



Gary Housing Authority



PROJECT MANUAL

DESCRIPTION: **SELECTED ROOF REPLACEMENT AND
FAÇADE REPAIRS
GENESIS TOWERS SENIOR BUILDING**

LOCATION: **578 Broadway
Gary, Indiana**

CONTRACT: **Selected Roof Replacement and Façade Repairs**

GARY HOUSING AUTHORITY #2021-001-009
578 BROADWAY
GARY, IN, 46402

ARCHITECT/ENGINEER: **GLOBETROTTERS ENGINEERING CORP.
300 SOUTH WACKER DRIVE, SUITE 400
CHICAGO, IL 60606**

GEC # 16060.011

DATE: **February 15, 2021**
ISSUED FOR BID

GARY HOUSING AUTHORITY
Genesis Towers Senior Building
Selected Roof Replacement and Facade Repairs Project

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SECTION 01 10 00

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:
 - 1. Project information
 - 2. Work covered by Contract Documents
 - 3. Schedule of Milestones
 - 4. Access to site
 - 5. Coordination with occupants
 - 6. Coordination with contractors on site
 - 7. Work restrictions
 - 8. Permits and Regulations
 - 9. Field Measurements
 - 10. Protection of Property
 - 11. Alterations and Coordination
 - 12. Miscellaneous Provisions
 - 13. Specification and Drawing conventions

1.3 PROJECT INFORMATION

- A. Project Identification: Genesis Towers Selected Roof Replacement and Façade Repairs.
 - 1. Project Location: 578 Broadway, Gary, IN 46402
- B. Owner: Gary Housing Authority (GHA), 578 Broadway, Gary IN 46402
- C. Architect: Globetrotters Engineering Corporation, 300 South Wacker, Suite 400, Chicago, IL 60606, 312-922-6400

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The existing building is a ten-story, senior building consisting of concrete structure with concrete deck floors, terra cotta and masonry cladding, and EPDM and coal tar pitch roofing systems.
 - 2. The Contractor shall include a Cash Allowance of \$50,000 in its base bid to be used for unforeseen conditions / costs as approved and authorized by the GHA which are beyond

the work that is to be included in the project; any unused funds up to the full \$50,000 shall be returned to the GHA as part of this project.

3. Exterior work includes:
 - a. Repair cracked brick masonry in specified locations.
 - b. Repoint existing inside face of parapet and masonry walls as indicated on the drawings.
 - c. Rebuild sections of existing walls as indicated on drawings.
 - d. Remove and salvage existing 4 to 5 courses of brick above windows and other locations. Remove existing steel angles and provide galvanized angles. Reinstall 4 to 5 courses of salvaged brick.
 - e. Remove existing caulk at all terra cotta coping. Provide sealant and backer rod at front top, front, and back of coping.
 - f. Remove all existing coal tar pitch roof systems indicated and install TPO roofing with tapered polyisocyanurate insulation as indicated on the drawings.
 - g. Existing EPDM roofing system to remain as indicated on the drawings. Install new metal counterflashing at perimeter of EPDM roof after repointing the inside face of parapet wall.
 - h. Remove existing roof drain and other associated assemblies. Contractor to rod existing plumbing piping to street and install new roof drain.
 - i. Repair sections of EPDM flashing as indicated on drawings.
 - j. Infill masonry wall where existing door and frame are to be removed as indicated. Provide new opening in masonry wall and new hollow metal door, frame and hardware.
 - k. The building is listed as a resource to the Gary City Center Historic District. Masonry subcontractor shall have experience working on similar significant buildings.

B. Type of Contract:

1. The project will be constructed under a single prime contract.

1.5 SCHEDULE OF MILESTONES

A. Time of Completion: The Contractor shall complete all the work in accordance with the Contract within 172 days from the date of the Notice to Proceed to Final Acceptance.

B. Schedule Milestones

1. Upon receipt of a Notice to Proceed, Contract shall promptly mobilize manpower and equipment to the site and commence work.
2. Substantial Completion shall be achieved within 150 days of Notice to Proceed:
 - a. Substantial Completion is defined as all work is complete except Punch List items that may be in progress.
 - b. Punch List Completion shall be (2-3) workable calendar days from the date of the transmittal of the punch list.
3. Final Acceptance shall be achieved within 172 days of Notice to Proceed, including receipt of close-out documents and warranties.

1.6 ACCESS TO SITE

- A. Contractor shall have limited use of the Project site for construction operations as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas of the Work indicated.
 - 1. Limits: Confine construction operations to roof and exterior walls.
 - 2. Driveways, Walkways, and Entrances: Keep driveways, parking spaces, and loading areas, and entrances service premises clear and available to GHA, GHYA's employees, residents, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize the use of driveways and entrances by the construction operations.
 - b. Schedule deliveries to minimize space and time requirements for the storage of materials and equipment on site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout the construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout the construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

- A. Full GHA Occupancy: GHA will occupy the site and existing building during the entire construction period. Cooperate with GHA during construction operations to minimize conflicts and facilitate GHA and its Residents' usage. Perform the Work so as not to interfere with GHA and its Residents' day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from GHA and approval of authorities having jurisdiction.
 - 2. Notify GHA not less than 72 hours in advance of activities that will affect GHA's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: GHA reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. The architect will prepare a Certificate of Substantial Completion for each specific portion of the Work that GHA will occupy prior to GHA acceptance of the completed Work.

2. On occupancy, GHA will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 COORDINATION WITH CONTRACTORS ON SITE

- A. Contractor is hereby advised that the GHA has leased the telecommunications system located on the roof. That telecommunications system is not the property of the GHA. Any issues the Contractor has related to the telecommunications installation on the roof is to be coordinated with the GHA.

1.9 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
 2. In order to avoid damage of the roof and parapet, utilization of 'swing stages' or similar devices will not be allowed in connection with the façade improvements work.
- B. On-Site Work Hours: Comply with limits stated in GHA's Invitation for Bids. Furthermore, comply with the following:
 1. Weekend Hours: The Municipal Code of Gary, Indiana prohibits the erection (including excavating), demolition, alteration, or repair of any building on any Sunday.
 2. Early Morning Hours: The Municipal Code of Gary, Indiana prohibits the erection (including excavating), demolition, alteration, or repair of any building between the hours of 6:00 p.m. and 7:00 a.m. on any day.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by GHA or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify GHA not less than 72 hours in advance of proposed utility interruptions.
 2. Obtain GHA's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to GHA occupancy with GHA.
 1. Notify GHA not less than 72 hours in advance of proposed disruptive operations.
 2. Obtain GHA's written permission before proceeding with utility interruptions.
- E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.10 PERMITS AND REGULATIONS

- A. The Contractors shall obtain and pay for all required permits exhibit them at the job site. Provide GHA and the A/E with copies of all permit applications, including requests for waivers or variances.

- B. At the start of the Work, submit copies of all permits, receipts and certificates, including waivers and variances, issued for the Work to the GHA and the A/E.
- C. All Work shall conform to the ordinances, codes and regulations of the City of Gary, Lake County and the State of Indiana.
- D. Give all notices and comply with laws, ordinances, rules and regulations bearing on the conduct of the work. If the Contract Documents are at variance therewith, promptly notify the GHA and A/E in writing. The Contractor shall bear all costs arising thereof from Work performed contrary to such laws, ordinances, rules and regulations.

1.11 FIELD MEASUREMENTS

- A. Field verify the accuracy of existing reference documents and contract documents with site conditions. Errors due to failure to verify such information shall be the responsibility of the Contractors and additional compensation will not be allowed.

1.12 PROTECTION OF THE PROPERTY

- A. The Contractor shall repair any damage to the surrounding areas of work outside the Contractor's work area at his own expense.

1.13 ALTERATIONS AND COORDINATION

- A. The Contractor shall coordinate its work with its Subcontractors.
- B. The Contractor and its Subcontractors are cautioned to read the entire Contract Documents; all items of work necessary for the project, whether or not individually listed in scope or referred to herein, are the Contractors' responsibility.
- C. The Contract Documents do not mention each particular item required, but rather are a guide for type, quality, finish and operation required. It is the responsibility of the Contractors to thoroughly verify all field conditions, check the drawings and specifications, verify types and locations of all utilities on or adjacent to the site or which might be affected by the Work, and to furnish all required material, and equipment whether specifically mentioned or not. No claims for extras will be allowed for any services that could have been or should have been foreseen by the Contractors and included in their proposals if required to furnish the Work.

1.14 MISCELLANEOUS PROVISIONS

- A. Safety
 - 1. The Contractors are hereby notified that they are required to comply with all applicable regulations for safety, including those of the Occupational Health and Safety Administration (OSHA). The Contractor and its Subcontractors shall avoid hazards to persons and property, they shall take all precautions necessary to protect pedestrians and vehicular traffic during the progress of the Work, and their operations shall not interfere with the use of adjacent buildings or interrupt the free passage to and from such adjacent buildings.
- B. GHA and A/E as Additional Insured on Certificates of Insurance
 - 1. In addition to the requirements in Section 3 Insurance in GHA's front end documents, the Contractors shall list the Housing Authority of the City of Gary, and Globetrotters Engineer-

ing Corporation as additional insureds on their insurance certificates and provide copies to the above-mentioned parties.

C. Quality Control

1. The Contractors shall maintain on-the-job-site qualified supervisors acceptable to the GHA. They shall have a minimum of 5 years' experience in the type of Work specified in the Contract Documents. The Contractor shall submit the qualifications of his supervisory personnel and emergency contact phone numbers to the GHA at the time of the Pre-Construction conference.
2. Safety, workmanship, demolition means and methods are the total responsibility of the Contractor.
3. Contractors shall, in addition to specifications contained herein, comply with any manufacturers' or suppliers' specifications and recommendations for storing, handling, mixing and applying materials used in the Work.

1.15 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 scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or GHA that are not required in order to meet other Project requirements but may offer advantage to GHA.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method replacing by substitution. Include Specification Section number and title, and Drawing numbers and titles.
 - 1. Substitution Request Form: Use facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method could not be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by GHA and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

- e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but minimum 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect

will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice of Award. Architect may consider or will reject requests received after that time.

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 35 91

TREATMENT PROCEDURES

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 general protection and treatment procedures for designated spaces, areas, rooms, and surfaces in Project.

1.3 DEFINITIONS

- A. Consolidate: To strengthen loose or deteriorated materials in place.
- B. 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.
- C. Dismantle: To disassemble or detach an item from a surface using gentle methods and equipment to prevent damage to items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- F. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.
- G. Remove: To take down or detach an item located within a space, area, or room, using methods and equipment to prevent damage to items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- H. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- I. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

- J. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- K. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- L. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.
- M. Retain: To keep existing items that are not to be removed or dismantled.
- N. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging materials unless otherwise indicated.
- O. Salvage: To protect removed or dismantled items and deliver them to GHA.
- P. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.
- Q. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. Treatment Subschedule: A construction schedule coordinating the sequencing and scheduling of treatment work for entire Project, including each activity to be performed in spaces, areas, and rooms, and on surfaces; and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for treatment work.
 - 1. Schedule construction operations in sequence required to obtain best treatment results.
 - 2. Coordinate sequence of treatment work activities to accommodate the following:
 - a. GHA's continuing occupancy of the existing building.
 - b. Other known work in progress.
 - c. Tests and inspections.
 - 3. Detail sequence of treatment work, with start and end dates.
 - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 - 5. Use of elevator and stairs.
 - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

1.5 MATERIALS OWNERSHIP

- A. Items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to GHA that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain GHA's property.

1. Carefully dismantle and salvage each item or object and protect it from damage, then promptly deliver it to GHA where directed.

1.6 INFORMATIONAL SUBMITTALS

A. Treatment Subschedule:

1. Submit treatment subschedule within seven days of date established for commencement of treatment work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's treatment operations.

1.7 QUALITY ASSURANCE

A. Treatment Specialist Qualifications: An experienced firm regularly engaged in treatments similar in nature, materials, design, and extent to this work as specified in each section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site when treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

- a. Construct new mockups of required work whenever a supervisor is replaced.

B. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

1.8 STORAGE AND HANDLING OF MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to GHA.
4. Transport items to GHA's storage area designated by GHA.
5. Protect items from damage during transport and storage.

B. Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after treatment and construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
1. Arrange for off-site locations for storage and protection of material that cannot be stored and protected on-site.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION, GENERAL

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from treatment procedures.
1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where treatment work is being performed.
 3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during treatment work.
 5. Contain dust and debris generated by treatment work, and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
- B. Temporary Protection of Materials:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to surfaces except as indicated as part of the treatment program and approved by Architect.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify GHA, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by treatment work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for treatment work.
 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. 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 functioning properly.
1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from treatment work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection.

3.2 PROTECTION FROM FIRE

- A. General:
1. Comply with NFPA 241 requirements unless otherwise indicated.
 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
 3. Prohibit smoking by all persons within Project work and staging areas.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Use of open-flame equipment is not permitted.
 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
 - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
 - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
 - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work at each area of Project site to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- C. Fire Extinguishers, Fire Blankets, and Rag Buckets: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proved to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in treatment program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off GHA's property.

- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL TREATMENT

- A. Have treatment work performed only by qualified treatment specialists.
- B. Ensure that supervisory personnel are present when treatment work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs.
- D. Perform surveys of Project Site as the Work progresses to detect hazards resulting from treatment procedures.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property and for dust control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure GHA's building manager's and other tenants' on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Coordination of GHA's continuing occupancy of portions of existing building and of GHA's partial occupancy of completed Work.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. GHA will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so GHA's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by GHA as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and GHA. Hazardous materials will be removed by GHA under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. 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.

1.9 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with GHA's operations.

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.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

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.
 - 1. Arrange to shut off utilities with utility companies.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.

3.4 SELECTIVE DEMOLITION, GENERAL

- 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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. 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.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 7. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. For items not immediately re-installed, pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, insulation, cover board, and roof accessories.
 2. Remove existing roofing system down to concrete roof deck.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

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.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. 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 02 41 19

SECTION 02 42 96

REMOVAL AND DISMANTLING

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 treatment procedures in the form of special types of selective demolition work for designated spaces, areas, rooms, and surfaces and the following specific work:
 - 1. Removal and dismantling of indicated portions of building or structure and debris hauling.
 - 2. Removal and dismantling of indicated site elements and debris hauling.
 - 3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

- A. Dismantle: To disassemble or detach a item from a surface using gentle methods and equipment to prevent damage to items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.
- C. Remove: To take down or detach a item located within a space, area, or room, using methods and equipment to prevent damage to items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Retain: To keep existing items that are not to be removed or dismantled.
- E. Salvage: To protect removed or dismantled items and deliver them to GHA.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For removal and dismantling specialist, and removal and dismantling specialist's field supervisors.

- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's removal and dismantling operations.
- C. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for GHA's use or for reinstallation.
- D. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.
 - 1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo of item in original location.
 - 2. As work proceeds, include on the inventory items that were indicated to be salvaged and items of importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

1.5 QUALITY ASSURANCE

- A. Removal and Dismantling Specialist Qualifications: A qualified treatment specialist. General selective demolition experience is insufficient experience for removal and dismantling work. All work shall be performed by workers experienced in the handling and setting of existing building materials, have not less than five 5 years of satisfactory experience in comparable demolition work, including a minimum of three 3 projects similar in scope and scale to this project. Firm shall have completed work similar in material, design, and extent to that indicated for this project with a record of successful inservice performance.
- B. Removal and Dismantling Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Mockups: Prepare mockups of specific removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Typical Removal Work: as shown on Drawings.
 - 2. Typical Dismantling Work: Dismantle typical brick and terra cotta, as shown on Drawings.
 - 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.

- D. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by GHA as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.
- D. Utility Service: Maintain existing utilities indicated to remain in services and protect them against damage during dismantling.
 - 1. Maintain fire protection facilities in service during selective dismantling operations.
- E. Conduct operation with a minimum interference to public or private thoroughfares.
- F. Maintain protected egress and access at all times.
- G. Do not obstruct public roadways or sidewalks without proper permits.
- H. No explosives will be allowed for dismantling in anyway.

1.7 WARRANTY

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

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 REMOVAL AND DISMANTLING EQUIPMENT

- A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Architect on a case-by-case basis:
 - 1. Light jackhammers are allowed subject to Architect's approval.
 - 2. Large air hammers are not permitted.

- B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Architect on a case-by-case basis:
 - 1. Hand-held power tools and cutting torches are permitted only as submitted in the treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
 - 2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

3.2 EXAMINATION

- A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.
 - 1. Verify that affected utilities are disconnected and capped.
 - 2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
 - 3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
- C. Perform surveys as the Work progresses to detect hazards resulting from removal and dismantling procedures.

3.3 SEQUENCING OF WORK

- A. Notify the GHA and obtain approval 72 hours before commencing any demolition work.
- B. Dismantle indicated materials, appurtenances, building elements and structures in an orderly and careful manner and in compliance with authorities having jurisdiction.
- C. Monitor on a regular basis for indications of shifting or movement due to the dismantling operations.
- D. Store items to be reused in designated area until re-installed. Seal all loose in strong cartons and identify.
- E. Do not stockpile demolition material so as to overload the building's structure.

3.4 REMOVAL AND DISMANTLING

- A. General: Have removal and dismantling work performed by a qualified removal and dismantling specialist. Ensure that removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.
- B. Perform work according to the treatment program and approved mockup(s).
 - 1. Perform removal and dismantling to the limits indicated.
 - 2. Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.
 - 3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
 - 4. Do not operate air compressors inside building unless approved by Architect in each case.
 - 5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
 - 6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.
- C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the treatment program to ensure that such water does not create a hazard or adversely affect other building areas or materials.
- D. Unacceptable Equipment: Keep equipment that is not permitted for removal or dismantling work away from the vicinity where such work is being performed.
- E. Removing and Dismantling Items on or Near Surfaces:
 - 1. Use only dismantling equipment and procedures within 12 inches of surface. Do not use pry bars. Protect surface from contact with or damage by tools.
 - 2. Unfasten items in the opposite order from which they were installed.
 - 3. Support each item as it becomes loosened to prevent stress and damage to the surface.
 - 4. Dismantle anchorages.
- F. Masonry Walls:
 - 1. Remove masonry carefully, and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
 - 2. Dismantle top edge and sides before removing wall. Stop removal work and immediately inform Architect if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
 - 3. Remove wall in easily managed pieces.
 - 4. During removal, maintain the stability of the partially remaining wall. Notify Architect of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal.
- G. Steelwork:

1. Expose structural steel for examination by Architect and Contractor's professional engineer before proceeding with removal or dismantling.
2. If distress in structure is apparent during performance of the work, stop removal or dismantling and take immediate precautionary measures to ensure safety of the structure. Inform Architect of the problem, steps taken, and proposed corrective actions.
3. Brace and support structural steel being removed and remaining during removal and dismantling.
4. Concrete-Encased Steel: Where steel is known to be encased by concrete that is being removed, saw cut with blades that can cut no deeper than the thickness of the concrete cover, with an adequate margin for error in the location of the steel. Isolate sections of concrete by saw cutting before beginning removal.

H. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.
3. In adjacent surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
4. In surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the surface being patched.

END OF SECTION

SECTION 03 95 00
CONCRETE REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Concrete repair including repair of spalled or missing concrete, voids using concrete repair mortar, and repair of cracks in concrete.
- B. Spalls, Missing Concrete: Concrete repair work of spalled or missing concrete include:
 - 1. Exposing and undercutting reinforcing steel.
 - 2. Repairing, cleaning, and treating reinforcing steel.
 - 3. Edge and surface conditioning of concrete area to be patched.
 - 4. Application of bonding agent.
 - 5. Application of concrete repair mortar.
 - 6. Finishing of the concrete patch to match adjoining surfaces.
- C. Cracks: Concrete crack repair work includes:
 - 1. Cleaning surface of cracked concrete.
 - 2. Application of gravity penetrating crack sealer to repair hairline surface cracks.
 - 3. Epoxy pressure injection of cracks to repair cracks.

