

Manchester Scattered Sites

Existing Repairs and Level Two Alterations

Manchester, Pittsburgh, Pennsylvania 15233
FARPC Project No. 2006

Fukui Architects PC

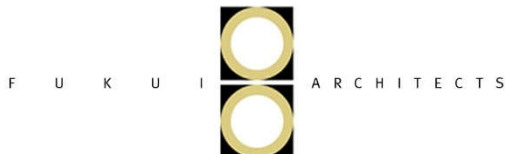
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Housing Authority of Pittsburgh

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Pittsburgh, PA 15219
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PA Housing Finance Agency

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DOCUMENT 000101 - PROJECT TITLE PAGE

- 1.1 PROJECT MANUAL VOLUME 1 Review Set - Not for Construction
- A. HACP Manchester Scattered Sites.
 - B. Housing Authority of Pittsburgh.
 - C. 200 Ross Street, Pittsburgh, Pennsylvania.
 - D. Owner Project No. 151
 - E. Architect Project No. 2006
 - F. Fukui Architects, PC.
 - G. 205 Ross Street
 - H. Pittsburgh Pennsylvania I.
Phone: 412.281.6001
 - J. Website: farpc.com

END OF DOCUMENT 00010

DOCUMENT 000107 - SEALS PAGE

1.2 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. Felix Fukui .
2. RA-011226-X
3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

B. Plumbing Engineer:

1. Dodson Engineering Service
2. Responsible for MEP Engineering service

C. HVAC Engineer

1. Dodson Engineering Service
2. Responsible for MEP Engineering service

D. Electrical Engineer

1. Dodson Engineering Service
2. Responsible for MEP Engineering service

END OF DOCUMENT 000107

DOCUMENT 011000 – SUMMARY 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. Project information.
- 2. Work covered by Contract Documents.
- 3. Phased construction.
- 4. Access to site.
- 5. Coordination with Owner / Occupants.
- 6. Work restrictions.
- 7. Specification and drawing conventions.

B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of HACP's Facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Housing Authority of the City of Pittsburgh, FARPC – Manchester Scattered Sites

- 1. Project Location:
 - a. Manchester, Pittsburgh, PA 15201

B. Owner: (HACP) Housing Authority of the City of Pittsburgh, 206 Ross Street, 9th Floor, Pittsburgh, PA 15219

- 1. HACP Contact: Mackenzie Pleskovic or Jerome Frank

E. Architect: Fukui Architects, PC; 205 Ross Street, Pittsburgh, PA 15219

- 1. FARPC Contact: Christen Frankhauser or Felix Fukui

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

- 1. Mechanical, Electrical and Plumbing Engineer: Dodson Engineering Group
 - a. Representative: Gregory Calabria

G. Prime Contractors: PDDM Solutions, LLC; 125 Technology Drive, Suite 101, Canonsburg, PA 15317

- 1. PDDM Contact: Steve Twiss

H. Project Web Site: A project Web site administered by General Prime Contractor will be used for purposes of managing communication and documents during the construction stage.

- 1. See Section 013100 "Project Management and Coordination." for requirements for establishing administering and using the Project Web site.

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1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. All work is to comply with all applicable codes, ICC/ANSI A117.1, PHFA Requirements, PHFA's Enterprise Green Communities Criteria for Preservation Projects, HUD Requirements and Section 504/UFAS requirements.
- B. There is no removal of any asbestos containing materials. If any contractor becomes aware of any friable materials during construction HACP's Representative and the Architect are to be notified. A Hazardous Materials Survey has been completed and is on file at HACP Offices and will be made available to all upon request.
- C. ATC Group Services LLC (ATC) was retained by Allies and Ross Management and Development Corporation (ARMDC) of Pittsburgh to conduct a lead-in water screening of potable water sources from 56 locations within the Manchester Neighborhood. Based on the analytical results from this current short-term screening, most of the radon concentrations in the areas sampled were low (<4 pCi/L). Ten sampled locations were elevated above the EPA action level of 4 pCi/c, with the highest recorded level being 8.4 pCi/c.:

1.	1017 Pennsylvania Ave	6.	1305 Fulton Street
2.	1019 Pennsylvania Ave	7.	1315 Pennsylvania Ave
3.	1109 Sheffield Street	8.	1333 N. Franklin Ave
4.	1111 Sheffield Street	9.	1403 Page Street
5.	1225 Sheffield Street	10.	1431 Nixon Street

Based on the results of the short-term testing, ATC recommends the following:

1. Re-test those properties with elevated and borderline readings.
2. Periodically re-test of all units as radon concentrations can fluctuate over time and during different seasons.
3. If levels are elevated after re-testing, evaluate the installation of a venting system (ie., vent pipe and fan that draws air from underneath the foundation and vents it outside the home) for units with elevated radon levels.

Test Results are on file at HACP Offices and will be made available to all upon request.

- D. PSI was retained by the Housing Authority of the City of Pittsburgh to install/repair radon mitigation systems and to conduct follow-up short-term (2-5 day) radon sampling. The follow-up sampling was conducted to document current levels in locations where concentrations were near or above the recommended limit following the initial testing and Radon Mitigation Systems were installed or existing mitigation systems were repaired. In all, sixteen (16) locations had radon mitigation systems installed, one (1) location had an existing radon mitigation system repaired, and all seventeen (17) locations were retested. The radon testing and analysis was conducted by Airtech Radon Services of Wexford, PA, a Pennsylvania licensed radon testing firm (PADEP #1771).

1.	1109 Sheffield Street	10.	1403 Page Street
2.	1111 Sheffield Street	11.	1405 Page Street
3.	1225 Sheffield Street	12.	1315 Liverpool Street
4.	1229 Sheffield Street	13.	1333 N. Franklin Ave
5.	1017 Pennsylvania Ave	14.	1335 N. Franklin Ave
6.	1019 Pennsylvania Ave	15.	1443 Adams Ave
7.	1101 Pennsylvania Ave	16.	1424 Nixon Street
8.	1315 Pennsylvania Ave	17.	1431 Nixon Street
9.	1305 Fulton Street		

The seventeen (17) locations that had Radon Mitigation Systems installed or repaired were below the upper recommended limit of 4.0 pCi/l following the installation of the Radon

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Mitigation Systems.

Based on the results of the short-term testing, PSI recommends the following:

1. Periodic re-testing of all units may be conducted, as radon concentrations can fluctuate over time and during different seasons.

Test Results are on file at HACP Offices and will be made available to all upon request.

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

1. The Scope of Work Area includes Existing Duplex Unit Repairs and Level 2 Alterations on the interior and exterior of the existing IEBC Classified R-2 (Residential), multiple story, Type V construction of 56 housing units, including 11 historic properties and 2 midrise apartment buildings. Buildings will be unoccupied during demolition and construction based on a phasing schedule provided by PDDM. The project is Multiple Prime General, Mechanical, Plumbing and Electrical and coordination is required with the Owner's Relocation Consultant.
2. Each Prime Contractor is to refer to the Entire set of Contract Documents for coordination of scope of work an additional detailed requirements with all other Prime Contractors and Owner Requirements and scope of work as described in the pertinent specification sections and/or shown on the drawings.
3. All associated fees for permits and inspections required to complete the scope of work described above.
4. General Prime Contractor:

In general, for the fifty-six (56) Units of Manchester Scattered Sites:
The Exterior Scope of Work includes, not limited to:

Temporary erosion control; concrete repairs at steps and walkways; wood fence removal and replacement; exterior building brick repointing; siding removal and replacement; replacement of handrails; removal and replacement of shingle roofing system, roof vents and accessories, gutters, and downspouts; all windows; all exterior swing doors and hardware; limited number of sliding glass doors; and all as indicated on the Construction Documents.

The Interior Scope of Work includes, not limited to:

Replacement of all floors, wall and ceiling finishes; all kitchen cabinets and countertops; all kitchen appliances, all toilets and tubs and showers; all bathroom surrounds, accessories, vanities, and integral sink countertops; all bathroom cabinetry and sinks in UFAS Units Only with UFAS/Accessible Compliant sinks provided by Plumbing Prime Contractor; all blinds; patching of drywall; and all as indicated on the Construction Documents.

5. Mechanical Prime Contractor:

In general, for the fifty-six (56) Units of Manchester Scattered Sites:
The Scope of work includes, but not limited to:

Removal and replacement of through-the-wall air conditioners, recirculating range hoods, exhaust grilles, and all as indicated on the Construction Documents. Roof: Replacement of exhaust fans on the rooftop; removal and replacement of gas fired heating furnaces and gas/electric air conditioning units, condensers and concrete pads; bathroom exhaust fans; thermostats; removal

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of all range hoods and replacement with recirculating range hoods; furnishings; duct cleaning; and all as indicated on the Construction Documents.

6. Plumbing Prime Contractor:

In general, for the fifty-six (56) Units of Manchester Scattered Sites:
The Scope of work includes, but not limited to:

Furnishing and installing UFAS/Accessible compliant wall mounted sinks, faucets, plumbing, pipe protection and wall carrier in all UFAS/Accessible Units; removal and replacement of vanity faucets, piping and p-traps in all Standard Units; removal, salvaging and reinstalling of water-closets; replacement of shower faucet and heads at tub surrounds; replacing kitchen sinks; removal and replacement of kitchen sink faucets, piping and p-traps; replacement of nonfunctioning valves; replacement of flexible gas hose to all ranges; replacement of plumbing as indicated on drawings. Restrooms: furnish and install sinks, faucets and plumbing; and all as indicated on the Construction Documents.

7. Electrical Prime Contractor:

The Scope of work includes, but not limited to:

Removal and replacement of all residential unit's lighting fixtures, and Common Area light fixtures as indicated, with LED fixtures; all smoke detectors; exterior building lighting fixtures; light switches and electrical outlets; electrical deenergizing and reenergizing of all connections required by other prime contractors

E. Type of Contract:

2. Project will be constructed under coordinated, concurrent multiple contracts. Refer to Division 01 Section "Multiple Contract Summary for a description of work included under each of the multiple contracts and for the responsibilities of the Project Coordinator. Contracts for this Project include the following:
 - a. General Construction Contract (General Prime Contractor or G.C.)
 - b. Mechanical Construction Contract (Mechanical Prime Contractor or H.C.)
 - c. Plumbing Construction Contract (Plumbing Prime Contractor or P.C.)
 - d. Electrical Construction Contract (Electrical Prime Contractor or E.C.)

1.5 PHASED CONSTRUCTION AND DISRUPTION

A. The Work shall be conducted in 16 phases and will be required to be coordinated and sequenced by the General Prime Contractor, with each phase substantially complete as indicated:

1. General Prime Contractor is responsible for the Demolition and Construction Phasing DCPOD Schedule and all Other Prime Contractors and disciplines and providing an update on a weekly bases during the Construction Phase. All Mechanical, Electrical and Plumbing Prime Contractors and disciplines are required to coordinate and provide detailed Demolition and Construction Phasing for their disciplines scope of work, to the General Prime Contractor, to be incorporated into the comprehensive schedule. All milestones shall be identified within the schedule.
 - a. General Phasing Schedule Milestones to be Minimally Identified and as per attached Phasing Schedule: Start and End dates of specific scope of work milestones, substantially complete milestones, and other associated milestones for approval from HACP and the Architect. Schedules to be inclusive of all required types of disruption. IE: Noise, Light, Odors, Displacement of Occupant, Dust, etc.

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- b. Issue notifications and post in the window of unit, Notify 2-3 adjacent neighbors on each side of property. The notification is to describe the nature and duration of activity and provide HACP and contractor contact information for questions and/or concerns.
 - c. Daily working hours must occur during the week. Work may start as early as 7 AM, but no hammering, power tools or other noisy operations are to be occur prior to 8 AM on a daily basis.
 - 2. General Prime Contractor to Schedule a Demolition and Construction Phase Occupant Disruption Meeting within 7 calendar days of receiving the Notice to Proceed.
 - 3. Demolition and Construction Phasing Occupant Disruption Schedule (DCPOD Schedule) shall be provided by each Contractor/Discipline to the General Prime Contractor within 14 calendar days from Notice to Proceed.
 - 4. General Prime Contractor is to provide the initial DCPOD Schedule within 28 calendar days after the Notice to Proceed.
 - 5. Phases can include multiple areas of scope of work simultaneously.
 - 6. No Demolition or Construction shall start until the DCPOD Schedule has been provided and approved by HACP's Representative to Proceed.
- B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates for all phases of the Work.

The 16 Phases for the fifty-six (56) Manchester Scattered Sites, provided by PDDM, are as follows:

Task Name	Duration
Phase I: Units 26,28, 35A, 35B, 20	43 Days
Phase II: Units 38 (A-O), 55	106 Days
Phase III: Units 18, 45, 29, 1, 12	42 Days
Phase IV: Units 53, 46	42 Days
Phase V: Units 50, 36	42 Days
Phase VI: Units 37, 34,42,56	42 Days
Phase VII: Units 19, 43, 47	42 Days
Phase VIII: Units 40, 13, 10, 24, 51	47 Days
Phase IX: Units 48, 8, 11	42 Days
Phase X: Units 21, 22, 32	42 Days
Phase XI: Units 5, 49, 9, 41, 33, 14, 44 30, 39	52 Days
Phase XII: Units 2, 7, 16	42 Days
Phase XIII: Units 3, 17, 31	42 Days
Phase XIV: Units 23, 25, 15, 27	42 Days
Phase XV: Unit 52	42 Days
Phase XVI: Units 49, 9, 41, 33, 6, 54, 4	47 Days

Attendance at weekly meetings is mandatory for all Prime Contractors. During meetings PDDM will take weekly attendance, record and issue weekly Progress Meeting Reports.

1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as coordinated with the HACP.
- B. Use of Site: Limit use of Project site to work zones delineated in General Prime Contractor's approved Plan and Schedule. Do not disturb portions of Project site beyond areas in which the Work is indicated.

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1. Limits: Confine construction operations to HACP approved limits of work per construction plan.
2. Dumpster logistics – one (1) per building with possibility of one (1) dumpster per two (2) buildings. GC is to provide and pull permit. The location of the Dumpster is to be on-street within 30-50 feet reserved for loading and unloading.
3. Port-a-john will be located on street adjacent to the dumpster or sidewalk adjacent. The bathrooms in the units are not to be used during construction.
4. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to HACP, HACP's employees, and emergency vehicles at all times. Each Prime Contractor will be responsible for providing offsite parking, offsite storage of materials, and offsite placement of trailer.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations and minimize space and time requirements for materials and equipment onsite.

C. Condition of Existing Building: Maintain existing buildings in a weathertight condition throughout all phases of the demolition and construction period. Repair damage caused by construction operations. Protect building and its occupants at all times during construction period. Daily cleaning and disposal of debris shall be maintained.

1. Mechanical Contractor shall be responsible for ductwork protection during construction and professional duct cleaning prior to start up of system. Coordinate with General Contractor.
2. General Contractor is to be responsible for the shut-off of water and gas.
3. Electrical Contractor is to be responsible for making arrangements for temporary power during construction.

1.7 WORK RESTRICTIONS

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

1. Comply with limitations on use of public streets and with other requirements of a authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to 7:00 a.m. to 3:30 p.m. to avoid noise before 8:00am, Monday through Friday, unless otherwise indicated or directed by HACP's Representative.

1. Weekend Hours: Only upon receipt of written approval from HACP.
2. Early Morning Hours: None without prior approval of HACP.
3. Hours for Utility Shutdowns: None without prior approval of HACP.
4. Hours for noisy activity: 8:00 a.m. to 3:30 p.m.

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

1. Notify HACP's Representative and Architect not less than 7 calendar days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without HACP's written permission.
3. Interruptions shall be scheduled such that current tenants are not without service for more than 2 hours.
4. Schedule interruptions such that the minimum numbers of units are without heat, electricity, or water at any given time.

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

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1. Notify HACP and Tenant Representative not less than two days in advance of proposed disruptive operations.
2. Obtain HACP's written permission before proceeding with disruptive operations.

- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.
- F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with HACP's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with HACP's Representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.
 4. Basis of Design does not restrict project materials to one manufacturer or model number. "Or Approved Equal", as indicated on the documents, applies to all products or equipment to be provided.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

DOCUMENT 011200 – MULTIPLE CONTRACT SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.
- C. Related Sections:
 - 1. Division 01 Section "Summary" for the Work covered by the Contract Documents, restrictions on use of the Project site, phased construction, coordination with occupants, and work restrictions, and continual fire protection systems.
 - 2. Division 01 Section "Project Management and Coordination" for general coordination-requirements.

1.4 PROJECT COORDINATION

- A. Project Coordinator shall be the General Construction Contractor, whom shall be responsible for coordination between the General Construction Contract, Plumbing Contract, Mechanical Contract, Electrical Contract, any hazardous remediation, and Owner's telecommunication and security departments.
- B. Each Prime Contractor is required to assign a Project Manager/Coordinator within their discipline to ensure coordination between all other Prime Contractors, the Owner, and within their own discipline.

1.5 COORDINATION ACTIVITIES

- A. Each Prime Contractor is responsible for each of the following coordination activities, but are not limited to the following:
 - 1. Provide overall coordination of the Work.
 - 2. Coordinate shared access to workspaces.
 - 3. Coordinate product selections for compatibility.
 - 4. Provide overall coordination of temporary facilities and controls.
 - 5. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
 - 6. Coordinate construction and operations of the Work with work performed by each Contract and Owner's construction forces.
 - 7. Prepare coordination drawings in collaboration with each contractor to coordinate work by more

than one contract.

8. Coordinate sequencing and scheduling of the Work. Include the following:
 - a. Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with all Contractors and Owner's Representative for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
 - b. Prepare a combined Contractors' construction schedule for entire Project. Base schedule on preliminary construction schedule. Secure time commitments for performing critical construction activities from contractors. Show activities of each contract on a separate sheet. Prepare a simplified summary sheet indicating combined construction activities of contracts.
 - 1) Submit schedules for approval.
 - 2) Distribute copies of approved schedules to contractors.
9. Provide quality-assurance and quality-control services specified in Division 01 Section "Quality Requirements."
10. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
11. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
12. Provide progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
13. Coordinate cutting and patching.
14. Coordinate protection of the Work.
15. Coordinate firestopping.
16. Coordinate completion of interrelated punch list items.
17. Coordinate preparation of Project record documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
18. Print and submit record documents if installations by more than one contractor are indicated on the same contract drawing or shop drawing.
19. Collect record Specification Sections from contractors, collate Sections into numeric order, and submit complete set.
20. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
21. Coordinate the waste disposal plan for the project to include all communications with sub-contractors.
22. Verify provision of waste management facilities, to divert as much waste as possible from landfill and provide training to other prime contractors.
 - a. Evaluate facilities in enough time prior to removal from the site to ensure load complies with requirements or to require responsible prime to remove inappropriate items

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- b. Allow each prime a minimum of half a working day to correct improper disposal of waste items

23. Do not use on site trash collection for construction disposal

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 011200

DOCUMENT 013100 - PROJECT MANAGEMENT AND COORDINATION

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

1. General coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project Web site.
6. Project meetings.

- B. Contractor shall participate in coordination requirements for all work proceeding on site, not just work included in this contract. Certain areas of responsibility are assigned to a specific contractor.

- C. Reference to "Contractor" on the drawings and the specifications shall refer to the each separate Prime Contractor, unless noted otherwise, with coordination responsibilities specified within this Section.

- D. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 COORDINATION

- A. Coordination: The contractors shall coordinate their construction operations with those of the HACP's Contractors and Construction Manager/HACP's Representative and entities to ensure efficient and orderly installation of each part of the Work and the work by other HACP's Contractors.

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

1. Schedule construction operations in sequence required to obtain the best results.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all

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- components, including mechanical and electrical.
- 5. Maintain safe access to all Duplex units and Apartment units.
- 6. Coordinate access to Duplex units and Apartments that will be concurrently under construction with other contractors.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for HACP and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with construction activities and activities of other contractors to ensure orderly progress of the Work. Activities include:
 - 1. Preparation of Contractors' construction schedule.
 - 2. Preparation of Contractors' Demolition and Construction Phasing Occupant Disruption Schedule (DCPOD)
 - 3. Preparation of the schedule of values.
 - 4. Preparation of the submittal schedule
 - 5. Installation and removal of temporary facilities and controls.
 - 6. Delivery and processing of submittals.
 - 7. Progress meetings.
 - 8. Preinstallation conferences.
 - 9. Project closeout activities.
 - 10. Startup and adjustment of systems.
 - 11. Project closeout activities.
 - 12. All RFI's logged and coordinated through General Construction contractor.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, civil, mechanical, and electrical systems.
 - b. Locate existing utilities that enter the building.
 - c. Locate existing Building Automation System (BAS) lines that enter the building.
 - d. Indicate required installation sequences.
 - e. Indicate functional and spatial relationships for components of systems.
 - f. Show location and size of access doors required for access to concealed controls.
 - g. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 11 by 17 inches but no larger than 30 by 42 inches.

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3. Submit Digitally to Architect through General Contractors project web site: PDF electronic files.
4. After return from Architect, mark up and provide one printed copy to be located at meeting site, as a Project Record Drawing, and provide HACP with five printed copies.
5. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

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

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: DWG, Version 2010, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
4. File Submittal location: All digital files shall be uploaded to the General Prime Contractor's project web site. Method and format for uploading digital files to the website will follow the Sites format as specified.
5. Architect will furnish the Contractor one set of digital data files of Drawings for use in preparing coordination digital data files. Refer to associated fees.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Refer to Division 01 Section Summary for requirements for using Architect's digital files.
 - c. Files shall be made available on General Prime Contractors Website.
 - d. Digital Data Software Program: Drawings are available in Autodesk AutoCAD and or Revit 2015.
 - e. General Prime Contractor shall execute, and pay for two years in advance, a data licensing agreement in the form of Agreement included in this Project Manual.
 - 1) See licensing agreement for fee.

C. Key Personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

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

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

1.7 PROJECT MEETINGS

A. General: Construction Manager (PDDM), HACP's Representative will schedule and conduct meetings and conferences. Prepare the meeting agenda. Distribute agenda, record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including HACP and Architect, within three days of the meeting.

B. Preconstruction Conference: Construction Manager/HACP's Representative will schedule and conduct a preconstruction conference before starting construction, at a time convenient to HACP and Architect, but no later than 7 days after execution of the Agreement. Hold the conference at Project site. Conduct the meeting to review responsibilities and personnel assignments.

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- C. Progress Meetings: Construction Manager/HACP's Representative will Schedule and conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of HACP, Architect and Construction Manager/HACP's Representative, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Review schedule for next period.
 3. Minutes: Construction Manager/HACP's Representative will record the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present, via email in digital format with-in 3 days of the meetings date.
- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.

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

E. Project Closeout Conference: Construction Manager/HACP's Representative will schedule and conduct a project closeout conference, at a time convenient to HACP and Architect, but no later than 10 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of HACP, Construction Manager/HACP's Representative, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - l. HACP's partial occupancy requirements.
 - m. Installation of HACP's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

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

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - a. RFI's should be submitted through the coordinating contractor.
 - b. Uploaded to the project web site
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.

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2. Date.
3. Name of Contractor.
4. Name of Architect and Construction Manager/HACP's Representative.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Format of RFIs:

1. RFI's shall be submitted electronically via email on standard RFI form. Paper copies may be substituted in addition.
2. Identify each page of attachments with the RFI number and sequential page number.
3. To expedite the RFI answering process, the Contractor shall process RFIs electronically through – web-based construction administration software.

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

1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager/HACP's Representative in writing within 7 days of receipt of the RFI response.

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

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. RFI Log shall be submitted electronically via email and web site. Submit log weekly. Use CSI Log Form 13.2B. Include the following:

1. Project name.

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2. Name and address of Contractor.
3. Name and address of Architect and Construction Manager/HACP's Representative.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's and Construction Manager's/HACP's Representative response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

- G. The Architect shall maintain the RFI log between the Architect and Contractor through Website's RFI software. It is recommended that the Contractor maintain a separate RFI log with subcontractors.

1.9 PROJECT WEB SITE

- A. General Prime Contractor is to set up and maintain Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. General Prime Contractor is responsible for all fees associated with the Project Web Site and is required to pay for two (2) years in advance. Project Web site shall include the following functions:
1. Project directory.
 2. Project correspondence.
 3. Meeting minutes.
 4. Contract modifications forms and logs.
 5. RFI forms and logs.
 6. Photo documentation.
 7. Schedule and calendar management.
 8. Submittals forms and logs.
 9. Payment application forms.
 10. Drawing and specification document hosting, viewing, and updating.
 11. Archiving functions.
- B. Provide unlimited Project Web site user licenses for use of HACP, Architect, Architect's consultants, and Electrical Prime Contractor. Provide eight hours of software training at Architect's office for Project Web site users.
- C. Upon completion of Project, provide one complete archive copy of Project Web site files to HACP and to Architect in a digital storage format acceptable to the Architect.
- D. Provide the following "Basis of Design" Project Web site software package under its licensing agreement.
- E. Contractors, subcontractors, and other parties granted access by the Contractor to project Web site shall execute a data licensing agreement in the form of an Agreement acceptable to HACP and Architect.

PART 2 - PRODUCTS (Not Used) PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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In accepting and using digital files, provided by Fukui Architects, P. C., the undersigned recognizes and accepts that:

1. Fukui Architects, P. C., is providing these digital files for the undersigned's sole convenience, and does not assume any responsibility for the accuracy or suitability of information contained therein for the use intended by the undersigned; and
2. the undersigned is fully and solely responsible to verify the accuracy of the digital files and the actual built conditions, as it may affect the undersigned's work; and
3. the digital files are an instrument of service of Fukui Architects, P. C. who shall be deemed the author of the digital files and shall retain all common law, statutory and other reserved rights, including the copyright; and
4. under no circumstances shall the transfer of the digital files, or other instruments of service, for use by the undersigned be deemed to be a sale by Fukui Architects, P. C., and Fukui Architects, P. C. makes no warranties, express or implied, of merchantability or of fitness for a particular purpose; and
5. the digital files shall not be used in whole or part for any project or purpose, other than *[INSERT SCOPE OF WORK, E.G., PREPARATION OF DUCTWORK SHOP DRAWINGS]*; and
6. to the fullest extent permitted by law, the undersigned hereby indemnifies and holds harmless Fukui Architects, P. C. and its officers, directors, employees and consultants from and against all claims, damages, losses and expenses, including, but not limited to, attorney's fees arising out of, relating to and resulting from use of any information provided by Fukui Architects, P.C.
7. a service and administrative fee of \$100 for each digital file is payable to Fukui Architects, P.C. prior to transfer of the requested files.

The Undersigned:

Signature

Name and Title (Print Clearly)

Company Name (Print Clearly)

Date

DOCUMENT 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractors' Construction Schedule.
 - 3. DCPOD: Contractors' Demolition and Construction Phasing Occupant Disruption Schedule
 - 4. Construction schedule updating reports.
 - 5. Daily construction reports.
 - 6. Material location reports.
 - 7. Site condition reports.
 - 8. Special reports.
 - 9. Draft and final waste management plan
 - 10. Draft and final construction-indoor air quality management plan
- B. Related Requirements:
 - 1. Section 013100 "Project Management and Coordination" for report and schedule formats and inclusion of project web site in document management.
 - 2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 PURPOSE

- A. The Construction Progress Schedule ("CPS") shall be utilized to track job progress, analyze potential delays, identify potential progress problems early, determine the project completion date, issue progress payments, determine validity of time extension requests, and complete cost projections and analysis.

1.4 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

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- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either HACP or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.
- H. Submittal Packages: a group of submittals packaged together for submission and approval by Architect and consultants. Refer to Division 01 Section "Submittal Procedures."
- I. Mandatory Project Schedule and Submittals Meeting: This is a meeting prior to the Pre- construction Job conference.

1.5 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
 - 2. After return from Architect provide HACP with five paper copies.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- D. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- E. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. DCPOD: Initial schedule integrated with the Contractors' Construction Schedule, of size required to display entire schedule for entire construction period. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
 - 1. Coordination with Owners' Relocation Consultant is required.
- F. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

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2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
- G. Field Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.
- I. Qualification Data: For scheduling consultant.
- 1.6 FORMAT
- A. The CPS shall be in time scale CPM Gantt Chart format
- B. The CPS shall provide graphical (horizontal bar chart) representations for each major portion of work or operation (Summary Tasks)
- C. The CPS shall provide a graphical representation for each of the activities/tasks and events that will occur during the performance of the work
- D. The CPS shall show the complete sequence of construction by activity/task, with dates for beginning and completion of each element of construction
- E. Activities shall be listed in a logical, sequential order, and shall use proper precedence logic (Chronological/Sequential System)
- F. Each activity shall have predecessor and/or successor ties. The CPS shall show the interrelations/interdependencies of all activities/tasks
- G. No onsite activity shall have a duration of greater than ten (10) working days
- H. The Critical Path shall be clearly identified
- I. All CPSs', CPS revisions, preliminary submissions, and associated backup documentation shall be submitted in hard copy and electronic formats. Six (6) hard copies of each document shall be submitted to the Housing Authority, and one (1) hard copy of each document shall be submitted to the A/E.
- J. Sheet Size: Minimum 8.5 x 14 inches
- 1.7 CONTENTS
- A. The CPS shall begin at the Notice to Proceed ("NTP") date. The initial CPS shall be based on the anticipated NTP date as provided by the Housing Authority.
- B. The CPS shall identify each phase/stage of demolition, construction, occupancy/relocation, and other logically grouped activities (Summary Tasks).
- C. The CPS shall set forth milestone dates and deadlines, including substantial completion of ALL work, i.e., the entire project.
- D. The CPS shall identify all project constraints.
- E. The CPS shall identify work for each building unit/apartment (unless authorization is obtained in writing from the Contracting Officer allowing the CPS to only identify work for each floor or building). Each task for each unit/apartment shall be identified on the CPS.
- F. The CPS shall identify all Housing Authority, governmental and/or regulatory review periods.

- G. CPS duration shall not exceed contractual construction period.
- H. The CPS shall indicate submittal package submission dates for review and approval.
- I. The CPS shall indicate decision dates for selection of finishes.
- J. The CPS shall clearly identify order dates and lead times for all specified products, particularly long lead time items, items requiring fabrication, and major equipment.
- K. The CPS shall indicate delivery dates for Housing Authority furnished products.
- L. The contractor(s) shall coordinate the CPS content with the Schedule of Values (Schedule of Amounts). All progress payment amounts will be derived from, and tied to, the Schedule of Values and the CPS; therefore, all activities on the CPS shall be consistent with the information contained in the Schedule of Values.

1.8 SUBMITTALS AND APPROVALS

- A. The Building Work Area –General Contractor is responsible for consolidating the work efforts of other Contractors for the Scope of Work into one realistic, aggressive CPS, and for submitting the CPS to the Housing Authority for approval.
 - 1. General Prime Contractor will also be responsible for submitting to Electrical Prime Contractor, that will be performing work on site, in a timely manner, to aid in their preparation of realistic, aggressive CPS, and for submitting the CPS to the Housing Authority for approval.
- B. Failure of any contractor to submit required information in a timely manner shall be a default in accordance with the terms of this contract.
- C. If any contractor is found to be in default by the Contracting Officer for failure to submit schedule information in a timely manner, the Contracting Officer may terminate the contractor's right to proceed with the schedule preparation and may elect to complete the contractor's schedule information in his stead, in which case the contractor will be bound by any approved CPS as if the schedule information was prepared/developed by the contractor's own personnel. The contractor and its surety shall then be liable for any damage to the Housing Authority resulting from the contractor's failure to submit the schedule information within the specified timeframe.
- D. All CPSs' submitted to the Contracting Officer for approval shall be dated and signed by a representative of all prime contractors involved in the project. The signatures shall represent an acknowledgement that all prime contractors are in agreement with the submitted schedule. The General Contractor shall be responsible for obtaining all signatures.
- E. Submittal of the initial CPS and subsequent updates/revisions for approval shall be understood to be the contractors' representation that the submitted CPS meets all of the conditions of the contract documents, accurately reflects work to be completed, and that the work will be executed in the sequence indicated on the submitted CPS.
- F. In no event shall any adjustment proposed in a progress report or corrective plan constitute an adjustment in the CPS, contract time, or any milestone date unless any such adjustment is agreed to and authorized in writing by the Contracting Officer.
- G. All contractors shall be aware that time is of the essence when submitting CPS information and when completing the Work in the timeframes established in the approved CPS.

