SECTION 040110 – MASONRY CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cleaning existing brick, concrete masonry, and stone.

B. Cleaning new brick, concrete masonry, and stone.

1.2 RELATED SECTIONS

A. Section 040120 – Unit Masonry Restoration.

B. Section 040122 – Stone Restoration.

1.3 REFERENCES

A. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound Content of Paints and Related Coatings; 1996.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Manufacturer's printed literature for each product, including test data indicating compliance with requirements, and installation instructions.

C. Restoration Plan: Written description of restoration process, including materials, methods, equipment, and sequencing of work.

D. Cleaning Plan: Written description of cleaning process, including materials, methods, equipment, and sequencing of work.

E. Installer's qualifications.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Capable of providing field service representation during installation and who will approve the installer and application method.

B. Installer Qualifications: Installer experienced in performing this type of work and who has specialized in work similar to the type required for this project.

C. Test Panels: Before full-scale application, test products to be used on test panels OR an inconspicuous location on the building as directed by the Construction Manager.
   1. Review manufacturer's Product Data to determine suitability of each product for each surface.
   2. Apply products using manufacturer-approved application methods, determining actual requirements for application.
   3. After 48 hours, review effectiveness of cleaning or treatment, compatibility with substrates, and ability to achieve desired results.
   4. Obtain approval by Architect and Owner of workmanship, color, and texture before proceeding with work.
   5. Test Panels: Inconspicuous sections of actual construction.
      a. Location and number as selected by Architect.
      b. Size; 4 feet by 4 feet.

c. Repair unacceptable work to the satisfaction of the Architect and Owner.

D. Pre-Installation Meeting: Hold a meeting prior to starting application, to review project conditions, protection requirements, manufacturer's installation instructions and manufacturer's warranty requirements. See Section 013300 for additional requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in time to avoid construction delays.

B. Deliver and store products in manufacturer's original packaging with identification labels intact.

C. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

A. Do not apply products under conditions outside manufacturer's requirements, which include:
1. Surfaces that are frozen; allow complete thawing prior to installation.
2. Surface and air temperatures below 40 degrees F (4 degrees C).
3. Surface and air temperatures above 95 degrees F (35 degrees C).
4. When surface or air temperature is not expected to remain above 40 degrees F (4 degrees C) for at least 8 hours after application.
5. Wind conditions that may blow materials onto surfaces not intended to be treated.
6. Less than 24 hours after a rain.
7. When rain is expected less than 6 hours after installation.

1.8 WARRANTY

A. See Division 1 for additional requirements.

B. Provide manufacturer's standard warranty for not less than two (2) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Chemique, Inc., Moorestown, NJ
2. “Safe n’ Easy” products as manufactured by Dumond Chemical, NY, NY
3. Diedrich Technologies, Inc., Milwaukee, WI
4. PROSOCO, Inc., Lawrence, KS

B. Requests for substitutions will be considered in accordance with provisions of Division 1.

2.2 RESTORATION CLEANERS

A. Cleaner for Removing Mold, Mildew, and Atmosphere Stains:
1. C-13 Limestone Cleaner/Restorer manufactured by Chemique, Inc.
2. “Safe n’ Easy” Limestone Cleaner as manufactured by Dumond Chemical, Inc.
3. “Safe n’ Easy” Ultimate Stone & Masonry Cleaner as manufactured by Dumond Chemical, Inc.
4. “707X Limestone Cleaner Pre-Rinse” & “707N Limestone Neutralizer After-Rinse” as manufactured by Diedrich Technologies, Inc.
5. “101 Masonry Restorer Super Concentrate” as manufactured by Diedrich Technologies, Inc.

B. Cleaner for Mortar Smears on New Construction:
   1. “Enviro Klean® Safety Klean” as manufactured by PROSOCO, Inc.

C. Cleaner for Old Brick Masonry:
   1. Sure Klean® Light Duty Restoration as manufactured by PROSOCO, Inc.
   2. Enviro Klean® EK Restoration Cleaner as manufactured by PROSOCO, Inc.