1.2 SUBMITTALS

- A. Product Data: Submit product data for proprietary materials and items, including patching materials and forming accessories, bonding compounds, curing and coating compounds.
- B. Repair Procedures: Submit repair mortar manufacturer's narrative description of procedures and methods for removal of concrete, repairing and cleaning of reinforcing steel, and applying new repair mortar and coatings.
- C. Statement of Application: Provide a statement, signed by authorized representative of patching materials manufacturer, that manufacturer has reviewed contract documents and project conditions relating to concrete repair and that manufacturer's materials proposed for use are suitable for the applications indicated.
- D. Certification: Submit manufacturer's certification that products provided comply with specified requirements.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer with not less than 5 years of successful experience providing concrete repairs similar in size and complexity to that required for this project and approved by the repair material manufacturer.
- B. Standards: Comply with provisions of the following Codes and Standards, except where the contract documents indicate requirements that are more stringent.
 - 1. ACI 318, "Building Code Requirements for Reinforced Concrete, latest edition
 - 2. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice", latest edition
- C. Testing: The GHA may engage a testing laboratory to perform material evaluation tests.
 - 1. Materials and installed work may require testing and re-testing at any time during the progress of the work. Re-testing of rejected materials for installed work shall be done at the Contractor's expense.
- D. Preparation Field Sample: Provide a field sample of concrete prepared for application of repair mortar, including undercutting and preparation of reinforcing steel, for Architect of Record's review prior to proceeding with the coating. The sample shall be an area approximately 1'-0" x 1'-0". Locate as determined by the Architect of Record.
- E. Concrete Mortar Repair Field Sample: Provide an in-place field sample installation of one mortar patch area of spalled concrete for Architect of Record's review prior to proceeding with repairs. Install field sample at final approved preparation sample specified above, in the presence of the Architect of Record.

1.4 PROJECT CONDITION

- A. Environmental Conditions: Perform concrete repairs only when weather and forecasted weather conditions comply with requirements of repair material manufacturer.

PART 2 - PRODUCTS

2.1 FORM- MATERIALS

- A. Forms for Exposed Concrete: Plywood panel materials, to provide continuous, straight, smooth, exposed surfaces
 - 1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High-Density Overlaid Concrete Form", Class I.
 - 2. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

2.2 REINFORCING MATERIALS

- A. Replacement Reinforcing Bars: ASTM A 615, Grade 60 deformed.
- B. Supports for Reinforcement: Provide supports for replacement reinforcement as necessary including wire ties and spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place.

2.3 REPAIR MATERIALS

- A. Bonding Agent: Multi-component, solvent-free, moisture-tolerant epoxy-modified cementitious product formulated as a bonding agent and anti-corrosion coating.
 - 1. Corrosion Inhibition: Provide material proven by independent laboratory testing to prevent corrosion of reinforcing steel when tested under procedures of the Federal Highway Administration Program Report FHWA/RD88/193.
 - 2. Bond Strength:
 - a. Plastic Concrete to Hardened Concrete: Wet on Wet: 2800-psi min., 14 days moist cure, per ASTM C-882
 - b. Steel Reinforcement to Concrete: 625-psi min., pullout test.
 - 3. Products:
 - a. Sika Armatec 110 EpoCem; Sika Corp
 - b. Sto Epoxy Adhesive; Sto Concrete Restoration Division
 - c. Duralprep AC, Euclid Chemical Company
 - d. SurePoxy HM EPL, Kuafman Products, Inc
- B. Repair Mortar: Silica fume polymer-modified Portland cement mortar intended for use as a patching mortar at thicknesses of 1/2" and greater, freeze-thaw resistant, compatible with the coefficient of thermal expansion of concrete.
 - 1. Flowable Mortar:
 - a. Bond Strength: 2200 psi at 28 days, per ASTM C-882 modified.
 - b. Flexural Strength: 720-psi min at 28 days, per ASTM C-293.
 - c. Splitting Tensile Strength: 500-psi min. at 28 days, per ASTM C-496
 - d. Compressive Strength: 3000 psi at 1 day, 6500 psi at 28 days, per ASTM C 109
 - e. Products:
 - 1) SikaTop 111 Plus; Sika Corp
 - 2) Sto Flowable Mortar; Sto Concrete Restoration Division
 - 3) Duraltop Flowable Mortar, Euclid Chemical Company
 - 4) MasterEmaco N 400, BASF

2. Non-Sag Mortar:

- a. Bond Strength: 1000 psi at 28 days, per ASTM C-882 modified.
- b. Flexural Strength: 1000-psi min at 28 days, per ASTM C-293.
- c. Splitting Tensile Strength: 400-psi min. at 28 days, per ASTM C-496
- d. Compressive Strength: 1500 psi at 1 day, 4300 psi at 28 days, per ASTM C 109
- e. Product:
 - 1) SikaTop 123 Plus; Sika Corp.
 - 2) Sto Trowel Grade Mortar; Sto Concrete Restoration Division
 - 3) Duraltop Gel, Euclid Chemical Company

C. Penetrating Crack Sealer: Two-component 100% solids epoxy crack penetrating sealer; conforming to ASTM C881.

1. Products:

- a. Sikadur 55SLV Healer/Sealer; Sika Corporation
- b. Sto Flexible Crack Sealer; Sto Concrete Restoration Division
- c. Dural 335, Euclid Chemical Company

D. Pressure Injection Crack Repair: Two-component 100% solids epoxy crack repair; cap sealer and pressure injection epoxy conforming to ASTM C881.

1. Products:

- a. Sikadur 33; and Injection epoxy: Sikadur Injection Gel; Sika Corporation
- b. Sto Quick Set Epoxy Gel; and Injection epoxy: Sto Epoxy Binder; Sto Concrete Restoration Division
- c. Dural Injection Gel, Euclid Chemical Company

E. Water: Drinkable

2.4 MIXING

- A. Mix repair materials in accordance with manufacturer's instructions. Mix multi-component products using equipment recommended by the manufacturer. Only mix quantities that usable within its pot life.

PART 3 - EXECUTION

3.1 GENERAL

- A. Coordinate the work required for the removal of the loose and delaminated concrete, the repair and cleaning of the exposed reinforcing steel, the placement of forms, and the placement of repair mortar to minimize the time that reinforcing steel is exposed.

3.2 CONCRETE SURFACE PREPARATION

- A. Remove delaminated concrete and remove additional concrete as required to provide a minimum required thickness of repair material.
- B. Edge Preparation: Make a minimum 1/2" deep saw-cut along the perimeter of repair areas. Make cut at right angle to surface. Avoid feather edges. Keep Geometric configurations or repair patches as simple as possible.
- C. After removals and edge conditioning are complete, remove bond-inhibiting materials (dirt, concrete slurry, loosely bonded aggregates) by abrasive blasting or high-pressure water blasting with or without abrasive. Check the surfaces after cleaning to ensure that surface are free from additional loose aggregate, or that additional delaminations are not present.
- D. If hydro-demolition is used, remove cement and particulate slurry from the prepared surfaces before slurry hardens.

3.3 EXPOSING AND UNDERCUTTING REINFORCING STEEL

- A. Remove damaged or unsound concrete. Use concrete removal procedures that will not structurally weaken the surrounding concrete.
- B. Once initial concrete removal takes place, undercut exposed oxidized (corroded) reinforcing to provide clearance for cleaning, full bar circumference bonding to surrounding concrete, and securing the patch structurally.
- C. Provide minimum 3/4" clearance between exposed rebars and surrounding concrete or 1/4" larger than largest aggregate in repair mortar, whichever is greater.
- D. Extend concrete removals along the bars to locations along the bar free of bond inhibiting corrosion and bonding well to surrounding concrete.
- E. If unoxidized reinforcing steel is exposed during the undercutting process, care shall be taken not to damage the bar's bond to surrounding concrete. If the bond between bar and concrete is broken, undercutting of the bar shall be required.
- F. Secure any loose reinforcement in place by tying to other secured bars or by other approved methods.
- G. Condition edges of repair area by making 1/2 in. sawcut along the perimeter.

3.4 REPAIRING AND CLEANING OF REINFORCING STEEL

- A. After removal of concrete, notify Architect of Record for inspection of steel reinforcing.
- B. Completely replace reinforcing or add supplemental reinforcing over the affected section. Mechanically splice the new reinforcing bar to the existing bar or place the new

bar parallel to and approximately 3/4" from the existing bar. Provide lap length in accordance with ACI 318.

- C. Remove heavy oxides and scale from the exposed reinforcing bars, as necessary to ensure a maximum bond of the replacement material.

3.5 APPLYING REPAIR MORTAR

- A. General: Perform repairs using flowable mortar or non-sag mortar as appropriate to conditions at each location.

- B. Forms:

1. Support, brace, and maintain forms as required to support loads that might be applied. Construct formwork to provide a concrete repair patch of correct size, shape, and alignment.
2. Construct forms of one piece with accurate alignment, location, grades, and plumb work in finished repair.
3. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
4. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive repair mortar. Remove chips, wood, sawdust, dirt or other debris just before placing concrete. Tighten forms and bracing before repair mortar placement to prevent mortar leaks and maintain alignment.

- C. Preparation of Form Surfaces:

1. Coat contact surfaces of forms with a nonresidual, form-coating compound.
2. Do not allow excess form-coating material to accumulate on forms or to come into contact with existing concrete surfaces against which repair mortar will be placed. Apply in compliance with manufacturer's instructions.

- D. Repair Mortar Placement:

1. Apply bonding compound to prepared concrete and reinforcing steel surfaces. Apply in compliance with manufacturer's instructions at coverage rate recommended for performance as a bonding agent and as a corrosion inhibitor.
2. Deposit repair mortar continuously in a manner to avoid segregation at its final location and in accordance with manufacturer's instructions.

- E. Finish of Formed Surfaces: Provide an as-cast concrete surface to match the existing cast in place concrete surface, with a minimum of seams. Repair and patch defective areas including fins and other projections completely removed and smoothed. Match approved field sample.

- F. Curing and Protection: Protect freshly placed repair mortar from premature drying and excessive cold or hot temperatures.

3.6 PENETRATING CRACK SEALER APPLICATION

- A. Clean and prepare cracked concrete surfaces in accordance with sealer manufacturer's instructions. Concrete shall be clean, sound, and free of surface moisture, Remove dust, laitance, grease, oils, curing compounds, waxes, impregnations, foreign particles, coatings and disintegrated materials by mechanical means.
- B. Apply penetrating crack sealer to cracked concrete surfaces, in accordance with manufacturer's instructions.

3.7 PRESSURE INJECTION CRACK REPAIR

- A. Prepare concrete cracks in accordance with sealer manufacturer's instructions. Cracks and surface 1" on each side of crack shall be clean, sound, and free of surface water (may be damp but not wet). Remove dust, laitance, grease, oils, curing compounds, waxes, impregnations, foreign particles, coatings and disintegrated materials by mechanical means from one inch on each side of the crack. Blow cracks clean with oil-free compressed air.
- B. Mix repair materials according to manufacturer's instructions.
- C. Install injection ports. Apply cap seal, trowel grade (nonsag) epoxy, to the crack forcing epoxy around the ports and sealing the crack. Allow the epoxy to cure before pressure injecting the crack.
- D. Pressure-inject epoxy into ports to fill cracks using pressure injection equipment recommended by the epoxy manufacturer.

END OF SECTION 03 95 00

SECTION 04 03 10

MASONRY CLEANING

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 treatment work consisting of cleaning clay brick, terra cotta and stone masonry surfaces.
- B. Related Requirements:
 - 1. Section 01 35 91 " Treatment Procedures" for general treatment requirements.

1.3 DEFINITIONS

- A. Very Low-Pressure Spray: Less than 100 psi (690 kPa).

1.4 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry cleaning work in the following sequence:
 - 1. Inspect masonry for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Clean masonry.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

1.5 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Quality-control program.
- B. Cleaning program.

1.7 QUALITY ASSURANCE

- A. Treatment Specialist Qualifications: Engage an experience and qualified masonry cleaning firm to perform work of this section. Firm shall have five (5) years of experience similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience cleaning new masonry work is insufficient experience for treatment work.
- B. 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.
- C. 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.
- D. 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.
- E. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Cleaning: Clean an area approximately 25 sq. ft. 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 not less 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 Architect specifically approves such deviations in writing.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry cleaning work to be performed according to 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 CLEANING MATERIALS

- A. Water: Potable.
- B. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.
- C. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.
- D. 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. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dumond Chemicals, Inc.; Safe n' Easy Ultimate Stone and Masonry Cleaner.
 - b. Price Research, Ltd.; Price Marble Cleaner
 - c. PROSOCO, Inc.; Sure Klean 942 Limestone & Marble Cleaner.
- E. 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. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABR Products, Inc.; Building Wash 3.
 - b. Cathedral Stone Products, Inc.; D/2 Biological Solution.
 - c. Diedrich Technologies Inc., a division of Sandell Construction Solutions; Diedrich 910PM Polished Marble/Granite Cleaner.
 - d. Dumond Chemicals, Inc.; Safe n' Easy All Purpose Cleaner.
 - e. Hydrochemical Techniques, Inc.; HydroClean HT-700 Polished Marble & Granite Cleaner.
 - f. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
 - g. PROSOCO, Inc.; Stand Off All Surface Cleaner.

2.2 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. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABR Products, Inc.; ABR Rubber Mask.
 - b. Price Research, Ltd.; Price Mask.
 - c. PROSOCO, Inc.; Sure Klean Strippable Masking.

2.3 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 Glazed Terra Cotta: 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.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Remove roofing assemblies adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.

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 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. 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 above, so that cleaned surfaces blend smoothly into surrounding areas.
- F. Water Application Methods:
 - 1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
 - 2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from masonry surface, and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- G. 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.
- H. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING

- A. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, 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 and calking with alkaline paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Repeat application as required.
 - 3. Remove asphalt and tar with solvent-type paste paint remover.

- a. Comply with requirements in "Paint Removal" Article.
- b. Apply paint remover only to asphalt and tar by brush without prewetting.
- c. Allow paint remover to remain on surface for 10 to 30 minutes.
- d. Repeat application if needed.

3.4 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. Detergent Cleaning:
 1. Wet surface with cold/hot water applied by low-pressure spray.
 2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
 3. Rinse with cold or hot water applied by low-pressure spray to remove detergent solution and soil.
 4. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup.
- D. Mold, Mildew, and Algae Removal:
 1. Wet surface with cold/[hot 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 or hot water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
 5. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
 6. Remove bulk of gel cleaner.

3.5 CLEANING TERRA COTTA

- A. Hot or Cold-Water Wash: Use cold water applied by low-pressure spray.
 1. Rinse with cold or hot water applied by low -pressure spray to remove detergent solution and soil.
 2. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup.
- B. Mold, Mildew, and Algae Removal:
 1. Wet surface with cold/hot 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.

C. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold/hot 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 recommended in writing by chemical-cleaner manufacturer.
4. Remove bulk of gel cleaner.
5. Rinse with cold or hot water applied by low pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

D. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with cold or hot water applied by low-pressure spray.
2. Apply cleaner to surface in two applications by brush or low-pressure spray as recommended by manufacturer
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer
4. Rinse with cold/hot water applied by low pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.6 CLEANING GLAZED TERRA COTTA

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

B. Detergent Cleaning:

1. Wet surface with cold/hot. Rinse with cold/hot water applied by low-pressure spray.
2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
3. Rinse with cold or hot water applied by low-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup.

C. Nonacidic Gel Chemical Cleaning:

1. Wet surface with cold/hot 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 recommended in writing by chemical-cleaner manufacturer.
4. Remove bulk of gel cleaner.
5. Rinse with cold or hot water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

D. Nonacidic Liquid Chemical Cleaning:

1. Wet surface with cold or hot water applied by low-pressure spray.
2. Apply cleaner to terra cotta per manufacturer's recommendations.
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer. Rinse with cold or hot water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.7 FINAL CLEANING

- A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.
- B. Remove masking materials, leaving no residues that could trap dirt.

3.8 FIELD QUALITY CONTROL

- A. The Architect's responsibilities at the site include observing progress and quality of portion of the Work completed. Allow Architect use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- B. Notify the GHA's Designated Representative and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until the GHA's Designated Representative and Architect have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.
- C. Manufacturer's Field Service: Engage chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection and provide on-site assistance when requested by Architect. Have 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

SECTION 04 03 22

BRICK UNIT MASONRY REPAIR

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 treatment work consisting of repairing clay brick masonry as follows:
 - 1. Repairing unit masonry, including replacing units.
 - 2. Removing abandoned anchors.
 - 3. Painting steel uncovered during the work.
 - 4. Reanchoring veneers.
- B. Related Requirements:
 - 1. Section 01 35 91 "Treatment Procedures" for general treatment requirements.
 - 2. Section 02 42 96 "Removal and Dismantling" for removal and dismantling work.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal flashing installed in or on repaired masonry.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 psi; 4 gpm.
- B. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Inspect masonry for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Remove paint.
 - 3. Clean masonry.

4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
5. Repair masonry, including replacing existing masonry with new masonry materials.
6. Rake out mortar from joints to be repointed.
7. Point mortar and sealant joints.
8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units. Patch holes in mortar joints according to Section 04 03 23 "Brick Unit Masonry Repointing."

1.5 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

- B. Samples for Verification: For the following:

1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected.
 - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
2. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For treatment specialists, including field supervisors and workers, and testing service.
- B. Quality-control program.
- C. Unit masonry treatment program.

1.7 QUALITY ASSURANCE

- A. Treatment Specialist Qualifications: Engage an experienced and qualified brick masonry repair firm. Firm shall have completed five (10) years experience similar in material, design, and extent to that indicted for this Project with a record of successful in-service performance. Experience installing standard unit masonry is insufficient experience for masonry treatment work.

1. Field Supervision: Brick masonry repair specialist firm shall maintain experience full-time supervisors on Project site during times that brick masonry repair work is in progress. Field Supervisor should have a minimum of 10 years of experience with brick masonry repair.

- 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. Unit Masonry Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of 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 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 treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation.
 1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches (1200 mm) in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: four brick units replaced.
 - b. Re-anchoring Veneers: Install three masonry repair anchors in mockup wall assembly of each anchor type required.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.

- B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- F. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repair masonry units 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 masonry repair unless otherwise indicated:
 - 1. 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 masonry repair when temperature and humidity conditions produce excessive evaporation of water from mortar and repair 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

2.2 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including molded, ground, cut, or sawed shapes where required to complete masonry repair work.

- a. Physical Properties: According to ASTM C 216 and as follows:
 - 1) Classification: Grade SW, Type FBS
 - 2) Compressive Strength: 5,000 psi minimum.
 - 3) Saturation Coefficient: .78 maximum
 - a) The absorption alternate in ASTM 216 shall not be allowed unless specifically approved by the Architect.
 - 4) Initial Rate of Absorption: between 5 and 25 grams per 30 square inches per minute.
 - b. End bricks used for headers shall be match sides.
 - c. Bricks with bed faces exposed shall be solid.
 - d. 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. Mechanically chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.
3. Tolerances as Fabricated: According to tolerance requirements in ASTM C 216, Type FBS.
- B. Building (Common) Brick: Provide building brick according to ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.
- a. Physical Properties: According to ASTM C 216 and as follows:
 - 1) Classification: Grade SW
 - 2) Compressive Strength: 5,000 psi minimum
 - 3) Saturation Coefficient: .78 maximum
 - a) The absorption alternate in ASTM 216 shall not be allowed unless specifically approved by the Architect.
 - 4) Initial Rate of Absorption: between 5 and 25 grams per 30 square inches per minute.
 - 5) Efflorescence: Brick rated as "not Efflorescence" per ASTM C67

2.3 MORTAR MATERIALS

- A. See Section 04 03 23 "Brick Unit Masonry Repointing".

