporting piping.
 6. Indicate the Following on Ceiling Plans:
 - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
 - b. Method of supporting piping.
 - c. Other equipment located in the ceiling space that is being protected including sprinkler piping, HVAC equipment, raceways, or conduit.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Domestic water piping.
 - 2. Items Penetrating Finished Ceiling Include the Following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets..
- B. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For special agent system to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
 - 1. Detection Devices: Not less than 20 percent of amount of each type installed.
 - 2. Container Valves: Not less than 10 percent of amount of each size and type installed.
 - 3. Nozzles: Not less than 20 percent of amount of each type installed.
 - 4. Extinguishing Agent: Not less than 100 percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.8 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

PART 2 - PRODUCTS

2.1 CLEAN-AGENT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings. Convey basic system design intent here. The "Description" Paragraph below contains sample descriptions of basic systems. Revise to define the zoning of the system if not indicated on Drawings.
- B. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area
- C. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
- D. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.
- E. System Operating Sequence:
 - 1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to fire-alarm system.
 - 2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds, and discharge extinguishing agent.
 - 3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.
- F. System Operating Sequence: System shall be cross-zoned, air-sampling detectors and photoelectric detectors reporting to a fully programmable microprocessor-based control panel programmed to operate as follows:
 - 1. If one photoelectric detector and air-sampling detector reaches the third detection level (Fire 1), agent discharge will be initiated as described for the third detection level (Fire 1) below.
 - 2. Air-Sampling System:
 - a. First Detection Level (Alert): Mild audible and visual indication on annunciator panel. Strobe lights flash slowly in the protected area.
 - b. Second Detection Level (Action): Strong audible and visual indication on annunciator panel. Strobe lights flash rapidly in the protected area.

- c. Third Detection Level (Fire 1): Strong audible and visual indication on annunciator panel. Energize horn(s), bell(s), and strobe light(s) in the protected area and outside entry doors. Shut down air-conditioning and ventilating systems serving the protected area, and close doors in the protected area. Send signal to fire-alarm system, initiate 30-second time delay for extinguishing-agent discharge, and discharge extinguishing agent. At agent discharge, terminate power to equipment in the protected area.
 - d. Fourth Detection Level (Fire 2): Same as Fire 1.
- G. Manual stations shall immediately discharge extinguishing agent when activated.
 - H. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.
 - I. EPO: Will terminate power to protected equipment immediately on actuation.
 - J. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.
 - K. Power Transfer Switch: Transfer from normal to stand-by power source.

2.2 PIPING MATERIALS

- A. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

2.3 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106/A 106M, Grade A and Grade B; Schedule 40, Schedule 80, and Schedule 160, seamless steel pipe.
 - 1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 - c. Fittings Working Pressure: 620 psig minimum.
 - d. Flanged Joints: Class 300 minimum.
 - 2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
 - 3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A 47/A 47M malleable iron or ASTM A 536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

- A. General Valve Requirements:
 1. UL listed or FM Approved for use in fire-protection systems.
 2. Compatible with type of clean agent used.
- B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.
- C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.
- D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

- A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.
 1. Finish: Manufacturer's standard color, enamel or epoxy paint.
 2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
 3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
 4. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

- A. Novec 1230 Clean Agent: Dodecafluoro-2-methylpentan-3-one.

1. Manufacturers: Subject to compliance with requirements:

a. 3M.

2.7 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

2.8 MANIFOLD AND ORIFICE UNIONS

A. Description: NRTL-listed device with minimum 2175-psig pressure rating, to control flow and reduce pressure of IG-541 gas in piping.

1. NPS 2 and Smaller: Piping assembly with orifice, sized for system design requirements.
2. NPS 2-1/2 and Larger: Piping assembly with nipple, sized for system design requirements.

2.9 CONTROL PANELS

A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

1. Mounting: Recessed flush with surface.

D. Supervised Circuits: Separate circuits for each independent hazard area.

1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
2. Manual pull-station circuit.
3. Alarm circuit.
4. Release circuit.
5. Abort circuit.
6. EPO circuit.

E. Control-Panel Features:

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.