1.9 INITIAL CPS SUBMITTAL AND APPROVAL

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- A. The General Construction Contractor shall submit at the Mandatory Project Schedule and Submittals Meeting the proposed CPS to the Construction Manager and HACP for review.
- B. The proposed CPS shall not be saved as a baseline until written approval is received from the Contracting Officer. Upon approval, the General Contractor shall be responsible for saving the baseline schedule, and monitoring and maintaining the CPS.
- C. The Contracting Officer shall review the initial CPS submission, (and any required resubmission), and respond with comments, recommendations, requests, or acceptance within five (5) working days of receipt.
- D. If the proposed CPS is not accepted by the Contracting Officer, the CPS shall be revised by the contractor(s) in accordance with the comments, recommendations, or requests of the Contracting Officer and resubmitted for acceptance within three (3) working days of receipt of said comments, recommendations, or requests. The contractor shall be required to make the changes as directed by the Contracting Officer to arrive at a reasonable, realistic, and acceptable CPS.
- E. The NTP will not be issued and the project shall not begin without a CPS approved in writing by the Contracting Officer. The NTP will be issued within five (5) working days of written CPS approval provided all required back up documentation is received by the Housing Authority in the timeframe required in the contract.
- F. Upon acceptance by the Contracting Officer of the proposed CPS, the accepted schedule shall be deemed the "Construction Project Schedule" and will be considered part of the contract.
- G. The Housing Authority's approval or acceptance of the CPS shall not impose on the Housing Authority any responsibility for the CPS, for timely submittals of complete and project-conforming shop drawings, for work sequencing, scheduling milestones, or progress of the work, nor shall acceptance interfere with or relieve the Contractor from the contractor's full responsibility to complete all work in accordance with the contract. Contractors are solely responsible for the development and performance of the means, methods, and execution of performance reflected in the CPS.
- H. A separate submittal schedule shall be submitted along with the initial CPS. The submittal schedule shall include and identify dates for shop drawing submittal and approval, product data, and samples, including Housing Authority furnished products. The submittal schedule must include dates reviewed submittals will be required from the Housing Authority. Contractors are required to relate submittal tasks to construction activities/tasks. The submittal schedule may be incorporated into the CPS provided written authorization is obtained from the Contracting Officer.
- I. The General Contractor shall keep the submittal schedule current. The submittal schedule shall be coordinated with the CPS, and shall allow for reasonable time for Housing Authority submittal review as documented in the contract.

1.10 MONTHLY UPDATED CPS SUBMITTAL AND APPROVAL

- A. A preliminary updated CPS and all associated backup documentation shall be submitted by the General Contractor for review along with the "pencil copy" of the application for payment. The preliminary updated CPS should be submitted to the Housing Authority and the A/E no later than three (3) working days before the pay application progress meeting, with the site walk occurring no later than one (1) working day before the pay application progress meeting.
- B. Backup documentation shall include a narrative discussion of the progress to date, forecasted work for next period, problem areas, and anticipated delays. If applicable, the narrative shall document schedule slippage, provide a detailed explanation concerning the reason(s) for the slippage, how each prime contractor is affected, and shall include a written recovery plan for getting the project back on schedule. The written recovery plan shall include any necessary overtime or additional labor and what steps are

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being taken to recover the original schedule, and/or what logic changes occurred and why said changes occurred. The plan shall indicate the date by which the progress of the work will comply with the current approved CPS.

- C. The preliminary updated CPS and the pencil copy of the application for payment shall be reviewed by all contractors, Housing Authority representative(s), and the A/E during the site walk meeting.
- D. The General Prime Contractor shall make any revisions as noted during the site walk meeting, and shall submit the formal/finalized updated CPS and all associated backup documentation along with the finalized monthly application for payment at the pay application progress meeting.
- E. The formal/finalized updated CPS and associated backup documentation shall be considered part of the application for payment submission. Failure to submit an accurate updated CPS and all associated backup documentation with the application for payment will be cause for rejection of the application for payment.

1.11 CRITICAL PATH, LOGIC, or TASK CHANGES CPS UPDATE SUBMITTAL

- A. The General Prime Contractor shall immediately submit a revised CPS and a written recovery/corrective action plan to the Contracting Officer any time a critical path item is three (3) working days behind the current approved CPS, if a non-critical activity becomes critical, or if there are changes in schedule logic and/or tasks.
- B. The Contracting Officer shall review the updated CPS submission and respond with comments, recommendations, requests, or acceptance within three (3) working days of receipt.
- C. If the revised/updated CPS is not accepted by the Contracting Officer, the schedule shall be revised by the contractor(s) in accordance with the comments, recommendations, or requests of the Contracting Officer and resubmitted for acceptance within five (5) working days of receipt of said comments, recommendations, or requests.
- D. The contractor(s) shall be required to make the changes as directed by the Contracting Officer to arrive at a reasonable, realistic, and acceptable CPS.

1.12 CHANGE ORDER OR DIRECTED WORK CPS SUBMITTALS

- A. Any contractor submitting a Request For Change Order ("RFCO") shall submit as backup documentation along with said RFCO a proposed CPS outlining how the change would impact the current approved CPS. The proposed CPS shall show in detail the work involved in the proposed change, how the proposed change will be incorporated into the current approved CPS, and the impact on other work caused by the adjustment to the current approved CPS.
- B. Within three (3) working days of receipt of any executed change order(s), change directive, or proceed order that affects the CPS, the contractor to whom the change order, directive, or proceed order was issued shall submit to the General Contractor a proposed revised CPS. The General Contractor shall then incorporate the changes into the current approved schedule and within three (3) working days of receipt of the proposed revised CPS from the contractor to whom the change order, directive, or proceed order was issued, issue a proposed CPS to the Contracting Officer for review and approval.
- C. Along with the proposed CPS, the General Contractor shall submit a written narrative outlining the change and how it affects the current, approved CPS.
- D. The Contracting Officer shall review the proposed CPS submission and respond with comments, recommendations, requests, or acceptance within three (3) working days of receipt.
- E. If the proposed CPS is not accepted by the Contracting Officer, the proposed CPS shall be revised by the

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contractor(s) in accordance with the comments, recommendations, or requests of the Contracting Officer and resubmitted for acceptance within three (3) working days of receipt of said comments, recommendations, or requests.

- F. The contractor(s) shall be required to make the changes as directed by the Contracting Officer to arrive at a reasonable, realistic, and acceptable CPS.

1.13 AS-BUILT CPS SUBMITTAL

- A. As a condition precedent to the release of final retention, the last update of the CPS submitted shall be identified by the General Contractor as the "As-Built" CPS. The As-Built CPS shall reflect the exact manner in which the project was actually constructed (including actual start and finish dates, activities, sequences, and logic), and shall be certified in writing by all contractors as being a true reflection of the way the project was actually constructed. The As-Built CPS shall be submitted with final close-out documents.

1.14 REVISIONS TO CONSTRUCTION PROGRESS SCHEDULES

- A. All revised CPSs' should be saved with the project # and revision # clearly noted.
- B. The lead contractor shall be responsible for updating/revising the current approved CPS.
- C. All revised/updated CPSs' shall include but not be limited to the following information:
 - 1. Actual and baseline construction start and finish dates
 - 2. Actual and baseline procurement start and finish dates
 - 3. Graphical representation of the baseline and actual task start and finish dates
 - 4. Logic revisions – any revised sequences
 - 5. Added or changed work, including change order work and RFI submittals that affect the work
 - 6. Activity duration projections/revisions
 - 7. Activity percent complete – actual percent complete of each activity not based on cost
 - 8. Current events that affect construction progress – adverse weather, strikes, differing site conditions

1.15 TIME EXTENSIONS & DELAY CLAIMS

- A. Time extensions will only be granted for delays that will demonstratively delay the contractual project completion date as of the date of the delay and are authorized by executed change orders from the Contracting Officer. Please note that the delay MUST affect the contract completion date at the time of the delay.
- B. Contractors may not request additional compensation and/or time from the Housing Authority unless the cause of any delay is attributable to the act or failure to act of the Housing Authority or its representative, or to other causes beyond the contractors' control for which time extensions are available per the contract.

1.16 FLOAT

- A. ALL Float shall be recognized as a shared resource that is available for reasonable use by all parties under contract for this project, and by the Housing Authority if necessary. Float shall not be considered for the exclusive use of the Housing Authority or any single contractor. This includes but is not limited to any float generated due to the efficiencies of any party, or efficiencies gained as a result of favorable weather within a calendar month, where the number of days of normally anticipated adverse weather are fewer than expected.
- B. Any submission, coupled with subsequent approval, of a CPS showing an early completion will have the effect of adding float to the project. This float shall be utilized as necessary and shall be recognized as

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outlined in Section 01310 Item 1.09 A. No compensation shall be due any contractor or HACP for failure of any party to meet the early end date. No time extensions will be granted nor delay damages paid unless a delay occurs which impacts the project's critical path, consumes all available float or contingency time, and extends the work beyond the contract completion date. If a CPS submitted shows early completion, but after analysis and review by the Contracting Officer the CPS is determined not to reflect a reasonable plan for performance, the CPS shall be rejected and returned to the contractor for revision and resubmission per the guidelines of this section.

1.17 DISTRIBUTION

- A. The General Contractor shall distribute all reviewed and approved CPS's to all project participants within one (1) working day of approval by the Contracting Officer.
- B. The General Contractor shall keep a copy of all approved (past and current) CPS's on the project site at all times.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by HACP.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

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6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
 1. Refer to Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor

intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

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

1. Use Microsoft Project, for Windows XP operating system.
2. Compatible with project Web site software.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

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

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

B. Contractors' Construction Schedule Updating: At two week intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Contractors' Demolition and Construction Phasing Occupant Disruption Schedule (DCPOD): At weekly intervals, update DCPOD to reflect actual construction occupant disruptive activities and durations of activities for the following week. Issue schedule one week before each regularly scheduled progress meeting to allow time for HACP Representative and On Site Manager to coordinate and approve. Close coordination with is required to mineralize disruption to occupants and Contractors' are not to proceed without approval.

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

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

END OF SECTION 013200

DOCUMENT 014000 - QUALITY REQUIREMENTS

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 administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, HACP, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect .
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople

of the corresponding generic name.

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

1.4 CONFLICTING REQUIREMENTS

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

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and

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- inspecting.
- 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
- 12. Name and signature of laboratory inspector.
- 13. Recommendations on retesting and reinspecting.

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

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.8 QUALITY CONTROL

1. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections are the Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by HACP, unless agreed to in writing by HACP.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are

- conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

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

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

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to HACP, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used) PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

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

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

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

3.2 REPAIR AND PROTECTION

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

1. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

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

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

END OF SECTION 014000

DOCUMENT 015000 - TEMPORARY FACILITIES AND CONTROLS

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 PROJECT CONDITIONS

- A. This Section is not intended to limit types and amounts of temporary construction facilities and controls required. Omission from this Section will not be accepted as an application that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.
- B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.
- C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.
- D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.
- E. The building will be occupied during construction. Provide temporary barriers to restrict access to the area(s) of construction for the health, safety and welfare of the Occupants and other members of the Public, to only those individuals that need for access to the area to complete the Work. Temporary barriers shall be required to coordinate with the Demolition and Construction Phasing Schedule, provided by the General Prime Contractor, updated on a weekly basis and as approved by HACP. Access to individual apartment units on a daily basis is required. Maintain means of egress at all times.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Provide and maintain all temporary facilities off-site in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.
- B. Be responsible for all temporary work provided and obtain any necessary permits and inspections for such work.
- C. Confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances, conditions stated in permits and directions of the Construction Manager/HACP's Representative.
- D. Do not interfere with normal use of roads in vicinity of project site, except as absolutely necessary to execute required work, and then only after proper arrangements have been made with authorities having jurisdiction, including permits, approvals and temporary traffic control as applicable.

1.4 TEMPORARY FIELD OFFICES AND TRAILERS

- A. Each Prime Contractor to provide an off-site construction trailer for field office.
- B. Locate trailer in close proximity to site and as approved by HACP.

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- C. Copies of permits, approved submittals, plans and specifications marked up-to-date with all revisions and all addenda shall be kept at said offices ready for use at all times.
- D. All expenses in connection with Contractor's field offices shall be borne by the Contractor, including utility installation costs to the field office.

1.4 TEMPORARY SANITARY FACILITIES

- A. No facilities are available on site. Provide temporary portable toilets, acceptable to public health authorities, as required to service the project. Maintain in a clean, sanitary condition; provide all supplies. Locate as directed by Construction Manager/HACP's Representative within secure construction area.

1.5 TEMPORARY LIGHT AND POWER

- B. Extend temporary service from public utility service. Provide meter and extend service with disconnect to central location on site. Provide system sized as required to service project construction needs.
- C. Remove temporary service when no longer required.
- D. Electrical work for construction purposes shall conform to Federal, State and local safety requirements, as well as requirements of the National Electrical Code. Obtain and pay for required applications, permits and inspections pertaining to this work.
- E. Pay all costs for installation, maintenance, supervision and removal of temporary light and power systems.
- F. Temporary use of on-site electrical power for construction shall be made available for use.

1.6 CONSTRUCTION AIDS

- A. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.
- B. Barriers: Provide protective barriers and fencing as required to protect the public from demolition operations, including demolition preparation work, and construction activities for the duration of the Work.
 - 1. Provide and maintain OSHA approved barriers where required by OSHA.
- C. First Aid Facilities: Provide a minimum of one (1) 16-unit first-aid kit (or equivalent) for each 25 persons (or fraction thereof) on the worksite.

1.7 WATCHMAN SERVICE

- A. If Contractor considers watchman services necessary or desirable for protection of their own interest, such services may be employed at their own complete expense.

1.8 SAFETY

- A. Safety requirements shall be in accordance with the General Conditions.
- B. Provide and maintain guard lights at all barricades, railings, obstructions in the roadways or sidewalks.
- C. Strict attention and full adherence must be given the Williams-Steiger Occupational Safety and Health Act of 1970, U.S. Department of Labor.

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1.9 TEMPORARY SIGNS

- A. Temporary Signs: Provide as required to adequately direct traffic, personnel and the public regarding the project.

1.10 STREETS AND TRAFFIC

A. Cleaning and Repair

1. Contractors shall remove mud and spillage from public walks, streets and sewers without delay. Failure to clean areas promptly will result in areas being cleaned by HACP at the responsible Contractor's expense.
2. Damage to roads or other facilities on the grounds, resulting from hauling, storage of materials, or other activities in connection with the work shall be repaired or replaced, at no expense to HACP, by the Contractor causing the damage. Repairs or replacements shall be made to the satisfaction of the Construction Manager/HACP's Representative and the Architect.

B. Traffic

1. Notify City of Pittsburgh Police Department at least two weeks in advance of any anticipated work affecting traffic flow.
 - a. To assure maintenance of flow and to safeguard all parties involved in planning to maintain flow, a field inspection should be made jointly by the Construction Manager/HACP's Representative, the Architect and Contractor personnel before performing any work which would interrupt normal traffic patterns.
 - b. Re-routing of traffic shall be planned, as to route and direction, in cooperation with the City of Pittsburgh Police Department.

1.11 PARKING

- A. There are no on-site or assigned parking for employees of Contractors and subcontractors. Parking on streets or in restricted areas is prohibited. Specific parking plans will be discussed at the Pre-Construction Meeting.

1.12 USE CHARGES

- A. General: Shall be as dictated by the General Conditions for Construction Contracts – Public Housing Programs and agreed upon between HACP and each Prime Contractor.

1.13 INFORMATIONAL SUBMITTALS

- A. Off-Site Plans: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire- prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

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3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

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

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

1.14 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized- steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.
- D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- E. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- G. Paint: Comply with requirements in Division 9 painting Sections.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

- A. Water Service: Use of HACP's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to HACP. At Substantial Completion, restore these facilities to condition existing before initial use.
 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 1. At all times during demolition and construction, Occupied Apartments are required to maintain a temperature as determined by HACP.
 2. All occupied apartments, offices and occupied areas are required by the end of the work day to be airtight, watertight, secure and able to be occupied at standard typical room temperatures of 72 degrees.
- D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air- filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices
 3. Contractors are required to continuously clean floor areas to keep areas not under demolition and construction clean.
 4. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

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1. Connect temporary service to HACP's existing power source, as directed by HACP.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

3.2 SUPPORT FACILITIES INSTALLATION

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of HACP's existing parking areas for construction personnel.

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

E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

F. Existing Elevator Use: Use of HACP's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to HACP. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

G. Existing Stair Usage: Use of HACP's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to HACP. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

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

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- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 2. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Tree and Plant Protection: Provide measures to prevent damage to existing tree and plants.
- E. Site Enclosure Fence: Before demolition and construction operations begin, furnish and install work area enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire portion determined sufficient to accommodate construction operations and public access to the tenant occupied areas.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to HACP.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by HACP and Residents from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 3-mil polyethylene sheet on each side. Cover floor with two layers of 3-mil polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood. This shall occur in the existing lobbies where adjacent to the units under construction.
 - 3. Insulate partitions to control noise transmission to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Provide walk-off mats at each entrance through temporary partition.
- K. Existing exterior wall mural:

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1. Protect temporary protection for existing exterior wall mural during cleaning of building and demolition and construction with materials and methods as required.

L. Temporary Fire Protection: Maintain existing fire-protection systems.

1. Smoking is prohibited on site and within construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.4 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Keep deck openings covered or dammed.

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

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

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

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

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1. Materials and facilities that constitute temporary facilities are property of Contractor. HACP reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

DOCUMENT 016000 - LOCKOUT TAG OUT INFORMATION

BY STANDARD NUMBER 1910.147 - THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT).

Part Number: 1910
Part Number Title: Occupational Safety and Health Standards
Subpart: 1910 Subpart J
Subpart Title: General Environmental Controls
Standard Number: 1910.147
Title: The control of hazardous energy (lockout/tagout).
Appendix: A
GPO Source: e-CFR

PART ONE - SCOPE, APPLICATION, AND PURPOSE

1.1 SCOPE

- A. This standard covers the servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy, could harm employees. This standard establishes minimum performance requirements for the control of such hazardous energy.
- B. This standard does not cover the following:
 - 1. Construction and agriculture employment;
 - 2. Employment covered by parts 1915, 1917, and 1918 of this title;
 - 3. Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering;
 - 4. Exposure to electrical hazards from work on, near, or with conductors or equipment in electric-utilization installations, which is covered by subpart S of this part; and
 - 5. Oil and gas well drilling and servicing.

1.2 APPLICATION

- A. This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.
- B. Normal production operations are not covered by this standard (See Subpart O of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:
 - 1. An employee is required to remove or bypass a guard or other safety device; or
 - 2. An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Note: Exception-Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).

- C. This standard does not apply to the following:
 - 1. Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the

- employee performing the servicing or maintenance.
2. Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that-
- i. continuity of service is essential;
 - ii. shutdown of the system is impractical; and
 - iii. documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

1.3 PURPOSE

- A. This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start up or release of stored energy in order to prevent injury to employees.
- B. When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

1.4 DEFINITIONS APPLICABLE TO THIS SECTION

- A. Affected Employee: An employee whose job requires him/her to operate or use a machine or equipment on which servicing, or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.
- B. Authorized Employee: A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.
- C. Capable of Being Locked Out: An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.
- D. Energized: Connected to an energy source or containing residual or stored energy.
- E. Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.
- F. Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- G. Hot Tap: A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.
- H. Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled

cannot be operated until the lockout device is removed.

- I. Lockout Device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.
- J. Normal Production Operations: The utilization of a machine or equipment to perform its intended production function.
- K. Servicing and/or Maintenance : Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.
- L. Setting Up: Any work performed to prepare a machine or equipment to perform its normal production operation.
- M. Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.
- N. Tagout Device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

PART 2 - GENERAL

2.1 ENERGY CONTROL PROGRAM.

- A. The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

2.2 LOCKOUT/TAGOUT

- A. If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.
- B. If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.
- C. After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

2.3 FULL EMPLOYEE PROTECTION.

- A. When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that

obtained by using a lockout program.

- B. In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energization.

2.4 ENERGY CONTROL PROCEDURE.

- A. Procedures shall be developed, documented, and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Note: Exception: The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist:

- 1. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut-down which could endanger employees.
 - 2. The machine or equipment has a single energy source which can be readily identified and isolated.
 - 3. The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment.
 - 4. The machine or equipment is isolated from that energy source and locked out during servicing or maintenance.
 - 5. A single lockout device will achieve a locked-out condition.
 - 6. The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance.
 - 7. The servicing or maintenance does not create hazards for other employees; and
 - 8. The employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.
- B. The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:
 - 1. A specific statement of the intended use of the procedure.
 - 2. Specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy.
 - 3. Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and
 - 4. Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

2.5 PROTECTIVE MATERIALS AND HARDWARE.

- A. Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.
- B. Lockout devices and tagout devices shall be singularly identified; shall be the only devices(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:
 - 1. Durable

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- i. Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
- ii. Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
- iii. Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

2. Standardized.

- i. Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

3. Substantial

- i. Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
- ii. Tagout devices. Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

4. Identifiable.

- i. Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).
- ii. Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.

C. Periodic inspection.

- 1. The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.
 - i. The periodic inspection shall be performed by an authorized employee other than the ones(s) utilizing the energy control procedure being inspected.
 - ii. The periodic inspection shall be conducted to correct any deviations or inadequacies identified.
 - iii. Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.
 - iv. Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.
 - v. The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

D. Training and communication.

1. The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:
 - i. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
 - ii. Each affected employee shall be instructed in the purpose and use of the energy control procedure.
 - iii. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.
2. When tagout systems are used, employees shall also be trained in the following limitations of tags:
 - i. Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.
 - ii. When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.
 - iii. Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
 - iv. Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
 - v. Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
 - vi. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.
3. Employee retraining.
 - i. Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.
 - ii. Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.
 - iii. The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.
4. The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

E. Energy isolation. Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance.

F. Notification of employees. Affected employees shall be notified by the employer or authorized employee of

the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

- G. Application of control. The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:
1. Preparation for shutdown. Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.
 2. Machine or equipment shutdown. The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
 3. Machine or equipment isolation. All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).
- H. Lockout or tagout device application.
1. Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.
 2. Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position.
 3. Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.
 - i. Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached
 - ii. Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.
- I. Stored energy.
1. Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.
 2. If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.
- J. Verification of isolation. Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.
- K. Release from lockout or tagout. Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:
1. The machine or equipment. The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

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L. Employees

1. The work area shall be checked to ensure that all employees have been safely positioned or removed.
2. After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

M. Lockout or tagout devices removal. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3): When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented, and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

1. Verification by the employer that the authorized employee who applied the device is not at the facility
2. Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
3. Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

N. Additional requirements.

1. Testing or positioning of machines, equipment or components thereof. In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:
 - i. Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;
 - ii. Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;
 - iii. Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;
 - iv. Energize and proceed with testing or positioning;
 - v. Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.
 - vi. Outside personnel (contractors, etc.).
 - a. Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.
 - b. The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

O. Group lockout or tagout.

1. When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.
2. Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

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- i. Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);
 - ii. Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment and
 - iii. When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and
 - iv. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.
- P. Shift or personnel changes. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy.

Note: The following appendix to §1910.147 services as a non-mandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the appendix adds to or detracts from any of the requirements of this section.

[54 FR 36687, Sept. 1, 1989, as amended at 54 FR 42498, Oct. 17, 1989; 55 FR 38685, 38686, Sept. 20, 1990; 61 FR 5507, Feb. 13, 1996; 76 24698, May 2, 2011]

END OF DOCUMENT 1910.147

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B.
- C. Existing drawings that include information on existing conditions including previous construction at Project site are available for viewing at the office of Architect.
- D. Existing specifications and submittals that include information on existing conditions including previous construction at Project site are available for viewing at the office of Architect.
- E. Survey information that includes information on existing conditions, prepared by Fukui Architects PC, dated, is available for viewing at the office of Architect as part of Drawings.
- F. Photographic report of existing conditions that includes photographic documentation on existing conditions, prepared by Fukui Architects PC, dated, is available at the office of Architect.
- G. Inspection Reports by Allies and Ross Management and Development Corporation are available for viewing at the office of Architect.
- H. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.
 - 3. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003119

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by Allegheny Global Environmental Inc., dated, is available for viewing at the office of HACP.
- C. An existing lead report for Project, prepared by Allegheny Global Environmental Inc., dated, is available for viewing at the office of HACP.
- D. An existing PCB (Polychlorinate Biphenyl) information report for Project, prepared by Allegheny Global Environmental Inc., dated, is available for viewing at the office of HACP.
- E. An existing mold report for Project, prepared by Allegheny Global Environmental Inc., dated, is available for viewing at the office of HACP.
- F. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 003119 "Existing Condition Information" for information about existing conditions that is made available to bidders.
 - 3. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003126

DOCUMENT 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. See Supplementary Document "HACP Manchester Scattered Site - Unit Price Schedule".

END OF SECTION 012200

HACP MANCHESTER SCATTERED SITES - UNIT PRICE SCHEDULE			
ITEM	SCOPE	UNIT	UNIT PRICE
Floor, Ceiling, and Wall Finishes			
Flooring at all floors (bathrooms, kitchens, hallways included)	<i>Demo</i>	SF	
	<i>Replace, Economy Grade</i>	SF	
Wall Paint	<i>2 Coats</i>	SF	
Ceiling Trim where applicable	<i>Demo</i>	LF	
	<i>Replace, Paint Grade Pine</i>	LF	
Wall Rubber Base at bathrooms only	<i>Demo</i>	LF	
	<i>Replace, Economy Grade</i>	LF	
Wall Base excluding Bathrooms and Closets	<i>Demo</i>	LF	
	<i>Replace, 1-1/2" Pine</i>	LF	
Window, Door Paint Finishes			
Window Frame & Trim Paint (5ft high / 3ft wide avg.)	<i>2 Coats</i>	EA	
Door Frame & Trim Paint (7 ft high x 3 ft wide door avg.)	<i>2 Coats</i>	EA	
Door Casing Material & Profile	<i>Replace, Standard Paint Grade</i>	EA	
Exterior Doors			
Type I Entry: Front Door	<i>Replace, Standard Grade</i>	EA	
Type I Entry: Storm Door	<i>Replace, Metal, Economy Grade</i>	EA	
Type II Entry: Rear 6' or 8' Sliding door	<i>Replace, Anodized Alum. Double Glazed</i>	EA (6 OR 8)	
Type I Entry: Historic Front Door	<i>Repair and Finish or Replace</i>	EA	
Type II Entry: Historic Rear Door	<i>Repair and Finish or Replace</i>	EA	
Interior Doors - with type			
Type III Privacy	<i>Replace, Hardboard Embossed</i>	EA	
Type III Passage//Dummy - closets	<i>Replace, Hardboard Embossed</i>		
		EA	
Type IV Folding - closets	<i>Replace, Hardboard Embossed</i>	EA	
Type VI Sliding Doors - closets	<i>Replace, Hardboard Embossed</i>	EA	
Type III 1315 Liverpool and 1100 Sheffield only unit entry doors	<i>Demo</i>	EA	
	<i>Replace, Hardboard Embossed</i>	EA	
Type V unit entry doors with glass	<i>Replace, Hardboard Embossed</i>		
		EA	
Type VII 1315 Liverpool and 1100 Sheffield only			
Hollow Metal Core Doors - Interior	<i>Replace, Hardboard Embossed</i>	EA	

Door Hardware and Accessories			
Type II Exterior Rear Sliding Door Hardware/Locks	Replace, Standard Grade	EA	
Type I Exterior Front Door Hardware	Replace, Standard Grade	EA	
Type III Door Locks	Replace, Standard Grade	EA	
Type II Type III Door stops at Interior Passage and Privacy Doors	Demo	EA	
	Replace, Ridid Baseboard	EA	
Windows			
Basement Glass Block	Demo	SF	
	Replace	SF	
Basement Hopper	Demo	EA	
	Replace	EA	
Double-Hung (Provide Unit Size Assumption with Price)	Demo	EA	
	Replace	EA	
Historic Window (Provide Unit Size Assumption with Price)	Repair and Finish or Replace	EA	
Historic Finish	Repair and Finish or Replace	EA	
1315 Liverpool and 1100 Sheffield only	Demo	EA	
	Replace	EA	
Double Hung Window Accessories			
Insect Screens (Provide Unit Size Assumption with Price)	Replace	EA	
Blinds (Provide Unit Size Assumption with Price)		EA	
Equipment			
EQ-01: Washer	Demo	EA	
	Replace, Economy Grade	EA	
EQ-02-Electric: Dryer	Demo	EA	
	Replace, Economy Grade	EA	
EQ-02-Gas: Dryer	Demo	EA	
	Replace, Economy Grade	EA	
EQ-03-Electric: Stove/Oven Electric	Demo	EA	
	Replace, Standard Grade	EA	
EQ-03-Gas: Stove/Oven Gas	Demo	EA	
	Replace, Standard Grade	EA	
EQ-04: Refrigerator	Demo	EA	
	Replace, Economy Grade	EA	
EQ-05: Dishwasher	Demo	EA	
	Replace, Economy Grade	EA	

Plumbing Fixtures/Faucets			
NSF Kitchen Faucet	<i>Replace, Economy Grade</i>	EA	
NSF Bathroom Faucet	<i>Replace, Economy Grade</i>	EA	
Kitchen Faucet	<i>Replace, Economy Grade</i>	EA	
Bathroom Faucet	<i>Replace, Economy Grade</i>	EA	
Laundry Sink Faucet	<i>Replace, Economy Grade</i>	EA	
Bathtub with Shower Faucet	<i>Replace, Economy Grade</i>	EA	
Kitchen Sink, Double Bowl	<i>Replace, Stainless Double Bowl</i>	EA	
Kitchen Sink, Single Bowl	<i>Replace, Stainless Single Bowl</i>	EA	
Laundry Sink Single	<i>Replace, Plastic Sink</i>	EA	
Laundry Sink Double	<i>Replace, Plastic Sink</i>	EA	
Pedestal Sink	<i>Replace, Economy Grade</i>	EA	
Wall Hung Bathroom Sink	<i>Replace, Economy Grade</i>	EA	
Tub/Shower Combo	<i>Replace, Standard Grade</i>	EA	
ADA Shower	<i>Replace, Standard Grade</i>	EA	
ADA Sink	<i>Replace, Standard Grade</i>	EA	
Corner Shower with fiberglass panels on walls	<i>Replace, Corner Entry, Standard Grade</i>	EA	
Glass Shower with fiberglass panels on walls	<i>Replace, Standard Grade</i>	EA	
Toilet	<i>Replace, Economy Grade</i>	EA	
ADA Toilet	<i>Replace, Economy Grade</i>	EA	
Bathroom Hardware/Accessories			
Mirror	<i>Replace, Beveled Glass</i>	EA	
Surface Mounted Medicine Cabinet	<i>Replace, Economy Grade</i>	EA	
Towel Holder/Bar :	<i>Replace, Economy Grade</i>	EA	
Toilet Paper Holder	<i>Replace, Economy Grade</i>	EA	
Towel Ring	<i>Replace, Economy Grade</i>	EA	
Soap Holder	<i>Replace, Economy Grade</i>	EA	

Kitchen Cabinets			
Plastic Laminate Countertop	<i>Replace, Post-Formed</i>	LF	
Upper Cabinets	<i>Replace, Economy Grade</i>	LF	
Lower Cabinets	<i>Replace, Economy Grade</i>	LF	
FullHeight Cabinets	<i>Replace, Economy Grade</i>	LF	
Lighting			
A: Exterior Surface Mounted	<i>Replace, Economy Grade</i>	EA	
New Installation : Recessed Light	<i>Replace, Standard Grade</i>	EA	
B: Short Bathroom Light Bar - Replacement : Vanity Light	<i>Replace, Standard Grade</i>	EA	
C: Long Bathroom Light Bar - Replacement : Long Vanity Light	<i>Replace, Standard Grade</i>	EA	
D: Bowl-Shade Light Fixture	<i>Replace, Economy Grade</i>	EA	
E: Exterior Wall Mounted	<i>Replace, Economy Grade</i>	EA	
F: Diningroom Ceiling Fan With Lights	<i>Replace, Economy Grade</i>	EA	
G: Bedroom Ceiling Fan	<i>Replace, Economy Grade</i>	EA	
H: LED Ceiling Hung Long Light	<i>Replace, Economy Grade</i>	EA	
I: Hung Pendant Light	<i>Replace, Economy Grade</i>	EA	
J: Surface Mounted Strip Light, with trim and diffuser	<i>Replace, Economy Grade</i>	EA	
K: Chandelier	<i>Replace, Economy Grade</i>	EA	

Electrical / Data			
Electrical Switches	Replace, Touch Dimmer Switch	EA	
Power Outlets	Replace, Standard Grade	EA	
Power Outlets GFCI	Replace, GFCI Outlet	EA	
Door Bells	Replace, Economy Grade	EA	
Thermostats	Replace	EA	
Smoke Detector/Alarm	Replace, Battery Operated	EA	
Smoke/CO2 Detector/Alarm	Replace, Battery Operated	EA	
Bathroom Ceiling Mounted Exhaust Fan	Replace, Standard Grade	EA	
Kitchen Diffuser / Register / Grille	Replace, Standard Grade	EA	
Exterior - Non-Historic Buildings			
Roof Asphalt Shingles	Demo	SF	
	Replace, 20 yrs	SF	
Address Numbers - per property		EA	
Exterior Deck Stair with Railing - per step	Replace, Synthetic Wood	LF	
Exterior Deck Railing (excluding stairs)	Replace, Synthetic Wood	LF	
Exterior 2"x6" Treated Exterior Wood Decking (excluding stairs)	Replace, Synthetic Wood	SF	
Wood Fence (avg. 200lf per property)	Demo		
	6' Treated Pine Board on Board	SF	
Wood Gate	Demo		
	6' Treated Pine with Hardware	SF	
Iron Railings (avg. 10lf per property)	Demo	LF	
	Replace	LF	
Trim / Facia (verify existing dimenstions)	Demo	LF	
	Replace, Vinyl	LF	
Soffit Material (avg. 40lf per property)	Demo	SF	
	Replace, Vinyl	SF	
Gutters (avg. 40lf per property)	Demo	LF	
	Replace, Aluminum	LF	
Downspouts (avg. 2 per property)	Demo	LF	
	Replace,Aluminum	LF	

Miscellaneous			
Hose Bibb	<i>Replace</i>	EA	
Stair Handrail	<i>Demo</i>	LF	
	<i>Replace, Paint-grade Pine</i>	LF	
Hand rail Bracket	<i>Replace, Standard Grade</i>	EA	
Stair Tread PER TREAD	<i>Replace Covered Treads and Risers</i>	EA	
Closet Rod	<i>Replace</i>	EA	
Closet Shelves	<i>Replace</i>	LF	
Tenant Storage Lockers	<i>Standard Grade</i>	EA	
<i>Multi-family mail box</i>		EA	

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1.3 INFORMATIONAL SUBMITTALS

- A. Schedule of selective demolition activities with starting and ending dates for each activity.