2.4 ACCESSORY MATERIALS

- A. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch- diameter, Type 316 stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.
1. Products: Subject to compliance with requirements, provide one of the following
 - a. BLOK-LOK Limited; Torq-Lok.
 - b. Dur-O-Wal, a Hohmann & Barnard Company; Mechanical Anchor Series DA5000 or DA5100.
 - c. Hohmann & Barnard, Inc.; #521RA-B.
- B. Masonry Repair Anchors, Spiral Type: Driven-in, Type 316 stainless-steel spiral rods designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BLOK-LOK Limited; Spira-Lok.
 - b. Dur-O-Wal, a Hohmann & Barnard company; Dur-O-Flex Friction Pinning Anchor DA508
 - c. Heckmann Building Products, Inc.; #391 Remedial Wall Tie.
 - d. Hohmann & Barnard, Inc.; Helix Spiro-Ties.
- C. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.
- D. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- E. Wicks: Cotton sash cord 3/8 inch diameter in length required to produce 2 inch exposure on exterior and 18 inch in cavity.
- F. Drip Edge: 26-Gage, Factory formed hemmed edge, stainless steel Type 304.
- G. Termination Bar: 26 gage x 1 1/2" inches wide with flange on top to receive sealant and 1/4" diameter holes at 8 inches on center, stainless steel Type 304.
- H. 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.

2.5 REINFORCING, ANCHOR, AND TIES

- A. Joint Reinforcing: Ladder Type ASTM A82 and ASTM A153-B2
 1. Gauge: Min. No 9 gauge deformed side rods with No. 9 gauge cross rods at max. 16" center to center.
 2. Width: 1 1/2" to 2" less than wythe thickness
 3. Finish: Stainless Steel, Type 316
- B. Dovetail Anchors: ASTM A82 and ASTM A153-B2
 1. Gauge: Min. 12 gauge sheet metal, 1-inch wide.
 2. Anchor Wire: 3/16" Triangular Tie
 3. Length: Dovetail tab and anchor length as required to fit existing construction.
 4. Finish: Stainless Steel, Type 316
- C. Adjustable Veneer Assemblies: ASTM A82 and ASTM A153- B2
 1. Wall Plate: Min. 14 Gauge
 2. Anchor Wire: Min. 3/16-inch
 3. Finish: Stainless Steel, Type 316
 4. Acceptable Products:
 - a. Hohmann & Barnard, Inc; HB-200 Adjustable veneer anchor
- D. Joint Stabilizing Anchors (to bridge expansion joints): ASTM A82 and ASTM A153-B2
 1. Construction: Double plate construction joined by 2 9-gauge wire shafts
 2. Length: 12-inches
 3. Finish: Stainless Steel, Type 316
- E. Corrugated ties are not acceptable.

2.6 SEALANT AND BACKER ROD

- A. See Section 07 92 00 "Joint Sealants".

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry 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 masonry and other surfaces.

3.2 MASONRY REPAIR, GENERAL

- A. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 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 masonry.
 2. Notify Architect before proceeding if an item cannot be removed without damaging surrounding masonry. 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 masonry as close around item as practicable.
 3. Patch the hole where each item was removed unless directed to remove and replace the masonry unit.

3.4 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections, where occur.
- D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, 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.
 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.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.

4. Deliver cleaned brick not required for reuse to GHA unless otherwise indicated.
- 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 and salvaged brick in good condition, where possible, or with new brick 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 sufficient 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 04 03 23 "Brick Unit Masonry Repointing." Point at same time as repointing of surrounding area.
 2. When mortar is sufficiently hard 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.

3.5 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 units. 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, anchors, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections, where occur.
- D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose units beyond the removal area, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible.

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.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned brick not required for reuse to the GHA unless otherwise indicated.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. 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.
- 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.
- I. 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 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.
- 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.

3.6 REANCHORING VENEERS

- A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Space anchors not more than 16 inches o.c. vertically and 24 inches o.c. horizontally apart unless otherwise indicated. Install at locations to avoid penetrating flashing.
- B. Recess anchors 5/8 inch or more from surface of mortar joint, and fill recess with pointing mortar according to Section 04 03 23 "Brick Unit Masonry Repointing."

3.7 FIELD QUALITY CONTROL

- A. The GHA's Designated Representative will perform inspections. Allow the GHA's Designated Representative use of lift devices and scaffolding, as needed, to perform inspections.
- B. The Architect's responsibilities at the site include observing progress and quality of portion of the Work completed. Allow Architect use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- C. Notify the GHA's Designated Representative and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until the

GHA's Designated Representative and Architect have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.8 MASONRY-WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.

END OF SECTION

SECTION 04 03 23

BRICK UNIT MASONRY REPOINTING

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 treatment work consisting of repointing brick masonry as follows:
 - 1. Repointing joints with mortar and sealant.
- B. Related Requirements:
 - 1. Section 01 35 91 "Treatment Procedures" for general treatment requirements.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 psi; 4 gpm.

1.4 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Inspect masonry for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Remove paint.
 - 3. Clean masonry.
 - 4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 5. Repair masonry, including replacing existing masonry with new masonry materials.
 - 6. Rake out mortar from joints to be repointed.
 - 7. Point mortar and sealant joints.
 - 8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to Section 04 03 22 "Brick Unit Masonry Repair." Patch holes in mortar joints according to "Repointing Masonry" Article below.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For the following:
 - 1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 - 2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
 - a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
 - b. Identify sources, both supplier and quarry, of each type of sand.
 - 3. Sealant materials.
 - 4. Include similar Samples of accessories involving color selection.
- C. Samples for Verification: For the following:
 - 1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 - 2. Sealant materials.
 - 3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For treatment specialists including field supervisors and workers and testing service.
- B. Quality-control program.
- C. Unit masonry treatment program.

1.7 QUALITY ASSURANCE

- A. Treatment Specialist Qualifications: Engage an experienced masonry 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 masonry repointing work.
 - 1. Treatment Worker Qualifications: Masonry specialist firm shall maintain a full-time supervisor on the project site during times that masonry repair work is in progress. Field Supervisor should have a minimum of 10 years of experience with Repointing repair.
- 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. Unit Masonry Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of treatment work, including protection of surrounding materials and Project site.
 - 1. Include methods for keeping pointing mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of 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 treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Provide sample of repointing in an area designated by Architect and the GHA's Designated Representative.
 - 2. Repointing: Rake out joints in two separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
 - 3. Sample must be cleaned prior to review by Architect and the GHA's Designated Representative.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver 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.

- C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repoint mortar joints 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 mortar-joint pointing unless otherwise indicated:
 - 1. 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 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150, Type I or Type II; white or gray where required for color matching of exposed mortar.
 - 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. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
- D. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- E. Water: Potable.

2.3 ACCESSORY MATERIALS

- A. Sealant Materials:
 - 1. See Section 07 92 00 "Joint Sealants."
- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- C. 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 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 will retain 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, unless otherwise demonstrated by a satisfactory history of performance.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by ASTM C 1713 Composition: ASTM C 1713, with binder material limited to portland cement and lime, and with a volume ratio of 1 part portland cement, 1 part lime, and 6 parts sand. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry 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 masonry and other surfaces.

3.2 MASONRY REPOINTING, GENERAL

- A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints indicated as sealant-filled joints.
- 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 2 times joint width or 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 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 masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
- 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 thoroughly 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 it 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 featheredge 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.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - 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.

END OF SECTION

SECTION 04 03 26

TERRA COTTA UNIT MASONRY REPAIR

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 treatment work consisting of repairing terra cotta masonry as follows:
 - 1. Repairing unit masonry, including replacing units.
 - 2. Removing abandoned anchors.
 - 3. Painting steel uncovered during the work.
 - 4. Re-anchoring veneers.
- B. Related Requirements:
 - 1. Section 01 35 91 "Treatment Procedures" for general treatment requirements.
 - 2. Section 02 42 96 "Removal and Dismantling" for removal and dismantling work.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal flashing installed in or on repaired masonry.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 psi; 4 gpm
- B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.
- C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of terra cotta units to freezing and thawing.

1.4 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry treatment work in the following sequence, which includes work specified in this and other Sections:

1. Inspect masonry for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
2. Remove paint.
3. Clean masonry.
4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
5. Repair terra cotta masonry, including replacing existing masonry with new masonry materials. If required, repair backup masonry.
6. Rake out mortar from joints to be repointed.
7. Point mortar and sealant joints.
8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
9. Where water repellents are to be used on or near masonry work, 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 terra cotta units according to "Terra Cotta Patching" Article. Patch holes in mortar joints according to Section 04 03 27 "Terra Cotta Unit Masonry Repointing."

1.5 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

- B. Shop Drawings:

1. Include plans, elevations, sections, and locations of masonry repair work on the structure.
2. Show full-size patterns with complete dimensions for new terra cotta units and their jointing, showing relationship of existing units to new units.
3. Indicate setting number of each new terra cotta unit and its location on the structure in annotated plans and elevations.
4. Show provisions for expansion joints or other sealant joints.
5. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.
6. Show replacement and repair anchors. Include details of anchors within individual terra cotta units, with locations of anchors and dimensions of holes and recesses in units required for anchors.
7. 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. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.

- a. Have each set contain a close color range of at least six. Samples of different mixes of patching compound that match the variations in existing masonry when cured and dry.
 - 2. Terra Cotta Glaze Replacement: Submit sets of terra cotta glaze replacement Samples, with glaze colors representative of the range of glaze colors on the building.
 - a. Have each set contain a close color range of at least six Samples of different formulas that match the variations in existing terra cotta glazes.
 - 3. Terra Cotta Replacement Units:
 - a. Submit three (3) samples, 12 inch x 12 inch representative of color, sheen and texture of cleaned terra cotta.
 - b. Repeat sample submittal until a match is approved by the Architect.
 - 4. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following:
- 1. Each type of terra cotta composition and color to be used for replacing existing units. Include sets of Samples to show the full range of color and texture to be expected.
 - a. Terra Cotta Units: Provide one of each shape, color, and texture of unit, suitable and ready for installation. Submit unit samples after acceptance of patterns for terra cotta.
 - 2. Each type of patching compound in the form of briquettes, at least 3 inches (75 mm) long by 1-1/2 inches (38 mm) wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
 - 3. Each color of terra cotta glaze replacement applied to 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.
 - 4. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For treatment specialists, including field supervisors and workers, terra cotta manufacturer and testing service.
- B. Quality-control program.
- C. Terra cotta treatment program.

1.7 QUALITY ASSURANCE

- A. Treatment Specialist Qualifications: A qualified terra cotta repair specialist. Experience installing standard unit masonry is insufficient experience for masonry treatment work.

1. Company specializing in repair/restoration of terra cotta masonry with a minimum of ten (10) years documented experience.
 2. All work shall be performed by mechanics experienced in the handling and setting of the material having not less than 10 years satisfactory experience in comparable installation of new terra cotta.
 3. Capable of submitting proof of work on a minimum of 3 projects similar in scope and scale to this Project.
- B. Terra Cotta Manufacturer Qualifications: A firm regularly engaged in manufacturing custom architectural terra cotta units for building restoration purposes, of same type and of similar size, complexity, and tolerances as those required for the Work.
1. Company specializing in manufacturer and reproduction of terra cotta masonry with minimum of five (10) years documented experience.
 2. Manufacturer shall provide a qualified technical representative to the project site for the purpose of:
 - a. Surveying and measuring of each terra cotta unit to be replaced.
 - b. Advising the installer of the procedures and precautions for the use of the material.
- C. 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.
- D. Terra Cotta Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of 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 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.
- E. Mockups: Prepare mockups of treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
1. Terra Cotta Repair: Prepare sample areas for each type of terra cotta material and assembly 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 where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: Four terra cotta units replaced.
 - b. Re-anchoring Veneers: Install three masonry repair anchors in mockup wall assembly of each anchor type required.

- c. Patching: Three small holes at least 1 inch in diameter or as directed for each type of terra cotta material indicated to be patched, so as to leave no evidence of repair.
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.
- 4.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver terra cotta units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.
- B. Deliver each piece of terra cotta 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. Schedule deliveries in sequence of installation.
- E. Notify manufacturer within 72 hours, in writing, if terra cotta units are damaged in transit.
- F. Terra cotta units shall remain in their original packing material until ready for use.
 1. Crates shall not be stacked, and shall remain in an upright position.
 2. Protect materials from physical damage, rain, snow, ground water and soilage or contamination by other deleterious materials that may cause staining or other defects.
 3. Protect terra cotta units from freezing when outside air temperature is lower than 40 degrees F.
- G. Handle terra cotta units to prevent overstressing, chipping, defacement, and other damage.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repair terra cotta units 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 masonry repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls 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 masonry repair when temperature and humidity conditions produce excessive evaporation of water from mortar and repair 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

2.2 TERRA COTTA REPLACEMENT UNITS

- A. Terra Cotta: Provide new terra cotta units to match existing terra cotta units in physical properties, color, gloss, surface texture, thickness, profile, dimensions, and composition of surface glaze.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boston Valley Terra Cotta.
 - b. Gladding, McBean
 2. Physical Properties: according to ASTM C 67 based on 10 sample averages:
 - a. Compressive Strength: 6,000 psi minimum.
 - b. Absorption (5 hour boil): 11.9 percent maximum.
 - c. Absorption (24 hour soak): 7.9 percent maximum.
 - d. Saturation Coefficient: 0.69 maximum.
 - e. Glaze absorption: 0.15 percent
 - f. Freeze/Thaw resistance: 300 cycles without degradation
 - g. Craze Resistance: the glaze shall not craze, spall or crack when subjected to one cycle of autoclaving in the Crazing Test.
 3. Physical Properties per ASTM C126:

- a. Imperviousness: after the Imperviousness Test, no stain seen from a distance of 5 feet shall remain on or beneath the surface, except a slight discoloration in the depressions on matt, stippled, or mottled.
 - b. Physical Properties per A.I.A. File No. 9, based on 10 sample average: Resistance to Fading: the color of the glaze shall not change in the Chemical Resistance Test.
- B. Terra Cotta Unit Materials: Mixture of clay, grog and fusible materials, proportioned, mixed and properly burned to produce a strong, homogeneous product with physical properties conforming to the "Standard Specifications for Ceramic Veneer" of the ATCI, Part II, Table 1.
 1. Unit Design: Anchored type, cast, matching existing unit face size and relief design.
- C. Mold Material
 1. Molds: Rigid, dimensionally stable nonabsorptive material, warp and buckle free, that will provide continuous and true GFRC mold surfaces; nonreactive with GFRC and capable of producing required finish surfaces.
 2. Mold-Release Agent:
 - a. Commercially produced liquid-release agent that will not bond with, stain, or adversely affect GFRC mold surfaces and will not impair subsequent surface or joint treatments of GFRC.
 - b. Shall not interfere with the adhesion of sealants or finishes specified under normal preparation requirements.
- D. Terra Cotta Unit Fabrication
 1. Duplicate existing terra cotta units based on one or more of the following, in order of preference:
 - a. Illustrative samples from existing building
 - b. Measured drawings
 - c. Original building drawings
 - d. Photographs.
 2. Fabricate terra cotta per approved shop drawings.
 3. Design terra cotta units to satisfy requirements specified in "Performance Criteria" Article.
 4. Terra cotta units shall be structurally sound with adequate provisions for anchorage and setting.
 - a. Walls shall be 1 inch thick, minimum.
 - b. Partitions shall be of such thickness to perform their proper function with regard to form and structure.
 - c. Beds shall be not less than 4 inches.
 - d. Provide projecting units with drips.

5. Necessary anchor holes and hand holds shall be provided in accordance with shop drawings so formed to properly engage the structure.
6. Thicknesses:
 - a. Closed-back TC:
 - 1) Outside shell: 1 1/8 inch thick, minimum.
 - 2) Web: 1 1/8 inch thick, minimum at 4 inch on center maximum spacing.
 - 3) Score or ribbed back surface.
 - b. Open-back TC:
 - 1) Outside shell and web: 1 inch thick minimum
 - 2) Web: 1 inch thick minimum, 8 inch on center maximum spacing.
7. Glazed Finish:
 - a. Frost-proof type.
 - b. Match the cleaned glazed surfaces of existing units, covering one or more sides as necessary to meet design requirements.
 - c. The glazed finish shall show no crazing, damage, staining or color change when subjected to the specified tests.

E. Mold Fabrication

1. Construct rigid molds that will result in finished terra cotta complying with profiles, dimensions, and tolerances indicated, without damaging terra cotta during stripping. Construct molds to prevent water leakage and loss of cement paste.
 - a. Use release agents per manufacturer's instructions.
 - b. Coat contact surfaces of molds with form-release agent.
2. Allow for clay shrinkage resulting from drying and firing.
3. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during terra cotta application. Coat form liner with form release agent.
4. If requested by the GHA, terra cotta molds shall be submitted for possession upon completion of the job.

F. Fabrication Tolerances

1. Face Dimension: The face dimensions (length and width) of terra cotta shall not vary more than 1/16 inch plus or minus the dimensions specified on the shop drawings.
2. Warpage: The exposed face of ceramic veneer shall not vary from a true plane by more than 0.005 inch per inch of length.

G. Finishes: Finish and Appearance: per ASTM C126.

1. Finish exposed-face surfaces to match approved sample.

2. Unit faces shall be free of cracks, joint marks, sand streaks, honeycombs, excessive air voids, grain, or other obvious defects.
3. Unit faces shall have uniform color and texture.

H. Source Quality Control

1. Terra Cotta Units for Quality Control Testing: Submit two (2) sample units from each firing during production for testing to an independent testing facility acceptable to the Architect and the GHA. Samples shall be complete units from units produced for this Project.
2. Testing shall be performed on each unit as described in the "Performance Criteria" Article in Part 2.
3. If a tested unit does not meet specified requirements, submit two (2) additional samples from that firing for testing. Cost of additional testing will be borne by Contractor.
4. Submit copy of test reports to Architect and the GHA.
5. Prior to packing for shipment:
 - a. Inspect terra cotta units for chips, cracks, and other defects.
 - b. Lay out terra cotta unit to check for uniformity of joint widths. Verify joints to be straight and true.
 - c. Verify dimensions comply with shop drawings dimensions and approved finishes.
 - d. Verify pieces meet fabrication tolerances.
 - e. Verify finishes comply with approved samples.
 - f. Correct deficiencies prior to shipment.
6. Date Identification: Emboss in the clay body on a concealed, interior surface of each unit in easily read 1/2-inch- high characters, "MADE (Insert year)." Manufacturer's name may also be embossed.

2.3 MORTAR MATERIALS

- A. See Section 04 03 27 "Terra Cotta Unit Masonry Repointing".

2.4 MANUFACTURED REPAIR MATERIALS

- A. Terra Cotta Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching terra cotta masonry.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
 - b. Conproco Corporation; Mimic or Matrix.
 - c. Edison Coatings, Inc.; Custom System 45.
 2. Use formulation that is vapor and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the terra cotta 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 patching compound used for patching terra cotta in colors and textures to match each unit being patched. Provide no fewer than three colors to enable matching the color, texture, and variation of each unit.
- B. Terra Cotta Glaze Replacement: A high-solids, nonyellowing, fade-resistant, waterborne acrylic latex, polyurethane, or epoxy coating intended for exterior use as terra cotta glaze replacement. Product shall be custom mixed by manufacturer to match color and gloss of existing terra cotta glaze.

2.5 ACCESSORY MATERIALS

- A. Terra Cotta Anchors, hangers, bolts, dowels, clips, straps, rods, pins, clamps and other metal items for securing terra cotta units: Type and size indicated or, if not indicated, to match existing, formed metal anchors in size and type. Fabricate anchors from Type 316 stainless steel.
1. Terra cotta units shall be attached to structural substrate to form a weather-tight veneer and ornamentation.
 2. Method of attachment shall be designed to adequately resist wind pressure, uplift, and other loads.
 3. Method of installation and expansion joints shall accommodate stresses caused by deflection, settlement, wind pressure, and temperature changes without failure of joints, undue stress on fasteners, or other detrimental effects.
- B. Building Brick: Brick having same vertical dimension as existing backup brick, according to ASTM C 62, Grade SW, and Section 04 03 22 "Brick Unit Masonry Repair."
- C. Shims: Shims for bearing on horizontal surfaces shall be "Korolath" bearing strips, thickness and sizes as required
- D. Wicks: 100 percent cotton sash cord, 3/8 inch diameter, length required to produce 2 inch exposure on exterior at 18 inches in cavity.
- E. 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.