D. Cleaner for Cast Stone:
   1. Enviro Klean® 2010 All Surface Cleaner as manufactured by PROSOCO, Inc.

E. Cleaner for Limestone
   1. Sure Klean® 766 Limestone & Masonry Prewash as manufactured by PROSOCO, Inc.
   2. Sure Klean® Limestone & Masonry Afterwash as manufactured by PROSOCO, Inc.

2.3 PAINT, COATING AND GRAFFITI REMOVERS

A. Stripper for Removing Multiple Layers of Coatings:
   1. “StripIt” Paint & Coating Remover as manufactured by Chemique, Inc.

B. Stripper for Removing Silicone Water Repellents, Sealants, and Adhesive Residue:
   1. “StripIt” for Silane & Siloxane Removal as manufactured by Chemique, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are acceptable for product installation; do not begin until substrates meet manufacturer's requirements.

B. Do not begin until test panels have been approved by Architect.

3.2 PREPARATION

A. Protect adjacent surfaces not to be treated prior to beginning application.

B. Contractor shall take necessary precautions to collect restoration wash from dripping onto lower surfaces and properly dispose of collected waste product in accordance with the manufacturer’s recommendations. Coordinate with the CM.

C. On surfaces to be coated or treated, remove dirt, dust, oil, grease, and other contaminants that would interfere with penetration or performance of products; where cleaners are required, use products recommended by manufacturer; rinse thoroughly and allow to dry completely.

3.3 REPAIR OF BRICK MASONRY

A. Refer to Specification Section 040120.

3.4 CLEANING EXISTING MASONRY

A. Clean all exposed surfaces of masonry using materials specified, so that resulting surfaces have a uniform appearance.
B. When cleaning stains and tough dirt, test masonry for composition and select appropriate cleaner in accordance with manufacturer's instructions and recommendations; use cleaner and cleaning methods selected to minimize damage to surfaces and deterioration of

appearance.

C. Application: Mortar Smears on New Construction

1. Working from bottom to top, use clean water to thoroughly prewet surface to be cleaned.

2. Apply Safety Klean liberally using low-pressure spray (50 psi max), roller or densely filled (tampico) masonry washing brush. Do not apply with high-pressure spray. Do not atomize.

3. Let the cleaning solution dwell 3-5 minutes. Reapply. Light scrubbing of the surface improves cleaning results especially where high pressure rinsing equipment is not available. Do not let cleaning solution "dry into" to the masonry. If solution starts to dry, reapply.

4. Rinse with clean water from the bottom to the top, covering each section of the surface with a concentrated stream of water. To avoid streaking on vertical walls, take care to keep the wall below wet and rinsed free of cleaner and residues.

D. Application: Old Brick Masonry – Stage 1 (Sure Klean® Light Duty Restoration)

1. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for EK Restoration Cleaner. Do not dilute or alter.

2. Working from bottom to top, prewet surface with fresh water.

3. Apply cleaner using a brush or roller. Gentle scrubbing application will improve results.

4. Leave the cleaning solution on the surface for 10 to 20 minutes. Heavy soiling or mineral deposits may require longer dwell times. Do not let cleaning solution “dry in” to the masonry. If drying occurs, lightly wet treated surfaces with fresh water, and reapply the cleaner, gently scrubbing.

5. Working from bottom to top, rinse thoroughly with fresh water. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also “Equipment” section of the Product Data Sheet.

    - The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip.
    - Older, more delicate masonry may require restricting water pressure to avoid damage. Always test first.

6. Repeat steps 2-5 if necessary.

E. Application: Old Brick Masonry - Stage 2 (Enviro Klean® EK Restoration Cleaner)

1. If the use of the mild, light duty cleaner specified as part of Stage 1 do not work, utilize a more aggressive product as described herein.
2. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for EK Restoration Cleaner. Do not dilute or alter.

3. Working from bottom to top, prewet surface with fresh water.

4. Apply cleaner using a brush or roller. Gentle scrubbing application will improve results.

5. Leave the cleaning solution on the surface for 10 to 20 minutes. Heavy soiling or mineral deposits may require longer dwell times. Do not let cleaning solution “dry in” to the masonry. If drying occurs, lightly wet treated surfaces with fresh water, and reapply the cleaner, gently scrubbing.