1.4 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before selective demolition, Owner will remove the following items:
 - a. All personal items of the tenants will have been previously removed.
 - b. Any incidental personal items belonging to tenants, shall be brought to the notification of HACP representative for removal.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.
- F. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

3.3 PROTECTION

- A. Remove temporary barricades and protections where hazards no longer exist.

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3.4 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 5. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

3.5 CLEANING

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent patching.
2. Floor joint repair.
3. Epoxy crack injection.
4. Corrosion-inhibiting treatment.
5. Polymer sealers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

2.2 BONDING AGENTS

- A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. ARDEX Americas.
 - b. Dayton Superior.
 - c. Kaufman Products, Inc.
 - d. MAPEI Corporation.
 - e. Master Builders Solutions.
 - f. Sika Corporation.
 - g. SpecChem, LLC.
 - h. Sto Corp.

- B. Epoxy Bonding Agent: ASTM C881/C881M, bonding system and free of VOCs.

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 or approved equal:
 - a. Abatron, Inc.
 - b. ChemCo Systems.
 - c. Dayton Superior.
 - d. Euclid Chemical Company (The); an RPM company.
 - e. Kaufman Products, Inc.

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- f. MAPEI Corporation.
 - g. Master Builders Solutions.
 - h. Sika Corporation.
 - i. Sto Corp.
 - j. US SPEC, Division of US MIX Company.
- C. Latex Bonding Agent, Redispersible: ASTM C1059/C1059M, Type I for use at nonstructural and interior locations unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. AWRC Corporation.
 - b. Dayton Superior.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. Kaufman Products, Inc.
 - e. US SPEC, Division of US MIX Company.
 - f. W.R. Meadows, Inc.
- D. Latex Bonding Agent, Non-Redispersible: ASTM C1059/C1059M, Type II for use at structural and exterior locations and where indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. AWRC Corporation.
 - b. ChemMasters, Inc.
 - c. Dayton Superior.
 - d. Euclid Chemical Company (The); an RPM company.
 - e. Kaufman Products, Inc.
 - f. MAPEI Corporation.
 - g. US SPEC, Division of US MIX Company.
 - h. W.R. Meadows, Inc.

2.3 PATCHING MORTAR

- A. Patching Mortar Requirements:
 - 1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
 - 2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar where indicated that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.
 - 3. Coarse Aggregate for Patching Mortar: ASTM C33/C33M, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.
- B. Polymer-Modified, Cementitious Patching Mortar where indicated: Packaged, dry mix for repair of concrete and that contains a latex additive as either a dry powder or a separate liquid that is added during mixing.
 - 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 or approved equal:

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- a. AQUAFIN, Inc.
- b. ARDEX Americas.
- c. AWRC Corporation.
- d. CGM, Incorporated.
- e. ChemMasters, Inc.
- f. Cortec Corporation.
- g. Dayton Superior.
- h. Euclid Chemical Company (The); an RPM company.
- i. Kaufman Products, Inc.
- j. MAPEI Corporation.
- k. Master Builders Solutions.
- l. Schönox; HPS North America, Inc.
- m. Sika Corporation.
- n. Simpson Strong-Tie Co., Inc.
- o. Sto Corp.
- p. US SPEC, Division of US MIX Company.
- q. W.R. Meadows, Inc.

2.4 JOINT FILLER

- A. Polyurea Joint Filler: Two-component, semirigid, 100 percent solids, polyurea resin with a Type A Shore durometer hardness of at least 80 according to ASTM D2240.
 - 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 or approved equal:
 - a. ARDEX Americas.
 - b. ASTC Polymers.
 - c. ChemCo Systems.
 - d. Euclid Chemical Company (The); an RPM company.
 - e. Kaufman Products, Inc.
 - f. Master Builders Solutions.
 - g. Metzger/McGuire.
 - h. SpecChem, LLC.
 - i. US SPEC, Division of US MIX Company.
- B. Color: Matching existing joint filler.

2.5 EPOXY CRACK-INJECTION MATERIALS

- A. Epoxy Crack-Injection Adhesive: ASTM C881/C881M, bonding system Type IV at structural locations and where indicated, Type I at other locations; free of VOCs.
 - 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 or approved equal:
 - a. Abatron, Inc.
 - b. ChemCo Systems.
 - c. Dayton Superior.
 - d. Euclid Chemical Company (The); an RPM company.
 - e. Fyfe Co. LLC.
 - f. Kaufman Products, Inc.
 - g. MAPEI Corporation.

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- h. Master Builders Solutions.
 - i. Sika Corporation.
 - j. Sto Corp.
 - k. US SPEC, Division of US MIX Company.
 - l. W.R. Meadows, Inc.
- 2. Capping Adhesive: Product manufactured for use with crack-injection adhesive by same manufacturer.

2.6 POLYMER-SEALER MATERIALS

- A. Epoxy Polymer Sealer: Low-viscosity epoxy, penetrating sealer and crack filler recommended by manufacturer for penetrating and sealing cracks in exterior concrete traffic surfaces; free of VOCs.
 - 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 or approved equal:
 - a. ChemCo Systems.
 - b. Dayton Superior.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. Master Builders Solutions.
 - e. Sika Corporation.
 - 2. Color: match existing material.

2.7 MISCELLANEOUS MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I, II, or III unless otherwise indicated.
- B. Water: Potable.

2.8 MIXES

- A. General: Mix products, in clean containers, according to manufacturer's written instructions.
- B. Dry-Pack Mortar: Mix required type(s) of patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

PART 3 - EXECUTION

3.1 CONCRETE MAINTENANCE

- A. Have concrete-maintenance work performed only by qualified concrete-maintenance specialist.
- B. Comply with manufacturers' written instructions for surface preparation and product application.

3.2 EXAMINATION

- A. Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.

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- B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.
- C. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.3 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
- B. Protect persons, motor vehicles, surrounding surfaces of building being repaired, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.
 - 1. Comply with each product manufacturer's written instructions for protections and precautions.
 - 2. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
 - 3. Protect floors and other surfaces along haul routes from damage, wear, and staining.
 - 4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
- C. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
 - 1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- D. Preparation for Concrete Removal: Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.
 - 1. Verify that affected utilities have been disconnected and capped.
- E. Preparation of Floor Joints for Repair: Saw-cut joints full width to edges and depth of spalls, but not less than 1 inch deep. Clean out debris and loose concrete; vacuum or blow clear with compressed air.

3.4 REMOVAL OF CONCRETE

- A. Do not overload structural elements with debris.
- B. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
- C. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
- D. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.

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- E. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least 3/4-inch clearance around bar.
- F. Test areas where concrete has been removed by tapping with hammer and remove additional concrete until unsound and disbonded concrete is completely removed.
- G. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.
- H. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.5 APPLICATION OF BONDING AGENT

- A. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar.
- B. Latex Bonding Agent, Type II: Mix with portland cement and scrub into concrete surface. Place patching mortar while bonding agent is still wet. If bonding agent dries, recoat before placing patching mortar.
- C. Slurry Coat for Cementitious Patching Mortar: Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar mixed with latex bonding agent into substrate, filling pores and voids.

3.6 INSTALLATION OF PATCHING MORTAR

- A. Place patching mortar as specified in this article unless otherwise recommended in writing by manufacturer or where dry-pack mortar is indicated.
 - 1. Provide forms where necessary to confine patch to required shape.
 - 2. Wet substrate and forms thoroughly and then remove standing water.
- B. Pretreatment: Apply specified bonding agent and slurry coat.
- C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
- D. Vertical Patching: Place material in lifts of not more than thickness recommended by manufacturer. Do not feather edge.
- E. Overhead Patching: Place material in lifts of not more than thickness recommended by manufacturer. Do not feather edge.
- F. Consolidation: After each lift is placed, consolidate material and screed surface.
- G. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

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- H. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.
- I. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.7 INSTALLATION OF DRY-PACK-MORTAR

- A. Use dry-pack mortar for deep cavities and where indicated. Place as specified in this article unless otherwise recommended in writing by manufacturer.
 - 1. Provide forms where necessary to confine patch to required shape.
 - 2. Wet substrate and forms thoroughly and then remove standing water.
- B. Pretreatment: Apply specified bonding agent bonding agent and slurry coat.
- C. Place dry-pack mortar into cavity by hand and compact tightly into place. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.
- D. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete.
- E. Wet-cure patch for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.8 FLOOR-JOINT REPAIR

- A. Cut out deteriorated concrete and reconstruct sides of joint with patching mortar as indicated on Drawings. Install joint filler in nonmoving floor joints where indicated and as specified in this article.
- B. Depth: Install joint filler to a depth of at least 1 inch. Use fine silica sand no more than 1/4 inch deep to close base of joint. Do not use sealant backer rods or compressible fillers below joint filler.
- C. Top Surface: Install joint filler so that when cured, it is flush at top surface of adjacent concrete. If necessary, overfill joint and remove excess when filler has cured.

3.9 EPOXY CRACK INJECTION

- A. Clean cracks with oil-free compressed air or low-pressure water to remove loose particles.
- B. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond.
- C. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.
- D. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.

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- E. Inject cracks wider than 0.003 inch to a depth of 8 inches.
- F. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.
- G. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.10 APPLICATION OF CORROSION-INHIBITING-TREATMENT

- A. Apply corrosion-inhibiting treatment to surfaces indicated on Drawings, from wall-to-wall or curb-to-curb and from joint-to-joint in the perpendicular direction.
- B. Apply by brush, roller, or airless spray in two coats at manufacturer's recommended application rate. Remove film of excess treatment before patching treated concrete or applying a sealer.

3.11 APPLICATION OF POLYMER SEALER

- A. Apply polymer sealer by brush, roller, or airless spray at manufacturer's recommended application rate.
- B. Apply to traffic-bearing surfaces, including parking areas and walks.

END OF SECTION 030130

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SECTION 040110 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cleaning the following:

1. Unit masonry surfaces.
2. Stone surfaces.

1.2 DEFINITIONS

- A. Medium-Pressure Spray: 400 to 800 psi ; 4 to 6 gpm .

1.3 ACTION SUBMITTALS

1.4 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Water: Potable.
- B. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

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3.2 CLEANING MASONRY, GENERAL

- A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.
- B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- C. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.
 - a. Equip units with pressure gages.
 - b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
- E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.
- F. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6 inches from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

3.3 CLEANING MASONRY

- A. Mold, Mildew, and Algae Removal:
 - 1. Wet surface with cold water applied by low-pressure spray.
 - 2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
 - 3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used, and that surface remains wet.
 - 4. Rinse with cold water applied by medium -pressure spray to remove mold, mildew, and algae remover and soil.

END OF SECTION 040110

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SECTION 040120.63 - BRICK MASONRY REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes repairing brick masonry.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Face Brick: As required to complete brick masonry repair work.
 - 1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork.
 - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
 - 2. Special Shapes:
 - a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
 - b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
 - c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.
- B. Building Brick: ASTM C 62, Grade SW where in contact with earth or Grade SW, MW, or NW for concealed backup; and of same vertical dimension as face brick, for masonry work concealed from view.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; to match existing where required for color matching of mortar.

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1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
 - B. Hydrated Lime: ASTM C 207, Type S.
 - C. Masonry Cement: ASTM C 91/C 91M.
 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 or approved equal:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Hanson Brick and Tile; Lehigh Hanson.
 - d. Holcim (US) Inc.
 - e. Lafarge North America Inc.
 - f. QUIKRETE.
 - D. Mortar Cement : ASTM C 1329/C 1329M.
 1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated in the Work include that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Lafarge North America Inc.
 - E. Mortar Sand: ASTM C 144.
 1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
 - F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
 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 or approved equal:
 - a. Davis Colors.
 - b. LANXESS Corporation.
 - c. Solomon Colors Inc.
 - G. Water: Potable.
- 2.3 MANUFACTURED REPAIR MATERIALS
- 2.4 ACCESSORY MATERIALS
- A. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 1. Previous effectiveness in performing the work involved.
 2. Minimal possibility of damaging exposed surfaces.
 3. Consistency of each application.

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4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.5 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 1. Rebuilding (Setting) Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime masonry cement or mortar cement.
 2. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Remove gutters and downspouts adjacent to masonry and store during masonry repair. Reinstall when repairs are complete.
 1. Provide temporary rain drainage during work to direct water away from building.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible.

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1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. Replace removed damaged brick with other removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.
- H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
1. Maintain joint width for replacement units to match existing joints.
 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated, but surface is dry when laid.
1. Rake out mortar used for laying brick before mortar sets according to Section 040120.64 "Brick Masonry Repointing." Point at same time as repointing of surrounding area.
 2. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.3 BRICK MASONRY PATCHING

- A. Patching Bricks:
1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.
 2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of brick.
 3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
 4. Rinse surface to be patched and leave damp, but without standing water.
 5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
 6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
 7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
 8. Keep each layer damp for 72 hours or until patching compound has set.

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3.4 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.

END OF SECTION 040120.63

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SECTION 040120.64 - BRICK MASONRY REPOINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes repointing joints with mortar.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Masonry Cement: ASTM C 91/C 91M.
 - 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 or approved equal:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Hanson Brick and Tile; Lehigh Hanson.
 - d. Holcim (US) Inc.
 - e. Lafarge North America Inc.
 - f. QUIKRETE.
- B. Mortar Cement : ASTM C 1329/C 1329M.
 - 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 or approved equal:
 - a. Lafarge North America Inc.
- C. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
 - 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 or approved equal:
 - a. Davis Colors.
 - b. LANXESS Corporation.
 - c. Solomon Colors Inc.

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- D. Water: Potable.

2.2 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to masonry cement or mortar cement. Add mortar pigments to produce mortar colors required to match existing.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Remove gutters and downspouts and associated hardware adjacent to masonry and store during masonry repointing. Reinstall when repointing is complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 REPOINTING

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints at locations of the following defects:
 - a. Holes and missing mortar.
 - b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
 - c. Cracks 1/8 inch or more in width and of any depth.
 - d. Hollow-sounding joints when tapped by metal object.
 - e. Eroded surfaces 1/4 inch or more deep.
 - f. Deterioration to point that mortar can be easily removed by hand, without tools.

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- g. Joints filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of not less than 1/2 inch and not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
 - 2. Remove mortar from brick and other masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 3. Do not spall edges of brick or other masonry units or widen joints. Replace or patch damaged brick or other masonry units as directed by Architect.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Pointing with Mortar:
 - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer and allow it to become thumbprint hard before applying next layer.
 - 3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to feather edge the mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.3 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.

END OF SECTION 040120.64

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SECTION 040140.61 - STONE REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes repairing stone masonry.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

1.6 QUALITY ASSURANCE

- A. Stone Repair Specialist Qualifications: Engage an experienced stone repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repair work.

PART 2 - PRODUCTS

2.1 STONE MATERIALS

- A. Stone Matching Existing: Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone.
 - 1. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range.
- B. Cutting New Stone: Cut each new stone so that, when it is set in final position, the rift or natural bedding planes will match the rift orientation of existing stones.

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2.2 MORTAR MATERIALS

A. Masonry Cement: ASTM C 91/C 91M.

1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Hanson Brick and Tile;Lehigh Hanson.
 - d. Holcim (US) Inc.
 - e. Lafarge North America Inc.
 - f. QUIKRETE.

B. Mortar Cement: ASTM C 1329/C 1329M.

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 or approved equal:
 - a. Lafarge North America Inc.

C. Cementitious Crack Filler: Ultrafine superplasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength to all types of stone.

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 or approved equal:
 - a. Edison Coatings, Inc.

D. Stone-to-Stone Adhesive: Two-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F , recommended in writing by adhesive manufacturer for type of stone repair indicated, and matching stone color.

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 or approved equal:
 - a. Akemi North America.
 - b. Bonstone Materials Corporation.
 - c. Edison Coatings, Inc.

2.3 ACCESSORY MATERIALS

A. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

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2.4 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Rebuilding (Setting) Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated, with cementitious material limited to masonry cement or mortar cement.
 - 2. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Remove gutters and downspouts and associated hardware adjacent to stone and store during stone repair. Reinstall when repairs are complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair. Carefully remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.
- B. Support and protect remaining stonework that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole stone units as possible.
 - 1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.

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- F. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.
- G. Replace removed damaged stone with other removed stone in good condition, where possible, matching existing stone, including direction of rift or natural bedding planes. Do not use broken units unless they can be cut to usable size.
- H. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.
 - 1. Maintain joint width for replacement stone to match existing joints.
- I. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting, and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors matching existing configuration.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
 - 2. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.3 PARTIAL STONE REPLACEMENT

- A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and removing defective material to depth required for fitting partial replacement (dutchman).
 - 1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
 - 2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
 - 3. If backing stone becomes damaged further, remove damaged area and enlarge partial replacement as required.
- B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.
- C. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch in width, and joints between partial replacement and other stones that match existing joints between stones.

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- D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, threaded stainless-steel pins set into 1/4-inch- diameter holes drilled into backing stone and into, but not through, the partial replacement.
- E. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.
- F. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use temporary shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.
- G. Clean adhesive residue from exposed surfaces and patch chipped areas as specified in "Stone Patching" Article.

3.4 STONE PLUG REPAIR

- A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.
- B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive.
- C. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.
- D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.
- E. Clean adhesive residue from exposed surfaces.

3.5 STONE-FRAGMENT REPAIR

- A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.
- B. Remove soil, loose particles, mortar, and other debris or foreign material from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.
- C. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch-diameter, threaded stainless-steel pins set into 1/4-inch- diameter holes drilled at a 45-degree downward angle through face of fragment and into parent stone.
- D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, threaded stainless-steel pins set into 1/4-inch- diameter holes drilled into parent stone and into, but not through, the fragment.
- E. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.
- F. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.

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- G. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes as specified in "Stone Patching" Article.

3.6 CRACK INJECTION

- A. General: Comply with cementitious crack-filler manufacturer's written instructions.
- B. Drill 1/4-inch- diameter injection holes as follows:
 - 1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
 - 2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
 - 3. Delaminations: Drill holes at approximately 18 inches o.c. both vertically and horizontally.
 - 4. Drill holes 2 inches deep.
- C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.
- D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.
- E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.
- F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.
- G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.7 STONE PATCHING

- A. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.
- B. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of stone unit.
- C. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
- D. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.
- E. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.

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1. Simple Details: Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
2. Carved Details: Build patch up 1/4 inch above surrounding stone, and carve surface to match adjoining stone after patching compound has hardened.

- F. Keep each layer damp for 72 hours or until patching compound has set.
- G. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.8 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
1. Do not use metal scrapers or brushes.
 2. Do not use acidic or alkaline cleaners.

END OF SECTION 040140.61

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SECTION 040140.62 - STONE REPOINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes repointing joints with mortar.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

1.5 QUALITY ASSURANCE

- A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Masonry Cement: ASTM C 91/C 91M.
 - 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 or approved equal:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Hanson Brick and Tile; Lehigh Hanson.
 - d. Holcim (US) Inc.
 - e. Lafarge North America Inc.
 - f. QUIKRETE.
- B. Mortar Cement: ASTM C 1329/C 1329M.
 - 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 or approved equal:

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a. Lafarge North America Inc.

C. Water: Potable.

2.2 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to masonry cement or mortar cement . Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

A. Remove gutters and downspouts and associated hardware adjacent to stone and store during stone repointing. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints at locations of the following defects:
 - a. Holes and missing mortar.
 - b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
 - c. Cracks 1/16 inch or more in width and of any depth.
 - d. Hollow-sounding joints when tapped by metal object.

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- e. Eroded surfaces 1/4 inch or more deep.
 - f. Deterioration to point that mortar can be easily removed by hand, without tools.
 - g. Joints filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of not less than 1/2 inch and not less than that required to expose sound, unweathered mortar . Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
 - 2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.
- E. Pointing with Mortar:
 - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
 - 3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch . Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to feather edge the mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.3 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners

END OF SECTION 040140.62

SECTION 040310 - HISTORIC MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment work consisting of cleaning historic clay brick and stone masonry surfaces.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by estimated quantities.
 - 2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.3 DEFINITIONS

- A. Very Low-Pressure Spray: Less than 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.
- D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and cleaning.
 - 2. Review methods and procedures related to cleaning historic masonry, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, and sequencing.
 - c. Quality-control program.
 - d. Fire-protection plan.
 - e. Cleaning program.
 - f. Coordination with building occupants.

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1.5 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform historic masonry cleaning work in the following sequence:
 - 1. Remove plant growth.
 - 2. Inspect masonry for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean masonry.
 - 5. Where water repellents or graffiti-resistant coatings are to be used on or near masonry work, delay application of these chemicals until after cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units in accordance with historic masonry repair Sections. Patch holes in mortar joints in accordance with historic masonry repointing Sections.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include material descriptions and application instructions.
 - 2. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For historic treatment specialists including field supervisors and workers and chemical-cleaner manufacturer.
- B. Quality-control program.
- C. Cleaning program.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry cleaning specialist. Experience cleaning new masonry work is insufficient experience for historic treatment work.
- B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry paint removers that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

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- E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, sequence, and equipment to be used; protection of surrounding materials; and control of runoff during operations.
 - 1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- F. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Clean an area as indicated for each type of masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
 - b. Allow a waiting period of no fewer than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry cleaning work to be performed in accordance with product manufacturers' written instructions and specified requirements.
- B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 PAINT REMOVERS

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation for removing paint from masonry; containing no methylene chloride.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Light Duty Paint Remover or comparable product by one of the following or approved equal:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. PROSOCO, Inc.

2.2 CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

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- C. Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9, that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Light Duty Cleaner or comparable product by one of the following or approved equal:
 - a. Price Research, Ltd.
 - b. PROSOCO, Inc.
- D. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Bio-Cleaner or comparable product by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Price Research, Ltd.
- E. Mild-Acid Cleaner: Manufacturer's standard mild-acid cleaner based on phosphoric, oxalic, or citric acid; but not containing muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Heavy Duty Cleaner or comparable product by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
- F. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - c. Dumond Chemicals, Inc.
 - d. EaCo Chem, Inc.
 - e. Hydroclean; Hydrochemical Techniques, Inc.
 - f. Price Research, Ltd.
 - g. PROSOCO, Inc.
- G. One-Part Limestone Acidic Cleaner: Manufacturer's standard one-part acidic formulation for cleaning limestone.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Light Duty Cleaner or comparable product by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. PROSOCO, Inc.

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2.3 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
 - 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 or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Price Research, Ltd.
 - c. PROSOCO, Inc.
- B. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Minimal possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave residue on surfaces.

2.4 CHEMICAL-CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical-cleaner manufacturer.
- B. Acidic Cleaner Solution for Brick and Unpolished Stone: Dilute acidic cleaner with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended in writing by chemical-cleaner manufacturer.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Light Duty Cleaner or comparable product that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Price Research, Ltd.
 - b. PROSOCO, Inc.
 - 2. Stones: Use only on unpolished granite, unpolished dolomite marble, and siliceous sandstone.
- C. Acidic Cleaner Solution for Polished Stone: Dilute acidic cleaner with water to concentration demonstrated by testing that does not etch or otherwise damage terra cotta surface, but not greater than that recommended in writing by chemical-cleaner manufacturer.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Heavy Duty Cleaner or comparable product by one of the following:
 - a. American Building Restoration Products, Inc.
 - b. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - 2. Stones: Use only on polished granite and polished dolomite marble.

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PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic masonry cleaning include, but are not limited to, the following:
 - 1. J&J Construction.
 - 2. Crown Restoration
 - 3. Tucker's Pointing and Restoration
 - 4. American Restoration

3.2 PROTECTION

- A. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.3 CLEANING MASONRY, GENERAL

- A. Have cleaning work performed only by qualified historic treatment specialist.
- B. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 ft. away by Architect.
- C. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- D. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gauges.
 - b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
 - c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - d. For high-pressure water-spray application, use fan-shaped spray that disperses water at an angle of at least 40 degrees.
 - e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
 - f. For steam application, use steam generator capable of delivering live steam at nozzle.
- E. Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking

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or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

- F. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed in accordance with "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.
- G. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces in accordance with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.4 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, caulking, asphalt, and tar.
 - 1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
 - 2. Remove paint with alkaline paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Repeat application up to two times if needed.
 - 3. Remove caulking by cutting out. Remove residue with suitable solvent or paint remover. Test in inconspicuous area.
 - 4. Remove asphalt and tar by scraping away excess. Remove residue with suitable solvent or paint remover. Test in inconspicuous area.

3.5 PAINT REMOVAL

- A. Paint-Remover Application, General: Apply paint removers in accordance with paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- B. Paint Removal with Alkaline Paste Paint Remover:

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1. Remove loose and peeling paint using low-pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with cold or hot water applied by low-pressure spray to remove chemicals and paint residue. Choice of water temperature depends on weather conditions.
5. Repeat process if necessary to remove all paint.
6. Apply acidic cleaner or manufacturer's recommended afterwash to surface, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended in writing by chemical-cleaner or afterwash manufacturer.
7. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.

C. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:

1. Remove loose and peeling paint using low-pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with trowel, spatula, or as recommended in writing by manufacturer.
3. Apply cover in accordance with manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with cold or hot water applied by low-pressure spray to remove chemicals and paint residue.
7. Apply acidic cleaner or manufacturer's recommended afterwash to surface, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended in writing by chemical-cleaner or afterwash manufacturer.
8. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
9. For spots of remaining paint, apply alkaline paste paint remover in accordance with "Paint Removal with Alkaline Paste Paint Remover" Paragraph.

3.6 CLEANING BRICKWORK

A. Cold-Water Wash: Use cold water applied by low-pressure spray.

B. Hot-Water Wash: Use hot water applied by low-pressure spray.

C. Mold, Mildew, and Algae Removal:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
4. Rinse with cold water applied by low -pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

D. Nonacidic Gel Chemical Cleaning:

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1. Wet surface with cold water applied by low-pressure spray.
2. Apply gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
3. Let cleaner remain on surface for period established by mockup.
4. Remove bulk of gel cleaner.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

E. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with hot water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

F. Mild-Acid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

G. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

3.7 CLEANING BROWNSTONE TERRA COTTA

A. Cold-Water Wash: Use cold water applied by low-pressure spray.

B. Hot-Water Wash: Use hot water applied by low -pressure spray.

C. Mold, Mildew, and Algae Removal:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used, and that surface remains wet.
4. Rinse with cold water applied by low -pressure spray to remove mold, mildew, and algae remover and soil.

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5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

D. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
3. Let cleaner remain on surface for period established by mockup.
4. Remove bulk of gel cleaner.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

E. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with hot water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

F. Mild-Acid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to masonry in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

G. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

3.8 CLEANING GLAZED TERRA COTTA

A. Hot-Water Wash: Use hot water applied by low-pressure spray.

B. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
3. Let cleaner remain on surface for period established by mockup.

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4. Remove bulk of gel cleaner.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

C. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with hot water applied by low-pressure spray.
2. Apply cleaner to terra cotta in one or two applications.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

D. Mild-Acid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to terra cotta in one or two applications.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

3.9 CLEANING UNPOLISHED STONework

A. Cold-Water Wash: Use cold water applied by low -pressure spray.

B. Hot-Water Wash: Use hot water applied by low-pressure spray.

C. Mold, Mildew, and Algae Removal:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used, and that surface remains wet.
4. Rinse with cold water applied by low -pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

D. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
3. Let cleaner remain on surface for period established by mockup.
4. Remove bulk of gel cleaner.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

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E. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

F. Mild-Acid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

G. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

H. One-Part Limestone Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Immediately repeat application of one-part limestone cleaner as indicated above over the same area.
5. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.

3.10 CLEANING POLISHED STONEWORK

A. Cold-Water Wash: Use cold water applied by low-pressure spray.

B. Hot-Water Wash: Use hot water applied by low-pressure spray.

C. Mold, Mildew, and Algae Removal:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used, and that surface remains wet.
4. Rinse with cold water applied by low -pressure spray to remove mold, mildew, and algae remover and soil.

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5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

D. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
3. Let cleaner remain on surface for period established by mockup.
4. Remove bulk of gel cleaner.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

E. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with hot water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

F. Mild-Acid Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in one or two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period established by mockup.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure where needed to produce cleaning effect established by mockup.

3.11 FINAL CLEANING

- A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.
- B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- C. Remove masking materials, leaving no residues that could trap dirt.

3.12 FIELD QUALITY CONTROL

- A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- B. Notify inspectors and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

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- C. Manufacturer's Field Service: Engage paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives visit Project site not less than twice to observe progress and quality of the Work.

END OF SECTION 040310

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SECTION 040342 - HISTORIC STONE MASONRY REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment work consisting of repairing historic stone assemblies as follows:
 - 1. Repairing stone masonry.
 - 2. Removing abandoned anchors.
 - 3. Painting steel uncovered during the Work.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
 - 3. Section 040345 "Historic Stone Consolidation Treatment" for repair of stone using chemical consolidation.
 - 4. Section 076200 "Sheet Metal Flashing and Trim" for metal flashing installed in or on repaired stonework.

1.2 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm .
- B. Face Bedding: Setting of stone with the rift or natural bedding planes (strata) vertical and parallel to the wall plane rather than horizontal or "naturally bedded," which holds bedding planes together by gravity.
- C. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.
- D. Rift: The most pronounced direction of splitting or cleavage of a stone.
- E. Stone Terminology: ASTM C119.

1.3 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform stone historic treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Remove plant growth.
 - 2. Inspect stonework for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean stone.

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5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
 6. Repair stonework, including replacing existing stone with new stone. If required, repair backup masonry.
 7. Rake out mortar from joints to be repointed.
 8. Point mortar and sealant joints.
 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone in accordance with Part 3 "Stone Patching" Article. Patch holes in mortar joints in accordance with Section 040343 "Historic Stone Masonry Repointing."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include recommendations for product application and use.
 3. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
1. Include plans, elevations, sections, and locations of stone repair work on the structure.
 2. Indicate complete dimensions for new stone units and their jointing, showing relation of existing to new units.
 3. Show partial replacement stone units (dutchmen).
 4. Indicate setting number of each new stone unit and its location on the structure in annotated plans and elevations.
 5. Show provisions for expansion joints or other sealant joints.
 6. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.
 7. Show replacement and repair anchors, including drilled-in pins. Include details of anchors within individual stone units, with locations of anchors and dimensions of holes and recesses in stone required for anchors, including direction and angle of holes for pins.
 8. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.
- C. Samples for Initial Selection: For the following:
1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following:
1. Each type of replacement stone. Include sets of Samples to show full range of color, texture, grain, veining, and finish to be expected. Provide sets of at least two 12-by-12-inch Samples for each type, but no fewer than necessary to indicate full range and the proportion of variations within range.
 2. Each type of patching compound in form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
 3. Each type of adhesive.

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4. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist.
- B. Quality-control program.
- C. Stone historic treatment program.

1.6 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic stone repair specialist. Experience installing standard unit masonry or new stone masonry is insufficient experience for stone historic treatment work.
 1. Historic Treatment Worker Qualifications: When stone units are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
- C. Stone Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of the historic treatment work, including protection of surrounding materials and Project site.
 1. Include methods for keeping exposed mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
 1. Stone Repair: Prepare sample areas for each type of stone indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls were directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: TBD stone units replaced.
 - b. Partial Stone Replacement: TBD partial stone replacements (dutchman repairs).
 - c. Stone Plug Repair: TBD stone plug repairs for each type of stone indicated to be plugged.
 - d. Crack Injection: Apply crack injection in two separate areas as directed.
 - e. Patching: Three small holes at least 1 inch in diameter for each type of stone indicated to be patched, so as to leave no evidence of repair.