PART 3 - EXECUTION

3.1 MASONRY REPAIR, GENERAL

- A. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.2 SITE SURVEY

- A. Contractor and manufacturer's representative shall measure existing terra cotta units to be replaced. Collect measurements, take photographs, make field sketches, and record other data as required for design and fabrication of replacement units.
- B. Conduct site survey of existing building prior to submittal of shop drawings.
- C. Identify and code units to be replaced.
- D. Remove existing terra cotta units required as samples for preparation of molds for fabrication of replacement units. Pack, crate and deliver samples to manufacturer's plant. Provide temporary protection to prevent moisture penetration into structure where terra cotta units are removed.
 - 1. Cut out deteriorated terra cotta units to be replaced in manner to prevent damage to remaining terra cotta and adjoining materials.
- E. Contractor shall provide terra cotta samples as required for manufacturer's use.
- F. Carefully remove existing unit, tag for location and store in protective container for use by GFRC mold manufacturer. Reinstall intact units following mold production.
- G. Fractured units may require gluing and/or pinning by the contractor to allow for mold production.
- H. Where existing irreparable units are not usable as models due to severe deterioration, identical intact pieces shall be photographed and measured by the manufacturer's representative and sent to the GFRC mold manufacturer.
- I. Representative units to be returned to GHA as requested.
- J. Cut away loose or unsound adjoining mortar and grout to provide clean surfaces and solid bearing for setting new units.
- K. Contractor and manufacturer's representative shall measure existing terra cotta units to be replaced.

3.3 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day.

3.4 CLEANING OF EXISTING TERRA COTTA

- A. Clean terra cotta units to be used for color matching.
- B. Protected areas below cleaning operations.
- C. Use cleaning materials described in Part 2 to clean terra cotta. Use fiber brushes and cloths. Do not use metallic tools for cleaning and scraping.
- D. Thoroughly rinse and wash off cleaning solution and dirt.

3.5 TERRA COTTA REMOVAL AND INSTALLATION

- A. Install new terra cotta units per manufacturer's recommended instructions and approved shop drawings.
- B. Securely attach anchors, hangers, bolts, clips, rods, and pins as required for securing terra cotta units. Use type of fastener and spacing recommended by terra cotta manufacturer. Ensure items are properly sized and accurately located.
- C. Support and protect remaining masonry that was supported by removed units. Reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections, where occur.
- E. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose units in existing masonry backup, rotted wood, rusted metal, delaminated concrete, and other deteriorated items.
- F. Protect opening from intrusion of foreign matter, debris and from weather including insulation for thermal protection of interior spaces and components.
- G. Remove corroded accessories and replace with stainless steel accessories designed to hold the terra cotta in place without placing detrimental stresses on the terra cotta unit.

- H. Soak walls to receive new terra cotta units by spraying with clean water at beginning of day and again within one hour of setting units.
- I. Soak terra cotta units 60 minutes prior to installation.
- J. Field cutting: where cutting is required to accommodate non-standard conditions, use power saw with diamond blade and rigid cutting template. Do not reduce strength of terra cotta by cutting webs and partitions.
- K. Install replacement units into bonding and coursing pattern of existing units.
 - 1. Do not cut or grind glazed terra cotta.
 - 2. Maintain joint width for replacement units to match existing joints.
 - 3. Use setting buttons or shims to set units accurately spaced with uniform joints.
- L. Set terra cotta plumb, true and aligned. Maintain courses to uniform dimension.
- M. Attach new terra cotta units to substrate with metal anchors as detailed on approved shop drawings. Set units in solid mortar bed. Fill spaces between terra cotta and substrate with grout or mortar.
 - 1. Spaces greater than 3/4 inch: fill with grout
 - 2. Spaces 3/4 inch or less: fill with mortar
- N. Set replacement units in a full bed of mortar. Replace existing anchors with new anchors of size and type indicated. Fasten anchors to back-up as detailed.
- O. Embed anchors in mortar and fill voids behind units with mortar.
- P. Do not shift or tap terra cotta units after mortar has achieved initial set. If adjustments are required, remove, clean and relay with fresh mortar.
- Q. Tool exposed mortar joints in repaired areas to match joints of surrounding existing terra cotta.
- R. Rake out mortar used for laying terra cotta before mortar sets 1 inch deep and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
- S. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.
- T. 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.
- U. As work progresses, install built-in flashing and sheet metal. Embed in mortar joints or reglets as indicated in Drawings.

- V. Fill terra cotta units cavities containing reinforcement with grout. Ensure that reinforcement, supports, anchors, and ties are encased with grout or mortar.
- W. Weep holes: provide weep holes through mortar joints as indicated on Drawings. Keep weep holes free of mortar and grout.
- X. Tolerances: maximum variation:
 - 1. Between face plane of adjacent panels: 1/16 inch.
 - 2. Joint thickness: match original joint thickness

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 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 according to requirements in Section 04 03 22 "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. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.
- E. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose 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 hand chisels, 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 GHA 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 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.

3.7 TERRA COTTA PATCHING

- A. Patching of terra cotta: Patch or rebuild the profile of larger spalls by the application of a patching compound.
 - 1. Grind and repoint non-moving cracks with mortar and coat with a waterproof/breathable coating to match the terra cotta glaze.
 - 2. Coat small spalls, flakes or chips with a waterproof/breathable coating to protect soft, porous bisque (i.e., body of the terra cotta and to approximate glazed surface of original units.
- B. Replace chipped and broken terra cotta units.
- C. Remove deteriorated material as determined by sounding gently with a small hammer. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer. Remove the terra cotta unit from the wall, as designated, to make satisfactory repair. Replace all corroded accessories and reinstall terra cotta unit.
- D. Apply patching compound per manufacturer's instructions. Sculpt material to match existing profiles and ornamental designs. Provide smooth transition between new and existing surfaces.
- E. Where mortar joints adjacent to patch are open, fill back of joints with pointing mortar and allow to cure before patching terra cotta. Leave space for pointing joints.
- F. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of unit.
- G. Rinse surface to be patched and leave damp, but without standing water.
- H. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
- I. Terra cotta units with full depth cracks continuous edge to edge: Remove for bonding, drill and install a minimum of two (2) stainless steel pins, apply adhesive, and clamp in alignment until adhesive has set.
- J. Terra cotta with spalled faces: Fill out to the face and profile with well compacted patch material. Form along edges to provide a true edge at the patch; do not make patch continuous between units.

1. Place patching compound in layers as recommended 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.
 2. All mortar patches to be mechanically anchored to the terra cotta unit with stainless steel anchors or wire epoxied into body of terra cotta unit.
- K. Do not apply patching compound over mortar joints. If patching compound bridges mortar joints, cut out joints after patching compound hardens.
- L. Trowel, scrape, or carve surface of patch to match texture, details, and surrounding surface plane or contour of terra cotta. Shape and finish surface before or after curing, as determined by testing to best match existing terra cotta.
- M. Keep each layer damp for 72 hours or until patching compound has set.
- N. Coat completed patch with a waterproof/breathable masonry coating in color to approximate original glaze. After compound has set and cured, apply primer and two finish paint coats. Blend and distress paint to match appearance and color of existing terra cotta per manufacturer's instructions.

3.8 TERRA COTTA GLAZE REPAIR

- A. Repair the glaze on the following terra cotta units that are otherwise sound unless another type of repair or replacement is indicated:
1. Units with abraded or chipped glaze.
 2. Units with spots or areas of shallow deterioration greater than glaze thickness and less up to 1/16 inch (1.5 mm) deep.
- B. Remove and replace discolored or mismatched glaze repairs unless otherwise indicated or approved by Architect.
- C. Application: After other repairs have cured, apply terra cotta glaze replacement according to manufacturer's written instructions. Apply two or more coats, as needed, to match glaze of adjacent terra cotta units. Do not apply glaze to joint surfaces between units or within joints that will be mortared or sealed.

3.9 PROTECTION AND CLEANUP

- A. During erection: cover uncompleted terra cotta and backing with waterproof sheeting at end of each day and hold securely in place.
- B. Protect face of adjacent walls and surfaces from water, mortar and grout used for terra cotta installation.
- C. Remove excess mortar and mortar smears as work progresses.

- D. Clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools.
- E. Protect terra cotta from subsequent construction operations. If damage occurs, remove and replace damaged components as required to provide terra cotta in original, undamaged condition.

3.10 FIELD QUALITY CONTROL

- A. Manufacturer's field representative shall inspect terra cotta restoration and installation, identify defects and submit report to Architect. Correct deficiencies identified by manufacturer's field representative.
- B. After restoration is complete, inspect joints. Replace defective mortar. Match adjacent work.
- C. The GHA's Designated Representative will perform inspections. Allow the GHA's Designated Representative use of lift devices and scaffolding, as needed, to perform inspections.
- D. The Architect's responsibilities at the site include observing progress and quality of portion of the Work completed. Allow Architect use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- E. Notify the GHA's Designated Representative and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until the GHA's Designated Representative and Architect have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION

SECTION 04 03 27

TERRA COTTA UNIT MASONRY REPOINTING

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 treatment work consisting of repointing terra cotta masonry joints with mortar and sealant.
- B. Related Requirements:
 - 1. Section 01 35 91 "Treatment Procedures" for general treatment requirements.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 psi; 4 gpm.

1.4 SEQUENCING AND SCHEDULING

- A. Order sand gray portland cement for pointing mortar immediately after approval of samples. Take delivery of and store at Project site a sufficient quantity to complete Project.
- B. Work Sequence: Perform masonry treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Inspect masonry for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Remove paint.
 - 3. Clean masonry.
 - 4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 5. Repair terra cotta, including replacing existing units with new terra cotta materials.
 - 6. Rake out mortar from joints to be repointed.
 - 7. Point mortar and sealant joints.
 - 8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

- C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to Section 04 03 26 "Terra Cotta Unit Masonry Repair." Patch holes in mortar joints according to "Repointing Masonry" Article below.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For the following:
 - 1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least six Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 - 2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
 - a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
 - b. Identify sources, both supplier and quarry, of each type of sand.
 - 3. Sealant materials.
 - 4. Include similar Samples of accessories involving color selection.
- C. Samples for Verification: For the following:
 - 1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 - 2. Sealant materials.
 - 3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For treatment specialists, including field supervisors and workers and testing service.

- B. Quality-control program.
- C. Terra cotta treatment program.

1.7 QUALITY ASSURANCE

- A. Treatment Specialist Qualifications: Engage an experienced masonry 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 masonry repointing work.
 - 1. Treatment Worker Qualifications: Masonry specialist firm shall maintain a full-time supervisor on the project site during times that masonry repair work is in progress. Field Supervisor should have a minimum of 10 years of experience with Repointing repair.
- 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. Terra Cotta Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of treatment work, including protection of surrounding materials and Project site.
 - 1. Include methods for keeping pointing mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of 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 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 each approximately 36 inches high by 48 inches wide 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.

1.8 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.

- C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repoint mortar joints 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 mortar-joint pointing unless otherwise indicated:
 - 1. 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 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II; white or gray where required for color matching of exposed mortar.
 - 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. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Color: Provide natural sand ground marble, granite, or other sound stone of color necessary to produce required mortar color.

- D. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.

- E. Water: Potable.

2.3 ACCESSORY MATERIALS

- A. Sealant Materials:
 - 1. See Section 07 92 00 "Joint Sealants."

- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

- C. 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 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 will retain 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, unless otherwise demonstrated by a satisfactory history of performance.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by ASTM C 1713 Composition: ASTM C 1713, with binder material limited to portland cement and lime, binder, and with a volume ratio of 1 part portland cement, 1 part lime, and 6 parts sand. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry 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 masonry and other surfaces.

3.2 MASONRY REPOINTING, GENERAL

- A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints indicated as sealant-filled joints.
- 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 joint width plus 1/8 inch 2 times joint width, but not less than 3/4 inch or 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 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 masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
- 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 1/4 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly 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 1/4 inch. Fully compact each layer and allow it 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 featheredge 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.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - 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. Pointing with Sealant: Comply with Section 07 92 00 "Joint Sealants" and as follows:
1. After raking out, keep joints dry and free of mortar and debris.

2. Clean and prepare joint surfaces. Prime joint surfaces. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant:
 - a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
 - c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - 1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.
 - d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.
 - e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.4 FIELD QUALITY CONTROL

- A. The GHA's Designated Representative will perform inspections. Allow the GHA's Designated Representative use of lift devices and scaffolding, as needed, to perform inspections.
- B. The Architect's responsibilities at the site include observing progress and quality of portion of the Work completed. Allow Architect use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- C. Notify the GHA's Designated Representative and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until the GHA's Designated Representative and Architect have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Clay face brick.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Ties and anchors.
6. Embedded flashing.
7. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel shelf angles for supporting unit masonry.

C. Related Requirements:

1. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings: For the following:
 - 1. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
- C. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - c. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C 67.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.
 - 7. Joint reinforcement.
 - 8. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup as shown on Drawings.
 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 3. Clean exposed faces of mockups with masonry cleaner as indicated.
 4. Protect accepted mockups from the elements with weather-resistant membrane.
 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
- B. Clay Face Brick: Facing brick complying with ASTM C 216.
 - 1. Grade: SW.
 - 2. Type: FBS.
 - 3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 5,000 psi.
 - 4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
 - 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 6. Nominal Size: Modular.
 - 7. Color and Texture: Match Architect's samples.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S, containing no air entrainment.
- C. Masonry Cement is not acceptable.
- D. Mortar Cement: is not acceptable.
- E. Mortar Pigments: ASTM C 979/C 979M, Inorganic compounds used in the proportions recommended by the manufacturer, but no case exceeding 10% of the weight of the cement, carbon black shall not exceed 2% of the weight of the cement.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bayer Corporation, Industrial Chemicals Div.
 - b. Davis Colors
 - c. Solomon Grind-Chem Services, Inc.
 - 2. Mortar Colors for Brick: Manufacturer's standard colors as selected by the Architect. Each brick type shall have a difference standard color selected as follows:
 - a. Brick Type A: Manufacturer's standard color as selected by the Architect.
- F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. For joints less than 3/8 inch (9.5 mm) thick, use aggregate graded with 100 percent passing the No. 8 (1.18-mm) sieve and 95% passing the No. 16 (1.18-mm) sieve.
4. White-Mortar Aggregates: Natural white sand or crushed white stone.
5. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Water: Potable.

2.5 REINFORCEMENT

A. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Exterior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
5. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

B. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.

2.7 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use the following unless otherwise indicated:

1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637/D 4637M, 0.045 inch (1.14 mm) thick.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net Solutions; Total Flash unitized flashing and cavity drainage system or comparable product by one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc.
 - 2) Firestone Specialty Products.
 - 3) Heckmann Building Products, Inc.
 - b. Accessories: Provide preformed corners, end dams, and materials produced by flashing manufacturer.
 - 1) Basis-of-Design Product: Mortar Net Solutions; CompleteFlash.
 - c. Sealants:
 - 1) Basis-of-Design Product: Mortar Net Solutions; MPE-1, Modified Polyether.

B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Expansion Joint Filler: ASTM D1065, Class RE41

1. Material: Closed cell neoprene

2. Compressibility: 50% minimum

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:
 - 1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.

2.9 MASONRY CLEANERS

- A. General purpose, non-acidic, cleaner by ProSoCo, Diedrich, or as recommended by masonry unit manufacturer.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints where indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

3.5 MORTAR BEDDING AND JOINTING

- A. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- B. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Unless otherwise indicated on drawings or specified under specific wall type, space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Unless otherwise indicated on drawings or specified under specific wall type, space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO CONCRETE

- A. Anchor masonry to concrete, where masonry abuts or faces structural concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) wide between back of masonry veneer and face of insulation.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

- B. Form expansion joints in brick as follows:
 - 1. Build in compressible joint fillers where indicated.
 - 2. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 1/4 inch.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and 1-1/2 inches (38 mm) into the inner wythe.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 - 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
 - 5. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated..
 - 6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep products to form weep holes.
 - 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 - 4. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
 - 5. Trim wicking material flush with outside face of wall after mortar has set.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

3.12 FIELD QUALITY CONTROL

- A. The GHA's Designated Representative will perform inspections. Allow the GHA's Designated Representative use of lift devices and scaffolding, as needed, to perform inspections.

- B. The Architect's responsibilities at the site include observing progress and quality of portion of the Work completed. Allow Architect use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- C. Notify the GHA's Designated Representative and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until the GHA's Designated Representative and Architect have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

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. Wood blocking and nailers
2. Plywood
3. Fasteners

B. Related Requirements:

1. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings
2. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction
- D. OSB: Oriented strand board

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with the minimum, allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Fire-retardant-treated wood
 2. Power-driven fasteners
 3. Post-installed anchors

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For the testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all rough carpentry unless otherwise indicated

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking
 - 2. Nailers
- B. Dimension Lumber Items: Construction or No. 2
- C. Concealed Boards: 15 percent maximum moisture content, any species and grades:
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD

- A. Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.5 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
- E. Screw Anchors: screw type. Pre-drill hole with a standard ANSI drill bit with the same diameter as the anchor and install the anchor with an impact wrench. Provide anchors with a diameter and anchor length marking on the head.
 - 1. Exterior Use: As indicated on the Drawings, provide stainless steel anchors manufactured from materials conforming to ISO 3506 Part 1 and having corrosion resistance equivalent to AISI Type 304 stainless steel. Stainless steel anchors shall be provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener and conforming to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Where wood-preservative-treated lumber is installed adjacent to concrete decking, install continuous flexible flashing separator between wood and metal decking.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES evaluation report for fastener
- G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

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. Adhered thermoplastic polyolefin (TPO) roofing system
2. Roof insulation
3. Walkways
4. Fluid-applied Silicone Roof Coating

- B. Related Requirements:

1. Section 06 10 00 - "Rough Carpentry" for fasteners and blocking
2. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

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

1. Meet with GHA, Architect, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects the roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product
 - 1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 - 1. Layout and thickness of insulation, if applicable
 - 2. Base flashings and membrane termination details
 - 3. Flashing details at penetrations.
 - 4. Tapered insulation layout, thickness, and slopes, if applicable
- C. Samples for Verification: For the following products:
 - 1. Roof membrane and flashings, of color required.
 - 2. Walkway pads or rolls, of color required.
- D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer
- B. Manufacturer Certificates:
 - 1. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- D. Evaluation Reports: For components of roofing system, from ICC-ES
- E. Field Test Reports:
 - 1. Membrane adhesion field test
- F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store the materials in a dry location. Comply with the insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store the roofing materials and place the equipment in a manner to avoid the permanent deflection of the deck.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with the installation only when the existing and forecasted weather conditions permit the installation of the roofing system according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within the specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, fasteners and other components of the roofing system.
 - 2. Warranty Period: 15 years from the date of Substantial Completion
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, fasteners, for the following warranty period:
 - 1. Warranty Period: Two years from the date of Substantial Completion

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
1. Zone 1 (Roof Area Field): 60 lbf/sq. ft.
 2. Zone 2 (Roof Area Perimeter): 90 lbf/sq. ft.
 - a. Location: From roof edge to 5-feet inside roof edge
 3. Zone 3 (Roof Area Corners): Insert lbf/sq. ft.
 - a. Location: 5-feet in each direction from each building corner
- D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
1. Fire/Windstorm Classification: Class 1A-90
 2. Hail-Resistance Rating: SH
- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of the applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet
1. Acceptable products:
 - a. Firestone: Ultraply TPO XR
 - b. GAF: Everguard Extreme
 - c. Versico: VersiFleece
 - d. Trimco: TPA Fleece-Back
 2. Source Limitations: Obtain components for the roofing system from roof membrane manufacturer or manufacturers approved by the roof membrane manufacturer.