6. Working from bottom to top, rinse thoroughly with fresh water. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also “Equipment” section of the Product Data Sheet.

    - The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip.
    - Older, more delicate masonry may require restricting water pressure to avoid damage. Always test first.

7. Repeat steps 3-6 if necessary.

F. Cleanup

1. Clean tools and equipment using fresh water.

3.5 REPAIR OF STONE MASONRY

A. Refer to Specification Section 040122 – Stone Restoration.

3.6 CLEANING EXISTING MASONRY

A. Clean all exposed surfaces of masonry using materials specified, so that resulting surfaces have a uniform appearance.

B. When cleaning stains and tough dirt, test masonry for composition and select appropriate

C. Application: Cast Stone

1. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for 2010 All Surface Cleaner. Use in concentrate or dilute 2010 All Surface Cleaner concentrate with 1-10 parts water. Refer to Product Data Sheet for recommended dilution for intended use.

2. Working from bottom to top, prewet the surface with clean water.

3. Apply the diluted cleaning solution to the masonry surface using a brush or low- pressure spray.

4. Let the cleaner stay on the surface 1-10 minutes, based on testing. Gently scrub heavily soiled areas.

5. Working from bottom to top, rinse the surface thoroughly with clean water. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute

delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also “Equipment” section of the Product Data Sheet.

6. Repeat steps 2 - 5 if necessary.

D. Application: Limestone & Masonry Prewash Cleaning

1. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for 766 Limestone & Masonry Prewash. Use 766 Limestone & Masonry Prewash in concentrate or dilute with up to 3 parts water to 1 part concentrate. Use test area results to determine dilution for intended use.

2. Always prewet the surface with clean water, working from the bottom to the top.

3. Apply a heavy coating of 766 to the surface using a brush or roller.

4. Let the Prewash dwell on the surface 30 minutes to 2-hours. Longer dwell times may be required with lower temperatures. Do not let material dry on surface.

5. Working from the bottom of the work area to the top, pressure rinse, making sure to flush each portion of the masonry surface with concentrated water pressure.

6. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also “Equipment” section of the Product Data Sheet.

7. If pressure water rinsing equipment is not available, reapply prewash and scrub vigorously with a stiff-bristled brush or scouring pad. Rinse thoroughly with fresh water.

E. Surface Neutralization

1. Treated surfaces must be neutralized by applying a solution of the proper Sure Klean® cleaning compound pursuant to the application instructions on the product label.

   a. Brick, Terra Cotta, Sandstone and Other Non-calcareous Masonry: Immediately apply a solution of Sure Klean® Restoration Cleaner, following the instructions on the product label.

   b. Limestone, Cast Stone, Stucco & Cementitious Materials: Immediately apply a solution of Sure Klean® Limestone & Masonry Afterwash or Sure Klean® Limestone Restorer, following the instructions on the product label.

Note: The second wash down with the appropriate Sure Klean® cleaner is always necessary to completely restore the surface and to neutralize any 766 Limestone & Masonry Prewash, which may still be in the surface. The prewash penetrates into the masonry, and failure to remove the cleaner will result in an unsightly detergent residue. Application of Sure Klean® Limestone & Masonry Afterwash, Restoration Cleaner or Limestone Restorer ensures complete removal of 766 Limestone & Masonry Prewash.

F. Application: Limestone & Masonry Afterwash Cleaning

1. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for Limestone & Masonry Afterwash. Dilute 1 part water to 1 part concentrate.

2. Use Limestone & Masonry Afterwash as a follow-up treatment to Sure Klean® 766 Limestone and Masonry Prewash and Enviro Klean® ReKlaim. Limestone & Masonry Afterwash works as part of these two-part cleaning systems to completely restore and neutralize masonry surfaces.

   a. Immediately after rinsing 766 Limestone & Masonry Prewash or ReKlaim from masonry surface, apply the diluted Afterwash to the wet surface.

   b. Let the Afterwash stay on the surface for three to five minutes.

   c. Pressure rinse from the bottom of the treated area to the top. Make sure to cover each portion of the masonry surface with a concentrated stream of water. To avoid streaking, keep wall surfaces immediately below area being cleaned running wet and free of cleaner rundown and residues.

   d. Using pH papers, pH pen or pH indicator solutions, check treated surfaces to ensure neutralization has been achieved. Repeat steps 1 through 3 above if needed until surface pH is 5.0 to 9.0.

   e. Let neutralized surface dry thoroughly. Before applying new surface coatings, check the cleaned surface again using pH papers, pH pen or pH indicator solutions. Check that surface pH is neutral. Inadequate neutralization may cause surface discoloration or failure of new surface coatings.