2. Automatic switchover to standby power at loss of primary power.
 3. Storage container, low-pressure indicator.
 4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.
- F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.
- G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.10 DETECTION DEVICES

- A. General Requirements for Detection Devices:
1. Comply with NFPA 2001, NFPA 72, and UL 268.
 2. 24-V dc, nominal.
- B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.
- C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.
- D. Remote Air-Sampling Detector System: Includes air-sampling pipe network, a laser-based photoelectric detector, a sample transport fan, and a control unit.
1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
 2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
 3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of 0.05-inch wg at all sampling ports.
 4. Control Unit: Multizone unit as indicated on Drawings. Provides same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.
- E. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones.

2.11 MANUAL STATIONS

- A. General Description: Semirecessed FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: "ABORT" caption, momentary contact, with green finish.
- D. EPO Switch: "EPO" caption, with yellow finish.

2.12 SWITCHES

- A. Description: FM Approved or NRTL listed, where available, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
 - 1. Low-Agent Pressure Switches: Pneumatic operation.
 - 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
 - 3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.13 ALARM DEVICES

- A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Division 28 Section "Digital, Addressable Fire-Alarm System" or Division 28 Section "Zoned (DC Loop) Fire-Alarm System" for alarm and monitoring devices.
- B. Bells: Minimum 6-inch diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

2.14 ELECTRICAL POWER AND WIRING

- A. Electrical power, wiring, and devices are specified in Division 26.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 NOVEC 1230 agent PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.
- C. NPS 2-1/2 and Larger: Schedule 40, steel pipe; forged-steel welding fittings; and welded joints steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

3.3 CLEAN-AGENT PIPING INSTALLATION

- A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.
- B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.
- C. Install extinguishing-agent containers anchored to substrate.
- D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."
 - 1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
 - 2. Support piping using supports and methods according to NFPA 13.
 - 3. Install seismic restraints for extinguishing-agent containers and piping systems.
 - 4. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.
- C. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Division 28 Section "Digital, Addressable Fire-Alarm System" or Division 28 Section "Zoned (DC Loop) Fire-Alarm System."

3.5 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.
- C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.
- D. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.

3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Units will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.7 CLEANING

- A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.8 SYSTEM FILLING

A. Preparation:

1. Verify that piping system installation is completed and cleaned.
2. Check for complete enclosure integrity.
3. Check operation of ventilation and exhaust systems.

B. Filling Procedures:

1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled extinguishing-agent containers.
3. Energize circuits.
4. Adjust operating controls.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 212200

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

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. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Plumbing demolition.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Painting and finishing.
 - 10. Concrete bases.
 - 11. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PE: Polyethylene plastic.
 - 3. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For the following:

- 1. Transition fittings.
- 2. Dielectric fittings.
- 3. Escutcheons.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Panels."

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
 - 1. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
- B. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe: ASTM D 1785, Schedule 40.
- E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With hinge, set screw or spring clips, and chrome-plated finish.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

- A. Refer to Division 02 Section "Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- F. Install piping to permit valve servicing. Valves located above ceilings shall be positioned no further than arms length away from accessible ceiling opening.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - 2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.

- a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
- 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
- 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
- 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealers" for materials and installation.
- O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Firestopping" for materials.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Section "Painting and Coating"
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. As specified in Division 03 Section.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.10 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 220500

SECTION 220516

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rubber union connector packless expansion joints.
2. Alignment guides and anchors.
3. Pipe loops and swing connections.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

- A. Rubber Union Connector Expansion Joints:
 - 1. Material: Twin reinforced-rubber spheres with external restraining cables.
 - 2. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
 - 3. End Connections for NPS 2 and Smaller: Threaded.

2.3 ALIGNMENT GUIDES AND ANCHORS

- A. Alignment Guides:
 - 1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.
- B. Anchor Materials:
 - 1. Steel Shapes and Plates: ASTM A 36/A 36M.
 - 2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
 - 3. Washers: ASTM F 844, steel, plain, flat washers.
 - 4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
 - 5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

- A. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.
- B. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
- C. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe, and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
 - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.

2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.2 ACTION SUBMITTALS

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

1.3 LEED Submittals:

- A. Product data for Credit EQ4.1, for premixed and factory package grouts applied within the building envelope.
- B. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, or proposed product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.
- E. Max. VOC content = 65g/L.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.