3. Thickness: Minimum 60 mils, nominal
4. Exposed Face Color: As selected by the GHA from manufacturer's standard colors.
Note: the GHA-selected color(s) may vary at various roof/canopy locations.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for the intended use and compatible with other roofing components.
 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, minimum 55 mils thick, minimum, of the same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Slip Sheet: Manufacturer's standard, of thickness required for the application.
- E. Metal Termination Bars: Manufacturer's standard, pre-drilled stainless steel or extruded aluminum bars, 3/4 by 0.090-inch minimum thick with anchors, angled lip sealant receiver and lower leg bulb stiffener.
- F. Cover tape: A 6-inch wide, 0.045 mil reinforced TPO membrane with a 3-inch self-adhered area, designed for use as a cover strip overcoated and non-coated metal edges and flanges.
- G. Sealant Pans: 24 gauge steel with 0.025" thick TPO based film as required for fabrication into sealant pans. Standard sheet size: 4' x 10', sheet weight 47 lbs.
- H. Roof Transition Anchor Strips: 0.045" reinforced TPO membrane with pressure sensitive adhesive, for installation on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size: 6" x 100'
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to the substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone, and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, 100% solids urethane based two-part sealant suitable for filling sealant pans, and other accessories.
- K. Detailing Membrane: 55-mil thick minimum un-reinforced weldable membrane capable of easy forming flashing for penetrations corners, and curbs where preformed products will not fit and where indicated.
- L. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.

- M. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- N. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene
- O. Preformed Vent Boots: 0.075" thick molded TPO membrane sized to accommodate most common pipe and conduits, (1" to 6" diameter pipes), including the square tube. Hot-air weld the boots directly to the TPO membrane, and supplied with stainless steel clamping rings
- P. Pourable Sealant Pockets: 0.070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h)

2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer and matching existing.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Compressive Strength: 20 psi
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Minimum Thickness: 1/4 inch
 - 2. Slope:
 - a. Roof Field: 1/4 inch per foot minimum.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to the substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to the substrate or to another insulation layer as follows:
 - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.

2.6 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D 312/D 312M, Type III or Type IV
- B. Asphalt Primer: ASTM D 41/D 41M.

2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches
 - 2. Color: As selected by the GHA from manufacturer's standard colors. Note: the GHA-selected color(s) may vary at various roof/canopy locations.

2.8 FLUID-APPLIED ROOF COATING

- A. Silicone Roof Coating: Solvent free one-component moisture curing silicone rubber roof coating.
 - 1. Acceptable products:
 - a. Henry Company: Pro-Grade® 988 Silicone Roof Coating
 - b. Neogard, Inc: Neogard 7870 Roof Coating
 - c. Uniflex: Silicone 44 Roof Coating
 - 2. Accessory Products:
 - a. Primer: Stain blocking water base acrylic primer as recommended by the Coating manufacture
 - b. Cleaner: Biodegradable detergent was suitable for cleaning designated surfaces.
 - c. Reinforcing fabric: Stitch bonded, high performance fabric reinforcement sheet
 - 3. Color: As selected by the GHA from manufacturer's standard colors. Note: the GHA-selected color(s) may vary at various roof/canopy locations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting the performance of the Work.
 - 1. Verify that the roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that the nailers match thicknesses of insulation.
 - 3. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than **75** percent, or as recommended by roofing system manufacturer, when tested according to ASTM F 2170.
 - a. Test Frequency: Four test probe approximately at equal distances from each other along the concrete edge
 - b. Submit test reports within 24 hours after performing tests.
- B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 DEMOLITION OF EXISTING CONSTRUCTION

- A. Remove all flashings, and related component around the perimeter of the roof, at curbs and penetrations, and at penthouse walls.
- B. Remove existing roof membrane and roof insulation where it does not provide a suitable condition for installation of TPO membrane.
- C. Power-wash existing roof membrane and allow to dry. Remove loose granules by sweeping, power brooming, or vacuuming. Spud existing roof as required to achieve a strong bond of the TPO membrane to the surface.

3.3 PREPARATION

- A. Clean the substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when weather reports forecast rain.

3.4 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. By the end of the workday or before the start of forecasted precipitation, complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie into existing roofing to maintain weather tightness of transition.

3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of the workday.
- B. Comply with the roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under the area of roofing to conform to slopes indicated.
- D. Install insulation with long joints of insulation in a continuous straight line, with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

- E. Install insulation under the area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of the previous layer a minimum of 6 inches in each direction.
- F. Install tapered edge strips at perimeter edges of the roof that do not terminate at vertical surfaces.
- G. Mechanically Fastened and Adhered Insulation: Install the first layer only of insulation to the deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten the first layer of insulation to resist uplift pressure at corners, perimeter, and field of the roof.
 - 2. Set each subsequent layer of insulation including cover board in a uniform coverage of manufacturer's recommended full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together. Tape joints if required by roofing system manufacturer.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of the roof.

3.6 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to the slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 4. Adhere cover board to the substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

3.7 ADHERED ROOFING INSTALLATION

- A. Adhere the roof membrane over the area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow it to relax before installing.

- C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by the manufacturer. Stagger end laps.
- D. Hot Roofing Asphalt: Apply a solid mopping of hot roofing asphalt to the substrate at temperature and rate required by the manufacturer, and install fabric-backed roof membrane. Do not apply to splice area of the roof membrane.
 - 1. Place membrane without wrinkles and buckles. Remove any wrinkles or buckles from the sheet prior to permanent attachment. Fully adhere roof membrane immediately after rolling it out and follow by welding to the adjacent sheets.
 - 2. Overlap roof membrane a minimum of 3" for side laps and 3" for end laps.
 - 3. Install membrane so that the side laps run across the roof slope lapped towards drainage points.
 - 4. All exposed sheet corners shall be rounded a minimum of 1".
 - 5. Use full-width rolls in the field and perimeter region of the roof.
 - 6. Adhere the membrane sheets fully to the substrate with hot roofing asphalt at a rate of 25 lbs per 100 square feet.
 - 7. Prevent seam contamination by keeping the asphalt application a few inches back from the seam area.
 - 8. Adhere approximately one-half of the membrane sheets at a time. Fold back one-half of the sheet's length in turn to allow for asphalt application. Lay membrane into asphalt immediately after application.
 - 9. Roll membrane with a weighted roller to ensure complete bonding between asphalt and membrane.
 - 10. Hot-air-weld the membrane laps together. Make all welds continuous, without voids or partial welds. Make all welds with no burns and scorch marks.
 - 11. Weld shall be a minimum of 1-1/2" (39 mm) in width for automatic machine welding and a minimum 2" (52 mm) in width for hand welding.
 - 12. Seal all cut edges of the reinforced membrane with manufacturer's sealant specifically made for cut edges.
 - 13. Provide supplemental membrane attachment at the base of all the walls and curbs and where the angle of the substrate changes by more than five (5) degrees (1" in 12"). Secure roofing membrane to the structure with appropriate screws and plates spaced every 12" o.c. Install the screws and plates no less than 1/2" from the membrane edge. Alternatively, turn the roofing membrane up the vertical plane a minimum of 3" and secured with screws and a termination bar. Use the same fastener spacing as used for in-lap attachment. Install the termination bar within 1-1/2" to 2" of the plane of the roof membrane, with a minimum of 1" of membrane extending above the termination bar.
 - 14. Install the fasteners to achieve the proper embedment depth. Install fasteners without lean or tilt.
 - 15. Install fasteners so that the plate or termination bar tightly draws down to the membrane surface. Install the fasteners in a manner that will not allow the plate or termination bar to move (underdriving) and will not cause wrinkling of the membrane (overdriving).
- E. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roof membrane with side laps shingled with a slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with a probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with a clamping ring.

3.8 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at the required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash the penetrations and field-form the inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld the side and end laps to ensure a watertight seam installation.
- E. Terminate and seal the top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 WALKWAY INSTALLATION

A. Flexible Walkways:

1. Install flexible walkways at the following locations:
 - a. Locations indicated on Drawings.
 - b. As required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch clearance between adjoining pads.
3. Heat-weld to substrate or adhere walkway products to the substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests:

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

1. Notify Architect and GHA 48 hours in advance of date and time of inspection.
2. Accompany the manufacturer's technical inspector, and assist with equipment and workers if necessary to provide access to the roof. Correct all defects noted during the inspection.

- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

- A. Protect the roofing system from damage and wear during the remainder of the construction period. When remaining construction does not affect or endanger the roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and GHA.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

3.12 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

- 1. Owner: Gary Housing Authority
- 2. Address: 578 Broadway
- 3. Building Name/Type: Genesis Towers
- 4. Address: 578 Broadway
- 5. Area of Work: Selected roof replacement as specified on the drawings
- 6. Acceptance Date: _____
- 7. Warranty Period: 2 years
- 8. Expiration Date: _____

- B. AND WHEREAS Roofing Installer has contracted (either directly with GHA or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

- D. This Warranty is made subject to the following terms and conditions:

- 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 110 mph;
 - c. fire;

- d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on the bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by GHA
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by GHA or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if GHA allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If GHA engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified GHA in writing, showing reasonable cause for the claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. The GHA shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off GHA from other remedies and resources lawfully available to GHA in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for the performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with GHA or a subcontract with GHA's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____
2. Name: _____
3. Title: _____

END OF SECTION 07 54 23

SECTION 07 59 00

MODIFICATIONS TO EXISTING WARRANTED ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDES:

- A. Base Bid:

- 1. Roofing contractor to provide modifications to existing warranted roofing and flashing system as specified and shown.
 - a. Remove existing construction where shown:
 - 1) Flashings.
 - 2) Roofing membrane.
 - 3) Insulation.
 - 4) Counter flashing.
 - 5) Termination bar.
 - b. Install new:
 - 1) Insulation.
 - 2) Roofing membrane.
 - 3) Flashings.
 - 4) Termination bar and Counter flashing.
 - 5) Pipe supports.

1.3 RELATED WORK

- A. Specified Elsewhere:

- 1. 06 10 00 - Rough Carpentry.
- 2. 07 62 00 - Sheet Metal Flashing & Trim.
- 3. 07 92 00 – Joint Sealants.

1.4 QUALIFICATIONS

- A. All roofing work to be done by only the roofing contractor(s) permitted by the roofing manufacturer to work on this roof.

1.5 REFERENCES

- A. Cited standards and the manufacturer's catalog, current at the date of bidding documents, unless otherwise specified, are incorporated herein by reference and govern the work. If a conflict is discovered between these standards or catalogs and the project specifications, request written clarification from the Architect. Do not proceed with the work until such clarification is received.
- B. Standards
 - 1. American Society for Testing and Materials (ASTM).
 - 2. Factory Mutual Laboratories (FM).
 - 3. Underwriters Laboratory (UL).

1.6 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings to the manufacturer for review.
 - 2. Submit shop drawings to the Architect.
 - 3. Minimum Scale for Details: 1-1/2" = 1' 0".
 - 4. Minimum Scale for Roof Plan: 1/8" = 1' 0".
 - 5. Submit the following:
 - a. Insulation Plan showing saddles at curbs.
 - b. Base flashing, Counter flashing, reglets.
 - c. Equipment curbs.
 - d. Pourable sealer pockets.
 - e. Pipe supports.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Per manufacturer's recommendations.

1.8 EXISTING CONSTRUCTION

- A. Existing Roofing System: Fully adhered EPDM membrane on polyisocyanurate insulation with vapor retarder and elastomeric flashings.
- B. Protection:
 - 1. Protect existing roofing and flashing, and building interior from the elements.
 - 2. Protect existing roofing, building surfaces, paving, and landscaping from spillage, traffic, and roofing equipment.
 - 3. Restore or replace all work or other materials damaged by the roofing operation.
 - 4. Remove protection materials upon completion of the work.

1.9 WARRANTY

- A. General Contractor's: Two years.

PART 2 - PRODUCTS

2.1 ROOFING/FLASHING SYSTEM

- A. Provide EPDM roofing membrane and polyisocyanurate insulation to match existing.
- B. Provide flashing and other related components to match existing.
- C. Provide the same type and thickness roof insulation as existing.

2.2 OTHER MATERIALS

- A. Termination Bar: 1/8" x 1" aluminum or 1/8" x 1-1/2" with 45 degree sealant pocket where space permits.
- B. Fasteners: Manufactured or approved by the roofing manufacturer, and that have Factory Mutual approval.
- C. Walkway pads as furnished or approved by the roofing manufacturer.

2.3 METAL COUNTERFLASHINGS

- A. Galvanized steel shall be Kynar 500 prefinished. Aluminum shall be either mill finish or Kynar 500 prefinished.

PART 3 - EXECUTION

3.1 REMOVE EXISTING CONSTRUCTION

- A. Permanent Removals
 - 1. Remove existing roofing membrane, roof insulation, flashing, and related components down to the roof deck as indicated on the drawings.

3.2 INSPECTION

- A. Examine all existing components for conditions and defects detrimental to the best quality and longevity of the roofing, flashing, and other components. Notify the Architect of all such conditions and defects.
- B. Do not proceed with the installation until all defects have been corrected to the satisfaction of the roofing manufacturer and the Architect.

3.3 ENVIRONMENTAL CONDITIONS

- A. Install all new roofing components only in dry weather, and comply with the manufacturer's climatic restrictions. Store materials on raised platforms.

3.4 INSTALLATION

- A. Install all roofing components in accord with the approved specifications and drawings, and the manufacturer's current printed instructions.

3.5 FIELD QUALITY CONTROL

- A. The Architect will provide onsite observation during installation.

3.6 ADJUST AND CLEAN

- A. Carefully inspect all completed work and correct all defects.
- B. Remove from the job site and legally dispose of rubbish and debris.
- C. Accompany the manufacturer's technical inspector and assist with equipment and workmen if necessary to provide access to the roof. Correct all defects noted during the inspection.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

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. Formed low-slope roof sheet metal fabrications

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking
2. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing"
3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing the direction of expansion and contraction from fixed points.
8. Include details of edge conditions.
9. Include details of special conditions.

10. Include details of connections to adjoining work.
 11. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.
 12. Provide three-dimensional details where applicable to show a thorough understanding of the Work.
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish
1. Sheet Metal Flashing: 12 inches long by the actual width of the unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Factory Corner Fabrications: 12 inches long and in required profile showing one minimum welded or solder joint.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator
- B. Product Certificates: For each type of roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency
- D. Sample Warranty: For special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals
- 1.7 QUALITY ASSURANCE
- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate the required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build a mockup of the typical roof edge, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within the specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal
 - 2. Finish Warranty Period: 20 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless requirements that are more stringent are indicated.
- C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with the name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: 100 psf.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, the opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 1. Surface: Smooth, flat unless indicated otherwise and mill phosphatized for field painting where indicated.
 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply a coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5-mil.

2.3 UNDERLAYMENT MATERIALS

- A. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by the manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by the manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head
 - a. Exposed Fasteners: Heads matching the color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on the weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for the application.

2.5 FABRICATION, GENERAL

- A. General: Custom-fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of the item required. Fabricate sheet metal flashing and trim in the shop to the greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within a 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of an elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from the same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than the thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing: Fabricate in minimum 96-inch long, but not exceeding 12-foot long sections. Furnish with 6-inch wide, joint cover plates. Shop-fabricate interior and exterior corners.
1. Joint Style: Overlapped, 4 inches wide unless indicated otherwise and butted with expansion space and 6-inch wide, exposed cover plate where indicated
 2. Fabricate from the Following Materials:
 - a. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028-inch thick

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings: Fabricate head, sill, and similar flashings to extend 4 inches as indicated in drawings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.022-inch thick

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting the performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

- B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 UNDERLAYMENT INSTALLATION

- A. Apply slip-sheet that is wrinkle-free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing, trim, and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete the sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart unless otherwise indicated. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Do not torch cut sheet metal flashing and trim.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with a bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws or not less than recommended by fastener manufacturer to achieve maximum pullout resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize the possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into the sealant. Form joints to completely conceal sealant. When the ambient temperature at the time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to the width of 1-1/2 inches; however, reduce pre-tinning where the pre-tinned surface would show in completed Work.
 - 1. Do not use torches for soldering.
 - 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- H. Rivets: Rivet joints where necessary for strength.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers or as calculated according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with the installation of wall-opening components such as windows, doors, and louvers.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within an installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within a 1/8-inch offset of adjoining faces and of alignment of matching profiles or as specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder.

- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in a clean condition during construction.
- D. Replace damaged sheet metal flashing and trim or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 71 00
ROOF SPECIALTIES

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. Roof-edge drainage systems

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
- 3. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For roof specialties.

- 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
- 2. Include details for expansion and contraction; locations of expansion joints, including the direction of expansion and contraction.
- 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
- 4. Detail termination points and assemblies, including fixed points.
- 5. Include details of special conditions.

- C. Samples for Initial Selection: For each type of roof specialty, indicated with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For the manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to the extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 54 23 Thermoplastic-polyolefin (TPO) Roofing.
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within the specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

- A. Acceptable Products:
 - 1. Metal-Era Seal-Tite K-Style Gutter and Corrugated Downspouts

2. Architectural Products Co. Inc Formed Gutters and Downspouts
 3. Alside Rainware System
- B. Gutters: Manufactured in uniform section lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above the front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from the same metal as gutters.
1. Aluminum Sheet: 0.032-inch thick minimum
 2. Gutter Profile: Style K according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and mechanically clinched and sealed watertight
 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
- C. Downspouts: Corrugated rectangular complete with machine-crimped elbows, manufactured from the following exposed metal. Furnish with metal hangers, from the same material as downspouts, and anchors.
1. Formed Aluminum: 0.032-inch thick.
- D. Aluminum Finish: Three-coat fluoropolymer
1. Color: As selected by Architect from manufacturer's full range.

2.3 MATERIALS

- A. Aluminum Sheet: ASTM B 209 alloy as standard with the manufacturer for finish required, with temper to suit forming operations and performance required.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for the application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching the color of sheet metal.
 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by the roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for the application.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in the same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting the performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by the manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

4. Torch cutting of roof specialties is not permitted.
 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by the manufacturer.
1. Bed flanges in a thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. When the ambient temperature at the time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by the roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with the installation of the roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
1. Provide elbows at the base of downspouts at grade to direct water away from the building.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal

filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 92 00

JOINT SEALANTS

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. Rehabilitation and replacement of exterior weatherproofing sealants
2. Silicone joint sealants
3. Mildew-resistant joint sealants
4. Butyl joint sealants
5. Latex joint sealants
6. Preformed, foam joint seals
7. Epoxy sealant / adhesive

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material.
- D. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation
 2. Joint-sealant manufacturer and product name
 3. Joint-sealant formulation
 4. Joint-sealant color

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Installer Qualifications
- B. Product Test Reports: For each kind of joint sealant, for tests performed by the contractor and witnessed by architect, manufacturer, or a qualified testing agency.
- C. Field-Adhesion-Test Reports: For each sealant application tested
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer
- B. Product Testing: Test joint sealants.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section. After sealant has achieved sufficient cure, conduct adhesion pull-tests. Leave approved mock-ups in place to establish standards and guidelines for acceptable application of sealant Work and acceptable appearance.