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2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver stone to Project site strapped together in suitable packs or pallets or in heavy-duty crates and protected against impact and chipping.
- B. Deliver each piece of stone with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.
- C. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- E. Store sand where grading and other required characteristics can be maintained, and contamination avoided.
- F. Handle stone to prevent overstressing, chipping, defacement, and other damage.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed in accordance with product manufacturers' written instructions and specified requirements.
- B. Temperature Limits: Repair stonework only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated:
 1. When air temperature is below 40 deg F, heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F.
 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.
- D. Hot-Weather Requirements: Protect stonework repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of material for repairing historic masonry (stone, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

- A. Stone Matching Existing: Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone and with physical properties as listed below:
 - 1. For existing stone that exhibits a range of colors, textures, grains, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II; to match existing where required for color matching of mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested in accordance with ASTM C114.
- B. Mortar Sand: ASTM C144 unless otherwise indicated.
- C. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide LANXESS Corporation; Bayferrox Iron Oxide Pigments or comparable product that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Davis Colors.
- D. Water: ASTM C270, potable.

2.4 MANUFACTURED REPAIR MATERIALS

- A. Stone-Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Jahn M70 Limestone and Sandstone Repair Mortar Jahn M120 Marble Repair Mortar Jahn M160 Granite and Bluestone Repair Mortar or comparable product that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Conproco Corporation.
 - b. Edison Coatings, Inc.

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2. Use formulation that is vapor and water permeable (equal to or more than the stone), exhibits low shrinkage, has lower modulus of elasticity than the stone units being repaired, and develops high bond strength to all stone types.
 3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 4. Formulate patching compound in colors, textures, and grain to match stone being patched. Provide sufficient number of colors to enable matching each piece of stone.
- B. Cementitious Crack Filler: Ultrafine superplasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength to all stone types.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Jahn M31 Micro Injection Grout Jahn M32 Micro Injection Grout or comparable product that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Edison Coatings, Inc.
- C. Stone-to-Stone Adhesive: Two-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F, recommended in writing by adhesive manufacturer for type of stone repair indicated, and matching stone color.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Natural Adhesive or comparable product that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Akemi North America.
 - b. Bonstone Materials Corporation.
 - c. Edison Coatings, Inc.

2.5 ACCESSORY MATERIALS

- A. Stone Anchors and Pins: Type and size indicated or, if not indicated, to match existing anchors in size and type. Fabricate from Type 304 stainless steel.
- B. Setting Buttons and Shims: Resilient plastic, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units, less the required depth of pointing materials unless removed before pointing.
- C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- D. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer in accordance with MPI #23 (surface-tolerant, anticorrosive metal primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating).
1. Surface Preparation: Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning," SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning," surface preparation in accordance with manufacturer's literature or certified statement.
 2. VOC Limit: Use coating with a VOC content of 400 g/L or less.
- E. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

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1. Previous effectiveness in performing work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave residue on surfaces.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic stone repair include, but are not limited to, the following or approved equal:
1. Wilson Restoration.
 2. Mara Restoration

3.2 PROTECTION

- A. Prevent mortar from staining face of surrounding stone and other surfaces.
1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during stone repair work. Reinstall when repairs are complete.
1. Provide temporary rain drainage during work to direct water away from building.

3.3 STONE REPAIR, GENERAL

- A. Have repair work performed only by qualified historic treatment specialist.
- B. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 ft. away by Architect.

3.4 ABANDONED ANCHOR REMOVAL

- A. Remove abandoned anchors, brackets, wood nailers, and other extraneous items no longer in use unless indicated to remain.
1. Remove items carefully to avoid spalling or cracking stone.
 2. Notify Architect before proceeding if an item cannot be removed without damaging surrounding stone; do the following where directed:
 - a. Cut or grind off item approximately 3/4 inch beneath surface, and core drill a recess of same depth in surrounding stone as close around item as practical.

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- b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
3. Patch the hole where each item was removed unless directed to remove and replace the stone unit.

3.5 STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that was supported by removed stone.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole stone units as possible.
 1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
 3. Store stone for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.
- G. Replace removed damaged stone with other removed stone and salvaged stone in good condition, where possible, or with new stone matching existing stone. Do not use broken units unless they can be cut to usable size.
- H. Rift: Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been cut so that, when it is set in final position, the rift or natural bedding planes are predominantly horizontal, except for arches, where bedding planes are predominantly radial or vertical, but perpendicular to the wall. Reject stone with vertical bedding planes, except as required for arches, lintels, and copings.
- I. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.
 1. Maintain joint width for replacement stone to match existing joints.
 2. Use setting buttons or shims to set stone accurately spaced with uniform joints.
- J. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors matching existing configuration.

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1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
 2. Rake out mortar used for laying stone before mortar sets in accordance with Section 040343 "Historic Stone Masonry Repointing." Point at same time as repointing of surrounding area.
 3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.
- K. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.6 BACKUP MASONRY REMOVAL AND REPLACEMENT

- A. Where backup masonry is fractured or unstable and at locations indicated, remove mortar and masonry units that are broken or deteriorated, and rebuild with whole, new brick or whole, salvaged backup masonry units. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Perform backup masonry removal and replacement in accordance with requirements in Section 040322 "Historic Brick Unit Masonry Repair."
- C. Support and protect remaining masonry that surrounds removal area.
- D. Maintain flashing, reinforcement, anchors, lintels, and adjoining construction in an undamaged condition.
- E. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units beyond the removal area, rotted wood, rusted metal, and other deteriorated items.
- F. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with handchisels, brushes, and water.
 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- G. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- H. Replace removed damaged brick with salvaged backup brick in good condition, where possible, or with new building brick matching existing backup brick. Do not use broken units unless they can be cut to usable size.
- I. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
- J. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of

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more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

- K. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.7 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Notify Architect if steel is exposed during stone removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint steel as follows:
 - 1. Surface Preparation: Remove paint, rust, and other contaminants in accordance with SSPC-SP 2, "Hand Tool Cleaning," SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning," , as applicable to comply with paint manufacturer's recommended preparation.
 - 2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.8 PARTIAL STONE REPLACEMENT

- A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and removing defective material to depth required for fitting partial replacement (dutchman).
 - 1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
 - 2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
 - 3. If backing stone becomes further damaged, remove damaged area and enlarge partial replacement as required.
- B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.
- C. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch in width, and to produce joints between partial replacement and other stones that match existing joints between stones. Cut partial replacement so that, when it is set in final position, natural bedding planes match the orientation of bedding planes of the backing stone unless otherwise indicated.
- D. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch-diameter, threaded stainless steel pins set into 1/4-inch-diameter holes drilled at a 45-degree downward angle through face of partial replacement and into backing stone.

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1. Center and space pins between 3 and 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches in backing stone and 2 inches in partial replacement, with end countersunk at least 3/4 inch from exposed face of partial replacement.
- E. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, threaded stainless steel pins set into 1/4-inch- diameter holes drilled into backing stone and into, but not through, the partial replacement.
 1. Center and space pins between 3 and 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches in backing stone and 2 inches in partial replacement, but no closer than 3/4 inch from exposed face of partial replacement.
- F. Apply stone-to-stone adhesive in accordance with adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.
- G. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.
- H. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes as specified in "Stone Patching" Article.

3.9 STONE PLUG REPAIR

- A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.
- B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that fits into hole drilled in damaged stone, with only minimum gap necessary for adhesive. Cut and install plug so that, when it is set in final position, natural bedding planes match the orientation of bedding planes of the backing stone unless otherwise indicated.
- C. Apply stone-to-stone adhesive in accordance with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.
- D. Apply plug flush with surrounding stone while adhesive is still tacky and hold securely in place until adhesive has cured.
- E. Clean adhesive residue from exposed surfaces.

3.10 STONE-FRAGMENT REPAIR

- A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.
- B. Remove soil, loose particles, mortar, and other debris or foreign material from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.
- C. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch-diameter, threaded stainless steel pins set into 1/4-inch- diameter holes drilled at a 45-degree downward angle through face of fragment and into parent stone.

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1. Center and space pins 3 to 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches in parent stone and 2 inches in fragment, with end countersunk at least 3/4 inch from exposed face of fragment.
- D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, threaded stainless steel pins set into 1/4-inch- diameter holes drilled into parent stone and into, but not through, the fragment.
 1. Center and space pins 3 to 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches in parent stone and 2 inches in fragment, but no closer than 3/4 inch from exposed face of fragment.
- E. Apply stone-to-stone adhesive in accordance with adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.
- F. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.
- G. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes as specified in "Stone Patching" Article.

3.11 CRACK INJECTION

- A. General: Comply with cementitious crack-filler manufacturer's written instructions.
- B. Drill 1/4-inch- diameter injection holes as follows:
 1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
 2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
 3. Delaminations: Drill holes at approximately 18 inches o.c., both vertically and horizontally.
 4. Drill holes 2 inches deep.
- C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.
- D. Place plastic injection ports in drilled holes, and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.
- E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material, and begin injecting filler at adjacent port, repeating process until all ports have been injected.
- F. Clean cementitious crack filler from face of stone before it sets, by scrubbing with water.
- G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

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3.12 STONE PATCHING

- A. Patch the following stone units unless another type of repair or replacement is indicated:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
 - 4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and over 1/4 inch deep.
- B. Remove and replace existing patches unless otherwise indicated or approved by Architect.
- C. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than as recommended in writing by patching compound manufacturer.
- D. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of stone unit.
- E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
- F. Apply a 1/8-inch wet bond coat prior to application of repair mortar.
- G. Place patching compound in single application up to 2 inches thick recommended in writing by patching compound manufacturer.
 - 1. Simple Details: Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
 - 2. Carved Details: Build patch up 1/4 inch above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.
- H. Keep each layer damp for 72 hours or until patching compound has set.
- I. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.13 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.

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- E. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure-wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.14 STONE-WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.
- B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040342

SECTION 040343 - HISTORIC STONE MASONRY REPOINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment work consisting of repointing stone masonry joints with mortar.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by estimated quantities.
 - 2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.3 DEFINITIONS

- A. Low-Pressure Spray:
 - 1. Pressure: 100 to 400 psi .
 - 2. Flow Rate: 4 to 6 gpm .
- B. Rift: The most pronounced direction of splitting or cleavage of a stone. Rift may be obscure in igneous rocks such as granite. Often it is obvious, as with bedding planes in many sedimentary stones.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference on historic masonry repair and repointing at Project site .
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and repointing.
 - 2. Review methods and procedures related to repointing historic stonemasonry including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Fire-protection plan.

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- e. Stone historic treatment program.
- f. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform stone historic treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Remove plant growth.
 - 2. Inspect for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean stone.
 - 5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
 - 6. Repair stonework, including replacing existing stone with new stone.
 - 7. Rake out mortar from joints to be repointed.
 - 8. Point mortar joints.
 - 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 - 10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone in accordance with Section 040342 "Historic Stone Masonry Repair."

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include recommendations for product application and use.
 - 3. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For the following:
 - 1. Pointing Mortar: Submit sets of mortar Samples.
 - 2. Include similar Samples of accessories involving color selection.
- C. Samples for Verification: For the following:
 - 1. Each type, color, and texture of pointing mortar.
 - 2. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist including field supervisors and workers.
- B. Quality-control program.
- C. Stone historic treatment program.

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1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry repointing specialist. Experience in pointing or repointing only new or nonhistoric masonry is insufficient experience for masonry historic treatment work.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
- C. Stone Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of the historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Repointing: Rake out joints in two separate areas as indicated for each type of repointing required, and repoint one of the areas.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed in accordance with product manufacturers' written instructions and specified requirements.
- B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F.
- C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients and existing stone to produce temperatures between 40 and 90 deg F.

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2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.
- D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of material for repointing historic masonry from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

- A. Historic Pointing Mortar: Factory-mixed cementitious product that is custom manufactured for repointing stone masonry.
 1. Products: Subject to compliance with requirements, provide the following: Cathedral Stone Products, Inc.; Jahn M110 Historic Pointing Mortar, or approved equal.
 2. Use formulation that is vapor and water permeable, exhibits low shrinkage, has higher modulus of elasticity than the stone units being repaired, and develops high bond strength to all types of masonry.
 3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 4. Formulate pointing mortar used for repointing stone masonry in colors and textures to match each unit being repointed.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type II; to match existing where required for color matching of mortar.
- C. Water: ASTM C 270, potable.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic masonry repointing include, but are not limited to, the following or approved equal:
 1. Wilson Restoration.
 2. Mara Restoration

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3.2 PROTECTION

- A. Prevent mortar from staining face of surrounding stone and other surfaces.
 - 1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during stone repointing work. Reinstall when repointing is complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.3 STONE REPOINTING, GENERAL

- A. Have repointing work performed only by qualified historic treatment specialist.
- B. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from minimum 20 ft. away by Architect.

3.4 REPOINTING

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints indicated as sealant-filled joints.
 - 3. Joints at locations of the following defects:
 - a. Holes and missing mortar.
 - b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
 - c. Cracks 1/16 inch or more in width and of any depth.
 - d. Hollow-sounding joints when tapped by metal object.
 - e. Eroded surfaces 1/4 inch or more deep.
 - f. Deterioration to point that mortar can be easily removed by hand, without tools.
 - g. Joints filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, in accordance with procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of 2-1/2 times the joint width and not less than that required to expose sound, unweathered mortar.
 - 2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.
 - a. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar in bed joints and mortar in head joints. Strictly adhere to approved quality-control program.
- D. Notify Architect of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

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E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply mortar to any depth in a damp sand consistency, without layering.
3. Fill joint and compact mortar when slightly dry.
4. After mortar has set, use a dry brush across mortar joints to remove excess material. Follow with a damp sponge across joints. Repeat cleaning with sponge with clean water several times to remove all mortar from masonry face.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - a. Acceptable curing methods include covering with plastic sheeting and periodic hand misting.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.

F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.5 FINAL CLEANING

- A. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.
- B. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- C. Remove masking materials, leaving no residues that could trap dirt.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- C. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040343

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SECTION 042300 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass block set in glass-block grid systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: glass-block grid material and joint materials involving color selection.

PART 2 - PRODUCTS

2.1 GLASS-BLOCK GRID SYSTEMS

- A. General: Aluminum extrusions complying with ASTM B221, Alloy 6063-T6 or Alloy 6463-T6, forming a grid system and frame designed for application indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. IBP.
- B. Window and Wall System: Aluminum T-bar grid with tubular frame and vinyl glass-block boots.
 - 1. Finish: As selected by Architect from manufacturer's full range.
 - 2. Glass-Block Size: 7-3/4 inches square by 3-1/8 inches thick.
 - 3. Provide aluminum exterior frame covers with vinyl thermal break.
 - 4. Provide aluminum trim and closures as indicated.
- C. Sealant: Product recommended by glass-block grid system manufacturer.
 - 1. Verify sealant has a VOC content of 250 g/L or less.
 - 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.

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1. Where joints are indicated to be raked out and pointed, gray cement may be used for setting mortar.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate: ASTM C144, with 100 percent passing No. 8 sieve.
- D. Water: Potable.

2.3 GLASS UNIT MASONRY ACCESSORIES

- A. Fasteners, General: Unless otherwise indicated, provide Type 304 or Type 316 stainless steel fasteners at exterior walls and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at interior walls. Select fasteners for type, grade, and class required.
- B. Sealants: Manufacturer's standard elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants."
 1. Verify sealant has a VOC content of 250 g/L or less.
 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
- C. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 GLASS-BLOCK GRID SYSTEM INSTALLATION

- A. General: Install glass-block grid systems according to manufacturer's written instructions.
- B. Window and Wall System Installation: Assemble grid system, apply continuous sealant bead to back of window Z-bar, place in position, adjust as needed to make grid level and plumb, and fasten to substrate.
 1. Insert glass blocks into vinyl glass-block boots and carefully insert into grid from exterior side. Install blocks firmly against T-bars without deforming boots.
 2. Apply sealant to completely fill channel around each glass block, and tool flush with exterior surface. Remove excess sealant and smears.

3.2 CLEANING

- A. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently to eliminate dried mortar particles and aggregate.

END OF SECTION 042300

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SECTION 050170.51 - DECORATIVE METAL CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes decorative metal cleaning as follows:
 - 1. Removing corrosion.
 - 2. Priming for repainting.
- B. Related Requirements:
 - 1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi ; 4 to 6 gpm .
- B. Medium-Pressure Spray: 400 to 800 psi ; 4 to 6 gpm .

1.4 PREINSTALLATION MEETINGS

1.5 ACTION SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Decorative Metal Cleaning Specialist Qualifications: A qualified decorative metal cleaning specialist. Cleaning specialist shall be experienced in using mechanical and chemical methods on the types of metal surfaces indicated.

PART 2 - PRODUCTS

2.1 FERROUS METAL PRIMERS

- A. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free, universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry-film thickness.

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- B. Finish Primer: Primer complying with applicable requirements in for finish painting of primed metal.

PART 3 - EXECUTION

3.1 DECORATIVE METAL CLEANING, GENERAL

- A. Execution of the Work: In cleaning items, disturb them as minimally as possible and as follows:
 - 1. Remove deteriorated coatings and corrosion.
 - 2. Sequence work to minimize time before protective coatings are reapplied.
 - 3. Clean items in place unless otherwise indicated.
- B. Mechanical Coating Removal: Use gentle methods, such as scraping and wire brushing, that will not abrade metal substrate.
- C. Repaint: Where indicated, prepare painted decorative metal by cleaning surface, removing less than firmly adhered existing paint, sanding edges smooth, and priming for painting as specified.

3.2 PRIMING

- A. Repair Primer: Apply immediately after completing a repair.
- B. Finish Primer: Apply as soon after cleaning as possible.

END OF SECTION 050170.51

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SECTION 050170.61 - DECORATIVE METAL REPAIR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Decorative metal repairs as follows:
 - a. Removing metal for shop repair and replacement of components; reinstalling repaired metal.

B. Related Requirements:

1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi ; 4 to 6 gpm .
- B. Medium-Pressure Spray: 400 to 800 psi ; 4 to 6 gpm .

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Decorative Metal Repair Specialist Qualifications: A qualified decorative metal fabrication and repair specialist. Experience installing and finishing new decorative metalwork is insufficient experience for repairing decorative metal.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design post-installed structural anchors.

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2.2 METAL MATERIALS

- A. General: Provide decorative metal materials made of the alloys, forms, and types that match existing metals and have the ability to receive finishes matching existing finishes unless otherwise indicated.

2.3 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Abrasive Materials:
 - 1. Abrasive Pads for Copper-Alloy Cleaning: Extra-fine bronze wool or plastic abrasive pads.
- D. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.4 FASTENERS

- A. Fasteners: Fasteners of the same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.
 - 1. Match existing fasteners in material and in type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting decorative metal components and for attaching them to other work unless exposed fasteners are unavoidable or the existing fastening method.
 - 3. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 4. Finish heads of exposed fasteners to match finish of metal fastened unless otherwise indicated.
- B. Anchors, General: Use bolt heads of same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal anchored.
- C. Post-Installed Nonstructural Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 AC193 AC58 or AC308 as appropriate for the substrate.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 METAL FABRICATION

- 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 or approved equal:

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1. Allen Architectural Metals, Inc.
 2. Alloy Casting Co., Inc.
 3. Antique Cast Iron.
 4. Architectural Iron Company.
 5. Brandywine Forge.
 6. f2 Industries.
 7. Heritage Cast Iron USA.
 8. Historical Arts & Casting, Inc.
 9. King Architectural Metals, Inc.
 10. Olek Lejbzon & Co.
 11. Postville Blacksmith Shop.
 12. Robinson Iron.
 13. Schiff Architectural Detail.
 14. Wiemann Metalcraft.
- B. Fabricate repairs of decorative metal items and components in sizes and profiles to match existing decorative metal, with accurate curves, lines, and angles. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
- C. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for fasteners. Use concealed fasteners where possible; use exposed fasteners to match existing work.
- D. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
- E. Castings: Fabricate castings free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.
1. Finish castings to match existing decorative metalwork.
 2. Replacement Casting for Handrail Bracket: Duplicate existing handrail bracket on the cast-iron railing of first-floor stairs in the lobby. Make molds from this bracket to create new cast-iron brackets.

2.6 FERROUS METAL FINISHES

- A. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Finish Primer: Primer complying with applicable requirements in Section 090190.52 "Maintenance Repainting" for finish painting of primed existing metal.
- C. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

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PART 3 - EXECUTION

3.1 DECORATIVE METAL REPAIR, GENERAL

- A. Execution of the Work: In repairing items, disturb remaining existing work as minimally as possible and as follows:
 - 1. Stabilize decorative metal to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove deteriorated coatings and corrosion.
 - 3. Sequence work to minimize time before protective coatings are reapplied.
 - 4. Repair items where stabilization is insufficient to stop progress of deterioration.
 - 5. Repair items in place where possible.
 - 6. Replace or reproduce items where indicated or scheduled.
 - 7. Install temporary protective measures to stabilize decorative metal that is indicated to be repaired later.
- B. Mechanical Coating Removal: Use gentle methods, such as scraping and wire brushing, that will not abrade metal substrate.
- C. Repair Decorative Metal Item: Match existing materials and features.
- D. Replace Decorative Metal Component: Where indicated, duplicate and replace items with new metal matching existing metal.
 - 1. Replace heavily deteriorated or missing parts or features of decorative metal with compatible materials, using surviving prototypes to create patterns or molds for duplicate replacements.

3.2 PREPARATORY CLEANING

- A. General: Use those methods indicated for each type of decorative metal and its location.
 - 1. Brushes: If using wire brushes, use brushes of same base metal composition as metal being cleaned. Use brushes that are resistant to chemicals being used.
 - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - c. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
 - 3. Uniformity: Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.
- B. Water Cleaning: Clean with cold water applied by medium-pressure spray. Supplement with natural-fiber or plastic-bristle brush. Use small brushes to remove soil from joints and crevices.
- C. Cleaning with Abrasive Pads: Clean surfaces to remove dirt by light rubbing with abrasive pads and water. Do not rinse ferrous metals with water; wipe with damp cloths to remove residue.

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D. Chemical Rust Removal:

1. Remove loose rust scale with approved abrasives for ferrous metal cleaning.
2. Apply rust remover with brushes or as recommended in writing by manufacturer.
3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing. Do not allow extended dwell time.
4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.
5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

E. Mechanical Rust Removal:

1. Remove rust with approved abrasives for ferrous metal cleaning.
2. Wipe off residue with mineral spirits and either steel wool or soft rags.
3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.3 REMOVAL, REPAIR, AND REINSTALLATION

- A. General: Perform removal work as required in Section 024119 "Selective Demolition" for specific requirements relating to selectively demolishing construction, including decorative metal removal for repair or reinstallation elsewhere.
- B. Defects in Painted Metal Surfaces: Repair nonload-bearing defects in existing metal surfaces, including dents and gouges more than 1/8 inch deep or 1 inch across, and all holes and cracks by filling with metal-patching compound and sanding smooth. Remove burrs and protruding fasteners. Prime iron and steel surfaces immediately after repair to prevent flash rusting.
- C. Reinstalling Railing Posts: After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup sloped away from post.
- D. Anchoring Wood Rails: Secure wood rails to metal subrail or brackets from bottom of wood rail as indicated on Drawings. Make fastener heads flush to metal surface.
- E. Installing Sealant: See Section 079200 "Joint Sealants."

3.4 PRIMING

- A. Repair Primer: Apply immediately after completing a repair.
- B. Finish Primer: Apply as soon after cleaning as possible.

END OF SECTION 050170.61

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SECTION 050170.63 - DECORATIVE METAL REFINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes refinishing bare decorative metal surfaces as follows:
 - 1. Removing metal for shop refinishing; reinstalling refinished metal.
 - 2. Integral metal finishes.
- B. Related Requirements:
 - 1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi ; 4 to 6 gpm .
- B. Medium-Pressure Spray: 400 to 800 psi ; 4 to 6 gpm .

1.4 PREINSTALLATION MEETINGS

1.5 ACTION SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Decorative Metal Refinishing Specialist Qualifications: A qualified decorative metal refinishing specialist.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Abrasive Materials:

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1. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

2.2 PROTECTIVE COATING MATERIALS

2.3 FERROUS METAL FINISHES

- A. Patina Finish: To match existing.

PART 3 - EXECUTION

3.1 DECORATIVE METAL REFINISHING, GENERAL

- A. Execution of the Work: In refinishing items, disturb remaining existing work as minimally as possible and as follows:
 1. Remove dirt and corrosion.
 2. Sequence work to minimize time before protective coatings are reapplied.
 3. Refinish items in place where possible and according to required appearance.
- B. Refinish Decorative Metal Item: Remove existing metal finishes on item unless otherwise indicated, including integral polished and patinated finishes, and reapply them.
- C. Repair Finish of Decorative Metal Item: Restore areas of deteriorated or missing finish on item and blend restored finish with existing, adjacent finish, including integral polished and patinated finishes.

3.2 PREPARATORY CLEANING

- A. General: Use those methods indicated for each type of decorative metal and its location.
 1. Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.
 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
 - c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - d. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
 3. Uniformity: Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.

END OF SECTION 050170.63

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
 - 2. Metal floor plate and supports.
 - 3. Downspout guards.
 - 4. Loose bearing and leveling plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Fasteners.
 - 3. Shop primers.
 - 4. Shrinkage-resisting grout.
 - 5. Prefabricated building columns.
 - 6. Slotted channel framing.
 - 7. Downspout guards.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Indigenous Materials: Manufacture products within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If transporting materials by rail or water, multiply the distance transported by rail or water by 0.25 to determine the distance to Project site.
- C. Stainless Steel Bars and Shapes: ASTM A276/A276M, .

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

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1. Provide stainless steel fasteners for fastening stainless steel .
 2. Provide bronze fasteners for fastening bronze.
- B. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

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- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- B. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 METAL FLOOR PLATE

- A. Fabricate from rolled-steel floor plate of thickness indicated below:
 - 1. Thickness: 1/4 inch .

2.8 DOWNSPOUT GUARDS

- A. Fabricate downspout guards from 3/8-inch- thick by 12-inch- wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.
- B. Galvanize steel downspout guards.
- C. Prime steel downspout guards with

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize bearing and leveling plates.
- C. Prime plates with

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2.10 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 099113 "Exterior Painting" primers specified in Section 099123 "Interior Painting" unless zinc-rich primer is primers specified in Section 099600 "High-Performance Coatings" are indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 - 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

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3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 REPAIRS

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

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum railings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Handrail brackets.
3. Shop primer.
4. Intermediate coats and topcoats.
5. Bituminous paint.
6. Anchoring cement.
7. Metal finishes.
8. Paint products.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.2 ALUMINUM RAILINGS

- 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 or approved equal:

1. ATR Technologies, Inc.
2. AZEK Building Products, Inc.
3. Blum, Julius & Co., Inc.
4. CraneVeyor Corp.
5. Fixfast USA.
6. Hollaender Mfg. Co.
7. Kane Innovations, Inc.

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8. Kee Industrial Products, Inc.
 9. Moultrie Manufacturing Corporation.
 10. R & B Wagner, Inc.
 11. Superior Aluminum Products, Inc.
 12. Thompson Fabricating, LLC.
 13. Trex Commercial Products, Inc.
 14. Tri Tech, Inc.
 15. Tubular Specialties Manufacturing, Inc.
 16. Tuttle, a Dant Clayton Division.
- B. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- C. Extruded Tubing: ASTM B221, Alloy 6063-T5/T52.
- D. Extruded Structural Round Tubing: ASTM B429/B429M, Alloy 6063-T6.
1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- E. Plate and Sheet: ASTM B209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- G. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.3 FASTENERS

- A. Fastener Materials:
1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.
 2. Aluminum Railing Components: Type 304 stainless steel fasteners.
- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast aluminum, center of handrail 3-1/8 inches from wall.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

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- D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting".
- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- I. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting."
- J. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- K. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- L. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.
- M. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- N. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

- A. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- B. Form work true to line and level with accurate angles and surfaces.
- C. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- D. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

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- E. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- H. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- I. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- J. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
 - 1. Provide socket covers designed and fabricated to resist being dislodged.
 - 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.6 ALUMINUM FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range to match existing .

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.

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1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

3.3 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.

3.4 CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055213

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SECTION 061533 - WOOD PATIO DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood decking.
2. Stairs for elevated decks.
3. Railings for elevated decks.

1.2 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.
2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness.
3. Timber. 19 percent .

2.2 WOOD DECKING AND STAIR TREADS

A. Board Decking and Stair Treads : 3/4-inch actual thickness radius-edged decking of the following species and grades:

1. Western red cedar, Select Dex ; WCLIB.
2. Western red cedar (North), Select Patio ; NLGA.

2.3 WOOD RAILINGS

A. Dimension Lumber Railing Members:

1. Construction or No. 2 grade and any of the following species:

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- a. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWP.
 - b. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWP.
 - c. Mixed southern pine; SPIB.
 - d. Redwood; RIS.
 - e. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWP.
- B. Railing Boards: Any of the following species and grades:
- 1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWP.
 - 2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWP.
 - 3. Redwood, ; RIS.
 - 4. Southern pine, B & B finish; SPIB.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install wood decking and stair treads with crown up (bark side down).
- D. Secure decking to framing with screws.
- E. Install metal framing anchors to comply with manufacturer's written instructions.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Apply copper naphthenate field treatment to comply with AWP M4, to cut surfaces of preservative-treated lumber.
- H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.
 - 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 INSTALLATION OF ELEVATED DECK JOIST FRAMING

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.
- B. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together.

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3.3 INSTALLATION OF STAIRS

- A. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
- B. Treads and Risers: Secure by gluing and screwing to carriages. Countersink fastener heads, fill flush, and sand filler. Extend treads over carriages.

3.4 INSTALLATION OF RAILINGS

- A. Balusters: Fit to railings, glue, and screw in place. Countersink fastener heads, fill flush, and sand filler.
- B. Newel Posts: Secure to stringers and risers with countersunk-head wood screws and glue.
- C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts and glue.

END OF SECTION 061533

SECTION 064013 - EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior standing and running trim.
2. Exterior frames and jambs.
3. Wood furring, blocking, shims, and hanging strips for installing exterior architectural woodwork items that are not concealed within other construction.
4. Shop finishing of exterior architectural woodwork.

1.2 COORDINATION

- A.** Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that exterior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Wood-Preservative Treatment:
 - a. Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - b. Indicate type of preservative used and net amount of preservative retained.
 - c. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.
2. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates:** AWI Quality Certification Program certificates.

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1.5 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
 - a. This project has been registered with AWI as AWI Quality Certification Program Number .
 - b. Contractor is to register the Work under this Section with the AWI Quality Certification Program at www.awiqcp.org or by calling 800-345-0991.

2.2 EXTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Architectural Woodwork Standards Grade: Custom to match existing .
- B. Backout or groove backs of flat trim members, and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- C. Wood Species: Any closed-grain hardwood .
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - 2. Wood Moisture Content: 9 to 15 percent.

2.3 EXTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

- A. Architectural Woodwork Standards Grade: Custom to match existing .
- B. Wood Species: Any closed-grain hardwood .
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - 2. Wood Moisture Content: 9 to 15 percent.

2.4 WOOD MATERIALS

- A. Hardboard: ANSI A135.4.

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- B. Softwood Plywood: DOC PS 1, exterior , medium-density overlay.

2.5 PRESERVATIVE-TREATED-WOOD MATERIALS

- A. Preservative-Treated-Wood Materials: Provide with water-repellent preservative treatment complying with AWPAC N1 (dip, spray, flood, or vacuum-pressure treatment).
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC) , combined with a compatible EPA-registered insecticide.
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Extent of Preservative-Treated Wood Materials: Treat wood materials unless otherwise indicated on Drawings .
 - 1. Items fabricated from the following wood species need not be treated:
 - a. Redwood All-heart redwood.
 - b. Western red cedar All-heart western red cedar.
 - c. White oak.
 - d. African mahogany.
 - e. Honduras mahogany.
 - f. Ipe.
 - g. Dark red meranti.
 - h. Teak.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use stainless steel unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, use stainless steel fasteners.
 - 3. For redwood, use stainless steel fasteners.
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A307 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

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- G. Postinstalled Anchors: Stainless steel, chemical anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.

- 1. Stainless steel bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

- 1. Wood-Preservative Treatment: By pressure process, AWWA U1; Use Category UC3b.
 - a. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - b. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - c. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.
 - 2. Fire-Retardant Treatment: Complying with requirements; provide where indicated on Drawings .