- a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079005 "Joint Sealers."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078400 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION 220517

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish with setscrew, spring or other device to hold them securely in place.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
- b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
- c. Insulated Piping: One-piece, stamped-steel type.
- d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

- 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- ###### A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

- ###### A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- ###### A. Manufacturers: Ashcroft Inc, Terrice, H.O. Co., Weksler
- ###### B. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.
- ###### C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.
- ###### D. Connector Type(s): Union joint, adjustable angle rigid, back and rigid, bottom, with unified-inch screw threads.

- E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- F. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- G. Window: Plain glass.
- H. Ring: Stainless steel.
- I. Element: Bimetal coil.
- J. Pointer: Dark-colored metal.
- K. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Weiss Instruments, Terrice, H.O. Co., Weksler
2. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Weiss Instruments, Weksler, Watts.
2. Case: Plastic; 9-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.

9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Ashcroft, Inc, Weiss Instruments, Trerice, H.O.Co,
2. Case: Liquid-filled Sealed type(s); brass; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Brass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Ashcroft, Weiss Instruments, Watts.
2. Case: Liquid-filled Sealed type; brass; 4-1/2-inch nominal diameter with front flange and holes for panel mounting.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Brass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.

- J. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- K. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.3 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
 - 1. Liquid-filled Sealed, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 - 1. Liquid-filled Sealed, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 - 1. Liquid-filled Sealed, direct-mounted, metal case.

3.4 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 300 psi or as required for pressure.
- B. Scale Range for Domestic Water Piping: 0 to 300 psi or as required for pressure.

END OF SECTION 220519

SECTION 220523.12

BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

A. One-Piece, Bronze Ball Valves:

1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig.
 - c. Body Design: One piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE.
 - g. Stem: Bronze.
 - h. Ball: Chrome-plated brass.
 - i. Port: Reduced.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. One piece, brass ball valve.
3. One piece, bronze ball valve with bronze trim.
4. Two-piece, brass ball valves with regular port and brass trim.
5. Two-piece, bronze ball valves with regular port and bronze or brass trim.

END OF SECTION 220523.12

SECTION 220523.14

CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze swing check valves.
2. Iron swing check valves.
3. Iron swing check valves with closure control.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. End Connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125, bronze disc with soldered end connections.
- B. Pipe NPS 2-1/2 and Larger:
 - 1. Iron swing check valves, Class 125, metal seats with flanged end connections.
 - 2. Iron swing check valves with closure control, Class 125, lever and spring or weight with flanged end connections.

END OF SECTION 220523.14

SECTION 220523.15

GATE VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze gate valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. RS Valves in Insulated Piping: With 2-inch stem extensions.
- H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

- A. Class 125, NRS, Bronze Gate Valves:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: Bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.

- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller: Bronze gate valves, Class 125, NRS with soldered ends.
- B. Pipe NPS 2-1/2 and Larger: Iron gate valves, Class 125, NRS with flanged ends.

END OF SECTION 220523.15

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.4 LEED Submittals:

A. Product data for Credit EQ4.1m, for premixed and factory packaged grouts applied within the building envelope.

- B. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed product.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

- B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 galvanized-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. System must be approved by structural engineer and owner.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Max. VOC content = 65g/L.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
1. Attach clamps and spacers to piping.

- a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099000 "Painting and Coating."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548.13

VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Elastomeric isolation pads.
 2. Open-spring isolators.
 3. Restrained-spring isolators.
 4. Pipe-riser resilient supports.
 5. Spring hangers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each vibration isolation device.
1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads: .
1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 2. Size: Factory or field cut to match requirements of supported equipment.
 3. Pad Material: Oil and water resistant with elastomeric properties.
 4. Surface Pattern: Ribbed pattern.
 5. Infused nonwoven cotton or synthetic fibers.
 6. Load-bearing metal plates adhered to pads.

2.2 OPEN-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators: .
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.3 PIPE-RISER RESILIENT SUPPORT

- A. Provide 1" neoprene pad under floor pipe clam. Provide 1/4" metal plate under and on top of neoprene pad.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 220548.13

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

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

1.3 LEED Submittals:

A. General:

1. Collect and submit data as required for completing the applicable LEED Submittal Template(s).

- ###### B. Product Data for Credit EQ4.1: Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed contact adhesive, and any other sealant or adhesive specified under this section.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 4. Fasteners: Stainless-steel rivets or self-tapping screws.
 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate; max. VOC of 80g/L
 6. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 7. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 8. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 9. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 10. Fasteners: Stainless-steel rivets or self-tapping screws.
 11. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger

lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

PART 3 - EXECUTION

3.1 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.2 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099000 "Painting and Coatings" and Section 099610 "High-Performance Coatings for Steel."