1.6 ADHESION TESTING

- A. Field-Adhesion Testing: Before installing sealants, field-test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when the erection of test joints will take place.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 4. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 5. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by the joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet
 - 3. Where joint widths are less than allowed by the joint-sealant manufacturer for applications indicated
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within the specified warranty period.
 - 1. Warranty Period: Two years from the date of Substantial Completion.
- B. Standard 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 standard warranty within the specified warranty period.
 - 1. Warranty Period: Manufacturers standard length of time 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. The 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 the accumulation of dirt or other atmospheric contaminants

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by the joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- C. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with adjacent materials, as demonstrated by sealant manufacturer using ASTM C1087 testing and related experience.
- D. Joint Sealant Standard: Comply with ASTM C 920 and other specified requirements for each joint sealant.
- E. Stain Test Characteristics: Where sealants are required to be nonstaining, provide sealants tested per ASTM C 1248 as non-staining on porous joint substrates specified.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. BASF Corporation Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379
 - a. Masterseal NP 150
 2. Dow Corporation, 2211 H.H. Dow Way, Midland, MI 48674
 - a. Dowsil 790
 3. Tremco, Inc., Commercial Sealants and Waterproofing Division, An RPM Company, Beachwood OH
 - a. Tremco, Inc., Spectrem 1
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. BASF Corporation Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379
 - a. Masterseal NP 100
 2. Dow Corporation, 2211 H.H. Dow Way, Midland, MI 48674
 - a. Dowsil 795
 3. Tremco, Inc., Commercial Sealants and Waterproofing Division, An RPM Company, Beachwood OH
 - a. Spectrem 2

2.3 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311
1. Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438
 - a. BC-158
 2. Tremco, Inc., Beachwood, OH 44122
 - a. Tremco Butyl Sealant
 3. C. L. Lawrence, 2503 E Vernon Avenue, Los Angeles, CA 90058-1897
 - a. PTI 707

2.4 BUTYL TAPE

- A. Preformed tape with solid polyisobutylene cross-linked butyl, preformed sealant on release roll; AAMA 800-92 specifications 804.3 and 807.3.

1. Tremco, Beachwood, OH 44122
 - a. 440 Tape
2. Marco Industries, 4150 S. 100th E. Ave., Suite 301, Tulsa, OK 74146
 - a. Mastix Butyl Tape
3. C. L. Lawrence, 2503 E Vernon Avenue, Los Angeles, CA 90058-1897
 - a. GT Series Butyl Tapes

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF

1. Pecora Corp., Harleysville, PA 19438
 - a. AVW 920
2. Tremco, Beachwood, OH 44122
 - a. Tremflex 834
3. GE Silicones Huntersville, NC 28078
 - a. RCS20

2.6 EPOXY SEALANTS

A. Epoxy resin adhesive sealant

1. Abatron, Inc., 5501-95th Avenue, Kenosha, Wisconsin 53144
 - a. Best Bond Joint Sealant
2. 3M Center Building 0230-B-E-16, St. Paul, MN 55144-1000
 - a. Epoxy Adhesive Sealant EG-2P-3005
3. Pro-Set Inc., 100 Patterson Ave, Bay City, MI 48707-0656
 - a. M1007-M2032

2.7 PREFORMED, FOAM JOINT SEALS

- ### A. Preformed, Pre-Compressed, Self- Expanding Foam Joint Seals: Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.

1. Tremco, Inc., Beachwood, OH 44122
 - a. ExoAir® Trio
2. Marco Industries, 4150 S. 100th E. Ave., Suite 301, Tulsa, OK 74146
 - a. X-Seal
3. Emseal Joint Systems Ltd, 25 Bridle Lane, Westborough, MA 01581
 - a. UST
4. Design Criteria:
 - a. Nominal Joint Width: Existing Condition; verify in the field.
 - b. Movement Capability: 25 percent/+25 percent unless otherwise indicated
5. Joint Seal Color: As selected by Architect from the full range of manufacturer's standard colors

2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Non-staining; 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. BASF, Shakopee, MN 55379
 - a. Masterseal 920 and 921
 2. Tremco, Beachwood, OH 44122
 - a. Tremco Backer Rod
 3. Nomaco, Zebulon, NC 27597
 - a. HBR and OC Foam
 4. Hohmann & Barnard, Inc, Hauppauge, NY 11788
 - a. Standard Backer Rod
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at the back of joint. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by the joint-sealant manufacturer where required for adhesion of the sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting the performance of the Work.
- B. Proceed with the installation only after the completion of corrections of the unsatisfactory conditions.
- C. Examination of Existing Joint Sealants: Examine existing joint sealants and indicate the extent of joint sealant replacement and rehabilitation on shop drawings. Examine joints for compliance with requirements for joint configuration, installation tolerances, the condition of the joint substrate, and other conditions affecting joint-sealant performance.

3.2 PREPARATION

- A. Removal of Failed Joint Sealant Materials: Cut out and remove joint materials and associated backing materials as indicated on drawings.
- B. 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 an 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

3. 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
- C. Joint Priming: Prime joint substrates where recommended by the 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.
- D. Masking Tape:
 1. 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.
 2. Use masking tape at fillet joints to maintain neat even lines on each side of the fillet.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless requirements that are more stringent apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of the kind indicated to support sealants during application and at the position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow the optimum capability for sealant movement.
 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 a uniform, cross-sectional shapes and depths relative to joint widths that allow the optimum capability for sealant movement.
- 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 with approval in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed, Foam Joint Seals:

1. Install each length of seal immediately after removing the protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by the manufacturer.
3. Do not pull or stretch the material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat the foam joint seal material in compliance with the manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform one test per each floor per elevation for each kind of sealant and joint substrate.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids
 - b. Whether sealant dimensions and configurations comply with specified requirements
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates of installations of sealants, names of persons who installed sealants, test dates, test locations, whether joints were

primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions. Provide before and after photographs of tests.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Inspection of installed sealants: Using a blunt instrument, depress the center of the sealant bead and note the cohesion of the sealant to the substrates. Remove sealants that separate from the substrate, correct the conditions creating the failure, and install new sealants.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after the 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 the time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior and interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

- a. Control and expansion joints in unit masonry
- b. Joints of metal flashing
- c. Joints between different materials listed above.
- d. Perimeter joints between materials listed above and frames of windows and louvers.
- e. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls
 - b. Joints in gypsum board assemblies unless noted otherwise
 - c. 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. Joint-Sealant Application: Concealed mastics
1. Joint Locations:
 - a. Metal to metal joints
 - 1) Overlaps of sheet metal flashing
 - 2) Crimped joints of sheet metal flashings
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based sealants and tapes
 3. Joint-Sealant Color: Black or Gray
- D. Joint Sealant Application: Exterior epoxy joints
1. Joint Locations:
 - a. Where indicated on drawings
 2. Joint Sealant: Epoxy resin adhesive sealant
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes steel doors and frames (hollow metal) indicated and as specified.

1.2 SUBMITTALS

- A. Product Data: Submit complete printed data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound, and finishes.
- B. Shop Drawings: Submit complete shop drawings; show the following:
 - 1. Elevations of each door design.
 - 2. Details of doors including vertical and horizontal edge details.
 - 3. Frame details for each frame type including dimensioned profiles.
 - 4. Details and locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, accessories, joints, and connections.
- C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- D. Thermal Performance Certification: For exterior door assemblies, submit certification required under "Quality Assurance" of this specification.

1.3 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Thermal Performance: Provide exterior door assembly (door and frame) having a maximum U-factor of 0.700 as determined in accordance with NFRC 100 by a laboratory accredited by a naturally recognized accreditation organization such as the National Fenestration Rating Council and labeled and certified by the manufacturer or if not so labeled certified by the manufacturer to have a maximum U-factor of 0.50.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

- B. Inspect doors and frames on delivery for damage and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4 inch (100 mm) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4 inch (6 mm) spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld Building Products, Inc.
 - 2. Benchmark Commercial Doors; a division of General Products Co., Inc.
 - 3. Ceco Door Products; a United Dominion Company.
 - 4. Curries Company.
 - 5. Deansteel Manufacturing, Inc.
 - 6. Mesker Door, Inc.
 - 7. Pioneer Industries Inc.
 - 8. Republic Builders Products.
 - 9. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Exterior Doors: Provide insulated doors meeting thermal performance requirements specified in "performance requirements" of this specification and complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra heavy duty) Model 1. (Full flush).

2.4 FRAMES

- A. General: Provide steel frames for doors that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Exterior Frames: Fabricate frames of 0.067 inch (1.7 mm) thick metallic-coated steel sheet.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames.
- D. Plaster Guards: Provide 0.016 inch (0.4 mm) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than 0.042 inch (1.0 mm) thick, electrolytic zinc-coated or metallic-coated steel sheet.
 - 1. Wall Anchors in Masonry Construction: 0.177 inch (4.5 mm) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053 inch (1.3 mm) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
 - 1. Resin-impregnated kraft/paper honeycomb.
 - 2. Polyurethane where code compliant.
 - 3. Polystyrene where code compliant
 - 4. Vertical steel stiffeners.
 - 5. Rigid mineral-fiber board.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads. Not more than 3/4 inch (19 mm) at bottom.
- F. Single-Acting, Door-Edge Profile (strike jamb).

- G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
 - H. Fabricate concealed stiffeners, reinforcement, and edge channels from either cold- or hot-rolled steel sheet.
 - I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
 - J. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
 - 1. Unless otherwise indicated, provide thermal-rated assemblies with a maximum U-value of 0.500 or tested and certified in accordance with NFRC 100 for a maximum U-value of 0.700.
 - K. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
 - 1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.
 - L. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
 - M. Frame Construction: Fabricate frames to shape shown.
 - 1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
 - 2. For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
 - 3. Provide welded frames with temporary spreader bars.
 - N. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
 - O. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- 2.6 FINISHES
- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
 - 2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 3. In existing masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 13

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes finish hardware as required and as specified.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturers technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finish.
- B. Hardware Schedule: Submit finish hardware schedule in a vertical format separate from door and frame schedule, conforming to "Sequence and Format for the Hardware Schedule" published by the Door and Hardware Institute (DHI). Horizontal and coded schedules are not acceptable.
 - 1. Finish Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Schedules not having the following information will be rejected:
 - a. Type, style, function, size and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - 2. Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) that is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule. Review and acceptance by the GHA or Architect does not relieve Contractor of responsibility to fulfill requirements of Contract Documents.
- C. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.
 - 1. Samples may be retrieved by the supplier. Units that are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final

check of operation, be used in the work, within limitations of keying coordination requirements.

- D. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.
- E. Keying Schedule: Submit keying schedule after meeting with GHA's agent for keying instructions.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.
- B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to GHA, Architect, and Contractor.

1.4 PREINSTALLATION CONFERENCE:

- A. Conduct preconstruction conference at the project site.
- B. Contractor shall notify hardware supplier two weeks prior to beginning of hardware installation to set up pre-installation meeting with installation carpenters. Hardware supplier shall provide a qualified Architectural Hardware Consultant to personally meet with, and instruct installers on job site in proper techniques for installation and adjustment of locks, closers, and exit devices.
 - 1. Lock, Door Closer and Exit Device Manufacturer's representative shall be available for a post installation walk and punch list assistance on behalf of the General Contractor, Architect and GHA.
 - 2. Review construction keying and final keying.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.
- C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.
- D. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that

completion of the work will not be delayed by hardware losses, both before and after installation.

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware item is indicated in the Schedule of Hardware sets.
- B. Manufacturer's Product Designations: A manufacturer's symbol in the hardware sets indicates whose product designation is used in the Schedule of Hardware Sets for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers that comply with requirements including those specified elsewhere in this section.
- C. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.
 - 1. Butts and Hinges: ANSI/BHMA A156.1.
 - 2. Locks & Lock Trim: ANSI/BHMA A156.13.
 - 3. Exit Devices: ANSI/BHMA A156.3.
 - 4. Door Controls - Closers: ANSI/BHMA A156.4.
 - 5. Auxiliary Locks: ANSI/BHMA A 156.5.
 - 6. Architectural Door Trim: ANSI/BHMA A156.6.
 - 7. Template Hinge Dimensions: ANSI//BHMA A156.7.
 - 8. Door Controls - Overhead Holders: ANSI/BHMA A156.8.
 - 9. Closer Holder Release Devices: ANSI/BHMA A156.15.
 - 10. Auxiliary Hardware: ANSI//BHMA A156.16.
 - 11. Materials & Finishes: ANSI/BHMA A156.18.
 - 12. Thresholds: ANSI/BHMA A156.21.
 - 13. Door Gasketing Systems: ANSI/BHMA A156.22.
 - 14. Continuous Hinges: ANS/BHMA 156.26.

2.2 MATERIALS AND FABRICATION, GENERAL

- A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement shown.
- B. Manufacturer's Name Plate: Do not use manufacturer's products that have manufacturer's name or trade name displayed in a visible location (omit removable name plates), except in conjunction with required UL labels and as otherwise acceptable to Architect.
- C. Manufacturer's identification will be permitted on rim of lock cylinders, and armor front.
- D. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware and with ANSI A156.18 for finish designations indicated. Do

not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

- E. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- F. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
- G. Provide concealed fasteners for hardware units that are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch- lock sets) for color and texture.
- B. Provide finishes that match those established by BHMA as indicated in the hardware schedule or, if none indicated, match the finish to which the item is applied.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.
- D. Finish Designations: Scheduled designations refer to ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

2.4 HINGES, BUTTS

- A. Templates: Provide only template- produced units.
- B. Screws: Furnish Phillips flat-head or machine screws for installation of units. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated in the hardware schedule, provide hinge pins as follows:
 - 1. Material: Stainless steel pins.
 - 2. Exterior Doors: Non-removable pins (NRP).
 - 3. Tips: Flat button and matching plug, finished to match leaves.

4. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
 5. All hinges shall be ball bearing type.
 6. Provide safety stud and locking hole for hinges where scheduled.
- D. Manufacturer, (Butts): Subject to compliance with requirements, provide products of one of the following:
1. Bommer Industries.
 2. Hager Hinge Co.
 3. Ives; Ingersoll-Rand Co.
 4. McKinney Mfg. Co.; Assa Abloy Co.
 5. PBB, Inc.
 6. Stanley Hardware.
- E. Manufacturer, (Geared Continuous Hinges): Provide products having UL listed units equal to or better than the rating of the opening of one of the following manufacturers:
1. ABH, Inc. 4240HD series
 2. Hager/Roton 780-224-HD series
 3. Pemko FMHD series
 4. Select Products SL-24-HD series
 5. Stanley 520 series
 6. Zero 914DB series

2.5 LOCK CYLINDERS AND KEYING

- A. General: Supplier shall meet with GHA to finalize keying requirements and obtain final instructions in writing. Comply with GHA's instructions for master keying and except as otherwise indicated, provide individual change key for each lock which is not designed to be keyed alike with a group of related locks.
- B. All cylinder cores shall be keyed at the factory by the cylinder manufacturer where records will be established and maintained.
- C. All cylinders shall be not less than six (6) pin interchangeable core keyed to the existing (GHA generally uses "Best Lock;" contractor to verify) registered Grand master Key system.
- D. Permanent keys shall be stamped with the key system symbol (VKC). Do not mark the keys with the cylinder biting. Permanent cores shall be marked with the key system symbol in such a manner that the mark is not visible when the core is installed in the cylinder (CVKC).
- E. Except where otherwise specified, locksets, cylinders and cores shall be by the same manufacturer, to assure proper operations.
- F. During construction, all cylinder cores shall be keyed alike. The Contractor shall receive three (3) copies of this key. Under no circumstances shall the Contractor receive any of the permanent building master keys or changes keys. The construction master key shall operate on no less than six (6) pins.

1. Quantity of Keys:
 - a. 3 Great Grand Master.
 - b. 3 Grand Master Keys.
 - c. 3 Master Keys.
 - d. 3 Keys per lock or cylinder.
 - e. 50 key blanks.
 - f. 3 Control keys.

G. Provide two key control systems, including envelopes, labels, tags with self locking key clips, receipt forms, 3-way visible card index, temporary markers and standard metal cabinet, all as recommended by system manufacturer with capacity for 150% of the number of locks required for the project.

1. The hardware supplier shall set up complete cross index system and place keys on markers and hooks in the cabinet as determined by the final key schedule.

H. Provide two hinges type wall mounted key cabinets for the above system to be installed as directed by the GHA.

2.6 LOCKS, LATCHES AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

1. Foot Bolts: Provide dust-proof strikes, except where special threshold construction provides non-recessed strike for bolt.
2. Roller Strikes: Provide where recommended by manufacturer of the latch and lock units.

B. Mortise Locks:

1. Locks shall have all functions available in one size case, manufactured from heavy gauge steel, minimum thickness 3/32 inch, completely chrome plated for corrosion resistance and lubricity of parts. Cases shall be closed on all sides to protect internal parts. Locks shall have adjustable, beveled and armored fronts, secured with spanner head security screws. Standard 2-3/4 inch backset convertible from one function to another, with a full 3/4 inch throw two-piece, or approved one-piece anti-friction latch bolt and 1" throw dead bolt with hardened steel insert and available for a minimum door thickness of 1-3/4 inch. Internal parts shall be heavy gauge steel, zinc dichromate-plated and nickel steel hubs.
2. All locksets with latch bolts, regardless of trim, shall be listed by UL for A and lesser labeled doors, single or pairs.
3. Lock trim shall be solid stainless steel levers with wrought rose, through bolted through the lock case to assure correct alignment.
4. Lockset shall conform to, and be certified as meeting, ANSI A156.13 Grade 1 requirements.
5. Subject to compliance with specifications, provide one of the following:

- | | | |
|----|--------------------------------|-------------------|
| a. | Best Lock; Stanley Works, Inc. | 45H-14H series |
| b. | Corbin Russwin; Assa Abloy Co. | ML2000 LSA series |
| c. | Dorma; Dorma Co. | ML9000 LTB Series |

- | | | |
|----|-------------------------------|-------------------|
| d. | Sargent; Assa Abloy Co. | 8200 LNJseries |
| e. | Schlage; Ingersoll-Rand Co. | L9000-B03 series |
| f. | Yale Security; Assa Abloy Co. | CRR 8800FL series |

C. Multi-Point Lock: Three point lock.

1. Description: Three 1/2 inch x 1 inch solid steel bolts with 3/4 inch throw; 16 gauge galvanized steel case; 12 gauge plated steel strikes; 3 inch backset.
2. Function: Levers on both sides of lock. Turning lever retracts bolts in unison. Bolts are held retracted and are released when door closes.
3. Acceptable Product/Manufacturer: Lock 301C; Wm. J. Perkinson Co., Inc.

2.7 PUSH/PULL UNITS

- A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units. Pulls to have 2-1/2 inch clearance from face of the door to the underside of the pull.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Rockwood.
 2. Hager.
 3. Ives.
 4. Trimco.
 5. Hiawatha.
 6. Von Duprin.

2.8 CLOSERS AND DOOR CONTROL DEVICES

- A. Closers shall be rack and pinion construction with both rack and pinion of heat treated steel and with a cast iron or cast aluminum case. Closing the door will be controlled by 2 valves, one to control closing speed and one to control latching speed. Closers shall be regularly furnished with fully adjustable backcheck allowing approximate 70 degrees backcheck on both regular and parallel arm closers. Delayed action shall be available. Valves shall be concealed against unauthorized adjustment and non-critical needle valve type. Spring power adjustment shall be standard with an adjustment size 1 to size 6. Closers shall be surface applied with rectangular metal covers, void of manufacturers' trademarks. All door closers intended to be mounted to the door shall be furnished with thru-bolts and sex nuts.
- B. Closers shall be certified as meeting the ANSI A156.4 Grade 1 requirements, be listed by UL for all classes of labeled doors and shall have a manufacturer's warranty of ten (10) years.
- C. Size of units: Except as otherwise specifically indicated, comply with the manufacturers recommendations for size of door control unit depending upon size of door, exposure to weather and anticipated frequency of use.
 1. Provide heavy duty arms.
 2. Provide spring cushion stops on parallel arm closers.
 3. Provide all necessary plates, brackets, arms, and shoes required for proper installation of closer.