2.8 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate exterior architectural woodwork to dimensions, profiles, and details indicated.
 - 1. Ease edges to radius indicated for the following:
 - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
 - 1. Disassemble components only as necessary for shipment and installation.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
 - a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
 - b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

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2.9 SHOP FINISHING

- A. Preparation for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing exterior architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of exterior architectural woodwork. Apply two coats to end-grain surfaces.
- B. Transparent Finish: Comply with Section 099300 "Staining and Transparent Finishing."
- C. Opaque Finish: Comply with Section 099113 "Exterior Painting."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition exterior architectural woodwork to average prevailing humidity conditions at Project site.
- B. Before installing exterior architectural woodwork, examine shop-fabricated work for completion, and complete work as required, including removing packing and backpriming concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install exterior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble exterior architectural woodwork, and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install exterior architectural woodwork level, plumb, true in line, and without distortion.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Standing and Running Trim:
 - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
 - 2. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
 - 3. Scarf running joints and stagger in adjacent and related members.
- E. Scribe and cut exterior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

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- F. Preservative-Treated Wood Materials: Where field cut or drilled, treat cut ends and drilled holes according to AWP A M4.
- G. Anchor exterior architectural woodwork to anchors or blocking built in or directly attached to substrates.
 - 1. Secure with countersunk, concealed fasteners and blind nailing.
 - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with exterior architectural woodwork.
 - 3. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.
 - 4. For shop-finished items, use filler matching finish of items being installed.
- H. Touch up finishing work specified in this Section after installation of exterior architectural woodwork.
 - 1. Fill nail holes with matching filler where exposed.
 - 2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- I. Field Finishing: See Section 099113 "Exterior Painting" and Section 099300 "Staining and Transparent Finishing" for final finishing of installed exterior architectural woodwork.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity is to prepare and submit report of inspection.

END OF SECTION 064013

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim.
2. Interior frames and jambs.
3. Interior stairs and railings.
4. Wood furring, blocking, shims, and hanging strips for installing interior architectural
woodwork items that are not concealed within other construction.
5. Shop priming of interior architectural woodwork.
6. Shop finishing of interior architectural woodwork.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that exterior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.
4. Fire-Retardant Treatment: Include data and warranty information from chemical-
treatment manufacturer and certification by treating plant that treated materials comply
with requirements.

B. Shop Drawings:

1. Include the following:
 - a. Dimensioned plans, elevations, and sections.
 - b. Attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and
reinforcement concealed by construction and specified in other Sections.
4. Apply AWI Quality Certification Program label to Shop Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.

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1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .
 - 1. Installer Qualifications: Licensed participant in AWI's Quality Certification Program .

1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK 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 or approved equal:
 - 1. MPI Wood working .
 - 2. Jonathan Moran Woodworks
 - 3. Mac Woodworking
 - 4. Allegheny Millwork and Lumber
 - 5. Artcraft Wood Products

2.2 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
 - a. This project has been registered with AWI as AWI Quality Certification Program Number .

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2.3 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom .
- B. Hardwood Lumber:
 - 1. Wood Species and Cut: to match existing Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
 - 2. Species: to match existing .
 - 3. Cut: Plain sliced/plain sawn .
 - 4. Wood Moisture Content: 5 to 10 percent.
 - 5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
 - 6. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.
 - a. For veneered base, use hardwood lumber core, glued for width.
 - 7. For base wider than available lumber, glue for width. Do not use veneered construction.
 - 8. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.
- C. Softwood Lumber:
 - 1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
 - 2. Species: Eastern white pine Sugar pine Western white pine Douglas fir to match existing .
 - 3. Cut: Plain sawn .
 - 4. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
 - 5. For trim items wider than available lumber, use veneered construction. Do not glue for width.
 - a. For veneered base, use softwood lumber core, glued for width.
 - 6. For base wider than available lumber, glue for width. Do not use veneered construction.
 - 7. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.
 - 8. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Architectural Woodwork Standards Grade: Custom .
 - 1. Wood Species: Any closed-grain hardwood .

2.5 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom .
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

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1. Species: Red oak White oak White ash Hickory to match existing .
2. Cut: Plain sliced/plain sawn .
3. Provide split species on frames and jambs that face areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.

C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.

2.6 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Custom .

B. Wood Species: Any closed-grain hardwood .

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.

2.7 INTERIOR WOOD STAIRS AND RAILINGS

A. Architectural Woodwork Standards Grade: Custom .

B. Wood for Transparent Finish:

1. Species and cut:
 - a. Stringers: Red oak, plain sawn Hard maple, plain sawn .
 - b. Risers: Red oak, plain sawn Hard maple, plain sawn .
 - c. Treads: Red oak, plain sawn Hard maple, plain sawn .
 - d. Railings: Red oak, plain sawn Hard maple, plain sawn .
 - e. Balusters: Red oak, plain sawn .
 - f. Newels: Red oak, plain sawn Hard maple, plain sawn .
 - g. Moldings: Red oak, plain sawn Hard maple, plain sawn .

C. Finishes for Stair Parts:

1. Treads: Transparent .
2. Risers: Transparent .
3. Stringers: Transparent .
4. Balusters: Transparent .
5. Handrails: Transparent .
6. Scotia, Cove, and Other Moldings: Transparent .

D. Handrail Brackets: Cast nickel-silver Cast aluminum Cast bronze Cast stainless steel with wall flange drilled and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Size to provide 1-1/2-inch clearance between handrail and face of wall.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Blum, Julius & Co., Inc.

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b. The Wagner Companies.

- E. Handrail/Bumper Rail Brackets: Pairs of extruded-aluminum channels: one for fastening to back of rail and one for fastening to face of wall, assembled in overlapping fashion and fastened together at top and bottom with self-tapping screws. Size to provide 1-1/2-inch clearance between handrail and wall.

2.8 HARDWOOD SHEET MATERIALS

- A. Composite Wood Products: Provide materials that comply with requirements of the Architectural Woodwork Standards for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130 .
2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1 , medium-density overlay.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.9 FIRE-RETARDANT-TREATED WOOD MATERIALS

- A. Fire-Retardant-Treated Wood Materials: Where fire-retardant-treated materials are indicated, use materials complying with requirements that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of the Architectural Woodwork Standards. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained, transparent, or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment, and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

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- C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture, to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less in accordance with ASTM E84.
1. 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 or approved equal:
 - a. Arauco North America.
 - b. Timber Products Company.
 2. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2, except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 3. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1, except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard (MDF) panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture, to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less in accordance with ASTM E84.
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 or approved equal:
 - a. Roseburg.

2.10 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Nailers: , kiln-dried to less than 15 percent moisture content.
1. Preservative Treatment: Provide softwood lumber treated by pressure process, AWPA U1; Use Category UC3b.
 - a. Provide where indicated .
 - b. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - c. Preservative Chemicals: Acceptable to authorities having jurisdiction.
 - d. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.
 2. Fire-Retardant Treatment: Complying with requirements; provide where indicated .

2.11 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.
1. Ease edges to radius indicated for the following:
 - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

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- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
 - 1. Disassemble components only as necessary for shipment and installation.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
 - a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
 - b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.
- D. Stairs: Cut rough carriages to accurately fit treads and risers.
 - 1. Glue treads to risers, and glue and nail treads and risers to carriages.
 - 2. House wall and face stringers, and glue and wedge treads and risers.
 - 3. Fabricate stairs with treads and risers no more than 1/8 inch from indicated position and no more than 1/16 inch out of relative position for adjacent treads and risers.

2.12 SHOP PRIMING

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
- B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 099123 "Interior Painting."
 - 1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.
- C. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."
 - 1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.13 SHOP FINISHING

- A. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.
- B. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Custom .
 - 2. Finish System - 1: Lacquer, Nitrocellulose.

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3. Finish System - 2: Lacquer, Pre Catalyzed.
4. Finish System - 3: Lacquer, Post Catalyzed.
5. Finish System - 4: Latex Acrylic, Water Based.
6. Finish System - 5: Varnish, Conversion.
7. Finish System - 6: Oil, Synthetic Penetrating.
8. Finish System - 7: Vinyl, Catalyzed.
9. Finish System - 8: Acrylic Cross Linking, Water Based.
10. Finish System - 9: UV Curable, Acrylated Epoxy, Polyester, or Urethane.
11. Finish System - 10: UV Curable, Water Based.
12. Finish System - 11: Polyurethane, Catalyzed.
13. Finish System - 12: Polyurethane, Water Based.
14. Finish System - 13: Polyester, Catalyzed.
15. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
16. Staining: Match Architect's sample.
17. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
18. Sheen: Semigloss, 50-70 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

C. Opaque Finish:

1. Architectural Woodworking Standards Grade: Custom .
2. Finish System - 1: Lacquer, Nitrocellulose.
3. Finish System - 2: Lacquer, Pre Catalyzed.
4. Finish System - 3: Lacquer, Post Catalyzed.
5. Finish System - 4: Latex Acrylic, Water Based.
6. Finish System - 5: Varnish, Conversion.
7. Finish System - 7: Vinyl, Catalyzed.
8. Finish System - 8: Acrylic Cross Linking, Water Based.
9. Finish System - 9: UV Curable, Acrylated Epoxy, Polyester, or Urethane.
10. Finish System - 10: UV Curable, Water Based.
11. Finish System - 11, Polyurethane, Catalyzed.
12. Finish System - 12: Polyurethane, Water Based.
13. Finish System - 13: Polyester, Catalyzed.
14. Color: As indicated by manufacturer's designations .
15. Sheen: Semigloss, 50-70 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
- B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

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- B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPAC M4.
- F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
 - 1. Secure with countersunk, concealed fasteners and blind nailing.
 - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
 - 3. For shop-finished items, use filler matching finish of items being installed.
- H. Standing and Running Trim:
 - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
 - 2. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
 - 3. Scarf running joints and stagger in adjacent and related members.
 - 4. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth; and finish same as wood base if finished.
 - 5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- I. Stairs: Securely anchor carriages to supporting substrates.
 - 1. Install stairs with treads and risers no more than 1/8 inch from indicated position.
 - 2. Secure with countersunk, concealed fasteners and blind nailing.
 - 3. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.
- J. Railings:
 - 1. Install rails with no more than 1/8 inch in 96-inch variation from a straight line.
 - 2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.
 - 3. Wall Rails: Support rails on wall brackets securely fastened to wall framing.

END OF SECTION 064023

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad architectural cabinets.
 - 2. Cabinet hardware and accessories.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .
- B. Installer Qualifications: Manufacturer of products .

1.7 FIELD CONDITIONS

- A. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

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PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, See Finish Standards and Cost Comparisons

2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from certification program indicating that woodwork complies with requirements of grades specified.
- B. Architectural Woodwork Standards Grade: Economy.
- C. Type of Construction: Face frame.
- D. Door and Drawer-Front Style: overlay.
 - 1. Coronet Door
 - 2. Reveal Dimension: As indicated .
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, See Finish Standards and Cost Comparisons
- F. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. See Finish and Cost Comparisons

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

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1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 1. Plantation Hardwood
 2. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."
- B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
 1. Dark, Oxidized, Satin Bronze, Oil Rubbed: ANSI/BHMA 613 for bronze base; ANSI/BHMA 640 for steel base; match Architect's sample.
- C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

2.6 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

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- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips .

3.2 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity shall prepare and submit report of inspection.

END OF SECTION 064116

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SECTION 064400 - ORNAMENTAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior ornamental woodwork for transparent finish.
2. Exterior ornamental woodwork for opaque finish
3. Interior ornamental woodwork for opaque finish.
4. Wood furring, blocking, shims, and hanging strips for installing ornamental woodwork items that are not concealed within other construction.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior ornamental woodwork can be supported and installed as indicated.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Composite wood products.
2. Fire-retardant-treated materials.
3. Finishing materials and processes.
4. Wood-Preservative Treatment:
 - a. Include data and warranty from chemical-treatment manufacturer and certification by treating plant that treated materials to comply with requirements.
 - b. Indicate type of preservative used and net amount of preservative retained.
 - c. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.
5. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials to comply with requirements.
6. Waterborne Treatments: For products receiving a waterborne treatment, Include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Shop Drawings: Show location of each item, including the following:

1. Dimensioned plans, elevations, and sections.
2. Attachment devices and other components.
3. Show large-scale details.

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4. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
5. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
6. Apply Program label to Shop Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For ornamental woodwork manufacturer and Installer.
- B. Product Certificates: For the following:
 1. Composite wood products.
 2. Adhesives.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: certificates.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .
- B. Installer Qualifications: Manufacturer of products and Licensed participant in AWI's Quality Certification Program .

1.8 FIELD CONDITIONS

- A. Weather Limitations for Exterior Work: Proceed with installation of exterior ornamental woodwork only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish is to be applied without exposure to rain, snow, or dampness.
- B. Environmental Limitations for Interior Work without Humidity Control: Do not deliver or install interior ornamental woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupancy for the remainder of the construction period.
- C. Environmental Limitations for Interior Work with Humidity Control: Do not deliver or install interior ornamental woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

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PART 2 - PRODUCTS

2.1 ORNAMENTAL WOODWORK 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 or approved equal:
 - 1. Clark Deco .
 - 2. Allegheny Millwork and Lumber

2.2 ORNAMENTAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of ornamental woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from certification program indicating that woodwork , including installation, complies with requirements of grades specified.

2.3 EXTERIOR ORNAMENTAL WORK FOR TRANSPARENT FINISH

- A. Exterior ornamental work for transparent finish includes the following:
 - 1. elements specified in drawings
- B. Architectural Woodwork Standards Grade: Custom .
- C. Wood Species: per manufacturers specifications .
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
- D. Wood Moisture Content: 9 to 15 percent.

2.4 EXTERIOR ORNAMENTAL WORK FOR OPAQUE FINISH

- A. Exterior ornamental work for opaque finish includes the following:
 - 1. elements specified in drawings .
- B. Architectural Woodwork Standards Grade: Custom .
- C. Wood Species: per manufacturers specifications .
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
- D. Wood Moisture Content: 9 to 15 percent.

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2.5 INTERIOR ORNAMENTAL WORK FOR OPAQUE FINISH

- A. Interior ornamental work for opaque finish includes the following:
 - 1. elements specified in drawings .
- B. Architectural Woodwork Standards Grade: Custom .
- C. Wood Species: per manufacturers specifications .
- D. Wood Moisture Content: 5 to 10 percent.

2.6 WOOD MATERIALS

- A. Composite Wood Products: Provide materials that comply with requirements of the Architectural Woodwork Standards for each type of ornamental woodwork and quality grade specified unless otherwise indicated.

2.7 PRESERVATIVE-TREATED WOOD MATERIALS

- A. Preservative-Treated Wood Materials: Provide with water-repellent preservative treatment complying with AWWA N1 (dip, spray, flood, or vacuum-pressure treatment).
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC) , combined with a compatible EPA registered insecticide.
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Extent of Preservative Treated Wood Materials: Treat exterior ornamental woodwork indicated on Drawings .
 - 1. Items fabricated from the following wood species need not be treated:
 - a. All-heart redwood.
 - b. All-heart western red cedar.
 - c. White oak.
 - d. African mahogany.
 - e. Honduras mahogany.
 - f. Ipe.
 - g. Dark red meranti.
 - h. Teak.

2.8 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of Architectural Woodwork Standards for the grade specified. Do not use materials that are warped, discolored, or otherwise defective.

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2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. For exterior applications, use materials that comply with testing requirements after being subjected to accelerated weathering in accordance with ASTM D2898.
 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 3. For items indicated to receive a stained, transparent or natural finish, use organic resin chemical formulation.
 4. Mill lumber before treatment, and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

2.9 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate ornamental woodwork to dimensions, profiles, and details indicated.
1. Ease edges to radius indicated for the following:
 - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Complete fabrication, including assembly and finishing, to maximum extent possible before shipment to Project site.
1. Disassemble components only as necessary for shipment and installation.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
 - a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
 - b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition ornamental woodwork to average prevailing humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

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- B. Before installing ornamental woodwork, examine shop-fabricated work for completion, and complete work as required, including removing packing and backpriming concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install ornamental woodwork to comply with same grade as item to be installed.
- B. Assemble ornamental woodwork, and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install ornamental woodwork level, plumb, true in line, and without distortion.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut ornamental woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Preservative-Treated Wood: Where cut or drilled, treat cut ends and drilled holes in accordance with AWP A M4.
- F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Anchor ornamental woodwork to anchors or blocking built in or directly attached to substrates.
 - 1. Secure with countersunk, concealed fasteners and blind nailing.
 - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with ornamental woodwork.
 - 3. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.
 - 4. For shop-finished items, use filler matching finish of items being installed.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity is to prepare and submit report of inspection.

END OF SECTION 064400

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SECTION 070150.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Partial tear-off of roof areas indicated on Drawings.
2. Re-cover preparation of roof areas indicated on Drawings.
3. Removal of flashings and counterflashings.

1.2 UNIT PRICES

- A. Work of this Section is affected by insulation removal and replacement unit price roof sheathing removal and replacement unit price and parapet wall sheathing removal and replacement unit price .

1.3 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site .

1.4 INFORMATIONAL SUBMITTALS

- A. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

1.6 FIELD CONDITIONS

- A. Existing Roofing System: as specified in drawings
- B. Owner will not occupy portions of building immediately below reroofing area.
1. Conduct reroofing so Owner's operations are not disrupted.
 2. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.

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3. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
 1. A roof moisture survey of existing roofing system is available for Contractor's reference.
 2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.
 3. Construction Drawings for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.
- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 1. Remove only as much roofing in one day as can be made watertight in the same day.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty issued by manufacturer .

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- B. Shut off rooftop utilities and service piping before beginning the Work.

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- C. Test existing roof drains to verify that they are not blocked or restricted.
 - 1. Immediately notify Architect of any blockages or restrictions.
- D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
 - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
 - 1. Prevent debris from entering or blocking roof drains and conductors.
 - a. Use roof-drain plugs specifically designed for this purpose.
 - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
 - a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Remove aggregate ballast from roofing.
- D. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing using a power broom.
- E. Remove pavers and accessories from roofing.
 - 1. Store and protect pavers and accessories for reuse in manner not to exceed structural loading limitations of roof deck.
 - 2. Discard cracked pavers.
- F. Partial Roof Tear-off: Where indicated on Drawings, remove existing roofing down to existing cover board and immediately check for presence of moisture.
 - 1. Engage a qualified testing agency to perform the following test:
 - a. Coordinate with Owner's testing agency to schedule times for tests and inspections immediately after removal.
 - 2. Survey exposed substrate that is to remain using infrared color thermography according to ASTM C 1153.
 - a. Prepare survey report of initial scan indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

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3. Remove wet or damp materials below existing roofing and above deck as directed by Architect.
4. Inspect wood blocking, curbs, and nailers for deterioration and damage.
 - a. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.
5. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry.
 - a. Remove unadhered bitumen, unadhered felts, and wet felts.
6. Remove excess asphalt from steel deck that is exposed by removal of wet or damp materials.
 - a. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
7. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 1. Do not proceed with installation until directed by Architect.
- D. Provide additional deck securement as indicated on Drawings.
- E. Replace plywood roof sheathing as indicated on Drawings.
- F. Replace plywood roof sheathing as directed by Architect.
 1. Roof sheathing replacement will be paid for by adjusting the Contract Sum, with a change order, according to unit prices included in the Contract Documents.

3.4 ROOF RE-COVER PREPARATION

- A. Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing that inhibit new recover boards from conforming to substrate.
 1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
 2. Broom clean existing substrate.
 3. Coordinate with Owner's inspector to schedule times for tests and inspections.
 4. Verify that existing substrate is dry.
 - a. Spot check substrates with an electrical capacitance moisture-detection meter.
 5. Remove materials that are wet or damp.
 - a. Removal will be paid for by adjusting the Contract Sum, with a change order, according to unit prices included in the Contract Documents.
- B. Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing that inhibit new roofing from conforming to substrate.

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1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Broom clean existing substrate.
3. Coordinate with Owner's inspector to schedule times for tests and inspections.
4. Verify that existing substrate is dry before proceeding with installation.
 - a. Spot check substrates with an electrical capacitance moisture-detection meter.
5. Remove materials that are wet and damp.
 - a. Removal will be paid for by adjusting the Contract Sum, with a change order, according to unit prices included in the Contract Documents.

END OF SECTION 070150.19

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SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, cut-back-asphalt dampproofing.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- 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 or approved equal:
 - 1. APOC, Inc; a division of Gardner Industries.
 - 2. Brewer Company (The).
 - 3. Henry Company.
 - 4. W.R. Meadows, Inc.
- B. Trowel Coats: ASTM D 4586/D 4586M, Type I, Class 1, fibered.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.

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1. Apply dampproofing to provide continuous plane of protection.
 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat or one trowel coat at not less than 4 gal./100 sq. ft..
- B. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat or primer and one trowel coat at not less than 4 gal./100 sq. ft..

END OF SECTION 071113

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SECTION 071900 - WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
 - 1. Concrete unit masonry.
 - 2. Clay brick masonry.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Penetrating Low-VOC Silane Water Repellent: Clear, containing 40 percent or more active content of modified silane; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
 - 1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Advanced Chemical Technologies, Inc.
 - b. Chemical Products Industries, Inc.
 - c. Concrete Sealers USA.
 - d. Dayton Superior.
 - e. Euclid Chemical Company (The); an RPM company.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
 - 2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - 3. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

3.2 PREPARATION

- A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions .
- C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

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3.4 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Molded (expanded) polystyrene foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Molded (expanded) polystyrene foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research reports.

PART 2 - PRODUCTS

2.1 MOLDED (EXPANDED) POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Molded (Expanded) Polystyrene Board Insulation, Type I : ASTM C578, Type I, 10-psi minimum compressive strength.
 - 1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Amvic Building System.
 - b. Atlas Roofing Corporation - Molded Polystyrene.
 - c. DiversiFoam Products.
 - d. Insulfoam; Carlisle Construction Materials Company.
 - e. Plymouth Foam, Inc.
 - 2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- B. Molded (Expanded) Polystyrene Board Insulation, Type VIII : ASTM C578, Type VIII, 13-psi minimum compressive strength.
 - 1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Atlas Roofing Corporation - Molded Polystyrene.
 - b. DiversiFoam Products.
 - c. Plymouth Foam, Inc.

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2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- C. Molded (Expanded) Polystyrene Board Insulation, Type II : ASTM C578, Type II, 15-psi minimum compressive strength.
1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Amvic Building System.
 - b. Atlas Roofing Corporation - Molded Polystyrene.
 - c. DiversiFoam Products.
 - d. Insulfoam; Carlisle Construction Materials Company.
 - e. Plymouth Foam, Inc.
 2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- D. Molded (Expanded) Polystyrene Board Insulation, Type IX : ASTM C578, Type IX, 25-psi minimum compressive strength.
1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Atlas Roofing Corporation - Molded Polystyrene.
 - b. DiversiFoam Products.
 - c. Insulfoam; Carlisle Construction Materials Company.
 - d. Plymouth Foam, Inc.
 2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced : ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to the following or approved equal:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

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- C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

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5. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward as indicated on Drawings.
 - b. Interior Walls: Set units with facing placed as indicated on Drawings .
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

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SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber-reinforced asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Metal flashing and trim.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

- B. Samples: For each exposed product and for each color and blend specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research reports for synthetic underlayment.
- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

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1.7 WARRANTY

- A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Materials Warranty Period: at least 20 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
 - 2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 80 mph for at least 20 years from date of Substantial Completion.
 - 3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five 20 years from date of Substantial Completion.
 - 4. Workmanship Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Impact-Resistant, Three-Tab-Strip Asphalt Shingles: ASTM D3462/D3462M; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with tabs regularly spaced and with impact resistance complying with UL 2218, Class 4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:
 - a. Certainteed; SAINT-GOBAIN.
 - 2. Strip Size: Manufacturer's standard .
 - 3. Algae Resistance: Granules resist algae discoloration.
 - 4. Color and Blends: As selected by Architect from manufacturer's full range to match existing .
- B. Hip and Ridge Shingles: Site-fabricated units cut from asphalt shingle strips. Trim each side of lapped portion of unit to taper approximately 1 inch.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 50-mil- thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied. Provide primer for adjoining concrete, masonry, and metal surfaces to receive underlayment.
 - 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 or approved equal:
 - a. Atlas Roofing Corporation - Molded Polystyrene.
 - b. Certainteed; SAINT-GOBAIN.
 - c. GAF.

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- d. IKO Industries Inc.
- e. Owens Corning.
- f. Tamko Building Products, Inc.

2.4 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid-section, high-density, UV-stabilized plastic ridge vent for use under ridge shingles.
 - 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 or approved equal:
 - a. Air Vent, Inc.; a Gibraltar Industries company.
 - b. Certainteed; SAINT-GOBAIN.
 - c. GAF.
 - d. Owens Corning.
 - e. Tamko Building Products, Inc.
 - 2. Features:
 - a. Nonwoven geotextile filter strips.
 - b. External deflector baffles.

2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.
- B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.
- C. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, sharp-pointed, with a 3/8- to 7/16-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through sheathing less than 3/4 inch thick.
 - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- D. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- minimum diameter.
 - 1. Provide with minimum 0.0134-inch- thick metal cap, 0.010-inch- thick power-driven metal cap, or 0.035-inch- thick plastic cap; and with minimum 0.083-inch- thick ring shank or 0.091-inch- thick smooth shank of length to penetrate at least 3/4 inch into roof sheathing or to penetrate through roof sheathing less than 3/4 inch thick.

2.6 METAL FLASHING AND TRIM

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Sheet Metal: Aluminum, mill finished .

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- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise indicated on Drawings.
 - 1. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT MATERIALS

- A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Synthetic Underlayment:
 - 1. Install on roof deck parallel with and starting at the eaves.
 - a. Lap sides and ends as recommended in writing by manufacturer, but not less than 4 inches for side laps and 6 inches for end laps.
 - b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches.
 - c. Fasten with underlayment nails in accordance with manufacturer's written instructions.
 - d. Cover underlayment within period recommended in writing by manufacturer.
 - 2. Install in single layer on roofs sloped at 4:12 and greater.
 - 3. Install in double layer on roofs sloped at less than 4:12.
 - 4. Install synthetic underlayment over areas protected by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.
 - a. Lap ends of underlayment not less than 6 inches over self-adhering sheet.
 - 5. Terminate synthetic underlayment extended up not less than 4 inches against sidewalls, curbs, chimneys, and other roof projections.
- C. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck in locations indicated on Drawings.
 - 1. Comply with low-temperature installation restrictions of underlayment manufacturer.
 - 2. Install lapped in direction that sheds water.
 - a. Lap sides not less than 4 inches.
 - b. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses.
 - c. Roll laps with roller.
 - 3. Prime concrete, masonry, and metal surfaces to receive self-adhering sheet.
 - 4. Cover underlayment within seven days.
- D. Metal-Flushed, Open-Valley Underlayment: Install two layers of minimum 36-inch-wide underlayment centered in valley.
 - 1. Use same underlayment as installed on field of roof.
 - 2. Stagger end laps between layers at least 72 inches.

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3. Lap ends of each layer at least 12 inches in direction that sheds water, and seal with asphalt roofing cement.
4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
5. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches.

3.2 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 1. Install metal flashings in accordance with recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
 2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.
- B. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.3 INSTALLATION OF ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches wide with self-sealing strip face up at roof edge.
 1. Extend asphalt shingles 1/2 inch over fascia at eaves and rakes.
 2. Install starter strip along rake edge.
- C. Install first and remaining courses of three-tab-strip asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with a minimum of five roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.
 1. Locate fasteners in accordance with manufacturer's written instructions.
 2. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
- E. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips.
 1. Maintain uniform width of exposed open valley from highest to lowest point.
 2. Extend shingle a minimum of 4 inches over valley metal.
 3. Set valley edge of asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.
 4. Do not nail asphalt shingles to metal open-valley flashings.

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- F. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.
 - 1. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

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SECTION 073126 - SLATE SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Slate shingles.
2. Underlayment materials.
3. Ridge accessories.
4. Metal flashing and trim.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Slate shingles.
2. Underlayment materials.
3. Ridge accessories.
4. Asphalt roofing cement.
5. Butyl sealant.
6. Elastomeric sealant.
7. Roofing asphalt.
8. Cold-applied adhesive.

- B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports for slate.

PART 2 - PRODUCTS

2.1 SLATE SHINGLES

- A. Slate Shingles: ASTM C406/C406M, Grade S1 ; hard, dense, and sound; with chamfered edges and nail holes machine punched or drilled and countersunk; with no broken or cracked slates, no broken exposed corners, and no broken corners on covered ends that could sacrifice nailing strength or laying of a watertight roof.

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 or approved equal:

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- a. American Slate Company.
 - b. Buckingham-Virginia Slate Corp.
 - c. Evergreen Slate Company, Inc.
 - d. New England Slate.
 - e. Vermont Structural Slate Company, Inc.
 2. Thickness and Surface Texture: Nominal to match existing .
 3. Length: to match existing .
 4. Width: to match existing .
 5. Butt Shape: to match existing .
 6. Color: to match existing .
 7. Weather-Exposure Color Change: Unfading .
- B. Starter Slate: Slate shingles with chamfered nail holes front-side punched.
1. Length: Exposure of slate shingle plus headlap.

2.2 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; recommended, in writing, by manufacturer for use under slate shingles; and evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
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 or approved equal:
 - a. Certainteed; SAINT-GOBAIN.
 - b. GAF.
 - c. Owens Corning.
 - d. SDP Advanced Polymer Products Inc.
 - e. Tamko Building Products, Inc.
- B. Polymer-Modified Bitumen Sheet: Styrene-butadiene-styrene- (SBS) modified asphalt, glass-fiber-mat-reinforced sheet; minimum 55-mil nominal thickness; recommended in writing by manufacturer and acceptable to authorities having jurisdiction for use as underlayment in slate steep-slope roofing systems; and designed for mechanical fastening or adhesive attachment using roofing asphalt or cold-applied adhesive.
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 or approved equal:
 - a. Atlas Roofing Corporation - Polyiso.
 - b. Boral USA; Boral Roofing LLC.
 - c. Certainteed; SAINT-GOBAIN.
 - d. G.A.P. Roofing, Inc.
 - e. Ludowici Roof Tiles.
- C. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 55-mil- thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied. Provide primer for adjoining concrete, masonry, and metal surfaces to receive underlayment.

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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 or approved equal:
 - a. Certainteed; SAINT-GOBAIN.
 - b. GAF.
 - c. GCP Applied Technologies Inc.
 - d. Henry Company.
 - e. Owens Corning.
- D. Self-Adhering, Polymer-Modified Bitumen Sheet, High Temperature: ASTM D1970/D1970M, minimum 55-mil- thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied. Provide primer for adjoining concrete, masonry, and metal surfaces to receive underlayment.
 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 or approved equal:
 - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
 - b. Certainteed; SAINT-GOBAIN.
 - c. GCP Applied Technologies Inc.
 - d. Henry Company.
 - e. SDP Advanced Polymer Products Inc.
 2. Thermal Stability: Stable after testing at 240 deg F in accordance with ASTM D1970/D1970M.

2.3 RIDGE ACCESSORIES

- A. Rigid-Plastic Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under slate ridge shingles.
 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 or approved equal:
 - a. Cor-A-Vent, Inc.
 - b. GAF.
 - c. Tapco International Corporation; Mid-America Components.
 2. Minimum Net Free Area: to match existing .
 3. Width: to match existing .
 4. Thickness: to match existing .

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.
- B. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubbersealant; polyisobutylene plasticized; heavy bodied.
- C. Elastomeric Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints in slate-shingle roofing and remain watertight; recommended in writing by manufacturer for applications indicated.
- D. Roofing Asphalt: ASTM D312/D312M Type IV.

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- E. Cold-Applied Adhesive: Manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with underlayments.
- F. Slating Nails: ASTM F1667, copper, smooth-shanked, wire nails; 0.135-inch- minimum thickness; sharp pointed; with 3/8-inch- minimum diameter flat head; of sufficient length to penetrate a minimum of 3/4 inch into sheathing or extend at least 1/8 inch through sheathing less than 3/4 inch thick.
 - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- G. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- minimum diameter.
 - 1. Provide with minimum 0.0134-inch- thick metal cap, 0.010-inch- thick power-driven metal cap, or 0.035-inch- thick plastic cap; and with minimum 0.083-inch- thick ring shank or 0.091-inch- thick smooth shank of length to penetrate at least 3/4 inch into roof sheathing or to penetrate through roof sheathing less than 3/4 inch thick.
- H. Nailer Strips: Comply with requirements in Section 061053 "Miscellaneous Rough Carpentry."
- I. Nails for Wood Strips: ASTM F1667; common or box, steel wire, flat head, and smooth shank; hot-dip galvanized.

2.5 METAL FLASHING AND TRIM

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for design, dimensions, metal, and other characteristics of the item unless otherwise indicated on Drawings.
- C. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch thick. Provide leadsleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT MATERIALS

- A. Comply with slate-shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free.
 - 1. Comply with low-temperature installation restrictions of underlayment manufacturer.
 - 2. Install lapped in direction that sheds water. Lap sides not less than 4 inches.
 - 3. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses.
 - 4. Roll laps with roller.