G. Cleanup

1. Clean tools and equipment using fresh water.

2. Contractor shall collect and dispose of the afterwash mix in accordance with the manufacturer’s recommendations. Coordinate with the Owner and CM.

3.7 CLEANING AND PROTECTION

A. At completion of work, remove protective coverings.

B. If surfaces that should have been protected from damage by this work have been damaged, clean, repair or replace to the satisfaction of the Architect.

C. Repair or replace damaged treated surfaces.

D. Protect completed work from damage during construction.

END OF SECTION 040110

SECTION 040120 – UNIT MASONRY RESTORATION

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 maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:

1. Mortar Analysis
2. Repairing unit masonry, including replacing units.
3. Repointing joints.
4. Preliminary cleaning, including removing plant growth and painted surfaces.
5. Cleaning exposed unit masonry.

1.3 UNIT PRICES

A. Unit prices for clay masonry restoration and cleaning are specified in Division 01 Section "Unit Prices."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

B. Provide preconstruction testing as part of unit price.

C. Remove and replace brick as part of exterior masonry repair / rebuilding.

D. Clean brickwork, including preliminary and final cleaning, as part of masonry cleaning unit price.

E. Repoint masonry as part of repointing masonry unit price.

1.4 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi, 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi, 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi, 4 to 6 gpm.

E. 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.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. 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 three samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.

2. Sealant Materials: See Division 07 Section "Joint Sealants."
3. Include similar Samples of accessories involving color selection

C. Samples for Verification: For the following:

1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary 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. 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.

3. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
4. Sealant Materials: See Division 07 Section "Joint Sealants."
5. Accessories: Each type of anchor, accessory, and miscellaneous support.

D. Qualification Data: For restoration specialists; including field supervisors and restoration workers, chemical-cleaner manufacturer and testing service.

E. Quality-Control Program.

F. Restoration Program

G. Cleaning Program

1.6 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Engage an experienced stone restoration and cleaning firm to perform work of this Section. Firm shall have completed (5) projects similar in material, design, and extent to that indicated for this Project with at least a (10) record of successful in-service performance. Experience installing standard unit masonry or new stone masonry is not sufficient experience for stone restoration work.

1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that stone restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond control of restoration specialist firm.
2. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When stone units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

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-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

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

D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

E. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration 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 restoration 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 and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, 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 restoration 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 and worker's ability to use such materials and methods properly.

2. Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Brick Repair: Prepare sample areas for each type of brick indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
   a. Brick Repair & Replacement: Two brick repairs for each type of brick indicated to be repaired and/or replaced.

2. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.

3. Cleaning: Clean an area approximately 25 sq. ft. for each type of stone and surface condition.

   a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use 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.

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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

B. Deliver other 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 lime putty covered with water in sealed containers.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing 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.

D. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

E. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.9 COORDINATION

A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.10 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand and portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
7. Repair masonry, including replacing existing masonry with new masonry materials.
8. Rake out mortar from joints to be repointed.
9. Point mortar and sealant joints.
10. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
11. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
12. Clean masonry surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

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

1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties as listed below:

a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both 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. Factory-Prepared Lime Putty: ASTM C 1489.

D. Quicklime: ASTM C 5, pulverized lime.

E. Mortar Sand: ASTM C 144 unless otherwise indicated.

1. Color: Provide natural sand of color necessary to produce required mortar color.
2. For pointing mortar, provide sand with rounded edges.
3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

G. Water: Potable.

2.3 MANUFACTURED REPAIR MATERIALS

A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. 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 masonry 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 brick in colors and textures to match each masonry unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.