D. Acceptable Manufacturers:

1. Dorma 8900 Series.
2. LCN 4040 Series.
3. Norton 7500 Series.
4. Sargent 281 Series.

2.9 DOOR TRIM UNITS

- A. Kick Plates, Mop Plates, Armor Plates: Stainless steel, 0.050 inch thick, beveled three sides.
- B. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screw.
- C. Door protection plates shall be stainless steel 18-8 type 302, 0.050 inch thick, beveled three sides with vertical finish grain.

2.10 STOP AND HOLDERS

- A. Provide wall mounted door stops and wall mounted door stop and holders as required to protect the wall and door lever.
 1. Wall door stops: BHMA Type L52261.
 2. Door Holders, Exterior doors: BHMA Type L11271.
- B. Acceptable Manufacturers:
 1. Rockwood Mfg. Co.
 2. Hager.
 3. Architectural Builders Hardware (ABH).
 4. Trimco.
 5. Ives.

2.11 THRESHOLDS, WEATHER SEALS AND RAIN DRIPS

- A. Provide thresholds and weather seals on all exterior doors as scheduled.
- B. Acceptable Manufacturers:
 1. National Guard Products.
 2. Pemko.
 3. Hager.
 4. Zero.
 5. Reese.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Locations: As indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, and "ADA Accessibility Guidelines for Buildings and Facilities", except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Install door hardware units using fasteners provided by the manufacturer as specified.
 - 1. Hinges: Phillips flat head machine screws into metal.
 - 2. Exit devices: Through bolts and sex nuts.
 - 3. Closers Through bolts and sex nuts.
 - 4. Door holder/release; armature mounted with through bolts and sex nuts.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl- rubber or polyisobutylene mastic sealant. Thresholds shall be notched or coped to fit around removable mullions.
- G. Removable mullion sill brackets shall be secured to the concrete floor with approved fasteners and anchors.
- H. Hardware shall be installed with the fasteners and anchors provided by the manufacturer of that hardware item.

3.2 ADJUSTMENT, CLEANING AND KEYING

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Permanent cores and keys shall be delivered by the hardware supplier directly to the contractor at the keying meeting. The contractor and representative of the hardware supplier shall jointly install the permanent cores in the presence of the GHA's agent who shall receive the keys. Hardware supplier shall return the construction cores and construction keys to the manufacturer.

- D. Tools and instructions: At the time of keying the hardware supplier shall provide a complete set of specialized tools and maintenance instructions and shall instruct the GHA's agent in the proper maintenance.
- E. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
 - 1. Instruct GHA's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.3 SCHEDULE OF FINISH HARDWARE SETS

- A. Provide finish hardware for each door to comply with requirements of this Section, hardware set numbers indicated on Door Schedule and the schedule of hardware sets on drawings.
- B. Manufacturer's function and catalog numbers used in the hardware sets are identified by the following symbols.

1.	Hager Hinge Co.	HA
2.	Yale Security	Y
3.	LCN Closers	L
4.	Ives	I
5.	Rockwood Mfg. Co	R
6.	Architectural Builders Hardware Products	A
7.	Von Duprin	V
8.	Pemco	P
9.	Du Seung	D

- C. Other Abbreviations:
 - 1. LDW - Less Door Width
 - 2. TBS - To Be Selected

3.4 FINISH HARDWARE SETS.

- A. Following is a partial listing of hardware typically required on doors of this type. NOTE: This partial listing is provided for advisory/guidance purposes only. GHA and Architect will evaluate and determine acceptability of hardware submitted by the Contractor.

ITEM	MFG. MODEL NUMBER	MFG.	BHMA FINISH
HARDWARE SET # 1			
GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98NL-2-697NL	V	630
STABILIZER SETS	154	V	-----
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041H SPRING- CUSH	L	689
DOOR SCOPE	DS/2000	D	-----
ARMOR PLATE	32" X 2" LDW	R	630
THRESHOLD	626S 5"	HA	TBS
WEATHERSTRIP	2891-S HEAD	P	TBS
WEATHERSTRIP	303-S JAMBS	P	TBS
SWEEP	345-P	P	TBS
DRIP CAP	346	P	TBS

END OF SECTION 08 71 00

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for field priming and painting of exposed items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces as indicated in the drawings. If the schedules do not indicate color or finish, the GHA or Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exterior door and frame.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include, but are not limited to, the following factory-finished components:
 - a. Architectural woodwork.
 - b. Metal lockers.
 - c. Elevator equipment.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures and supports.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
 - e. Elevator shafts (if any).
 - 3. Finished metal surfaces include, but are not limited to, the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plating.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.

5. Labels: Do not paint over:
 - a. UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 - b. Labels designating materials or assemblies as accessible.

1.2 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- B. Gloss ranges used in this Section include the following:
 1. Flat refers to a lusterless or matte finish with a gloss range below 5 when measured at a 60-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 10 when measured at a 60-degree meter.
 3. Satin refers to low-sheen finish with a gloss range between 10 and 35 when measured at a 60-degree meter.
 4. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- C. Concealed: Refers to surfaces, materials, assemblies, or items that cannot be accessed without moving a building element, such as within a chase, wall, or ceiling cavity.
- D. Exposed: Refers to any item or surface that is not concealed.
 1. Exposed to Public View: Refers to items situated so they can be seen from eye level from a public location. A public location is that which is accessible to persons not responsible for operation or maintenance of the building.

1.3 SUBMITTALS

- A. Product Data: For each type of product, including block fillers and primers. Include preparation requirements and application instructions.
 1. For paints and coatings, include documentation indicating that they meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Samples:
 1. Initial Selection: Submit manufacturer's color charts illustrating their full range of available colors for each type of product and finish required for the Project.
 2. Verification: Submit three (3) draw-downs of each type of product, sheen, and color specified or scheduled in Drawings. Draw-downs shall be prepared on hardboard, not less than 12-inches square.
 - a. Each sample shall be labeled with the following:

- 1) Project name and number.
- 2) Date.
- 3) Manufacturer's name.
- 4) Installer's name.
- 5) Product name.
- 6) Product number.
- 7) Color name and number as stated in the color schedule.
- 8) Name, address, and phone number of the supplying facility.

- b. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
- c. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application (e.g. "door frame").

- C. Qualification Data: When requested, submit qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 REGULATORY REQUIREMENTS

- A. Comply with all applicable regulations of authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experience applicator who has completed painting system application similar in material, design, and extent to that indicated for the Project, and whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
 1. The Architect will select one surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 2. After permanent lighting and other environmental services have been activated, apply coatings to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.

4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

D. Do not apply paint in areas where dust is being generated or will be generated while the applied paint is drying.

E. In rooms and spaces where paint is being applied, ensure there is adequate ventilation to allow for proper paint drying, as well as to exhaust paint fumes and minimize odors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Benjamin Moore & Co. (BM).
2. Pittsburgh Paints, PPG Industries, Inc. (PPG).
3. The Sherwin-Williams Company (SW).
4. Tnemec Company, Inc. (Tnemec).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: 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. 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.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (IPA Method 24).
1. Flat Paints and Coating: 50-g/l.
 2. Non-Flat Paints and Coatings: 150-g/l.
 3. Dry-Fog Coatings: 400-g/l.
 4. Primers, Sealers, and Undercoaters: 200-g/l.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250-g/l.
 6. Zinc-Rich Industrial Maintenance Primers: 340-g/l.
 7. Pretreatment Wash Primers: 420-g/l.
 8. Floor Coatings: 100-g/l.
 9. Shellacs, Clear: 730-g/l.
 10. Shellacs, Pigmented: 550-g/l.
- C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors: Provide color selections made by the Architect and selected from manufacturer's full range.
- E. Paint Systems: The paint systems specified are intended to comply with the VOC and chemical component limits of Green Seal Standard for Paints and Coatings GS-11 (interior non-clear systems). When the paint manufacturer produces a product that improves upon those of the specified product, provide the improved product. It is the intent that all components of the systems individually (primer/sealer, undercoat, top coat) comply. Provide products that comply to the extent available or prepare a budget that will ensure compliance on a project wide basis.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect in writing about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General:

- 1. Remove hardware and hardware accessories, stainless steel plates, machined surfaces, lighting fixtures, wire guards, screens, grilles and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and painting of scheduled materials.
- 2. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved and remove surface-applied protection from unpainted objects.

- B. Protection: In each area to be painted, cover and protect adjacent surfaces and materials, equipment, and floors from overspray, splatter, and other damage with clean cloths, heavy building paper, or clean plastic sheeting secured in place. All protection shall be carefully removed when painting operations are complete.

- C. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

- 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

- 1. Provide barrier coats over incompatible primers or remove and reprime.
- 2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances in accordance with SSPS-SP1 "Solvent Cleaning." After solvent cleaning, prepare any bare metal surfaces by removing all stratified rust (rust scale), all loose mill scale, all loose or non-adherent rust, and detrimental welding deposits by methods specified in SSPC-SP3 "Power Tool Cleaning."
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wirebrush, clean with solvents recommended by paint manufacturer and spot prime with rust-inhibitive metal primer recommended by the topcoat manufacturer.
 - b. Primer coats should be applied without delay, before rust reappears, with rust inhibitive primer.
- 3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents in accordance with SSPC-SP1 "Solvent Cleaning." Remove grease and oil residue by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of applied paint products.

- a. Weathered, unpainted galvanized metal surfaces shall be wire brushed or power washed to remove deposits of white zinc corrosion, then primed with a metal primer according to recommendations of the topcoat manufacturer. Rusted areas shall be sanded clean, and spot primed with a metal primer, then coated overall with same according to recommendations of topcoat manufacturer.
 - b. Peeling and scaling paint and chalk must be removed by scraping, sanding and wirebrushing. Rusted and abraded surfaces must be cleaned by scraping, sanding, and wirebrushing, then primed, without delay, with an acrylic latex metal primer.
 - c. For newly installed surfaces and materials that have been hot-dipped galvanized, allow not less than 6-months of weathering prior to cleaning. Clean surfaces according to recommendations of topcoat manufacturer. Immediately before painting, roughen surface with coarse sandpaper, exercising care to not damage the zinc galvanizing, and wipe clean.
- E. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application, and during application as required, to produce and maintain a mixture of uniform density. Do not stir any surface film that may form into material. Remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. No Work shall be performed:
 - a. In spaces that are not broom clean and free of dust and waste.
 2. Paint colors, surface treatments, and finishes are indicated in the schedules.
 3. Apply paint materials to produce smooth finished surfaces, free of brush or roller marks, holidays, drops, runs, or sags.
 4. Apply first or prime coat with brush or roller; work well into surface.
 5. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 6. Provide finish coats that are compatible with primers used.
 7. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 8. Finish doors on tops, bottoms, and side edges the same as exterior faces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended

by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying according to manufacturer's recommendations to ensure application of subsequent coat(s) of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the type of material and finish texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the type of material and finish texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness (DFT) of the entire system as defined in these specifications and as recommended by the manufacturer (whichever is greater).

E. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The GHA reserves the right to invoke the following test procedure at any time and as often as the GHA deems necessary during the period when paint is being applied:

1. The GHA will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The GHA may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove non-complying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site and dispose of legally.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.
- B. The testing agency will perform on site and laboratory tests for the following characteristics as required by the Board Authorized Representative:
 - 1. Adhesion Tests: ASTM D 3359 and ASTM D 6677.
 - 2. Film thickness tests.
 - 3. Quantitative materials analysis.
 - 4. Apparent reflectivity.
 - 5. Washability.
 - 6. Dry Capacity.

3.6 PROTECTION

- A. Confine dust and odor emissions by using low-dust wet methods. If this is insufficient, the contractor must use barriers, containment and HEPA filtered negative air equipment to limit migration of dust and odors beyond the work areas.
- B. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to warn occupants of and to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items. Spot prime damaged shop-primed surfaces.
 - 1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
 - 1) BM: Super Spec HP D.T.M. Acrylic Semi-Gloss P29.
 - 2) PPG: 6-208 Speedhide Alkyd Primer.
 - 3) SW: DTM Primer B66W1.
 - 4) Tnemec: Series V10 Tnemec Primer.
 - b. First and Second Coats: Semi-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.

- 1) BM: Super Spec HP D.T.M. Acrylic Semi-Gloss P29.
- 2) PPG: 7-series Industrial Gloss Enamel.
- 3) SW: DTM Acrylic Semi-Gloss B66W200 Series.
- 4) Tnemec: Series 1029 Enduratone.

3.8 INTERIOR PAINT SCHEDULE

A. Ferrous Metal (except as specified above): Provide the following finish systems over ferrous metal:

1. Semi-gloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater over a primer.

a. Primer: Quick-drying, rust-inhibitive, metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

- 1) BM: M04 Acrylic Metal Primer.
- 2) PPG: Pitt-Tech 90-712 DTM primer.
- 3) SW: DTM Primer B66W1.
- 4) Tnemec: Series V10 Tnemec Primer.

b. First and Second Finish Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

- 1) BM: IronClad Latex Low Lustre Metal & Wood Enamel #363.
- 2) PPG: Pure Performance 9-510 Series 6-411.
- 3) SW: ProClassic W/B Acrylic Semi-Gloss B31W200 Series.
- 4) Tnemec: Series 1029 Enduratone.

END OF SECTION 09 91 00

APPENDIX A
ROOF CONDITION EVALUATION REPORT

**Roof
Condition
Evaluation**

Project

Genesis Towers
578 Broadway
Gary, IN

Report For

Mr. Antwane Lee
Globetrotters Engineering Corporation
300 S. Wacker Drive, Suite 400
Chicago, IL 60606

IRCA Project Number

21003

Report Date

January 21, 2021

IRCA

ROOF CONDITION EVALUATION

Illinois Roof Consulting Associates, Inc. 4302-G Crystal Lake Road McHenry, IL 60050 (815) 385-6560 (Fax) 385-3581	PROJECT: Genesis Towers		JOB NO.: 21003
	ROOF ID: Roofs A & B	AREA: 10,182 square feet	STORIES: 11
	EVALUATION BY: Robert Heideman and William Richardson on January 14, 2021		

HISTORICAL INFORMATION		
BLDG. AGE: 1926	INSTALLER: Unsatisfactory	CURRENT ROOFER: Unknown
ROOF AGE: 2014	GUARANTOR: Carlisle SynTec Systems	ROOFER'S PHONE NO.: Unknown
RECOVER AGE: N/A	GUAR. TERM: Unknown	LAST REPAIRS: 2020

CONDITION SUMMARY	
OVERALL PHYSICAL CONDITION OF SYSTEM: Fair	OVERALL PERFORMANCE OF SYSTEM: Fair
IMPACT OF ANOMALIES: Notable	REPORTED LEAKAGE: None

EXISTING ROOF SYSTEM	OBSERVATIONS	EVALUATION
SURFACE: Smooth, uncoated		ADHESION: Fair CONDITION: Fair
MEMBRANE: 60 mil EPDM		CONDITION: Satisfactory
MEMBRANE ATTACHMENT: Fully adhered		CONDITION: Satisfactory
INSULATION: Single Layer – 3.5” polyisocyanurate		
INSULATION ATTACHMENT: Adhered		
VAPOR RETARDER: Yes		
FLASHINGS: Elastomeric	Open laps	CONDITION: Satisfactory
DRAINAGE: Direction, sloped to drain Saddles – No		CONDITION: Satisfactory
DRAINS: 5 internal drains		CONDITION: Satisfactory
EXISTING LEAKS: None reported		
EXISTING REPAIRS/PATCHES: Minor preventive maintenance-type repairs		

DETAILS – PERIMETER & TERMINATION	OBSERVATIONS	EVALUATION
INTERIOR PARAPET WALLS: Construction – Masonry	Deteriorated joint caulking, wall rotating, deteriorated masonry, vertical joints cracked	CONDITION: Marginal-Unsatisfactory
Coping – Terra cotta	Splices unsealed	CONDITION: Fair-Marginal CONSTRUCTION: Acceptable

Flashing termination –
Counterflashing – type, receiver-mounted

Sections falling, top edge openings

CONDITION: Marginal-Unsatisfactory
CONSTRUCTION: Acceptable

EDGE DETAIL: None
Elevation – Flat

CONDITION: Fair
CONSTRUCTION: Acceptable

DETAILS – ROOF FIELD	OBSERVATIONS	EVALUATION
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BOX CURBS:
Types – Vent, RTU
Elevation – 5+ inches

CONDITION: Satisfactory
CONSTRUCTION: Acceptable

SOIL STACKS:
Material – PVC
Flashings – Pre-fabricated boot

CONDITION: Fair
CONSTRUCTION: Acceptable

PIPE PENETRATIONS:
Direct pipes – Iron pipe, gas
Conduit, electrical

CONDITION: Fair
CONSTRUCTION: Acceptable

DETAILS – MECHANICAL	OBSERVATIONS	EVALUATION
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HVAC & A/C & CABINetry:
Mounting – Boxes

Open electrical

CONDITION: Fair
CONSTRUCTION: Acceptable

POWERED VENTILATORS:
Type – Motor in-board

CONDITION: Fair
CONSTRUCTION: Acceptable

GENERAL INFORMATION	OBSERVATIONS	EVALUATION
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EXTERIOR BUILDING FACES: Masonry

DECK SUPPORT CONSTRUCTION:
Joists – material, Concrete

Beams – material, Concrete

DECK TYPE: Concrete

Continued...

ROOF CONDITION EVALUATION

Illinois Roof Consulting Associates, Inc. 4302-G Crystal Lake Road McHenry, IL 60050 (815) 385-6560 (Fax) 385-3581	PROJECT: Genesis Towers		JOB NO.: 21003
	ROOF ID: Roofs D & G	AREA: 2,450 square feet	STORIES: 12
	ROOF ID: Roof C	AREA: 1,760 square feet	STORIES: 13
	ROOF ID: Roofs E & F	AREA: 2,292 square feet	STORIES: 3 & 4
	ROOF ID: Canopies	AREA: 301 square feet	STORIES: 1
EVALUATION BY: Robert Heideman and William Richardson on January 14, 2021			

HISTORICAL INFORMATION		
BLDG. AGE: 1926	INSTALLER: Unknown	CURRENT ROOFER: Unknown
ROOF AGE: ≈2002	GUARANTOR: Unknown	ROOFER'S PHONE NO.: Unknown
RECOVER AGE: N/A	GUAR. TERM: Unknown	LAST REPAIRS: Unknown

CONDITION SUMMARY	
OVERALL PHYSICAL CONDITION OF SYSTEM: Unsatisfactory	OVERALL PERFORMANCE OF SYSTEM: Unsatisfactory
IMPACT OF ANOMALIES: Substantial	REPORTED LEAKAGE: None

EXISTING ROOF SYSTEM	OBSERVATIONS	EVALUATION
SURFACE: Gravel – size, 5/8"	Wind erosion/bare spots	ADHESION: Unsatisfactory CONDITION: Unsatisfactory
BITUMEN: Coal tar		CONDITION: Marginal-Unsatisfactory
ORIGINAL MEMBRANE: Organic	Base sheet plus 4 plies, blisters, ridges	CONDITION: Unsatisfactory
INSULATION: Bottom Layer – 2 ½" polyisocyanurate Top Layer – ¾" wood fiberboard		
INSULATION ATTACHMENT: Adhered		
VAPOR RETARDER: Yes	Except on Roof G	
FLASHINGS: Modified bitumen	Open laps, deteriorated material	CONDITION: Marginal-Unsatisfactory
DRAINAGE: Direction, sloped to drain Saddles – No		CONDITION: Fair
DRAINS: 6 internal drains		CONDITION: Fair
GUTTERS: Flanged Stripping – felts	Gravel in gutter	CONDITION: Marginal-Unsatisfactory
EXISTING LEAKS: None reported active		
EXISTING REPAIRS/PATCHES: Preventive maintenance repairs and newer flashings in some areas		

DETAILS – PERIMETER & TERMINATION	OBSERVATIONS	EVALUATION
INTERIOR PARAPET WALLS: Construction – Masonry	Deteriorated joint caulking, deteriorated masonry, vertical joints cracked	CONDITION: Marginal-Unsatisfactory
Coping – Terra cotta	Splices unsealed	CONDITION: Fair-Marginal CONSTRUCTION: Acceptable
Flashing termination – Counterflashing – type, receiver-mounted	Sections falling, top edge openings	CONDITION: Marginal-Unsatisfactory CONSTRUCTION: Acceptable
EDGE DETAIL: Gravel stop Elevation – Flat Fascia height – 12 inches Fascia cleats – Yes	Deteriorated/no stripping	CONDITION: Marginal-Unsatisfactory CONSTRUCTION: Acceptable

DETAILS – ROOF FIELD	OBSERVATIONS	EVALUATION
BOX CURBS: Types – Vent, RTU, abandoned/capped Elevation – 6 inches		CONDITION: Fair CONSTRUCTION: Acceptable
SOIL STACKS: Material – PVC Flashings – Lead		CONDITION: Fair CONSTRUCTION: Acceptable
FLUE STACKS: Material – Steel Flashings – Mastic Storm collars – Yes Sealant – Mastic		CONDITION: Unsatisfactory CONSTRUCTION: Inadvisable
PIPE PENETRATIONS: Direct pipes – Conduit, electrical	Improper seal at roof	CONDITION: Unsatisfactory CONSTRUCTION: Inadvisable

DETAILS – MECHANICAL	OBSERVATIONS	EVALUATION
HVAC & A/C & CABINetry: Mounting – Boxes	Open electrical	CONDITION: Fair CONSTRUCTION: Acceptable
POWERED VENTILATORS: Type – Motor in-board		CONDITION: Fair CONSTRUCTION: Acceptable

GENERAL INFORMATION	OBSERVATIONS	EVALUATION
EXTERIOR BUILDING FACES: Masonry		
DECK SUPPORT CONSTRUCTION: Joists – material, Concrete Beams – material, Concrete		
DECK TYPE: Concrete, Steel on Roof G, and the canopies		

RECOMMENDATIONS – NARRATIVE

For the purposes of this report we are using an evaluation key that includes Satisfactory, Fair, Marginal and Unsatisfactory conditions. The roof system has an expected usable and serviceable life cycle and, depending on the type of roof, this cycle varies in length; it could be as short as 10 years and as long as 100 years.