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5. Prime concrete, masonry, and metal surfaces to receive self-adhering, polymer-modified bitumen sheet.
 6. Single-Layer Installation: Install over entire roof deck.
 7. Top-Layer Installation: Install as second layer over anchor-layer underlayment.
 - a. Completely cover anchor-layer underlayment.
 - b. Offset side laps halfway between side laps of underlying anchor layer and offset end laps from those of underlying anchor layer at least 72 inches.
 8. Water and Ice-Dam Protection Installation: Install on roof deck where indicated on Drawings.
- C. Valley Underlayment: Install one layer of 36-inch- wide underlayment centered in valley, running full length of valley, and on top of underlayment on field of roof that is woven through valley. Install all layers of underlayment in and through valley tight with no bridging.
1. Use same underlayment as installed on field of roof .
 2. Lap ends at least 12 inches in direction that sheds water, and seal with asphalt roofing cement.
 3. Fasten to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.

3.2 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
1. Install metal flashings in accordance with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."
- B. Pipe Flashings: Form flashing around pipe penetrations and slate shingles. Fasten and seal to slate shingles.

3.3 INSTALLATION OF SLATE SHINGLES

- A. Beginning at eaves, install slate shingles in accordance with manufacturer's written instructions and with details and recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."
1. Install wood strip cant at eave edges under underlayment materials .
 2. Install shingle starter course chamfered face down.
- B. Install first and succeeding shingle courses chamfered face up. Install full-width first course at rake edge.
1. Offset joints of uniform-width slate shingles by half the shingle width in succeeding courses.
 2. Offset joints of random-width slate shingles a minimum of 3 inches in succeeding courses.
- C. Maintain a 4-inch- minimum headlap between succeeding shingle courses.

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- D. Maintain uniform exposure of shingle courses midway between eaves and ridge, and increase headlap of succeeding shingle courses to ensure uniform exposure on remaining shingle courses.
- E. At eaves, extend shingle starter course and first course 1 inch over fascia.
- F. At rakes, extend shingle starter course and succeeding courses 1 inch over fascia.
- G. Cut and fit slate neatly around roof vents, pipes, ventilators, and other projections through roof.
- H. Hang slate with four slating nails for each shingle, with nail heads lightly touching slate.
 - 1. Do not drive nails home, which draws slates downward, and do not leave nail heads protruding enough to interfere with the overlapping shingle above.
 - 2. At vented ridges, terminate slate shingles to produce a uniform airspace on each side of ridge apex.
- I. Remove and replace damaged or broken slate shingles.

3.4 INSTALLATION OF RIDGE ACCESSORIES

- A. Rigid-Plastic Ridge Vents: Install continuous ridge vents in accordance with manufacturer's written instructions. Fasten with slating nails of sufficient length to penetrate sheathing.

END OF SECTION 073126

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SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal soffit panels.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL SOFFIT PANELS

- A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

- B. Metal Soffit Panels: Match profile and material of metal roof panels.

1. Finish: As indicated on Drawings.
2. Sealant: Factory applied within interlocking joint.

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2.2 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.3 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

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2.4 FINISHES

A. Panels and Accessories:

1. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports , as required to comply with requirements for assemblies indicated.

3.2 INSTALLATION

A. Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

B. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

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3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074293

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SECTION 074633 - PLASTIC SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl siding and soffit.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For vinyl siding, include VSI's official certification logo printed on Product Data.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.4 QUALITY ASSURANCE

- A. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-certified Installer on Project.

PART 2 - PRODUCTS

2.1 VINYL SIDING

- A. Vinyl Siding: Integrally colored product complying with ASTM D 3679.
 - 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 or approved equal:
 - a. Alside.
 - b. Certainteed; SAINT-GOBAIN.
 - c. Gentek Building Products, Inc.
 - d. Mastic Home Exteriors; PLY GEM Siding Group.
 - e. Royal Building Products.
- B. Vinyl Siding Certification Program: Provide products that are listed in VSI's list of certified products.
- C. Horizontal Pattern: To match existing
- D. Texture: To match existing
- E. Minimum Profile Depth (Butt Thickness): To match existing .

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2.2 VINYL SOFFIT

- A. Vinyl Soffit: Integrally colored product complying with ASTM D 4477.
 - 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 or approved equal:
 - a. Alside.
 - b. Certaineed; SAINT-GOBAIN.
 - c. Gentek Building Products, Inc.
 - d. Mastic Home Exteriors; PLY GEM Siding Group.
 - e. Royal Building Products.
- B. Vinyl Siding Certification Program: Provide products that are listed in VSI's list of certified products.
- C. Pattern: To match existing
- D. Texture: To match existing .
- E. Ventilation: Provide perforated soffit unless otherwise indicated.
- F. Colors: .

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside cornercaps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Vinyl Accessories: Integrally colored vinyl accessories complying with ASTM D 3679 except for wind-load resistance.
 - 1. Texture: Smooth .
- C. Colors for Decorative Accessories: To match existing
- D. Flashing: Provide To match existing flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- E. Fasteners:
 - 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
 - 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
 - 3. For fastening vinyl, use aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install vinyl siding and soffit and related accessories according to ASTM D 4756.
 - 1. Install fasteners for horizontal vinyl siding no more than 16 inches o.c.
 - 2. Install fasteners for vertical vinyl siding no more than 12 inches o.c.
- C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074633

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product data.

1.4 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:

1. Field-Adhesion-Test Reports: For each sealant application tested.

- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.
2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide "low VOC" joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 1. 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 or approved equal:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. Construction Foam Products; a division of Nomaco, Inc.
 - d. Master Builders Solutions.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or

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harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

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- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings in accordance with Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- H. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered

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satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

- C. Prepare test and inspection reports.

3.4 JOINT-SEALANT SCHEDULE

- A. Exterior joints in horizontal traffic surfaces:

- 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Tile control and expansion joints.
 - c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Urethane, M, P, 50, T, NT .
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

- B. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement:

- 1. Joint Locations:
 - a. Other joints as indicated on Drawings.
- 2. Joint Sealant: Acrylic latex .
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

- C. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces:

- 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT .
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

END OF SECTION 079200

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SECTION 080152.61 - WOOD WINDOW REPAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wood window repairs as follows:
 - 1. Replacing wood window frames and sash units.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- B. Window: Includes window frame, sash, and hardware, unless otherwise indicated by context.

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Wood-Window-Repair Specialist Qualifications: A qualified wood window specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part. Experience only in fabricating and installing new wood windows is insufficient experience for repairing wood windows.
- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar wood-repair applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

PART 2 - PRODUCTS

2.1 WOOD WINDOW REPAIRS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 6, "Interior & Exterior Millwork," in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 6, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

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2.2 REPLICATED WOOD WINDOW UNITS

- A. Replicated Wood Window Frames and Sash: Custom-fabricated replacement wood units and trim, with operating and latching hardware.
 - 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 or approved equal:
 - a. Cleary and Son, Inc.
 - b. Kingsland Architectural Millwork.
 - c. Smith Restoration Sash.
 - d. Weston Millwork Company.
 - e. WOODSTONE Company (The).
 - f. Pella
 - 2. Wood Species: Match wood species of exterior window trim and sash parts to match existing .
 - 3. Wood Window Members and Trim: Match profiles and detail of existing window members and trim.
 - 4. Weather Stripping: Full-perimeter and meeting rail weather stripping for each operable sash.

2.3 INSECT SCREENS

- A. Wood Insect-Screen Frames: Custom fabricated; tight fitting and removable , replicating appearance of existing insect-screen frames, and with a minimum of exposed fasteners and latches.
 - 1. Wood Species: Match wood species of window .
 - 2. Insect-Screen Members: Match wood profiles of existing shutters .

2.4 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

2.5 WOOD-REPAIR MATERIALS

- A. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
- B. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

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2.6 GLAZING MATERIALS

A. Glazing Systems:

1. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.7 HARDWARE

- A. Window Hardware: Provide complete sets of window hardware consisting of sash balances, hinges, pulls, latches, and accessories indicated for each window or required for proper operation. Sets shall include replacement hardware to complement repaired and refinished, existing hardware. Window hardware shall smoothly operate, tightly close, and securely lock wood windows and be sized to accommodate sash or ventilator weight and dimensions.

- B. Replacement Hardware: Replace existing damaged or missing hardware with new hardware.

C. Material and Design:

1. Material: Cast or wrought aluminum unless otherwise indicated.
2. Design: Match type and appearance of existing hardware.

- D. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements indicated.

2.8 WEATHER STRIPPING

2.9 MISCELLANEOUS MATERIALS

A. Cleaning Materials:

1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

2.10 WOOD WINDOW FINISHES

- A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

- B. Factory-Primed Replacement Units: Manufacturer's standard factory-prime coat on exposed exterior and interior wood surfaces; compatible with indicated finish coating.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- B. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 WOOD WINDOW REPAIRS, GENERAL

- A. Have wood window repairs performed only by qualified wood-window-repair specialist.
- B. Execution of the Work: In repairing wood windows, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090190.52 "Maintenance Repainting" unless otherwise indicated.
 - 3. Repair items in place where possible.
 - 4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
 - 5. Refinish wood windows according to Section 090190.52 "Maintenance Repainting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use gentle mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail.
- D. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood Windows: Match existing materials and features.
 - 1. Repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Sash Balance: Repair sash balances to function according to type as specified in "Hardware" Article" above. Provide missing sash balances.
- F. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
- G. Protection of Openings: Where sash or windows are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.
- H. Identify removed windows, frames, sash, and members with numbering system corresponding to window locations to ensure reinstallation in same location.

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3.3 WOOD WINDOW PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids and that have limited amounts of rotted or decayed wood. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces after removing rotted or decayed wood and before applying wood consolidant or patching compound.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 - 3. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.

3.4 WOOD WINDOW UNIT REPLACEMENT

- A. General: Replace existing wood window frame sash and shutter units with new custom-fabricated units to match existing at locations where damage is too extensive to repair.
- B. Apply borate preservative treatment to accessible surfaces before finishing. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Mill glazed members to accommodate glass thickness. Glaze units before installation.
- D. Install units level, plumb, square, true to line, without distortion or impeding movement; anchored securely in place to structural support; and in proper relation to wall flashing, trim, and other adjacent construction.
- E. Set sill members in bed of sealant for weathertight construction unless otherwise indicated.
- F. Install window units with new anchors into existing openings.
- G. Weather Stripping: Install full-perimeter and meeting rail weather stripping for each operable sash.
- H. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- I. Disposal of Removed Units: Remove from Owner's property and legally dispose of them.

3.5 WEATHER STRIPPING INSTALLATION

- A. Install weather stripping for tight seal of joints as determined by preconstruction testing and demonstrated in mockup.

END OF SECTION 080152.61

SECTION 080352 - HISTORIC TREATMENT OF WOOD WINDOWS

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

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

4.2 SUMMARY

- A. Section includes historic treatment of wood windows in the form of the following:
 - 1. Repairing wood windows and trim.
 - 2. Replacing wood window frames and sash units.
 - 3. Reglazing.
 - 4. Repairing, refinishing, and replacing hardware.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
 - 3. Section 064013 "Exterior Architectural Woodwork" for new wood shutters not included in this Section.
 - 4. Section 085200 "Wood Windows" for replacement wood windows or new replacement sash not included in this Section.

4.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by estimated quantities.
 - 2. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

4.4 DEFINITIONS

- A. Glazing: Includes glass, glazing points, glazing tapes, glazing sealants, and glazing compounds.
- B. Window: Includes window frame, sash, hardware, storm window, and exterior and interior shutters unless otherwise indicated by context.
- C. Wood Window Component Terminology: Wood window components for historic treatment work include the following classifications:

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1. Frame Components: Head, jambs, and sill.
2. Sash Components: Stiles and rails, parting bead, stop, and muntins.
3. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
4. Interior Trim: Casing, stool, and apron.

4.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of wood windows.
 2. Review methods and procedures related to historic treatment of wood windows including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Fire-protection plan.
 - d. Wood window historic treatment program.
 - e. Coordination with building occupants.

4.6 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of wood windows in the following sequence, which includes work specified in this and other Sections:
1. Label each window frame with permanent opening-identification number in inconspicuous location.
 2. Tag existing window sash, storm windows, and shutters with opening-identification numbers and remove for on-site or off-site repair. Indicate on tags the locations on window of each component, such as "top sash," "bottom sash," "left shutter," and "right shutter."
 3. Remove window, dismantle hardware, and tag hardware with opening-identification numbers.
 4. Install temporary protection and security at window openings.
 5. In the shop, label each sash, storm window, shutter, and louvered blind unit with permanent opening-identification number in inconspicuous location and remove site-applied tags.
 6. Sort units by condition, separating those that need extensive repair.
 7. Clean surfaces.
 8. General Wood-Repair Sequence:
 - a. Remove paint to bare wood.
 - b. Rack frames slightly to inject adhesive into mortise and tenon joints; square frames to proper fit before adhesive sets.
 - c. If thicker than original glass is required, rout existing muntins to required rebate size.
 - d. Repair wood by consolidation, member replacement, partial member replacement, and patching.
 - e. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
 9. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
 10. Install glazing.
 11. Remove temporary protection and security at window openings.
 12. Reinstall units.
 13. Apply finish coats.
 14. Install remaining hardware and weather stripping.

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4.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 - 1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing into or attaching to existing wood window, accessory items, and finishes.
 - 2. Include field-verified dimensions and the following:
 - a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relation of existing to new components.
 - b. Templates and directions for installing hardware and anchorages.
 - c. Identification of each new unit and its corresponding window locations in the building on annotated plans and elevations.
 - d. Provisions for sealant joints flashing as required for location.
- C. Samples for Initial Selection: For each type of exposed wood and finish.
 - 1. Identify wood species, cut, and other features.
 - 2. Include Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 - 1. Replacement Units: 12-inch- long, full-size frame and sash sections with applied finish.
 - 2. Replacement Members: 12 inches long for each replacement member, including parts of frame, sash, exterior trim, and interior trim.
 - a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.
 - 3. Repaired Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and prepared for refinishing.
 - 4. Refinished Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and refinished.
 - 5. Hardware: Full-size units with each factory-applied or restored finish.
 - 6. Weather Stripping: 12-inch- long sections.
 - 7. Glass: Full-size units of each type and appearance.

4.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist including workers and wood-repair-material manufacturer.
- B. Wood Window Historic Treatment Program: Submit before work begins.
- C. Preconstruction Test Reports: For historic treatment of wood windows.

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4.9 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood window specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part. Experience only in fabricating and installing new wood windows is insufficient experience for wood-window historic treatment work.
- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
 - 1. ISO 9001 quality management system current registration.
- C. Wood Window Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups on existing windows where directed by Architect .
 - 2. Wood Window Repair: Prepare one entire window unit to serve as mockup to demonstrate samples of each type of repair of wood window members including frame, sash, glazing, and hardware.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

4.10 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing on historic wood windows.
 - 1. Provide test specimens representative of proposed materials and existing construction.
 - 2. Test historic treatment products and methods for effectiveness and compliance with specified requirements.

4.11 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products are not deformed, broken, or otherwise damaged.

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- B. Store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

4.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic treatment of wood windows only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 5 - PRODUCTS

5.1 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

5.2 REPLICATED WOOD WINDOW UNITS

- A. Replicated Wood Window Frames and Sash: Custom-fabricated replacement wood units and trim, with operating and latching hardware.
 - 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 or approved equal:
 - a. Adams Architectural Millwork Co.; a subsidiary of Dubuque Sash & Door Mfg.
 - b. Allegheny Restoration & Builders Inc.
 - c. Architectural Components, Inc.
 - d. Bear Wood Windows, Inc.
 - e. Cleary and Son, Inc.
 - f. Custom Wood Reproductions Inc.
 - g. Grabill Incorporated.
 - h. H. Hirschmann LTD.
 - i. Kingsland Architectural Millwork.
 - j. Olek Lejbzon & Co.
 - k. Parrett Manufacturing, Inc.
 - l. Replica Windows.
 - m. Smith Restoration Sash.
 - n. Weston Millwork Company.
 - o. Wewoka Window Works.
 - p. Wood Window Workshop.
 - q. WOODSTONE Company (The).
 - 2. Joint Construction: Joints matching existing .
 - 3. Wood Species: Match wood species of exterior window trim and sash parts .
 - 4. Wood Cut: Match cut of existing exterior wood window trim and sash parts .

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5. Wood Window Members and Trim: Match profiles and detail of existing window members and trim.
6. Glazing Stops: Provide replacement glazing stops coordinated with glazing system indicated.
7. Exposed Hardware: Match existing exposed window hardware.
8. Weather Stripping: Full-perimeter and meeting rail weather stripping for each operable sash.

5.3 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.
- B. Frame Heads and Jambs and Exterior Trim : Match existing species .
- C. Exterior Trim: Match existing species .
- D. Sills: Match existing species .
- E. Sash Components: Match existing species .
- F. Interior Trim: Match existing species .

5.4 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product, 100 percent epoxy solids containing no solvent or water, designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Abatron, Inc.; LiquidWood or comparable product by one of the following or approved equal:
 - a. ConServ Epoxy LLC.
 - b. Gougeon Brothers, Inc.
- C. Wood-Patching Compound: Lightweight, two-part epoxy-resin wood-patching compound; shrink-free, 100 percent epoxy solids, knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Abatron, Inc.; WoodEpoxy or comparable product by one of the following or approved equal:
 - a. Polymeric Systems, Inc.
 - b. System Three Resins, Inc.

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5.5 GLAZING MATERIALS

- A. Glass: See Section 088000 "Glazing."

5.6 HARDWARE

- A. Window Hardware: Provide complete sets of window hardware consisting of sash balances, hinges, pulls, latches, and accessories indicated for each window or required for proper operation. Sets shall include replacement hardware to complement repaired and refinished, existing hardware. Window hardware shall smoothly operate, tightly close, and securely lock wood windows and be sized to accommodate sash or ventilator weight and dimensions.
- B. Other Hardware: Provide complete sets of hardware for each type of consisting of hinges, pulls, latches, and accessories indicated or required for proper operation. Hardware shall smoothly operate, tightly close, and secure units appropriately for unit weight and dimensions.
- C. Replacement Hardware: Replace existing damaged or missing hardware with new hardware manufactured by one of the following:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Architectural Resource Center (The).
 - b. Ball and Ball.
 - c. Blaine Window Hardware Inc.
 - d. Bronze Craft Corporation (The).
 - e. Phelps Company.
 - f. Smith Restoration Sash.
- D. Material and Design:
 - 1. Design: Match type and appearance of existing hardware.
 - 2. Replacement Window Hardware: Match existing window hardware of the following types:
 - a. Projected window hinge.
 - b. Window lock.
 - c. Window latch.
 - d. Handle.
 - e. Pole ring.
- E. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements indicated by the following:
 - 1. BHMA 605: Bright brass, clear-coated; brass base metal.
 - 2. BHMA 606: Satin brass, clear-coated; brass base metal.
 - 3. BHMA 611: Bright bronze, clear-coated; bronze base metal.
 - 4. BHMA 612: Satin bronze, clear-coated; bronze base metal.
 - 5. BHMA 613: Dark-oxidized satin bronze, oil-rubbed; bronze base metal.
 - 6. BHMA 624: Dark-oxidized statuary bronze, clear-coated; bronze base metal.
 - 7. BHMA 628: Satin aluminum, clear-anodized; aluminum base metal.
 - 8. BHMA 630: Satin stainless steel; stainless steel base metal.
 - 9. BHMA 689: Aluminum painted; over any base metal.

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5.7 WEATHER STRIPPING

- A. Compression-Type Weather Stripping: Compressible weather stripping designed for permanently resilient sealing under bumper or wiper action; completely concealed when window is closed.
 - 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 or approved equal:
 - a. National Guard Products, Inc.
 - b. Pemko Manufacturing Co.
 - c. Reese Enterprises, Inc.
 - d. Zero International, Inc.
 - 2. Weather-Stripping Material: Match existing materials and profiles as much as possible unless otherwise indicated.
 - a. Cellular Elastomeric Gaskets: Preformed; complying with ASTM C509.
 - b. Dense Elastomeric Gaskets: Preformed; complying with ASTM C864.
- B. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric.
 - 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 or approved equal:
 - a. National Guard Products, Inc.
 - b. Pemko Manufacturing Co.
 - c. Reese Enterprises, Inc.
 - d. Zero International, Inc.
 - 2. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.
- C. Metal Weather Stripping: Bronze Zinc or other weather stripping; designed either as one piece to seal by sliding into a groove in the sash or as two pieces that interlock; and completely concealed when window is closed.
 - 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 or approved equal:
 - a. Accurate Metal Weatherstrip Co. Inc.
 - b. Zero International, Inc.

5.8 MISCELLANEOUS MATERIALS

- A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage by decay fungi and wood-boring insects; complying with AWWA P5; containing no boric acid.
 - 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 or approved equal:
 - a. American Borate Co.; Disodium octaborate tetrahydrate.
 - b. Nisus Corporation; BoraCare.
 - c. U.S. Borax; TimBor.

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- B. Cleaning Materials:
 - 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
 - 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- C. Adhesives: Wood adhesives for exterior exposure, with minimum 5-minute to 3-hour hardening time at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair.
- D. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
 - 4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
 - 5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.
- E. Anchors, Clips, and Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B633 for SC 3 (Severe) service condition.

5.9 WOOD WINDOW FINISHES

- A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.
- B. Factory-Primed Replacement Units: Manufacturer's standard factory-prime coat on exposed exterior and interior wood surfaces; compatible with indicated finish coating.
- C. Factory-Finished Units: Latex finish system consisting of primer and two finish coats on exposed exterior and interior wood surfaces.
 - 1. Finish Coats: Match intermediate coat and topcoat products used for adjacent, repaired wood windows, as specified in Section 090391 "Historic Treatment of Plain Painting."
 - 2. Color and Gloss: Match colors indicated on Drawings to match existing .

PART 6 - EXECUTION

6.1 PREPARATION

- A. Protect adjacent materials from damage by historic treatment of wood windows.

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- B. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

6.2 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from the window interior at 5 ft. away and from the window exterior at 20 ft. away.
- B. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings in accordance with Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
 - 3. Repair items in place where possible.
 - 4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
 - 5. Refinish historic wood windows in accordance with Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood Windows: Match existing materials and features, retaining as much original material as possible to perform repairs.
 - 1. Unless otherwise indicated, repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Where indicated, repair wood windows by limited replacement matching existing material.
 - 3. Sash Balance: Repair sash balances to function in accordance with type as specified in "Hardware" Article" above. Provide missing sash balances.
- F. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
 - 1. Do not use substitute materials unless otherwise indicated.
 - 2. Compatible substitute materials may be used.

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- G. Protection of Openings: Where sash or windows are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.
- H. Identify removed windows, frames, sash, and members with numbering system corresponding to window locations to ensure reinstallation in same location. Key windows, sash, and members to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

6.3 WOOD WINDOW PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids, and that have limited amounts of rotted or decayed wood.
 - 1. Remove sash and screens from windows before performing patch-type repairs at meeting or sliding surfaces unless otherwise indicated. Reglaze units before reinstallation.
 - 2. Verify that surfaces are sufficiently clean and free of paint residue before patching.
 - 3. Treat wood members with wood consolidant before applying patching compound in accordance with manufacturer's written instructions. Coat deteriorated wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Apply patching compound when wood consolidant is tacky and not completely hardened. If applying glycol-borne preservative, wait two days before applying consolidant.
 - 4. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Mix only as much patching compound as can be applied in accordance with manufacturer's written instructions.
 - 3. Apply patching compound as recommended in writing by manufacturer until the void is completely filled.
 - 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 - 5. Clean spilled compound from adjacent materials immediately.

6.4 WOOD WINDOW MEMBER-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood window members at locations indicated on Drawings and where damage is too extensive to patch .
 - 1. Remove sash from windows before performing member-replacement repairs unless otherwise indicated.
 - 2. Verify that surfaces are sufficiently clean and free of paint residue before repair.
 - 3. Treat wood members with wood consolidant before applying patching compound in accordance with manufacturer's written instructions. Coat deteriorated wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Apply patching compound when wood consolidant is tacky and not completely hardened.

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4. Remove broken, rotted, and decayed wood down to sound wood.
 5. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 6. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- D. Clean spilled materials from adjacent surfaces immediately.
- E. Glazing: Reglaze units before reinstallation.
1. Mill new and rout existing glazed members to accommodate new glass thickness.
 2. Provide replacement glazing stops coordinated with glazing system indicated.
 3. Provide glazing stops to match contour of sash frames.
- F. Reinstall units removed for repair into original openings.
- G. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter and meeting rail weather stripping for each operable sash.

6.5 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, glazing systems, and glazing materials, unless more stringent requirements are indicated.
- B. Remove cracked and damaged glass and glazing materials from openings and prepare surfaces for reglazing.
- C. Remove existing glass and glazing where indicated on Drawings , and prepare surfaces for reglazing.
- D. Remove glass and glazing from openings and prepare surfaces for reglazing.
- E. Size glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.
- F. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.
- G. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.
- H. Install glass with proper orientation so that coatings, if any, face exterior or interior as required.
- I. Install glazing points.
- J. Disposal of Removed Glass: Remove from Owner's property and legally dispose of it unless otherwise indicated.

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6.6 WOOD WINDOW UNIT REPLACEMENT

- A. General: Replace existing wood window frame sash units with new custom-fabricated units to match existing at locations indicated on Drawings and where damage is too extensive to repair .
- B. Apply borate preservative treatment to accessible surfaces before finishing. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Mill glazed members to accommodate glass thickness. Glaze units before installation.
- D. Install units, hardware, weather stripping, accessories, and other components as indicated on Drawings.
- E. Install units level, plumb, square, true to line, without distortion or impeding movement; anchored securely in place to structural support; and in proper relation to wall flashing, trim, and other adjacent construction.
- F. Set sill members in bed of sealant for weathertight construction unless otherwise indicated.
- G. Install window units with new anchors into existing openings.
- H. Weather Stripping: Install full-perimeter and meeting rail weather stripping for each operable sash.
- I. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- J. Disposal of Removed Units: Remove from Owner's property and legally dispose of them .

6.7 STORM WINDOW INSTALLATION

- A. Install wood storm windows at each window jamb indicated.
- B. Install interior aluminum storm windows at each window indicated.
- C. Install units by mounting to window frames as indicated on Drawings and in accordance with manufacturer's written instructions.

6.8 SHUTTER INSTALLATION

- A. Install wood shutters at each window jamb indicated.
- B. Install units by mounting as indicated on Drawings and in accordance with manufacturer's written instructions.

6.9 INSECT-SCREEN INSTALLATION

- A. Install insect-screen frames for each operable exterior sash or ventilator where indicated .
 - 1. Locate insect-screen frames on inside of window unless otherwise indicated.
 - 2. Install insect-screen frames by mounting to window or sash frame as indicated on Drawings and in accordance with manufacturer's written instructions.

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- B. Replace existing insect screening; remove it from Owner's property.
- C. Install insect screening to be smooth, flat, and uniformly taut.

6.10 WEATHER STRIPPING INSTALLATION

- A. Install weather stripping for tight seal of joints as determined by preconstruction testing and demonstrated in mockup.

6.11 FIELD QUALITY CONTROL

- A. Manufacturers Field Service: Engage wood-repair-material manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.

6.12 ADJUSTING

- A. Adjust existing and replacement operating sash, screens, hardware, weather stripping, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

6.13 CLEANING AND PROTECTION

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. Monitor window surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact window surfaces, remove contaminants immediately.
- B. Clean exposed surfaces immediately after historic treatment of wood windows. Avoid damage to coatings and finishes. Remove excess sealants, glazing and patching materials, dirt, and other substances.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction.

END OF SECTION 080352

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow-core flush wood doors for opaque finish.
2. Factory finishing flush wood doors and frames.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.
 - 1. Temperature-Rise Limit: Where indicated on Drawings , provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 HOLLOW-CORE FLUSH WOOD DOORS FOR OPAQUE FINISH

- A. Interior Doors, Hollow Core :
 - 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. ABS-American Building Supply, Inc.
 - b. Chappell Door Co.
 - c. General Veneer Manufacturing Co.
 - d. Haley Brothers, Inc.
 - e. Lambton Doors.
 - f. Vancouver Door Company.
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Standard Duty.
 - 3. ANSI/WDMA I.S. 1A Grade: Custom.
 - 4. Faces: Hardboard or MDF.
 - a. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
 - 5. Construction: Standard hollow core.
 - 6. Blocking: Provide wood blocking with minimum dimensions as follows:
 - a. 5-by-18-inch lock blocks at both stiles.
 - b. 5-inch top- and bottom-rail blocking.
 - c. 2-1/2-inch midrail blocking.

2.3 LIGHT FRAMES AND LOUVERS

2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Openings: Factory cut and trim openings through doors.

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1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.
- C. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before factory finishing.
1. Flash top of outswinging doors with manufacturer's standard metal flashing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
 3. Install fire-rated doors and frames in accordance with NFPA 80.
 4. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 2. Machine doors for hardware.
 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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3.2 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Provide inspection of installed Work through AWI's Quality Certification Program , certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.3 ADJUSTING

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

END OF SECTION 081416

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SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior stile and rail wood doors.
2. Interior stile and rail wood doors.
3. Interior fire-rated stile and rail wood doors.
4. Fire-rated wood door frames.
5. Factory fitting stile and rail wood doors to frames and factory machining for hardware.
6. Factory finishing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Details of construction and glazing.
2. Door frame construction.
3. Factory-machining criteria.
4. Factory- priming finishing specifications.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.2 MATERIALS

- A. Use only materials that comply with referenced standards and other requirements specified.
 - 1. Assemble exterior doors, including components, with wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.
 - 2. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.
- B. Panel Products: Any of the following unless otherwise indicated:
 - 1. Particleboard: ANSI A208.1, Grade M-2.
 - 2. Medium-density fiberboard (MDF), complying with ANSI A208.2, Grade 130.
 - 3. Hardboard complying with ANSI A135.4.
 - 4. Veneer-core plywood.
- C. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Exterior Stile and Rail Wood Doors: Exterior custom doors complying with the AWI, AWMAC, and WI's Architectural Woodwork Standards, and with other requirements specified.
 - 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 or approved equal:
 - a. Pella, or equal
 - 2. Performance Grade:
 - a. Architectural Woodwork Standards WDMA I.S. 6A: Custom.
 - 3. Finish: Opaque.
 - 4. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction:
 - 1) Clear softwood; may be edge glued for width and finger jointed.
 - b. Raised-Panel Construction: Clear softwood lumber; edge glued for width .
 - 1. Stile and Rail Widths: As indicated on Drawings.
 - 2. Raised-Panel Thickness: As indicated on Drawings .
 - 3. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
 - 4. Glass: Uncoated, clear, per manufacturers specifications , complying with Section 088000 "Glazing."
 - 5. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors: Interior custom doors complying with AWI, AWMAC, and WI's Architectural Woodwork Standards and with other requirements specified.

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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 or approved equal:
 - a. ETO Doors Corp.
 - b. Karona by JELD-WEN.
 - c. Masonite Architectural.
 - d. VT Industries Inc.
2. Performance Grade:
 - a. Architectural Woodwork Standards WDMA I.S. 6A: Custom.
3. Finish: Opaque.
4. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction:
 - 1) Clear softwood; may be edge glued for width and finger jointed.
 - 2) Veneered, structural composite lumber or veneered edge- and end-glued lumber.
 - b. Raised-Panel Construction: Clear softwood lumber; edge glued for width Shaped, medium-density fiberboard.
5. Stile and Rail Widths: As indicated.
6. Raised-Panel Thickness: As indicated .
7. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.5 INTERIOR FIRE-RATED STILE AND RAIL WOOD DOORS

- A. 20-Minute, Interior Fire-Rated Stile and Rail Wood Doors: Fire-rated (20-minute rating) doors complying with AWI, AWMAC, and WI's Architectural Woodwork Standards and with other requirements specified.
 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 or approved equal:
 - a. ETO Doors Corp.
 - b. Karona by JELD-WEN.
 - c. Masonite Architectural.
 - d. VT Industries Inc.
 2. Performance Grade:
 - a. Architectural Woodwork Standards WDMA I.S. 6A: Custom.
 3. Panel Designs: Indicated on Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 4. Finish: Opaque.
 5. Stile and Rail Widths: As indicated on Drawings.
 6. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
 7. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.
- B. 45-Minute, Interior Fire-Rated Stile and Rail Wood Doors: Fire-rated (45-minute rating) doors complying with AWI, AWMAC, and WI's Architectural Woodwork Standards and with other requirements specified.
 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 or approved equal:
 - a. Karona by JELD-WEN.
 - b. Masonite Architectural.