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
2. Sanitary Waste and Storm Drainage] Piping:
 - a. Background Color: Safety purple.
 - b. Letter Color: White.

END OF SECTION 220553

SECTION 221116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type L water tube, annealed temper.

- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- H. Copper Push-on-Joint Fittings:
 - 1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
 - 2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Neoprene or phenolic.
4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312300 "Excavation and Fill" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22054813 "Vibration Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install PEX piping with loop at each change of direction of more than 90 degrees.
- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- U. Install thermometers on outlet piping from water heater with storage capacity of 100 gal. or greater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 22054813 "Vibration and Controls for Plumbing Piping and Equipment."
- B. Support vertical piping and tubing at base and at each floor.

- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. NPS 6: 10 feet with 5/8-inch rod.
 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 3. NPS 2: 10 feet with 3/8-inch rod.
 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 7. NPS 6: 12 feet with 3/4-inch rod.
 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- G. Install supports for vertical steel piping every 15 feet.
- H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
- 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
- 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
- E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

END OF SECTION 221116

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 224713 "Drinking Fountains" for water filters for water coolers.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- ###### A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- ###### A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
 - 5. Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
 - 1. AS indicated on drawings
 - 2. Standard: ASSE 1013.
 - 3. Operation: Continuous-pressure applications.

2.5 BALANCING VALVES

- A. Memory-Stop Balancing Valves:
 - 1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 - 2. Pressure Rating: 400-psig minimum CWP.
 - 3. Size: NPS 2 or smaller.
 - 4. Body: Copper alloy.

5. Port: Standard or full port.
6. Ball: Chrome-plated brass.
7. Seats and Seals: Replaceable.
8. End Connections: Solder joint or threaded.
9. Handle: Vinyl-covered steel with memory-setting device.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
 - c. Strainers NPS 5 and Larger: 0.125 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.7 HOSE BIBBS

A. Hose Bibbs :

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

2.9 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.10 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
2. Size: NPS 1-1/4 minimum.
3. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve and pump.
- F. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.
- G. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.
- H. Install water-hammer arresters in water piping according to PDI-WH 201.
- I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and CISPI 310.
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and ASTM C 1540.
 - 2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312300 "Excavation and Fill."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and

calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 1/4" per foot downward in direction of flow for piping NPS 2 and smaller; 1/8" per foot downward in direction of flow for piping NPS 2 1/2" and larger.
 - 2. Vent Piping: 1/8" per foot down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- M. Install aboveground PVC piping according to ASTM D 2665.

- N. Install underground PVC piping according to ASTM D 2321.
- O. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waste gravity-flow piping. "
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping
 - 3. Install drains in sanitary drainage gravity-flow piping.
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22054813 "Vibration and Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- I. Install supports for vertical copper tubing every 10 feet.
- J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- K. Install supports for vertical PVC piping every 48 inches.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Install horizontal backwater valves with cleanout cover flush with floor.
 - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 - C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 6 and smaller shall be the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- C. Aboveground, vent piping NPS 6 and smaller shall be the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- D. Underground, soil, waste, and vent piping NPS 6 and smaller shall be the following:
 - 1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221413

FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

B. Related Section:

1. Section 334000 "Storm Drainage Utilities" for storm drainage piping outside the building.

1.2 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and CISPI 310.
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
 - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312300 "Excavation and Fill."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Storm Drain: 1/8" per ft. downward in direction of flow.
 - 2. Horizontal Storm-Drainage Piping: 1/8" per ft. downward in direction of flow.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Plumbing Specialties:
 - 1. Install backwater valves in storm drainage gravity-flow piping. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
 3. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828 procedure. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- E. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22054813 "Vibration and Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- I. Install supports for vertical copper tubing every 10 feet.
- J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- K. Install supports for vertical PVC piping every 48 inches.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
 - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
 - 2. Install horizontal backwater valves with cleanout cover flush with floor.
 - 3. Comply with requirements for backwater valves, cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.8 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.10 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping NPS 6 and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
- C. Underground storm drainage piping NPS 6 and smaller shall be the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221413