- The term “satisfactory” refers to the first third of the roof’s life cycle.
- The term “fair” refers to the middle third of the roof’s life cycle.
- The term “marginal” refers to the last third of the roof’s life cycle.
- The term “unsatisfactory” means the roof is in the failure mode and requires replacement.

These evaluations are also based on the physical condition of the roof system at the time of the inspection, which affects how the roof’s condition is graded. For example, a roof system in the last third of its cycle may be downgraded to unsatisfactory based on its physical condition. Conversely, however, this does not mean a roof system in the last third of its life cycle can be upgraded from marginal to fair even if there are no current defects at the time of the inspection, because we know that roofs have a maximum useful service life that cannot be exceeded.

There are two different types of roof systems present on this building, an EPDM system, and a coal tar pitch built-up system. The EPDM system was installed approximately 7 years ago and is in fair condition. The coal tar pitch built-up roof systems are approximately 19 years of age and are in unsatisfactory condition. The built-up roofs (BURs) have experienced heavy gravel loss and have bare spots throughout. These bare spots expose the coal tar pitch and organic felt plies which serve as the waterproofing for the system. Coal tar pitch and the organic felts are sensitive to UV degradation and as a result, many areas of the membrane are blistered and brittle. All of the coal tar pitch BURs should be replaced as soon as budgets allow. There are minor repairs required on the EPDM roof areas, but the greatest areas of concern are the related masonry and copings. A masonry project will be necessary to remediate these areas to prevent water infiltration as well as to stabilize the wall between Roofs A & E. Also attached to this report is the asbestos analysis. No asbestos mineral fibers were found in any of the samples that were tested from each test cut location.

The following items should be performed in 2021:

1. Remove existing sealant and replace (Photos #2 & #3)
2. Repair masonry throughout building*
3. Re-adhere EPDM to masonry (Photo #5)
4. Re-fasten counterflashing (Photo #6)
5. Address as part of masonry repairs (Photo #7)*
6. Repair/re-wire electrical properly (Photo #8)
7. Install EPDM repair (Photo #9)
8. Cut flashing, re-adhere wall flashing, install EPDM repair (Photo #11)
9. Install roof cement and fabric mesh repair (Photos #14, #15, #18 & #19)
10. Install roof cement repair (Photo #23)

PROJECTED BUDGETS

DESCRIPTION	YEAR	ESTIMATE IN CURRENT DOLLARS
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PREVENTIVE MAINTENANCE: As described above *Does not include masonry repairs	2021	\$ 3,800*
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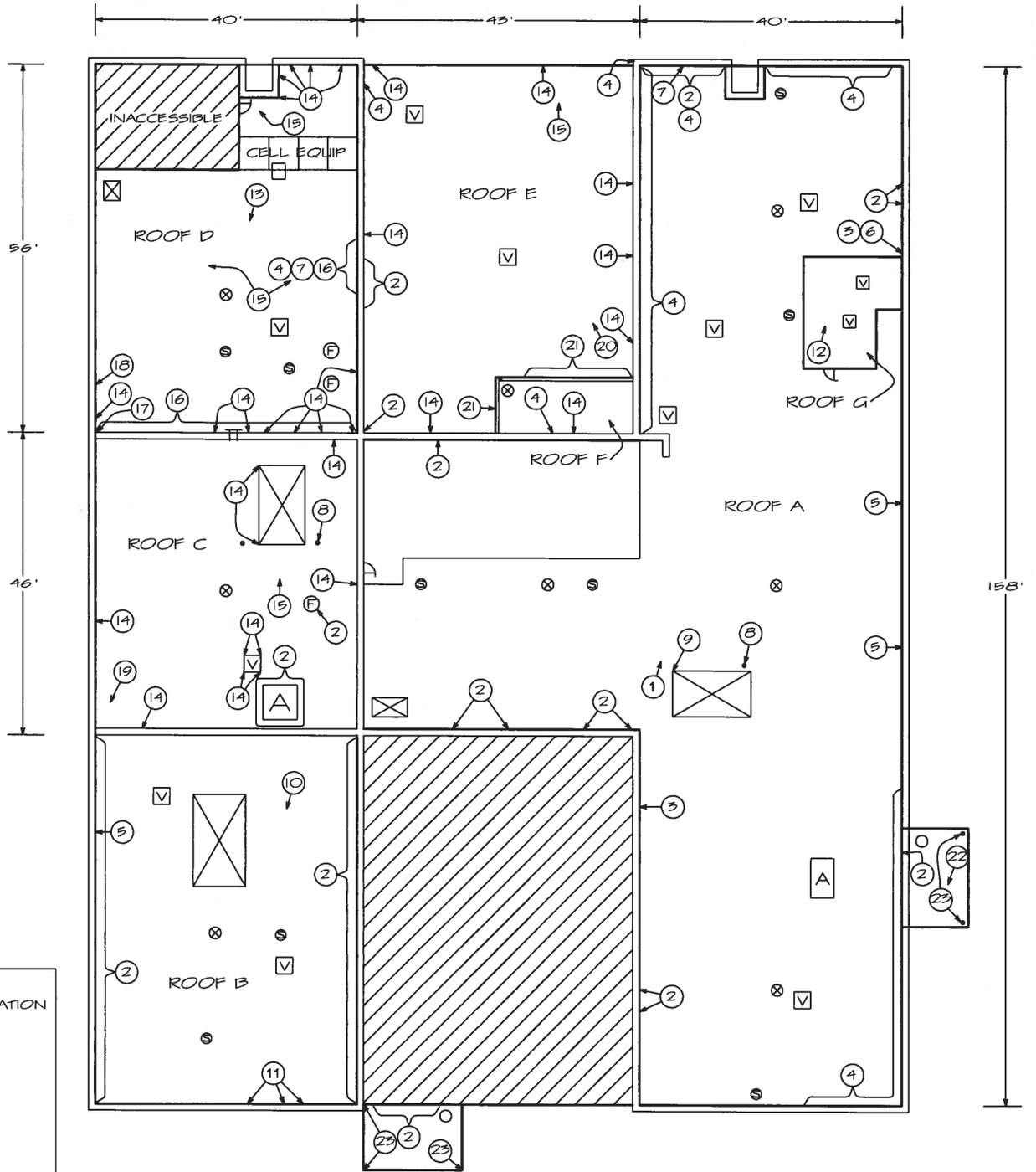
REPLACEMENT: Roofs C-G and canopies 6,803 sq. ft. X \$25.00 per sq. ft.	2021	\$170,075
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James C. Gruebnaue, RRC, Project Manager
 Illinois Roof Consulting Associates, Inc.
 4302-G Crystal Lake Road
 McHenry, IL 60050
 (815) 385-6560 ext: 18
 (Fax) 385-3581
 jim@irca.com www.irca.com



Robert Heideman, Project Coordinator



LEGEND

- ROOF PENETRATION
- TT LADDER
- ⊗ ○ DRAIN
- ∇ ∇ ∇ VENT
- F F FLUE STACK
- HATCH
- ⊙ SOIL STACK
- A A ABANDONED
- ⊗ ROOF TOP UNIT
- ══ GLITTER
- ══ DOWNSPOUT

(n) DENOTES PHOTO NUMBER

▨ NOT IN CONTRACT

ROOF A	7,949	SQ. FT.
ROOF B	2,233	SQ. FT.
ROOF C	1,760	SQ. FT.
ROOF D	2,231	SQ. FT.
ROOF E	2,113	SQ. FT.
ROOF F	179	SQ. FT.
ROOF G	219	SQ. FT.
CANOPY		
ROOFS	301	SQ. FT.
TOTAL	16,985	SQ. FT.



21003 RS

IRCA

PROJECT: GENESIS TOWERS
578 BROADWAY
GARY, ILLINOIS

DRAWING TITLE:
ROOF SKETCH

PROJECT #:
21003

DATE:
01 / 21

SCALE: 1" = 25'-0"
0 5' 15' 25'

DETAIL #:
RS - 1



1. OVERVIEW OF ROOF A



2. OPEN SEALANT



3. OPEN COPING JOINTS (TYPICAL)



4. OPEN / DETERIORATED MASONRY



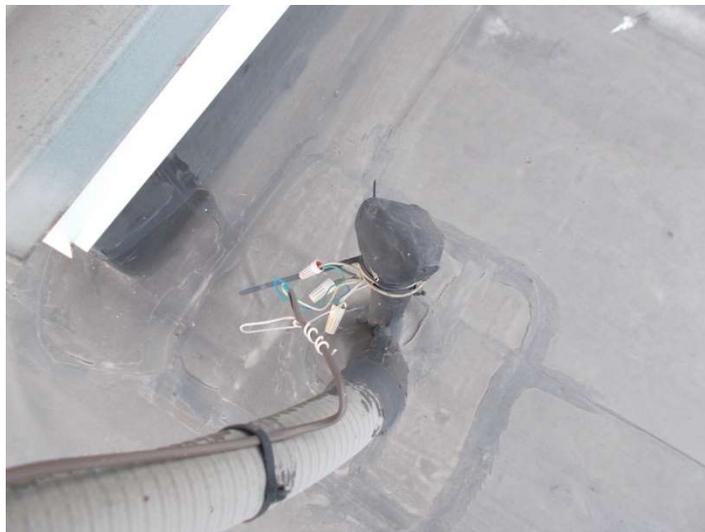
5. LOOSE EPDM COVER (TYPICAL)



6. LOOSE COUNTERFLASHING



7. LOOSE COUNTERFLASHING RECEIVER



8. OPEN ELECTRICAL



9. OPEN EPDM FLASHING



10. OVERVIEW OF ROOF B



11. DETACHED FLASHING



12. OVERVIEW OF FAILED SYSTEM



13. OVERVIEW OF ROOF D



14. OPEN MODIFIED BITUMEN FLASHING



15. DETERIORATED MEMBRANE / RIDGING



16. FAILED REPAIR



17. OPEN MASONRY / POSSIBLE STRUCTURAL EVENT



18. MISSING SEALANT / OPEN PENETRATION



19. FAILED REPAIR



20. OVERVIEW OF ROOF E



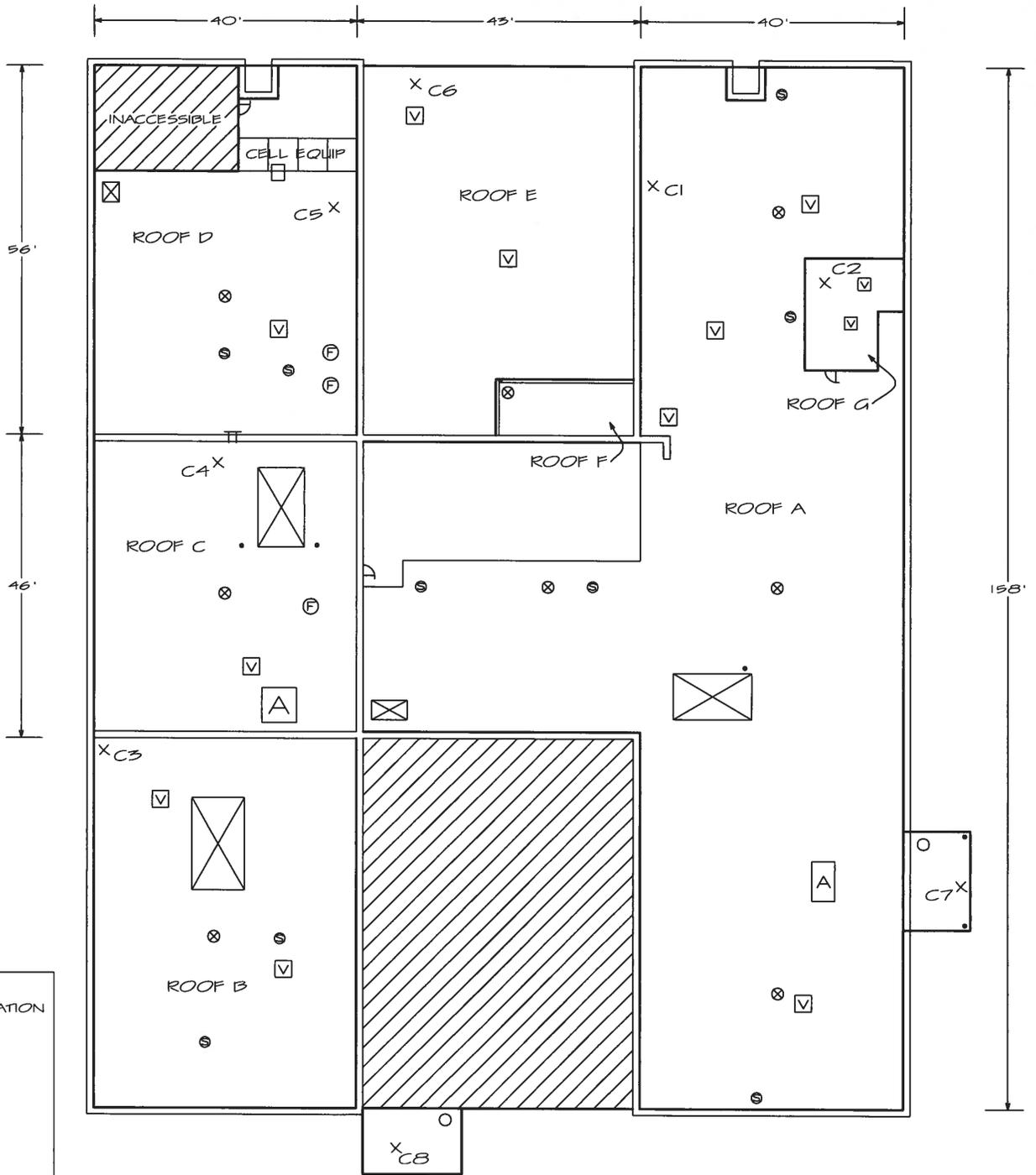
21. GRAVEL IN GUTTER



22. OVERVIEW OF EAST CANOPY



23. DEPLETED SEALANT PAN



LEGEND

- ROOF PENETRATION
- TT LADDER
- ⊗ DRAIN
- ☑ VENT
- ⓕ FLUE STACK
- ⌋ HATCH
- Ⓢ SOIL STACK
- Ⓐ ABANDONED
- ⊠ ROOF TOP UNIT
- ══ GLUTTER
- ══ DOWNSPOUT

X INDICATES CORE CUT LOCATIONS

▨ NOT IN CONTRACT

ROOF A	7,949	SQ. FT.
ROOF B	2,233	SQ. FT.
ROOF C	1,760	SQ. FT.
ROOF D	2,231	SQ. FT.
ROOF E	2,113	SQ. FT.
ROOF F	179	SQ. FT.
ROOF G	219	SQ. FT.
CANOPY		
ROOFS	301	SQ. FT.
TOTAL	16,985	SQ. FT.



21003 RS

IRCA

PROJECT: GENESIS TOWERS
578 BROADWAY
GARY, INDIANA

DRAWING TITLE:
ROOF SKETCH

PROJECT #:
21003

DATE:
01 / 21

SCALE: 1" = 25'-0"
0 5' 15' 25'

DETAIL #:
RS - 1

ASBESTOS ANALYSIS BY POLARIZED LIGHT MICROSCOPY

Method: EPA/600/R-93/116

Illinois Roof Consulting Assoc.
 4302-G W Crystal Lake Road
 McHenry, IL 60050, IL 60050
 Phone: (815) 385-6560
 Fax: (815) 385-3581

Reference:	21003	Date Received:	01/18/2021
Location:	Genesis Towers Apartments Gary, IN	Date Analyzed:	01/20/2021
Batch No.:	350613	Date Reported:	01/20/2021
Customer No.:	3923	Turn Around Time:	3 Days

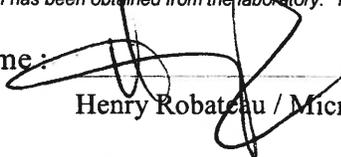
Laboratory Sample	Customer Sample Number	Asbestos Components (%)	Non-Asbestos Components (%)
350613001	21003-C1	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613002	21003-C2	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613003	21003-C3	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613004	21003-C4	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613005	21003-C5	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613006	21003-C6	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%
350613007	21003-C7	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%

ND = Asbestos Not Detected (Not Present) NA = Not Analyzed NS = Not Submitted
 Components of inhomogeneous samples are analyzed per our Standard Operating Procedure, or per customer request.

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Analyzed by Name :



Henry Robateau / Microscopist

Date: 01/20/2021

ASBESTOS ANALYSIS BY POLARIZED LIGHT MICROSCOPY

Method: EPA/600/R-93/116

Illinois Roof Consulting Assoc.
4302-G W Crystal Lake Road
McHenry, IL 60050, IL 60050
Phone: (815) 385-6560
Fax: (815) 385-3581

Reference: 21003 Date Received: 01/18/2021
Location: Genesis Towers Apartments Gary, IN Date Analyzed: 01/20/2021
Batch No.: 350613 Date Reported: 01/20/2021
Customer No.: 3923 Turn Around Time: 3 Days

Laboratory Sample	Customer Sample Number	Asbestos Components (%)	Non-Asbestos Components (%)
350613008	21003-C8	ND	Cellulose 5-10% Binder 80-85% Glass 5-10%

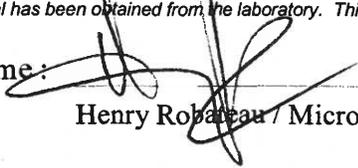
ND = Asbestos Not Detected (Not Present) NA = Not Analyzed NS = Not Submitted

Components of inhomogeneous samples are analyzed per our Standard Operating Procedure, or per customer request.

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Analyzed by Name :



Henry Robateau / Microscopist

Date: 01/20/2021