2.4 CLEANING MATERIALS

A. Water: Potable.

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

C. Refer to Specification Section 040110 for appropriate cleaner.

2.5 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABR Products, Inc.; Rubber Mask.
b. Price Research, Ltd.; Price Mask.
c. PROSOCO; Sure Klean Strippable Masking.

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants."
2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.
3. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the 100 sieve.

C. Joint-Sealant Backing:

1. Refer to Specification Section 079200.

D. Setting Buttons: Resilient plastic buttons, non-staining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

E. Masking Tape: Non-staining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

F. Miscellaneous 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. Little 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 in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
    b. Leave a residue on surfaces.

2.6 MORTAR MIXES

A. Mortar Analysis: General contractor to hire a conservator to perform a mortar analysis. A conservator regularly engaged in analyzing mortar mixes shall be hired to determine mortar compatibility and identify appropriate mortar selection. The following conservators are preapproved for this type of work:

1. J. Christopher Frey
   Keystone Preservation Group
   P.O. Box 831
   Doylestown, PA 18901
   Tel/Fax: 215-348-4919

2. Jablonski Building Conservation
   40 West 27th street, Suite 1201
   New York, NY 10001
   Tel: 212-532-7775
   Fax: 212-532-2188
   www.jbconservation.com

3. Richbrook Conservation
   P.O. Box 1061
   New York, NY 10025
   Tel: 646-315-5442
   www.richbrook.net

B. Substitutions: If proposed equal is submitted, lab test to establish equivalent performance levels. Use an independent testing laboratory, as determined by the Specifier, and paid for by the submitting party.

C. Contractor shall assume that a minimum of (8) mortar analyses will be required.

2.7 CHEMICAL CLEANING SOLUTIONS

A. Refer to Specification Section 040110 for appropriate cleaner.

B. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 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. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.
3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. 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.

D. Remove downspouts adjacent to masonry and store during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning are complete.

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

3.2 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or 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. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. 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 Owner unless otherwise indicated.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. 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.

H. Lay replacement brick 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. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets 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.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 MASONRY UNIT PATCHING

A. Patch the following masonry units unless another type of replacement or repair is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners.
4. Units with small areas of deep deterioration.

B. Remove and replace existing patches unless otherwise indicated or approved by Architect.

C. Patching Bricks:

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

3.4 WIDENING JOINTS

A. Do not widen a joint, except where indicated or approved by Architect.

B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than 1/8 inch, widen the joint for length indicated and to depth required for repointing after obtaining Architect's approval.

C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.

D. Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

3.5 CLEANING MASONRY, GENERAL

A. 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 will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.

    a. Equip units with pressure gages.

3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.

4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

C. 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.

D. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

E. 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.

F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.6 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.

3.7 CLEANING BRICKWORK

A. Detergent Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Scrub masonry 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 masonry surface remains wet.
3. Rinse with cold water applied by low pressure spray to remove detergent solution and soil.

B. Mold, Mildew, and Algae Removal:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub masonry 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 masonry surface remains wet.
4. Rinse with cold water applied by low pressure spray to remove mold, mildew, and algae remover and soil.

C. Nonacidic Gel Chemical Cleaning:

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

    a. As recommended by chemical-cleaner manufacturer.
    b. As established by mockup.

4. Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
5. Rinse with cold water applied by low pressure spray to remove chemicals and soil.

D. Nonacidic Liquid Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply cleaner to masonry in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:

    a. As recommended by chemical-cleaner manufacturer.
    b. As established by mockup.
    c. Two to three minutes.

3. Rinse with cold water applied by low pressure spray to remove chemicals and soil.

3.8 REPOINTING MASONRY

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

1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
4. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. 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 1-1/2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
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.
    b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to 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 low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to 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. Completely remove such mortar and repoint.

F. Pointing with Sealant:

1. After raking out, keep joints dry and free of mortar and debris.

2. Clean and prepare joint surfaces according to Division 07 Section "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant according to Division 07 Section "Joint Sealants" and the following:

    a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that will ensure that sealant will be 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 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. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate 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.