SECTION 221423

STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Backwater valves.
5. Trench drains.
6. Flashing materials.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

1. Standard: ASME A112.6.4, for general-purpose roof drains.
2. Body Material: Cast iron.
3. Dimension of Body: Nominal 14-inch diameter.
4. Combination Flashing Ring and Gravel Stop: Not required.
5. Outlet: Bottom.
6. Extension Collars: Not required.
7. Underdeck Clamp: Required.
8. Expansion Joint: Not required.
9. Sump Receiver Plate: Not required.
10. Dome Material: Aluminum, Cast iron.

11. Perforated Gravel Guard: Not required.
12. Vandal-Proof Dome: Not required.
13. Water Dam: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 2. Install expansion joints, if indicated, in roof drain outlets.
 3. Position roof drains for easy access and maintenance.
- B. Install downspout boots at grade with top 6 inches above grade. Secure to building wall.
- C. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:
 1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate cleanouts at base of each vertical soil and waste stack.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. Install horizontal backwater valves in floor with cover flush with floor.
- G. Install test tees in vertical conductors and near floor.
- H. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.
- I. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 223300

ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Commercial, light-duty, storage, electric, domestic-water heaters.
 - 2. Thermostat-control, electric, tankless, domestic-water heaters.
 - 3. Domestic-water heater accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex, "Drinking Water System Components - Health Effects."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Five years.
 - b. Electric, Tankless, Domestic-Water Heaters: Five year(s).
 - c. Compression Tanks: Five years.

PART 2 - PRODUCTS

- A. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
 - 1. Standard: UL 174.
 - 2. Storage-Tank Construction: Steel, vertical arrangement.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
 - c. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending lining material into tappings.
 - 3. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.

- b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1.
 - e. Jacket: Steel with enameled finish.
 - f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
 - h. Temperature Control: Adjustable thermostat.
 - i. Safety Control: High-temperature-limit cutoff device or system.
 - j. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
4. Special Requirements: NSF 5 construction with legs for off-floor installation.

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

- A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:
- 1. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
 - 2. Construction: Copper piping or tubing complying with NSF 61 Annex barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
 - c. Heating Element: Resistance heating system.
 - d. Temperature Control: Thermostat.
 - e. Safety Control: High-temperature-limit cutoff device or system.
 - f. Jacket: Aluminum or steel with enameled finish or plastic.
 - 3. Support: Bracket for wall mounting.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

- A. Domestic-Water Compression Tanks:
- 1. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 - 2. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.

- b. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.
- F. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Electric, Domestic-Water Heater Mounting: Install residential, electric, domestic-water heaters on water-heater stand or domestic-water heater mounting bracket.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.

- B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.
- C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping,"
- D. Fill electric, domestic-water heaters with water.
- E. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Inspect components, assemblies, and equipment installations, including connections.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements. Prepare test and inspection reports.

END OF SECTION 223300

SECTION 224213.13

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
2. Product data for Credit EQ4.1, for adhesives and sealants applied within the building envelope.
3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed adhesives and sealants, and any other sealant or adhesive specified under this section.

1.3 CLOSEOUT SUBMITTALS

- ###### A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- ###### A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard and Handicapped/elderly, complying with ICC/ANSI A117.1.
 - f. Rim Contour: Elongated.
 - g. Max Water Consumption: 1.28 gal. m per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.
 - i. Color: White.
2. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
3. Flushometer Valve: Refer to drawings.

2.2 WALL-MOUNTED WATER CLOSETS

- A. Water Closets: Wall mounted, top spud, accessible.
 1. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard.
 - f. Rim Contour: Elongated.
 - g. Maximum Water Consumption: 1.28 gal. per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.
 2. Flushometer Valve: Refer to drawings..
 3. Support:
 - a. Standard: ASME A112.6.1M.
 - b. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.
 - c. Water-Closet Mounting Height: Standard Handicapped/elderly according to ICC/ANSI A117.1.