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- c. VT Industries Inc.
2. Performance Grade:
 - a. WDMA I.S. 6A: As indicated on Drawings.
 - b. Architectural Woodwork Standards WDMA I.S. 6A: Custom.
3. Panel Designs: Indicate on Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
4. Finish: Opaque.
5. Interior Fire-Rated Door Construction: 1-3/4-inch- thick, edged and veneered mineral-core stiles and rails and 1-1/8-inch- thick, veneered mineral-core raised panels.
6. Edge Construction for Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - a. At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: 400 lbf according to WDMA T.M. 10.
7. Edge Construction for Fire-Rated Pairs of Doors:
 - a. Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - 1) At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a) Screw-Holding Capability: 400 lbf according to WDMA T.M. 10.
 - b. Provide formed-steel edges and astragals with intumescent seals.
 - 1) At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a) Screw-Holding Capability: 400 lbf according to WDMA T.M. 10.
 - 2) Finish steel edges and astragals with baked enamel same color as doors.
 - 3) Finish steel edges and astragals to match door hardware (locksets or exit devices).
8. Stile and Rail Widths: As indicated.
9. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.

2.6 FIRE-RATED WOOD DOOR FRAMES

A. Interior Frames:

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 or approved equal:
 - a. Masonite Architectural.
2. Architectural Woodwork Standards WDMA I.S. 6A Grade: Custom.
3. Wood Species and Cut: Match species and cut indicated for wood doors unless otherwise indicated.
4. Species: Anigre Select white ash Figured select white ash Select white birch Select red birch Cherry Select red gum Figured select red gum Select white maple Red oak White oak Persimmon Sapele Sycamore Walnut as specified in drawings .
5. Wood Moisture Content: 5 to 10 percent.
6. Profile: As indicated on Drawings.
7. Construction: Solid lumber, fire-retardant particleboard, or fire-retardant medium density fiberboard (MDF) with veneered exposed surfaces and listed and labeled by a testing and

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inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Drawings.

2.7 STILE AND RAIL WOOD DOOR FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 - 1. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering.
 - c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 - d. Comply with NFPA 80 requirements for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- B. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- C. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 3. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 4. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings:
 - 1. Trim openings indicated for glazing with solid-wood moldings, with one side removable. Miter wood moldings at corner joints.
 - 2. Factory install glazing in doors, complying with Section 088000 "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- E. Exterior Doors: Factory treat exterior doors with water-repellent preservative after fabrication has been completed but before factory finishing.
 - 1. Comply with WDMA I.S. 4.
 - 2. Flash top of outswinging doors with manufacturer's standard metal flashing.

2.8 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.

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- 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings.
- E. Opaque Finish:
 - 1. Architectural Woodwork Standards Grade: Custom.
 - 2. Finish:
 - a. Architectural Woodwork Standards System 10, UV Curable, Water Based.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Semigloss .

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated door frames according to NFPA 80.
 - a. Install frames level, plumb, true, and straight.
 - 1) Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 - b. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - 1) Secure with countersunk, concealed fasteners and blind nailing.
 - 2) Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - c. For shop-finished items, use filler matching finish of items being installed.
 - 2. Install fire-rated doors according to NFPA 80.
 - 3. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 - 2. Machine doors for hardware.
 - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/4 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown on Drawings or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
 - 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

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- 6. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory- Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Provide inspection of installed Work through AWI's Quality Certification Program , certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.3 ADJUSTING

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

END OF SECTION 081433

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SECTION 083513 - FOLDING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel folding doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 PANEL FOLDING DOORS

A. Description: Top-supported, horizontal-sliding, manually operated panel folding doors, with panels joined by continuous hinge connectors for the full height of panels.

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 or approved equal:
 - a. Won-Door Corporation.
 - b. Woodfold Mfg Co.

B. Nominal Panel Width: as specified in drawings .

C. Panel Facing:

1. Plastic-Laminate Facing: Grade VGS, high-pressure plastic laminate complying with NEMA LD 3.
 - a. Color, Texture, and Pattern: As indicated by manufacturer's designation Match Architect's sample As selected by Architect from manufacturer's full range to match existing .

D. Carriers: Four-wheel carriers at lead post and two-wheel carriers at intermediate spacing.

E. Tracks: Limit track deflection, independent of structural supporting system, to no more than 80 percent of bottom clearance. Provide the following features:

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1. Recessed mounting.
 2. Ceiling guard.
 3. Center stop for center-opening doors.
- F. Hinge Connector: In color matching Architect's sample selected by Architect from manufacturer's full range matching or coordinating with facing color to match existing .
- G. Hardware:
1. Finish: to match existing .
 2. Latch: Operable from both sides of closed door.
 3. Foot Bolts: On lead post where indicated. Secure to post to avoid interference with seals.
- H. Jamb Molding: At closing jamb for light-tight jamb closure.
1. Material: Wood, matching species and finish of panel facing .
 2. Jamb Strip: Nonferrous for end-opening doors.
- I. Wood Track Molding: To match species and finish of panel facings.
- J. Jambs and Posts:
1. Fixed Jambs: For doors anchors anchored to stack jamb.
 2. Double End Posts: To allow door to operate from both ends.
 3. Rolling Jamb Post: To allow door to disconnect from stack jamb.
 4. Sliding Jamb: To allow door to stack in storage pocket.
 5. Lead Post: At closing edge of door.
- K. Tiebacks: To maintain door in stacked position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install folding doors complying with manufacturer's written installation instructions. Install track in one piece.
- B. Standard Floor Clearances: 1/4 to 3/4 inch maximum (above floor finish).

END OF SECTION 083513

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SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl-framed windows.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Window: 15 to 20 years from date of Substantial Completion.
 - b. Glazing Units: 15 to 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: WDMA certified with label attached to each window.

2.2 VINYL WINDOWS

- 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 or approved equal:
 - 1. Pella Corporation.
- B. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Finish: Integral color, to match existing.

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- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered .
- D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal .
- E. Hardware, General: Provide manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range to match existing .
- F. Hung Window Hardware:
 - 1. Counterbalancing Mechanism: AAMA 902.
 - 2. Locks and Latches: Operated from the inside only.
 - 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

2.4 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze vinyl windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.
- E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085313

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - 2. Cylinders for door hardware specified in other Sections.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC) Architectural Openings Consultant (AOC).

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Manual Closers: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested in accordance with UL 1784 and installed in compliance with NFPA 105.
- C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" .

2.2 HINGES

- A. Hinges: BHMA A156.1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Allegion plc.
 - b. Design Hardware.
 - c. Hager Companies.
 - d. INOX by Unison Hardware, Inc.
 - e. PAMEX Inc.

2.3 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: BHMA A156.17.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. Bommer Industries, Inc.
 - c. Design Hardware.
 - d. Hager Companies.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.4 CENTER-HUNG AND OFFSET PIVOTS

- A. Center-Hung and Offset Pivots: BHMA A156.4.

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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 or approved equal:
 - a. Allegion plc.
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. DORMA USA, Inc.
 - d. Hager Companies.
 - e. INOX by Unison Hardware, Inc.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Pin-and-Barrel-Type Hinges:
 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 or approved equal:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Lawrence Hardware Inc.
 - d. McKinney Products Company; an ASSA ABLOY Group company.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Trim:
 1. Description: As indicated on Drawings .
 2. Levers: Cast.
 3. Escutcheons (Roses): Cast.
 4. Dummy Trim: Match lever lock trim and escutcheons.
- C. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 1. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
- D. Bored Locks: BHMA A156.2; Grade 1 ; Series 4000.
 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 or approved equal:
 - a. Allegion plc.
 - b. DORMA USA, Inc.
 - c. Hager Companies.
 - d. PAMEX Inc.

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- e. SOSS Door Hardware; by Universal Industrial Products, Inc.
- E. Mortise Locks: BHMA A156.13; Security Grade 1 ; stamped steel case with steel or brass parts; Series 1000.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. Design Hardware.
 - c. DORMA USA, Inc.
 - d. Hager Companies.
 - e. INOX by Unison Hardware, Inc.

2.7 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks and Alarms: BHMA A156.29, Grade 1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Arrow USA; an ASSA ABLOY Group company.
 - b. Detex Corporation.
 - c. Precision Hardware, Inc.; dormakaba Group.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.

2.8 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
 - 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 or approved equal:
 - a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
 - b. Allegion plc.
 - c. Don-Jo Mfg., Inc.
 - d. Hiawatha, Inc; a division of the Activar Construction Products Group.
 - e. INOX by Unison Hardware, Inc.

2.9 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Allegion plc.
 - b. C.R. Laurence Co., Inc.
 - c. Design Hardware.
 - d. DORMA USA, Inc.
 - e. Hager Companies.

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2.10 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Interchangeable .

2.11 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. No Master Key System: Only change keys operate cylinders.
 - a. Provide three cylinder change keys.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver .
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.12 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Allegion plc.
 - b. Don-Jo Mfg., Inc.
 - c. Hager Companies.
 - d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - e. Trimco.

2.13 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release ; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

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2.14 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. DORMA USA, Inc.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.15 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. American Specialties, Inc. (ASI).
 - c. Cal-Royal Products, Inc.
 - d. Hager Companies.
 - e. Trimco.

2.16 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 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 or approved equal:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko; an ASSA ABLOY Group Company.
 - d. Reese Enterprises, Inc.
 - e. Zero International; an Allegion brand.
- B. Maximum Air Leakage: When tested in accordance with ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per ft. of door opening.

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2.17 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko; an ASSA ABLOY Group Company.
 - d. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - e. Zero International; an Allegion brand.

2.18 SLIDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Arthur Cox & Sons, Inc.
 - b. Hager Companies.
 - c. Hettich America L.P.
 - d. Johnson, L. E., Products, Inc.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.19 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainlesssteel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. Burns Manufacturing Incorporated.
 - c. Hager Companies.

2.20 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 - 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 or approved equal:
 - a. Allegion plc.
 - b. Hager Companies.

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2.21 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
 - 1. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

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3.2 ADJUSTING

- A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100

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SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silvered flat glass mirrors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

- A. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

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

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 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 or approved equal:
 1. Avalon Glass and Mirror Company.

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2. Binswanger Mirror; a division of Vitro America, Inc.
3. D & W Incorporated.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C1503 ; manufactured using copper-free, low-lead mirror coating process.
- B. Annealed Monolithic Glass Mirrors: Mirror Glazing Quality, clear .
 1. Nominal Thickness: per manufacturers specifications .
- C. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
 1. Nominal Thickness: per manufacturers specifications .
- D. Laminated Mirrors: ASTM C1172, Type II.
 1. Glass for Outer Lite: Annealed float glass, Mirror Glazing Quality, clear .
 2. Nominal Thickness for Outer Lite: per manufacturers specifications .
 3. Glass for Inner Lite: Annealed float glass; ASTM C1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).
 4. Nominal Thickness: per manufacturers specifications .
 5. Interlayer: 0.030-inch- thick, clear polyvinyl-butylal.
- E. Safety Glazing Products: For mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. C.R. Laurence Co., Inc.
 - b. Franklin International.
 - c. Liquid Nails Adhesive.
- D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

- A. Mirror Bottom Clips: As indicated as specified in drawings .

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- B. Mirror Top Clips: As indicated as specified in drawings .
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

2.5 FABRICATION

- A. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts, so they fit closely around penetrations in mirrors.
- B. Mirror Edge Treatment: Flat polished .
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
- C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced National Glass Association (NGA) publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

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1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.
- C. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer and NGA's publication "Proper Procedures for Cleaning Flat Glass Mirrors."

END OF SECTION 088300

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SECTION 090190.52 - MAINTENANCE REPAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes maintenance repainting as follows:
 - 1. Patching substrates.
 - 2. Repainting.
- B. Related Requirements:
 - 1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.
 - 2. Section 040110 "Masonry Cleaning" for cleaning and removing paint from masonry.
 - 3. Section 050170.51 "Decorative Metal Cleaning" for cleaning and removing paint from decorative metal.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 PREINSTALLATION MEETINGS

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

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1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of paint system and each pattern, color, and gloss.
 - 1. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
 - 2. Label each Sample for location and application.
- C. Product List: Printout of current "MPI Approved Products List" for each MPI-product category specified in paint systems, with the proposed product highlighted.

1.6 INFORMATIONAL SUBMITTALS

- A. Color Matching Certificate: For computer-matched colors.

1.7 QUALITY ASSURANCE

- A. Color Matching: Custom computer-match paint colors to colors indicated on Drawings Sherwin Williams, Windfresh White Semi-gloss, or Equivalent low VOC paint.
- B. Mockups: Prepare mockups of maintenance repainting processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
 - 1. Surface-preparation mockups using applicable specified methods of cleaning and other surface preparation.
 - 2. Coating mockups to represent surfaces and conditions for application of each type of coating system.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

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- B. Colors: Sherwin Williams, Windfresh White Semi-gloss, or matching.

2.3 PAINT MATERIALS, GENERAL

- A. Transition Coat: Paint manufacturer's recommended low VOC coating for use where a residual existing coating is incompatible with the paint system.

2.4 PAINT MATERIAL 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 or approved equal:
 - 1. Sherwin Williams or Equivalent.

2.5 PAINT MATERIALS

- A. Primers and Sealers:
 - 1. Primer Sealer, Latex, Interior Low Odor/VOC :
 - a. Basis-of-Design Product: Sherwin Williams, or Equivalent.
- B. Water-Based Paints:
 - 1. Latex, Interior, Institutional Low Odor/VOC, Semigloss (Gloss Level 5):
 - a. Basis-of-Design Product: Sherwin Williams, Windfresh White Semi-gloss, or Equivalent.

2.6 PATCHING MATERIALS

- A. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound according to ASTM C 842 and manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MAINTENANCE REPAINTING, GENERAL

- A. Execution of the Work: In repainting surfaces, disturb them as minimally as possible and as follows:
 - 1. Remove failed coatings and corrosion and repaint.
 - 2. Verify that substrate surface conditions are suitable for repainting.
 - 3. Allow other trades to repair items in place before repainting.
- B. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use gentle methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail.
- C. Heat Processes: Do not use torches, heat guns, or heat plates.

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3.2 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:
 - 1. Gypsum Board: 12 percent.
- C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.

3.3 PREPARATORY CLEANING

- A. General: Use the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.

3.4 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Gypsum-Plaster and Gypsum-Board Substrates:
 - 1. Repair defects including dents and chips more than 1/8 inch in size and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth. Remove protruding fasteners.
 - 2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.

3.5 PAINT APPLICATION, GENERAL

- A. Prepare surfaces to be painted according to the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.
- B. Apply a transition coat over incompatible existing coatings.
- C. Blending Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

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3.6 FIELD QUALITY CONTROL

3.7 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.8 SURFACE-PREPARATION SCHEDULE

- A. General: Before painting, prepare surfaces where indicated on Drawings for painting according to applicable requirements specified in this schedule.
 - 1. Examine surfaces to evaluate each surface condition according to paragraphs below.
 - 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
 - 3. Repair substrate defects according to "Substrate Repair" Article.
- B. Surface Preparation for MPI DSD 0 Degree of Surface Degradation:
 - 1. Surface Condition: Existing paint film in good condition and tightly adhered.
 - 2. Paint Removal: Not required.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Roughen or degloss cleaned surfaces to ensure paint adhesion according to paint manufacturer's written instructions.
- C. Surface Preparation for MPI DSD 1 Degree of Surface Degradation:
 - 1. Surface Condition: Paint film cracked or broken but adhered.
 - 2. Paint Removal: Scrape by hand-tool cleaning methods to remove loose paint until only tightly adhered paint remains.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use other cleaning methods for small areas of bare substrate if required. Roughen, degloss, and sand the cleaned surfaces to ensure paint adhesion and a smooth finish according to paint manufacturer's written instructions.
- D. Surface Preparation for MPI DSD 2 Degree of Surface Degradation:
 - 1. Surface Condition: Paint film loose, flaking, or peeling.
 - 2. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool or chemical paint-removal methods.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Use other cleaning methods for small areas of bare substrate if required. Sand surfaces to smooth remaining paint film edges. Prepare bare cleaned surface to be painted according to paint manufacturer's written instructions for substrate construction materials.

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E. Surface Preparation for MPI DSD 3 Degree of Surface Degradation:

1. Surface Condition: Paint film severely deteriorated obscuring fine architectural detail work because of paint-layer buildup and surface indicated to have paint completely removed.
2. Paint Removal: Completely remove paint film by hand-tool or chemical paint-removal methods. Remove rust.
3. Preparation for Painting: Prepare bare cleaned surface according to paint manufacturer's written instructions for substrate construction materials.

F. Surface Preparation for MPI DSD 4 Degree of Surface Degradation:

1. Surface Condition: Missing material, small holes and openings, and deteriorated or corroded substrate.
2. Substrate Preparation: Repair, replace, and treat substrate according to "Substrate Repair" Article and requirements in other Specification Sections.
3. Preparation for Painting: Sand substrate surfaces to smooth remaining paint film edges and prepare according to paint manufacturer's written instructions for substrate construction materials. Remove rust.
4. Painting: Paint as required for MPI DSD 2 degree of surface degradation.

3.9 INTERIOR MAINTENANCE REPAINTING SCHEDULE

END OF SECTION 090190.52

SECTION 090391 - HISTORIC TREATMENT OF PLAIN PAINTING

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 historic treatment of plain painting as follows:
 - 1. Removing existing paint.
 - 2. Repairing substrates.
 - 3. Plain painting of historic surfaces , including staining and varnishing of historic wood.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 090394 "Historic Treatment of Decorative Painting" for graining, marbleizing, stenciling, and striping on historic surfaces.
 - 3. Section 090395 "Historic Treatment of Artistic Painting" for freehand painting and trompe l'oeil on historic surfaces.
 - 4. Section 090398 "Historic Treatment of Gilding" for gilding on historic surfaces.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

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- H. Historic Paint Materials: Paint materials manufactured to match historic paint formulations; either custom-formulated products or standard products of manufacturers of historic paint materials.
- I. Modern Paint Materials: Paint materials not designed to match historic paint formulations but that may be required to match historic paint colors.
- J. Plain Painting: For historic treatment, this means painting that requires attention to historic treatment requirements, but no special, decorative or artistic painting skill.
- K. Low-Pressure Spray: 90 to 350
- L. Medium-Pressure Spray: 350 to 600

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of painting.
 - 2. Review methods and procedures related to historic treatment of painting including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, colors, patterns, and sequencing.
 - c. Fire-protection plan.
 - d. Plain painting historic treatment program.
 - e. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of painting in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of surfaces to be painted.
 - 4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 - 5. Apply paint system.
 - 6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.6 ACTION SUBMITTALS

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

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1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Sustainable Design Submittals:
 1. Product Data: For paints and coatings, indicating VOC content.
 2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each type of paint system and each pattern, color, and gloss; minimum 6 inches long in least dimension, but not less than whole pattern.
 1. Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, color, and texture is achieved.
 2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
 3. Include a list of materials for each coat of each Sample.
 4. Label each Sample for location and application.
 5. Sample Size:
 - a. Plain Painted Surfaces: 4-by-8-inch Samples for each color and material, on hardboard.
 - b. Stained or Natural Wood: 12-by-12-inch Samples of natural- or stained-wood finish, on representative wood surfaces.
- D. Product List: For each paint product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current MPI's "MPI Approved Products List" for each MPI-product category specified in paint systems, with the proposed product highlighted.
 3. VOC content.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist(s) and paint-remover manufacturer.
- B. Plain Painting Historic Treatment Program: Submit before work begins.
- C. Color Matching Certificate: For computer color matching of historic colors.
- D. Preconstruction Test Reports: For cleaning materials, paint removers and paint coatings and systems.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.

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1.9 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic painting specialist with expertise in matching and touching up existing painting. Experience only in new painting work is insufficient experience for historic treatment work.
- B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing paint removers that have been used for similar historic painting applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Color Matching: Custom computer-match paint colors to colors indicated on Drawings . For colors indicated by a standardized coding system, obtain a color chip for each color indicated from the color-coding-system company; computer match paint colors to the color chips.
- D. Plain Painting Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site and control of runoff during cleaning, paint removal, repainting, and other processes.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- E. Mockups: Prepare mockups of historic treatment processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
 - 1. Locate mockups in locations that enable viewing under same conditions as the completed Work .
 - 2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least 100 sq. ft. .
 - 3. Coating Mockups: Two wall surfaces of at least 100 sq. ft. to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.
 - a. Plain painted surfaces.
 - b. Stained or natural wood.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.10 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing of cleaning materials, paint removers and compatibility of paint coatings and systems for each indicated type of historic painted surface.
 - 1. Use test areas as indicated and representative of proposed materials and existing construction.
 - 2. Propose changes to materials and methods to suit Project.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste daily.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic treatment of painting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

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- D. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.
- E. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.2 PAINT REMOVERS

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methylene chloride.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - c. EaCo Chem, Inc.
 - d. PROSOCO, Inc.
 - e. Shore Corporation.
- B. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-forming alkaline paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methylene chloride.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.
 - b. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - c. Dumond Chemicals, Inc.
- C. Solvent-Type Paste Paint Remover: Manufacturer's standard water-rinsable, solvent-type paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. Hydroclean; Hydrochemical Techniques, Inc.
 - c. PROSOCO, Inc.
 - d. Shore Corporation.
- D. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. American Building Restoration Products, Inc.

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- b. Cathedral Stone Products, Inc.
 - c. Dumond Chemicals, Inc.
 - d. EaCo Chem, Inc.
 - e. PROSOCO, Inc.
- E. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinsable, solvent-type paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Dumond Chemicals, Inc.
 - b. PROSOCO, Inc.

2.3 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from full range of industry colors.

2.4 MODERN PAINT MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Dry-Fog Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 100 g/L.
 - 5. Rust-Preventive Coatings: 100 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Clear Wood Finishes, Varnishes: 275 g/L.
 - 9. Clear Wood Finishes, Lacquers: 275 g/L.
 - 10. Floor Coatings: 50 g/L.
 - 11. Shellacs, Clear: 730 g/L.
 - 12. Shellacs, Pigmented: 550 g/L.
 - 13. Stains: 100 g/L.

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- C. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

2.5 PATCHING MATERIALS

- A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Abatron, Inc.
 - b. Advanced Repair Technology, Inc.
 - c. ConServ Epoxy LLC.
 - d. Gougeon Brothers, Inc.
 - e. Polymeric Systems, Inc.
 - f. Protective Coating Company.
 - g. System Three Resins, Inc.
- B. Metal Patching Compound: Two-part, polyester-resin, metal patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated due to corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.
- C. Cementitious Patching Compounds: Cementitious patching compounds and repair materials specifically manufactured for filling cementitious substrates and for sanding or tooling prior to repainting; formulation as recommended in writing by manufacturer for type of cementitious substrate indicated, exposure to weather and traffic, the detail of work, and site conditions.
- D. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound according to ASTM C 842 and manufacturer's written instructions.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic treatment of plain painting include, but are not limited to, the following or approved equal:

1. Preservation Pittsburgh .

3.2 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
3. Neutralize and collect alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.3 HISTORIC TREATMENT OF PAINTING, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from painted surface and from building exterior at 10 feet away from painted surface.
- B. Execution of the Work: In treating historic items, disturb them as minimally as possible and as follows:
1. Remove failed coatings and corrosion and repaint.
 2. Verify that substrate surface conditions are suitable for painting.
 3. Allow other trades to repair items in place and retain as much original material as possible before repainting.
 4. Reproduce original, historic paint systems where indicated or scheduled.
 5. Install temporary protective measures to protect historic painted surfaces that shall be treated later.

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- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail. Do not use abrasive methods such as rotary sanding, rotary wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Heat Processes: Do not use torches, heat guns, or heat plates.

3.4 EXAMINATION

- A. Examine substrates and conditions, with historic treatment specialist present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 - 1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.5 PREPARATORY CLEANING

- A. General: Use only the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.
- C. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash

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to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.

- D. Mildew: Clean off existing mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. Rinse with water applied by clean rags or sponges.
- E. Chemical Rust Removal:
 - 1. Remove loose rust scale with approved abrasives for ferrous-metal cleaning.
 - 2. Apply rust remover with brushes or as recommended in writing by manufacturer.
 - 3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing. Do not allow extended dwell time.
 - 4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.
 - 5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
 - 6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.6 PAINT REMOVAL

- A. General: Remove paint where indicated. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.
 - 1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
 - a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
 - b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.
 - 2. Brushes: Use brushes that are resistant to chemicals being used.
 - a. Metal Substrates: If using wire brushes on metal, use brushes of same metal composition as metal being treated.
 - b. Wood Substrates: Do not use wire brushes.
 - 3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
 - c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
 - d. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.

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- e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- B. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material. Do not use other methods except as indicated as part of the historic treatment program and as approved by Architect.
- C. Paint Removal with Alkaline Paste Paint Remover:
1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Apply paint remover to dry, painted surface with brushes.
 3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 4. Rinse with cold water applied by medium-pressure spray to remove chemicals and paint residue.
 5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
 6. Repeat process if necessary to remove all paint.
- D. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:
1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Apply paint remover to dry, painted surface with brushes or as recommended in writing by manufacturer.
 3. Apply cover according to manufacturer's written instructions.
 4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 5. Scrape off paint and remover.
 6. Rinse with cold water applied by medium-pressure spray to remove chemicals and paint residue.
 7. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
 8. For spots of remaining paint, apply alkaline paste paint remover according to "Paint Removal with Alkaline Paste Paint Remover" Paragraph.
- E. Paint Removal with Solvent-Type Paste Paint Remover:
1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Apply thick coating of paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paintbrush. Apply in one or two coats according to manufacturer's written instructions.
 3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 4. Rinse with cold water applied by medium-pressure spray to remove chemicals and paint residue.
 5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.

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6. Repeat process if necessary to remove all paint.

F. Paint Removal with Covered, Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paint brush or as recommended in writing by manufacturer.
3. Apply cover according to manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with cold water applied by medium-pressure spray to remove chemicals and paint residue.
7. Use mechanical methods recommended in writing by manufacturer to remove remaining chemicals and paint residue.

3.7 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.

B. Wood Substrate:

1. Repair wood defects including dents and gouges more than 1/4 inch in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.
2. Where existing paint is allowed to remain, sand irregular buildup of paint, runs, and sags to achieve a uniformly smooth surface.

C. Cementitious Material Substrate:

1. General: Repair defects including dents and chips more than 1/2 inch in size and all holes and cracks by filling with cementitious patching compound and sanding smooth. Remove protruding fasteners.
2. New and Bare Plaster: Neutralize surface of plaster with mild acid solution as recommended in writing by paint manufacturer. In lieu of acid neutralization, follow manufacturer's written instruction for primer or transition coat over alkaline plaster surfaces.
3. Concrete, Cement Plaster, and Other Cementitious Products: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. If surfaces are too alkaline to paint, correct this condition before painting.

D. Gypsum-Plaster and Gypsum-Board Substrates:

1. Repair defects including dents and chips more than 1/4 inch in size and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth. Remove protruding fasteners.

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2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.

E. Metal Substrate:

1. Preparation: Treat repair locations by wire-brushing and solvent cleaning. Use chemical or mechanical rust removal method to clean off rust.
2. Defects in Metal Surfaces: Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than 1/8 inch deep or 1 inch across and all holes and cracks by filling with metal patching compound and sanding smooth. Remove burrs and protruding fasteners.
3. Priming: Prime iron and steel surfaces immediately after repair to prevent flash rusting. Stripe paint corners, crevices, bolts, welds, and sharp edges. Apply two coats to surfaces that are inaccessible after completion of the Work.

3.8 PAINT APPLICATION, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
- B. Prepare surfaces to be painted according to the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings.
- D. Metal Substrate: Stripe paint corners, crevices, bolts, welds, and sharp edges before applying full coat. Apply two coats to surfaces that are inaccessible after completion of the Work. Tint stripe coat different than the main coating and apply with brush.
- E. Blending Plain Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until testing agency has had reasonable opportunity to inspect work areas at lift device or scaffold location.
- C. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection and provide on-site assistance when requested by Architect.
- D. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.

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1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:
 - a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - b. Testing agency will perform tests for compliance of paint materials with product requirements.
 - c. If test results show materials being used do not comply with product requirements, Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
2. Dry Film Thickness:
 - a. Contractor shall touch up and restore painted surfaces damaged by testing.
 - b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.10 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 090391

SECTION 090394 - HISTORIC TREATMENT OF DECORATIVE PAINTING

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 historic treatment of decorative painting in the form of graining stenciling and striping <Insert item> applied over substrates in good condition.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 090391 "Historic Treatment of Plain Painting" for removing paint, substrate repair, and plain painting of historic surfaces.
 - 3. Section 090395 "Historic Treatment of Artistic Painting" for freehand painting and trompe l'oeil on historic surfaces.
 - 4. Section 090398 "Historic Treatment of Gilding" for gilding on historic surfaces.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by estimated quantities.
 - 2. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

- A. Artistic Painting: Painting requiring a higher level of skill than plain painting. This classification includes freehand painting and trompe l'oeil.
- B. Decorative Painting: Painting requiring a higher level of skill than plain painting. This classification includes graining, marbleizing, stenciling, and striping.
- C. Glazing: Applying translucent paint material (glaze coat) to protect paint beneath it and impart a more uniform surface gloss.
- D. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

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- E. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- F. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- G. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- H. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- I. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- J. Graining: Decorative painting that simulates wood.
- K. Historic Paint Materials: Paint materials manufactured to match historic paint formulations; either custom-formulated products or standard products of manufacturers of historic paint materials.
- L. Marbleizing: Decorative painting that simulates marble or other stone.
- M. Modern Paint Materials: Paint materials not designed to match historic paint formulations but that may be required to match historic paint colors.
- N. Plain Painting: For historic treatment, this means painting that requires attention to historic treatment requirements, but no special, decorative or artistic painting skill.
- O. Stenciling: Decorative paint designs applied using pattern cutouts.
- P. Striping: Decorative painting in striped patterns.

1.5 PREINSTALLATION MEETINGS

- 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of decorative painting.
- 2. Review methods and procedures related to historic treatment of decorative painting including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, colors, patterns, and sequencing.
 - c. Fire-protection plan.
 - d. Decorative painting historic treatment program.
 - e. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of decorative painting in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware that overlie decorative painting work except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.

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3. Examine condition of surfaces to be painted.
4. Repair and repaint or touchup existing, substrate and substrate paint to the degree required for a uniform, tightly adhered surface on which to apply decorative painting.
5. Apply decorative paint.
6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings: Show location and extent of work, whether new, replacement, inpainting, or touchup; and with finishes and colors noted. Include field-verified dimensions and the following:
 1. Full-size patterns or design cartoons with complete dimensions and relation to existing work.
 2. Provisions for design modifications as required for each location to decoratively trim or otherwise accommodate penetrations through painted surfaces for items such as pipes and ductwork.
- C. Samples: For each type of paint coating and each pattern, color, and gloss
 1. Include stepped Samples defining each separate coat. Resubmit until each required sheen, color, and texture is achieved.
 2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
 3. Include a list of materials for each coat of each Sample.
 4. Label each Sample for location and application.
- D. Product List: For each paint product indicated, include the following:
 1. Cross-reference to locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current MPI's "MPI Approved Products List" for each MPI-product category specified, with the proposed product highlighted.
 3. VOC content.

1.8 INFORMATIONAL SUBMITTALS

- A. Decorative Painting Historic Treatment Program: Submit before work begins.
- B. Color Matching Certificate: For computer color matching of historic colors.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.

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1.10 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic painting specialist with expertise in matching and touching up existing, decorative painting. Experience only in new painting work is insufficient experience for historic treatment work.
- B. Color Matching: Custom computer-match paint colors to colors indicated , see Finish Standards and Cost Comparisons
- C. Decorative Painting Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment processes for each type of decorative painting and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
 - 1. Locate mockups in locations that enable viewing under same conditions as the completed work.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste daily.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic treatment of decorative painting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

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1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.
- D. Concealed and undocumented historic items, murals, and similar objects encountered during historic treatment remain Owner's property. Carefully protect each item or object.
 1. Coordinate with Owner's historical adviser, who will establish special procedures for protection.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

- A. Material Compatibility:
 1. Provide paint materials that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat, provide products recommended in writing by manufacturer for use over substrate paint system or on substrate indicated.
- B. Colors: See Finish Standards and Cost Comparisons

2.2 HISTORIC PAINT MATERIALS

- A. Milk Paint: See Finish Standards and Cost Comparisons, casein paint emulsion produced primarily from organic milk casein, lime, pigments, and natural fillers; containing zero VOCs.
- B. Glaze Coat: See Finish Standards and Cost Comparisons

2.3 MODERN PAINT MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- C. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the decorative paint material.
- D. Glaze Coat See Finish Standards and Cost Comparisons.

2.4 MODERN PAINT MATERIAL MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Coronado® Paint manufactured by Benjamin Moore & Co.; products as designated in "Modern Paint Materials" See Finish Standards and Cost Comparisons.