4. Cure sealant according to Division 07 Section "Joint Sealants."

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

3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

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

END OF SECTION 040120

SECTION 040122 – STONE RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes maintenance of stone assemblies consisting of stone restoration and cleaning as follows:

1. Mortar Analysis.

2. Repointing joints.

3. Cleaning exposed stone surfaces.

4. For repairing limestone, sandstone and brownstone.

5. Removing plant growth.

B. Related Sections:

1. Division 4 Section 040110 "Masonry Cleaning"

2. Division 7 Section 079200 "Joint Sealants"

1.3 DEFINITIONS

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

B. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

C. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

D. High-Pressure Spray: 800 to 1200 psi (5510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

E. Stone Terminology: ASTM C 119.

F. Face Bedding: Setting of stone with the natural bedding planes (strata) vertical and parallel to the wall plane rather than horizontal or "naturally bedded," which holds bedding planes together by gravity.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For the following:

1. Replacement stone units and their jointing, showing relation of existing to new units.

2. Partial replacement stone units (dutchmen).

3. Setting number of each new stone unit and its location on the structure in annotated plans and elevations.

4. Provisions for expansion joints or other sealant joints.

5. Provisions for flashing, lighting fixtures, conduits, and weep holes as required.

6. Replacement and repair anchors, including drilled-in pins. Include details of anchors within individual stone units, with locations of anchors and dimensions of holes and recesses in stone required for anchors, including direction and angle of holes for pins.

C. 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 (150 mm) long by 1/4 inch (6 mm) 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 cleaned stone 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. Patching Compound: Prepare a sample of each type of repair listed below, using masonry removed from the building where designated by the Architect. Prepare, install, and finish each sample repair according to the specifications. All samples must be applied to masonry. Prepare samples in an area where they will be exposed to the same conditions as will be present on the building during curing. Allow samples to cure at least three (3) days (or longer, if possible) before obtaining Architect’s approval for color match. Mortar colors will continue to lighten as they cure and are exposed to the weather, so samples should be installed as far in advance as possible. A slightly darker color will give better long-term results. Samples should be viewed from a minimum distance of 12 feet.

3. Sealant Materials: See Division 7 Section "Joint Sealants."

4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of sand used for pointing mortar; minimum 1 lb (0.5 kg) of each in plastic screw-top jars.

   a. For blended sands, provide Samples of each component and blend.
   b. Identify sources, both supplier and quarry, of each type of sand.

2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches (150 mm) long by 1/4 inch (6 mm) 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.

3. Each type of stone patching compound in 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.

4. Each type of adhesive.

5. Sealant Materials: See Division 7 Section "Joint Sealants."

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

E. Qualification Data: For restoration specialists; including field supervisors and restoration workers, chemical-cleaner manufacturer and testing service.

F. Quality-Control Program.

G. Restoration Program.

H. Cleaning Program.

1.5 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Engage an experienced stone restoration and cleaning firm to perform work of this Section. Firm shall have completed (5) projects similar in material, design, and extent to that indicated for this Project with at least a (10) record of successful in-service performance. Experience installing standard unit masonry or new stone masonry is not sufficient experience for stone restoration work.

1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that stone restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond control of restoration specialist firm.

2. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When stone units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

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-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

C. Source Limitations: Obtain each type of material for stone restoration (stone, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

E. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration 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 restoration 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 and worker's ability to use such materials and methods properly.

F. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, 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 restoration 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 and worker's ability to use such materials and methods properly.

G. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) 50 feet (15 m) away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

H. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Stone Repair: Prepare sample areas for each type of stone indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:

a. Stone Plug Repair: Two stone plug repairs for each type of stone indicated to be plugged.
b. Crack Injection: Apply crack injection in 2 separate areas, each approximately 36 inches long.
c. Patching: Three small holes at least 1 inch in diameter.

Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.

2. Cleaning: Clean an area approximately 25 sq. ft. for each type of stone and surface condition.

a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use 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.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to stone restoration and cleaning including, but not limited to, the following:

a. Construction Schedule: Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates.

B. Deliver each piece of granite with code mark or setting number on unexposed face, corresponding to Shop Drawings, using non-staining paint.

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

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store 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.