2.3 FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves:
 1. Standard: ASSE 1037.
 2. Minimum Pressure Rating: 125 psig.
 3. Features: Include integral check stop and backflow-prevention device.

4. Material: Brass body with corrosion-resistant components.
5. Exposed Flushometer-Valve Finish: Chrome plated.
6. Panel Finish: Chrome plated or stainless steel.
7. Style: Refer to drawings.
8. Consumption: Max 1.28 gal. per flush.
9. Minimum Inlet: NPS 1.
10. Minimum Outlet: NPS 1-1/4.

2.4 TOILET SEATS

- A. Toilet Seats:
1. Standard: IAPMO/ANSI Z124.5.
 2. Material: Plastic.
 3. Type: Commercial (Heavy duty).
 4. Hinge: Max 1.28 gal. per flush.
 5. Hinge Material: Noncorroding metal.
 6. Color: White.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water-Closet Installation:
1. Install level and plumb according to roughing-in drawings.
 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 2. Use carrier supports with waste-fitting assembly and seal.
 3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Flushometer-Valve Installation:
1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.

- 4. Install actuators in locations that are easy for people with disabilities to reach.
- D. Install toilet seats on water closets.
- E. Wall Flange and Escutcheon Installation:
 - 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
 - 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 - 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- F. Joint Sealing:
 - 1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 - 2. Match sealant color to water-closet color.
 - 3. Comply with sealant requirements specified in Section 079005 "Joint Sealers".

3.2 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.3 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.

- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16

COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
2. Product data for Credit EQ4.1, for adhesives and sealants applied within the building envelope.
3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed adhesives and sealants, and any other sealant or adhesive specified under this section.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet, siphon jet, accessible.

1. Fixture:

- a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Water saving, refer to drawings.
 - f. Spud Size and Location: NPS 3/4; top.
 - g. Outlet Size and Location: NPS 2; back.
 - h. Color: White.
- 2. Flushometer Valve: Refer to drawings.
 - 3. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
 - 4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.
- B. Urinals: Wall hung, back outlet, washout, accessible.
- 1. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Water saving, refer to drawings.
 - f. Spud Size and Location: NPS 3/4, top.
 - g. Outlet Size and Location: NPS 2, back.
 - h. Color: White.
 - 2. Flushometer Valve: Refer to drawings..
 - 3. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
 - 4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079205 "Joint Sealers."

3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224216.13
COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
2. Product data for Credit EQ4.1, for adhesives and sealants applied within the building envelope.
3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed adhesives and sealants, and any other sealant or adhesive specified under this section.

C. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

- A. Lavatory:
 - 1. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: Refer to drawings.
 - c. Nominal Size: Refer to drawings.
 - d. Faucet-Hole Punching: Refer to drawings..
 - e. Faucet-Hole Location: Refer to drawings.
 - f. Color: White.
 - g. Mounting Material: Sealant.
 - 2. Faucet: Refer to drawings.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory: Vitreous china, wall mounted, with back.
 - 1. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Refer to drawings.
 - d. Faucet-Hole Punching: Refer to drawings.
 - e. Faucet-Hole Location: Top.
 - f. Color: White.
 - g. Mounting Material: Chair carrier.
 - 2. Faucet: Refer to drawings.
 - 3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.
- B. Lavatory: Wheelchair, vitreous china, wall mounted.
 - 1. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: Slab or wheelchair.
 - c. Nominal Size: Refer to drawings.
 - d. Faucet-Hole Punching: Refer to drawings.
 - e. Faucet-Hole Location: Top.
 - f. Color: White.
 - g. Mounting: For concealed-arm carrier.
 - 2. Faucet: Refer to drawings.

3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier with rectangular, steel uprights.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
 1. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
- C. Trap:
 1. Size: NPS 1-1/4.
 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories and counters and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079005 "Joint Sealers."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.

- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 224216.16
COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service basins.
2. Service sinks.
3. Utility sinks.
4. Handwash sinks.
5. Sink faucets.
6. Laminar-flow, faucet-spout outlets.
7. Supply fittings.
8. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
2. Product data for Credit EQ4.1, for premixed and factory packaged grouts applied within the building envelope.
3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed adhesives and sealants, and any other sealant or adhesive specified under this section.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 SERVICE SINKS

- A. Service Sinks: Enameled, cast iron, trap standard mounted.
 - 1. Fixture:
 - a. Standard: ASME A112.19.1/CSA B45.2.
 - b. Type: Service sink with back.
 - c. Color: White.
 - d. Mounting: Refer to architectural drawings
 - 2. Faucet: Refer to drawings.
 - 3. Support: ASME A112.6.1M, Type II, sink carrier.