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PART 3 - EXECUTION

3.1 HISTORIC TREATMENT OF DECORATIVE PAINTING, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniformly delineated appearance as viewed by Architect from building interior at 5 feet away from painted surface and from building exterior at 10 feet away from painted surface.
- B. Execution of the Work: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Remove failed coatings and corrosion before painting.
 - 2. Verify that substrate surface conditions are suitable for painting.
 - 3. Allow other trades to repair items in place and retain as much original material as possible before painting.
 - 4. Reproduce original, historic paint systems where indicated or scheduled.
 - 5. Install temporary protective measures to protect historic painted surfaces that shall be treated later.

3.2 EXAMINATION

- A. Examine substrates and conditions, with historic treatment specialist present, to review conditions affecting performance of the painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 - 1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing, notify Architect in writing.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.3 PAINT APPLICATION, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
- B. Substrate Surface Preparation: Before painting, prepare surfaces for painting according to manufacturer's written instructions for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings and substrate materials.

3.4 DECORATIVE PAINTING APPLICATIONS

- A. General: Apply decorative painting with adequate illumination that does not distort the colors of surfaces or paint being applied.

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- B. Graining: Treat each grained substrate item or component as a separate decorative pattern, differentiating individually grained pieces. Do not overlay a single grain pattern over multiple grained pieces.
 - 1. Graining Pattern match existing as indicated on drawings
- C. Marbleizing: Treat each marbleized item as a separate decorative pattern, differentiating individually marbleized pieces. Do not overlay a single marbleized pattern over multiple marbleized piece: match existing as indicated on drawings.
- D. Stenciling Pattern: Match existing as indicated on drawings
- E. Striping Pattern: Match existing as indicated on drawings

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until testing agency has had reasonable opportunity to inspect work areas at lift device or scaffold location.
- C. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.
 - 1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:
 - a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - b. Testing agency will perform tests for compliance of paint materials with product requirements.
 - c. If test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
 - 2. Dry Film Thickness:
 - a. Contractor shall touch up and restore painted surfaces damaged by testing.
 - b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.6 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

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- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 EXTERIOR DECORATIVE PAINTING SCHEDULE

- A. Graining Marbleizing Stenciling on Painted Doors Porch Ceiling
- B. Marbleizing Graining Stenciling on Painted Doors Beams and Ceilings Walls
- C. Stenciling Striping on Painted Wood Floor Concrete Floor

3.8 INTERIOR DECORATIVE PAINTING SCHEDULE

- A. Graining Marbleizing Stenciling on Painted Doors Porch Ceiling
- B. Marbleizing Graining Stenciling on Painted Doors Beams and Ceilings Walls
- C. Stenciling Striping on Painted Wood Floor Concrete Floor

END OF SECTION 090394

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 VINYL COMPOSITION FLOOR TILE

- 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 or approved equal:
 - 1. American Biltrite.
 - 2. Armstrong Flooring, Inc.
 - 3. Armstrong World Industries, Inc.
 - 4. Congoleum Corporation.
 - 5. Johnsonite; a Tarkett company.
- B. Tile Standard: ASTM F 1066, Class 2, through pattern .
- C. Wearing Surface: Embossed.
- D. Colors and Patterns: Natural Woodgrains Mahogany .

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2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis .
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction .
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between

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pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

END OF SECTION 096519

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SECTION 099114 - EXTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and application of paint systems on exterior substrates.
 - a. Wood.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Samples: For each type of topcoat product.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

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 or approved equal:

1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT PRODUCTS

A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

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- C. Colors: Match Architect's samples to match existing .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 INSTALLATION

- A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099114

SECTION 099124 - INTERIOR PAINTING (MPI STANDARDS)

PART 4 - GENERAL

4.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete masonry units (CMUs).
 - 2. Gypsum board.
 - 3. Plaster.
 - 4. ASJ insulation covering.

4.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of topcoat product.
- C. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

4.3 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 50 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

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PART 5 - PRODUCTS

5.1 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 or approved equal:
 - 1. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

5.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: Match Architect's samples .

PART 6 - EXECUTION

6.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

6.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

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- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
- C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

6.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- C. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

6.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

6.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

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6.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Water-Based Light-Industrial Coating System:
 - a. Intermediate Coat: Light-industrial coating, interior, water based, matching topcoat.
 - b. Topcoat: Light-industrial coating, interior, water based (MPI Gloss Level 3) not limited to the following or approved equal:
 - 1) Sherwin Williams, Windfresh White Semi-gloss .

B. Gypsum Board Substrates:

1. Water-Based Light-Industrial Coating System:
 - a. Prime Coat: Primer sealer, latex, interior not limited to the following or approved equal:
 - 1) Sherwin Williams, Primer .
 - b. Intermediate Coat: Light-industrial coating, interior, water based, matching topcoat not limited to the following or approved equal:
 - c. Topcoat: Light-industrial coating, interior, water based (MPI Gloss Level 3).
 - 1) Sherwin Williams, Windfresh White Semi-gloss .

END OF SECTION 099124

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Private-use bathroom accessories.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PRIVATE-USE BATHROOM ACCESSORIES

- A. Private-Use Toilet Tissue Dispenser :
 - 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 or approved equal:
 - a. Mohen
 - b. AJW Architectural Products.
 - c. American Specialties, Inc. (ASI).

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- d. Bobrick Washroom Equipment, Inc.
- e. Bradley Corporation.
- f. GAMCO Specialty Accessories; a division of Bobrick.
2. Description: Single -roll dispenser with the following features:
 - a. Hood.
 - b. Mohen .
3. Mounting: Surface mounted.
4. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
5. Material and Finish: to match existing .

B. Private-Use Shower Curtain Rod :

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 or approved equal:
 - a. Mohen
 - b. AJW Architectural Products.
 - c. American Specialties, Inc. (ASI).
 - d. Bobrick Washroom Equipment, Inc.
 - e. Bradley Corporation.
 - f. GAMCO Specialty Accessories; a division of Bobrick.
2. Description: 1-inch- outside diameter, straight rod.
3. Configuration: As indicated on Drawings
4. Mounting Flanges: Designed for concealed fastening, in manufacturer's standard material and finish to match existing .
5. Rod Material and Finish: to match existing .
6. Features: Integral chrome-plated brass glide hooks.

C. Private-Use Towel Bar :

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 or approved equal:
 - a. Mohen
 - b. AJW Architectural Products.
 - c. American Specialties, Inc. (ASI).
 - d. Bobrick Washroom Equipment, Inc.
 - e. Bradley Corporation.
 - f. GAMCO Specialty Accessories; a division of Bobrick.
2. Description: to match existing .
3. Mounting: Flanges with concealed fasteners.
4. Length: as indicated on drawings .
5. Material and Finish: to match existing .

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 1. Remove temporary labels and protective coatings.

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- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

END OF SECTION 102800

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SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cooking appliances.
2. Kitchen exhaust ventilation.
3. Refrigeration appliances.
4. Cleaning appliances.
5. Trash compactors.

1.2 PREINSTALLATION MEETINGS

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

1.6 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.

2.2 COOKTOPS

- A. Electric Cooktop refer to architectural drawing set for manufacturer make and model :
 1. Electric Burner Elements: Four coil -type burners.
 2. Top Material: Ceramic glass .
- B. Gas Cooktop refer to architectural drawing set for manufacturer make and model :

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1. Gas Burners: Four .
2. Top Material: Ceramic glass .

2.3 RANGES

- A. Electric Range refer to architectural drawing set for manufacturer make and model : Slide-in range with one oven(s) and complying with AHAM ER-1.
1. Electric Burner Elements: Four coil -type burners.
 2. Anti-Tip Device: Manufacturer's standard.
- B. Gas Range refer to architectural drawing set for manufacturer make and model : Slide-in range with one oven(s).
1. Gas Burners: Four .
 2. Anti-Tip Device: Manufacturer's standard.

2.4 MICROWAVE OVENS

- A. Microwave Oven refer to architectural drawing set for manufacturer make and model :
1. Mounting: Wall cabinet .

2.5 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer refer to architectural drawing set for manufacturer make and model : and complying with AHAM HRF-1.
1. Type: Freestanding .
 2. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.

2.6 CLOTHES WASHERS AND DRYERS

- A. Clothes Washer refer to architectural drawing set for manufacturer make and model : Complying with AHAM HLW-1.
1. Type: Freestanding , front-loading unit.
 2. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 3. Water-Efficient Clothes Washer: Provide clothes washer with modified energyfactor greater than or equal to 2.0 and water factor less than 5.5.
- B. Clothes Dryer refer to architectural drawing set for manufacturer make and model : Complying with AHAM HLD-1.
1. Type: Freestanding , frontloading, electric unit.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

END OF SECTION 113013

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SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal louver blinds with polymer slats.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

- 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 or approved equal:
 - 1. CACO, Inc., Window Fashions.
 - 2. Comfortex Window Fashions.
 - 3. Hunter Douglas Contract.
 - 4. Levolor.
 - 5. Springs Window Fashions; SWFcontract.
 - 6. TimberBlindMetroShade.
- B. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.
 - 1. Width: per manufacturers specifications .
 - 2. Thickness: per manufacturers specifications .
- D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully encloses operating mechanisms on three sides and ends.
 - 1. Manual Lift Mechanism:

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- a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating range .
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Dual cord .
 3. Manual Lift-Operator and Tilt-Operator Lengths: As indicated on Drawings .
 4. Manual Lift-Operator and Tilt-Operator Locations: Right side of headrail unless otherwise indicated.
- E. Bottom Rail: Secures and protects ends of ladders and lift cords.
1. Type: Manufacturer's standard .
- F. Ladders: Braided cord .
- G. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
- H. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range to match existing .
 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated .

2.2 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 2. Install mounting and intermediate brackets to prevent deflection of headrails.

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- 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.
- B. Electrical Connections: Connect motorized operators to building electrical system.
- C. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.
- D. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION 122113

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SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Kitchen and vanity cabinets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For residential casework. Include plans, elevations, details, and attachments to other work.
- C. Samples: For casework and hardware finishes.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For casework.

PART 2 - PRODUCTS

2.1 CABINETS

- 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 or approved equal:
 - 1. Advanta Cabinets, a CabinetWorks Group Brand.
 - 2. American Woodmark Corp.
 - 3. KraftMaid Cabinetry, Inc.
 - 4. Master WoodCraft Cabinetry LLC.
 - 5. Merillat Industries, Inc.
- B. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with KCMA A161.1.

2.2 CABINET MATERIALS

- A. Plantation hardwood, Coronet door, Mocha finish
- B. Exposed Materials:

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1. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS and edgebanded.
 - a. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range mocha finish .
 - b. Plastic-Laminate Edgebanding: Of same grade, pattern, color, and texture of plastic laminate as for faces.
- C. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as indicated by manufacturer's designations as selected by Architect from manufacturer's full range as indicated on drawings .
- B. Pulls: Surface-mounted decorative pulls .
- C. Hinges: Concealed butt hinges as indicated on drawings .
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.
- E. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.
 1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
 2. Drawers: Provide one bumper on back side of drawer front at each corner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install casework with no variations in adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework.
- B. Install casework without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten casework to adjacent units and to backing.
 1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.
- E. Adjust hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- F. Clean casework on exposed and semiexposed surfaces. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123530

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad countertops.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad countertops.
 - 1. Apply Program label to Shop Drawings.
- C. Samples: Plastic laminates in each type, color, pattern, and surface finish required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For the following:
 - 1. Composite wood products.
 - 2. High-pressure decorative laminate.
 - 3. Adhesives.
- B. Quality Standard Compliance Certificates: .

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Shop Certification: .
- B. Installer Qualifications: Fabricator of products .

1.5 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install wood countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install wood countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining

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temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from certification program indicating that countertops comply with requirements of grades specified.
- B. Grade: Custom .
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS .
 - 1. Manufacturers: Subject to compliance with requirements, provide products not limited to the following or approved equal:
 - a. Formica Corporation.
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations.
 - 2. Match Architect's sample.
 - 3. As selected by Architect from manufacturer's full range in the following categories:
 - a. Patterns, matte finish.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces As indicated on Drawings.
- F. Core Material: As selected by fabricator to comply with quality standard.
- G. Core Thickness: 3/4 inch .
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
 - 1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130 .

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2.3 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Plastic Laminate: As selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.4 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
 - 2. Secure backsplashes to walls with adhesive.

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3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
- F. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bathtubs.
2. Bathtub faucets.
3. Showers.
4. Shower faucets.
5. Kitchen sinks.
6. Sink faucets.
7. Water closets.
8. Toilet seats.
9. Supply fittings.
10. Waste fittings.
11. Grout.

B. Related Requirements:

1. Section 224213.13 "Commercial Water Closets."
2. Section 224213.16 "Commercial Urinals."
3. Section 224216.13 "Commercial Lavatories."
4. Section 224216.16 "Commercial Sinks."
5. Section 224223 "Commercial Showers."
6. Section 224300 "Healthcare Plumbing Fixtures."
7. Section 224500 "Emergency Plumbing Fixtures."
8. Section 224600 "Security Plumbing Fixtures."
9. Section 224713 "Drinking Fountains."
10. Section 224716 "Pressure Water Coolers."
11. Section 224723 "Remote Water Coolers."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

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1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Servicing and adjustments of whirlpool baths .

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of baths that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures of unit shell.
 - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 2. Warranty Period for Residential Applications of Shells: 20 years from date of Substantial Completion.
 3. Warranty Period for Residential Applications of Pumps and Blowers: 20 years from date of Substantial Completion.
 4. Warranty Period for Residential Applications of Electronic Controls: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

2.2 BATHTUBS

- A. Bathtubs with Shower - PMMA:
 1. PMMA Bathtubs:
 - a. Manufacturers: See Finish Standards and Cost Comparisons subject to compliance and requirements.
 2. Fixture: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
 3. Faucet: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
 4. Supply Fittings: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
 5. Tub Filler: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
 6. Waste Fittings: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
- B. BATHTUB FAUCETS
- C. NSF Standard: Comply with NSF61 and NSF 372 for faucet materials that will be in contact with potable water.
- D. Bathtub Faucets - Single Handle, Mohen or equal : See Finish Standards and Cost Comparisons, subject to compliance and requirements.

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1. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016/ASME A112.1016/CSA B125.16.
2. Faucet: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
3. Shower Head: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
4. Bathtub Filler Spout: See Finish Standards and Cost Comparisons, subject to compliance and requirements.

2.3 SHOWERS

A. Showers - Standard PMMA with Base and Faucet :

1. PMMA Showers:
 - a. Manufacturers: Subject to compliance with requirements, See Finish Standards and Cost Comparisons
2. Standard: IAPMO Z124.1.2/ANSI Z124.1.2.
3. Nominal Size: as indicated on drawings.
4. Surround:
 - a. One piece or sealed, multiple piece.
 - b. Surround: One piece.
5. Bathing Surface: Slip resistant.
6. Color: White to match existing.
7. Drain Location: Center.
8. Faucet: Mohen or equal.

B. Showers - Accessible, PMMA with Seat, Grab Bar, Base, and Faucet as indicated on drawings:

1. PMMA Showers:
 - a. Products: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
2. Standards: IAPMO Z124.1.2/ANSI Z124.1.2 and ICC/ANSI A117.1 for roll-in shower compartments.
3. Nominal Size: as indicated on drawings.

2.4 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. Shower Faucets:

1. Single-Handle, Pressure-Balance Faucets:
 - a. Manufacturers: See Finish Standards and Cost Comparisons, subject to compliance and requirements.
 - b. Description: Include hot- and cold-water indicators, check stops, and fixed showerhead, arm, and flange. Coordinate faucet inlets with supplies.
 - c. Standard: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 - d. Body Material: See Finish Standards and Cost Comparisons
 - e. Finish: See Finish Standards and Cost Comparisons
 - f. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
 - g. Mounting: Concealed.
 - h. Backflow-Prevention Device for Handheld Shower: Required.

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- i. Operation: Compression, manual .
 - j. Antiscald Device: Integral with mixing valve .
 - k. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
- 2. Supply Connections: NPS 1/2 .
- 3. Shower Head: See Finish Standards and Cost Comparisons

2.5 KITCHEN SINKS

A. Kitchen Sinks - Counter Mounted :

- 1. Stainless Steel Kitchen Sinks:
 - a. Mohen, 2000 Series 33"x22" stainless steel drop in sink GS2021731Q
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Mohen Incorporated

2.6 SINK FAUCETS

- A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.
- B. Sink Faucets : See Finish Standards and Cost Comparisons

2.7 WATER CLOSETS

- A. Water Closets as indicated on drawings: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china, 1.0 gal./flush.
 - 1. Manufacturers: See Finish Standards and Cost Comparisons, subject to compliance and requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing fixtures level and plumb in accordance with roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

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1. Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
 1. Omit trap on fixtures with integral traps.
 2. Omit trap on indirect wastes unless otherwise indicated.
- K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.
- M. Set bathtubs baths and shower receptors in leveling bed of cement grout.
- N. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- O. 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."
- P. Seal joints between plumbing fixtures, 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 079200 "Joint Sealants."

3.2 PIPING 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."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

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3.3 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

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SECTION 233533 - LISTED KITCHEN VENTILATION SYSTEM EXHAUST DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Listed grease ducts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in listed grease ducts and field-fabricated grease ducts.

PART 2 - PRODUCTS

2.1 LISTED GREASE DUCTS

A. Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

1. AMPCO Stacks.
2. McGill AirFlow LLC.
3. Metal-Fab, Inc.
4. Schebler Co. (The).
5. Selkirk Corporation.

B. Description: Factory-fabricated, -listed, and -labeled, double-wall ducts tested according to UL 1978 and rated for 500 deg F continuously, or 2000 deg F for 30 minutes; with positive or negative duct pressure and complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1-inch annular space filled with high-temperature, ceramic-fiber insulation.

1. Inner Shell: ASTM A 666, Type 316 stainless steel.

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2. Outer Jacket: Aluminized steel where concealed. Stainless steel where exposed.
- D. Gaskets and Flanges: Ensure that gaskets and sealing materials are rated at 1500 deg F minimum.
- E. Hood Connectors: Constructed from same material as grease duct with internal or external continuously welded or brazed joints.
- F. Accessories: Tees, elbows, increasers, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly. Include unique components required to comply with NFPA 96 including cleanouts, transitions, adapters, and drain fittings.
- G. Grease Duct Supports: Construct duct bracing and supports from non-combustible material.
 1. Design bracing and supports to carry static and seismic loads within stress limitations of the International Building Code.
 2. Ensure that bolts, screws, rivets and other mechanical fasteners do not penetrate duct walls.
- H. Comply with ASTM E 2336.
- I. Factory Tests: Test and inspect fire resistance of grease duct system according to ASTM E 2336.
 1. Allow consultant two days' minimum notification before test is performed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. Comply with requirements in Section 077200 "Roof Accessories."
- B. Coordinate connections to kitchen exhaust hoods with requirements in Section 233813 "Commercial-Kitchen Hoods."
- C. Coordinate connections to exhaust fans with requirements in Section 233416 "Centrifugal HVAC Fans."
- D. Coordinate firestopping where grease ducts penetrate fire separations with requirements in Section 078413 "Penetration Firestopping."
- E. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211 and UL 2221, whichever is most stringent.
- F. Seal between sections of grease exhaust ducts according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- G. Connections: Make grease duct connections according to the International Mechanical Code.

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1. Grease duct to exhaust fan connections: Connect grease ducts to inlet side of fan using flanges, gaskets, and bolts.
 2. Grease duct to hood connections:
 - a. Make grease duct to hood joints connections using internal or external continuously welded or brazed joints.
 - b. Make watertight grease duct to hood joints connections using flanges, gaskets, and bolts.
- H. Support ducts at intervals recommended by manufacturer to support weight of ducts and accessories, without applying loading on kitchen hoods.
1. Securely attach supports and bracing to structure.
- I. Grease Duct Enclosures: Comply with requirements of the International Building Code and ASTM E 2336.
- J. Coordinate fire-rated enclosure construction with Section 092116.23 "Gypsum Board Shaft Wall Assemblies."
- K. Repair damage to adjacent materials caused by listed kitchen ventilation system exhaust ducts installation.

3.2 FIELD QUALITY CONTROL

- A. Perform air leakage test before concealment of any portion of the grease duct system.
1. Notify Owner a minimum of two days before test is performed.

END OF SECTION 233533

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**SECTION 262726.11 - GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED
CONTROLLER SWITCHES**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches.
2. General-use dimmer switches.
3. General-use fan-speed controller switches.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.
4. Section 260936 "Modular Dimming Controls" for multiscene and multipreset dimming controls.
5. Section 260943.16 "Addressable Luminaire Lighting Controls" for network lighting control solid-state devices.
6. Section 260943.23 "Relay-Based Lighting Controls" for network lighting control relay devices.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Toggle switches.
2. Key lock switches.
3. Rocker switches.
4. Dimmer switches.
5. Fan-speed controllers.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Dimmers.
2. Fan-speed controllers.

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1.4 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES

- A. Description: Snap switches intended for mounting in device boxes.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.
- C. Toggle Switch :
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 - 2. Options:
 - a. Device Color: White As indicated on architectural Drawings.
 - b. Configuration:
 - 1) General-duty, 120-277 V, 15 A, single pole double pole .
 - 2) General-duty, 120-277 V, 20 A, single pole double pole .
 - 3. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.2 GENERAL-USE DIMMER SWITCHES

- A. Description: Line-voltage dimmers intended for mounting in flush device boxes or on outlet box covers (wall box).
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN EOYX and UL 1472.
- C. Type III Dimmer Switch :

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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 or approved equal:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. GE Lighting; General Electric Company.
 - c. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - d. Leviton Manufacturing Co., Inc.
 - e. Lutron Electronics Co., Inc.
 - f. Pass & Seymour; Legrand North America, LLC.
2. Additional Characteristics: UL 1472 Type III dimmer.
3. Options:
 - a. Device Color: White As indicated on architectural Drawings.
 - b. Switch Style: Momentary rocker .
 - c. Dimming Control Style: Momentary rocker .
 - d. Network connection to provide programmable presets, scenes, and time-clock.
4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.3 GENERAL-USE FAN-SPEED CONTROLLER SWITCHES

- A. Description: Semiconductor, capacitive-type, and inductive-type fan-speed controllers for regulating speed of fan motor, including starting and stopping of fan motor, intended for mounting in flush device boxes or on outlet box covers (wall box).
- B. Performance Criteria:
 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. General Characteristics:
 - a. Reference Standards: UL CCN GQHG and UL 1917.
- C. Air-Gap Fan-Speed Controller Switch :
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 2. Options:
 - a. Device Color: White As indicated on architectural Drawings.
 3. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECANEIS 130.
 - 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 - 3. Consult Architect for resolution of conflicting requirements.
- C. Identification:
 - 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with red-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
 - b. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

3.2 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by Architect .
- B. Tests and Inspections:
 - 1. Perform tests and inspections in accordance with manufacturers' instructions.
- C. Nonconforming Work:
 - 1. Unit will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- D. Assemble and submit test and inspection reports.
- E. Manufacturer Services:
 - 1. Engage factory-authorized service representative to support field tests and inspections.

3.3 SYSTEM STARTUP

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks for momentary switches, dimmer switches, and fan-speed controller switches in accordance with manufacturer's instructions.

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3.4 PROTECTION

- A. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
- B. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726.11

SECTION 262726.31 - GENERAL-GRADE SINGLE STRAIGHT-BLADE RECEPTACLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single straight-blade receptacles for plugs and attachment plugs.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 262726.33 "General-Grade Duplex Straight-Blade Receptacles" for duplex receptacles.
4. Section 262726.35 "Hospital-Grade Straight-Blade Receptacles" for hospital-grade receptacles.
5. Section 262726.37 "Receptacles with Arc-Fault and Ground-Fault Protective Devices" for AFCI and GFCI receptacles.
6. Section 262726.39 "Locking Receptacles" for locking receptacles.
7. Section 262726.41 "Pin-and-Sleeve Receptacles" for pin-and-sleeve receptacles.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Single straight-blade receptacles.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Single straight-blade receptacles.

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PART 2 - PRODUCTS

2.1 EXISTING PRODUCTS TO BE REMOVED AND RE-INSTALLED

2.2 SINGLE STRAIGHT-BLADE RECEPTACLES FOR PLUGS AND ATTACHMENT PLUGS

- A. Description: General-grade, single straight-blade receptacles for use in wiring systems recognized by NFPA 70.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
- C. Single Straight-Blade Receptacle :
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Pass & Seymour; Legrand North America, LLC.
 - 2. Options:
 - a. Device Color: As indicated on architectural Drawings.
 - b. Configuration:
 - 1) General-duty, smooth face, NEMA 5-15R NEMA 5-20R.
 - 3. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions.
- B. Reference Standards:

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1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECANEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with red-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
 - b. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

D. Interfaces with Other Work:

1. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.
2. Coordinate installation of new products for with existing conditions.

3.3 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect .

B. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
6. Healthcare Facilities: Test straight-blade receptacles in patient care spaces with receptacle pin tension test instrument in accordance with NFPA 99. Retention force of ground pin must be not less than 115 g (4 oz).
7. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

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3.4 PROTECTION

- A. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
- B. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726.31

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SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of LED luminaires:

1. Downlight.
2. Surface mount, linear.
3. Fan/Light Combination

1.2 ACTION SUBMITTALS

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

1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
2. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

- B. Shop Drawings: For nonstandard or custom luminaires.

1. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

- C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.

- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

- C. Product Certificates: For each type of luminaire.

- D. Product test reports.

- E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

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1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: 10 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Ambient Temperature: 5 to 104 deg F.
 - 1. Relative Humidity: Zero to 95 percent.

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

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- F. California Title 24 compliant.

2.3 DOWNLIGHT .

- A. Manufacturers: Subject to compliance with requirements, See Finish Standards and Cost Comparisons.
- B. Nominal Operating Voltage: 120 V ac .
- C. Lamp:
1. Dimmable from 100 percent to zero percent of maximum light output.
 2. User-Replaceable Lamps:
 - a. Bulb shape complying with ANSI C78.79.
 - b. Lamp base complying with ANSI C81.61 or IEC 60061-1.
 3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Diffusers and Globes:
1. Fixed lens.
 2. Medium light distribution.
 3. Diffuse glass .
 4. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 5. Glass: Annealed crystal glass unless otherwise indicated.
 6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- F. Standards:
1. ENERGY STAR certified.
 2. RoHS compliant.
 3. UL Listing: Listed for damp location.
 4. Recessed luminaires shall comply with NEMA LE 4.

2.4 SURFACE MOUNT, LINEAR

- A. See Finish Standards and Cost Comparisons.
- B. Nominal Operating Voltage: 120 V ac .
- C. Lamp:
1. Dimmable from 100 percent to zero percent of maximum light output.
 2. Internal driver.
 3. User-Replaceable Lamps:
 - a. Bulb shape complying with ANSI C78.79.
 - b. Lamp base complying with ANSI C81.61 or IEC 60061-1.
 4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

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- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Diffusers and Globes:
 - 1. Diffuse glass.
 - 2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 3. Glass: Annealed crystal glass unless otherwise indicated.
 - 4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- F. Standards:
 - 1. ENERGY STAR certified.
 - 2. RoHS compliant.
 - 3. UL Listing: Listed for damp location.

2.5 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.

2.6 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage .
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119

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SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.
3. Section 260943.16 "Addressable-Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
4. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

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- C. Delegated-Design Submittal: For luminaire supports.
 - 1. Include design calculations for luminaire supports

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of the following:
 - 1. Luminaire.
 - 2. Photoelectric relay.
- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 - 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598

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- E. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- F. Lamp Rating: Lamp marked for outdoor use
- G. Source Limitations:
 - 1. Obtain luminaires from single source from a single manufacturer.
 - 2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES

- A. Decorative Post Top:
 - 1. See Finish Standard and Cost Comparisons

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Support luminaires without causing deflection of finished surface.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Coordinate layout and installation of luminaires with other construction.
- I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Aim as indicated on Drawings.

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3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- C. Luminaire will be considered defective if it does not pass tests and inspections.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION 265619

SECTION 284621.13 - CONVENTIONAL FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual fire-alarm boxes.
2. System smoke detectors.
3. Notification appliances.

B. Related Requirements:

1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for cables and conductors for fire-alarm systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.
- C. Field quality-control reports.
- D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide the "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment.
 - d. Riser diagram.
 - e. Record copy of site-specific software.
 - f. Provide the "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

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- 1) Equipment tested.
- 2) Frequency of testing of installed components.
- 3) Frequency of inspection of installed components.
- 4) Requirements and recommendations related to results of maintenance.
- 5) Manufacturer's user training manuals.
- g. Manufacturer's required maintenance related to system warranty requirements.
- h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. NFPA Certification:

1. Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with and operate as an extension of existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded system dedicated to fire-alarm service only.
- C. All components provided shall be listed for use with the selected system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Smoke detectors.

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2. Carbon monoxide detectors.
3. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Transmit an alarm signal to the remote alarm receiving station.
2. Unlock electric door locks in designated egress paths.
3. Close smoke dampers in air ducts of designated air-conditioning duct systems.
4. Activate elevator power shunt trip.
5. Activate emergency lighting control.
6. Activate emergency shutoffs for gas and fuel supplies.
7. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and systems:

1. Valve supervisory switch.
2. Elevator shunt-trip supervision.
3. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in internal circuits of fire-alarm control unit.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions:

1. Initiate notification appliances.
2. Annunciate at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 PERFORMANCE REQUIREMENTS

2.4 MANUAL FIRE-ALARM BOXES

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 or approved equal:

1. Kidde; Carrier Global Corporation.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Single-action mechanism, pull-lever type.
2. Station Reset: Key- or wrench-operated switch.

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2.5 SYSTEM SMOKE DETECTORS

- 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 or approved equal:
 - 1. Kidde; Carrier Global Corporation.
- B. General Requirements for System Smoke Detectors:
 - 1. Operating at 120-V dc, nominal.
 - 2. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 4. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
 - 5. Provide multiple levels of detection sensitivity for each sensor , with alarm-verification feature.
- C. Ionization Smoke Detector: Comply with UL 268.

2.6 CARBON MONOXIDE DETECTORS

- A. Description: Listed for connection to fire-alarm system.
 - 1. Mounting: Adapter plate for outlet box mounting.
 - 2. Detector shall provide a means to test by introducing test carbon monoxide into the sensing cell.
 - 3. Detector shall provide alarm contacts and trouble contacts.
 - 4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 - 5. Detector shall be listed to comply with UL 2075.
 - 6. Detectors shall be located, mounted, and wired according to manufacturer's written instructions.
 - 7. Test button simulates an alarm condition.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

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1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Communications Systems."

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

G. Elevator Shafts: Install a heat detector within 24 inches of each sprinkler head. Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

H. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

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1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Connect supervised interface devices to the following devices and systems. Install the interface device less than 36 inches from the device controlled.
 1. Smoke dampers in air ducts of designated HVAC duct systems.
 2. Magnetically held-open doors.
 3. Electronically locked doors and access gates.
 4. Supervisory connections at valve supervisory switches.
 5. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
 6. Supervisory connections at fire-pump engine control panel.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect .
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. Visual Inspection: Conduct the visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in Chapter 10 "Fundamentals," Section 10.18.21 "Completion Documents, Preparation."
 - b. Comply with NFPA 72, Chapter 14, "Inspection, Testing, and Maintenance," Section 14.3 "Inspection" and the "Visual Inspection Frequencies" Table; retain the "Initial/Reacceptance" column and list only the installed components.
 2. System Testing: Comply with NFPA 72, Chapter 14, "Inspection, Testing, and Maintenance," Section 14.4 "Testing" and the "Test Methods" Table.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72

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and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with the visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 284621.13

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Excavating and backfilling for buildings and structures.
3. Subbase course for concrete walks pavements.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

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- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

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- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

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3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.5 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.6 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring, bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

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- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.8 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.9 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

3.11 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch .
 - 2. Walks: Plus or minus 1 inch .
 - 3. Pavements: Plus or minus 1/2 inch .
- C. Grading inside Building Lines: Finish subgrade to a tolerance of when tested with a 10-foot straightedge.

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3.12 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight.

3.13 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

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- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 312000

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SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes concrete paving including the following:
 - 1. Driveways.
 - 2. Walks.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, gray white portland cement Type I .
- B. Water: Potable and complying with ASTM C94/C94M.

2.3 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

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1. Fly Ash or Pozzolan: 25 percent.
 2. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Concrete Mixtures: Normal-weight concrete.
1. Maximum W/C Ratio at Point of Placement: 0.50 .
 2. Slump Limit: 4 inches, plus or minus 1 inch.

2.4 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C1116/C1116M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

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- B. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness , to match jointing of existing adjacent concrete paving:
- C. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing curing compound or a combination of these.

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3.9 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
 - 4. Joint Spacing: 3 inches.
 - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 6. Joint Width: Plus 1/8 inch, no minus.

3.10 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

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SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.

1.2 DEFINITIONS

- A. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See drawing designations for planting soils.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Certification of grass seed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.

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PART 3 - EXECUTION

3.1 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft. .
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch , and roll surface smooth.

END OF SECTION 329200