2.2 UTILITY SINKS

- A. Utility Sinks: Stainless steel, counter mounted.
 - 1. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Ledge back.
 - c. Number of Compartments: Refer to drawings.
 - d. Overall Dimensions: Refer to drawings.
 - e. Metal Thickness: 0.050 inch.
 - 2. Faucet(s): Refer to drawings.
 - 3. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Refer to drawings.
 - 2) Risers: NPS 1/2, chrome-plated, rigid-copper pipe or ASME A112.18.6, braided or corrugated stainless-steel flexible hose.
 - 4. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap(s):

- 1) Size: NPS 1-1/2.
- 2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
- 3) Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

5. Mounting: On counter with sealant.

2.3 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets: Manual type, single-control or two-lever-handle mixing valve.
 1. Standard: ASME A112.18.1/CSA B125.1.
 2. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
 3. Maximum Flow Rate: Low flow refer to drawings.
 4. Vacuum Breaker: Required for hose outlet in service sink.
 5. Spout Outlet: Aerator.

2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Wheel handle.
- F. Risers:
 1. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.

- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079205 "Joint Sealers."

- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224223
COMMERCIAL SHOWERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Individual showers.
2. Shower faucets.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
2. Product data for Credit EQ4.1, for premixed and factory packaged grouts, sealants and adhesives applied within the building envelope.
3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed grouts, adhesives and sealants, and any other sealant or adhesive specified under this section.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 SHOWER FAUCETS

- A. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets:

1. Description: Single-handle, pressure-balance mixing valve with hot- and cold-water indicators; check stops; and shower head.
2. Faucet:
 - a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 - b. Body Material: Solid brass.
 - c. Finish: Polished chrome plate.
 - d. Maximum Flow Rate: Refer to drawings.
 - e. Mounting: Refer to architectural drawings.
 - f. Antiscald Device: Integral with mixing valve.
 - g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
3. Supply Connections: NPS 1/2.
4. Shower Head:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Type: Refer to drawings.
 - c. Shower Head Material: Metallic with chrome-plated finish.
 - d. Shower-Arm, Flow-Control Fitting: 1.5 gpm.
 - e. Temperature Indicator: Not required.

2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble shower components according to manufacturers' written instructions.
- B. Install showers level and plumb according to roughing-in drawings.
- C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use ball or gate valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 2. Install stops in locations where they can be easily reached for operation.
- D. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- E. Set shower receptors in leveling bed of cement grout.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079005 "Joint Sealers."

3.2 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.3 ADJUSTING

- A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of showers, inspect and repair damaged finishes.
- B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed fixtures and fittings.

- D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

END OF SECTION 224223

SECTION 224713
DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes drinking fountains and related components.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountains.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.
 - 2. Product data for Credit EQ4.1, for all sealants and adhesives applied within the building envelope.
 - 3. Submit documentation required to show credit compliance in the LEED Submittal Template, including but not limited to manufacturer's name, product name, specific VOC data, and the corresponding allowable VOC from the referenced standard, for proposed adhesives and sealants, and any other sealant or adhesive specified under this section.

1.3 CLOSEOUT SUBMITTALS

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

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

- A. Drinking Fountains: Stainless steel, wall mounted.
 - 1. Standards:
 - a. Comply with ASME A112.19.3/CSA B45.4.
 - b. Comply with NSF 61 Annex G.

2. Drain: Grid type with NPS 1-1/4 tailpiece.
3. Supply Piping: NPS 3/8 with shutoff valve.
4. Drain Piping: ASME A112.18.2/CSA B125.2, NPS 1-1/4 chrome-plated brass P-trap and waste.
5. Support: ASME A112.6.1M, Type III lavatory carrier.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Set pedestal drinking fountains on floor.
- C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079205 "Joint Sealers."
- H. Adjust fixture flow regulators for proper flow and stream height.

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 CLEANING

- A. After installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224713