F. Store lime putty covered with water in sealed containers.

G. Store sand where grading and other required characteristics can be maintained, and contamination avoided.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair stone units and repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair and mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F (4 and 49 deg C).

2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 7 days after repair and pointing.

D. Hot-Weather Requirements: Protect stone repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

F. Clean stone surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

G. Apply stone consolidation treatment only when surface and air temperatures are between 50 and 90 deg F (10 and 32 deg C) and rain is not expected within 24 hours.

1.8 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Perform stone restoration work in the following sequence:

1. Removal and salvage of existing stone.

2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

3. Repair/removal of steel lintels.

4. Clean stone surfaces.

5. Reinstallation of existing salvaged stone.

6. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.

7. Rake out mortar from joints to be repointed.

8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

9. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

10. Remove paint.

11. Clean stone surfaces not removed.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone to comply with "Stone Patching" Article. Patch holes in mortar joints to comply with "Repointing Stonework" Article.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I 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. Factory-Prepared Lime Putty: ASTM C 1489.

D. Quicklime: ASTM C 5, pulverized lime.

E. Mortar Sand: ASTM C 144 unless otherwise indicated.

1. Color: Provide natural sand or other sound stone of color necessary to produce required mortar color.

2. For pointing mortar, provide sand with rounded edges.

3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

G. Water: Potable.

2.2 MANUFACTURED REPAIR MATERIALS

A. Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cathedral Stone Products, Inc.; Jahn Restoration Mortars.
b. Conproco Corporation; Mimic.
c. Edison Coatings, Inc.; Custom System 45.

2. Use formulation that is vapor- and water permeable (equal to or more than the stone), exhibits low shrinkage, has lower modulus of elasticity than the stone units being repaired, and develops high bond strength to all types of stone.

3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.

4. Formulate patching compound in colors, textures, and grain to match stone being patched. Provide sufficient number of colors to enable matching each piece of stone.

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

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cathedral Stone Products, Inc.; Jahn Injection Grout.
b. Conproco Corporation; Terra Cotta Finish.
c. Edison Coatings, Inc.; Pump-X 53-Series.

2.3 CLEANING MATERIALS

A. Restoration Cleaners

1. Refer to Specification Section 040110.

2.4 ACCESSORY MATERIALS

A. Stone Anchors and Pins: Type and size indicated or, if not indicated, to match existing anchors in size and type. Fabricate anchors and pins from Type 304 stainless steel.

1. Set using Jahn anchor setting mortar (M80).

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 7 Section "Joint Sealants."

2. Colors: Provide colors of exposed sealants to match colors of stonework adjoining installed sealant unless otherwise indicated.

3. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the 100 sieve.

C. Joint-Sealant Backing:

1. Refer to Specification Section 07920 for additional information.

D. Setting Buttons: Resilient plastic buttons, non-staining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

E. Masking Tape: Non-staining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely including adhesive.

F. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 29 zinc-rich coating.

1. Use coating requiring no better than [SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.

2. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Miscellaneous 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. Little 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 in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
b. Leave a residue on surfaces.

2.5 MORTAR MIXES

A. Mortar Analysis: General contractor to hire a conservator to perform a mortar analysis. A conservator regularly engaged in analyzing mortar mixes shall be hired to determine mortar compatibility and identify appropriate mortar selection. The following conservators are preapproved for this type of work:

1. J. Christoper Frey
Keystone Preservation Group
P.O. Box 831
Doylestown, PA 18901
Tel/Fax: 215-348-4919

2. Jablonski Building Conservation
40 West 27th street, Suite 1201
New York, NY 10001
Tel: 212-532-7775
Fax: 212-532-2188
www.jbconservation.com

3. Richbrook Conservation
P.O. Box 1061
New York, NY 10025
Tel: 646-315-5442
www.richbrook.net

B. Substitutions: If proposed equal is submitted, lab test to establish equivalent performance levels. Use an independent testing laboratory, as determined by the Specifier, and paid for by the submitting party.

C. Contractor shall assume that a minimum of (4) mortar analyses will be required.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from stone 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. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3. Do not clean stone during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.

5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Prevent mortar from staining face of surrounding stone 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 stone and other surfaces.

4. Clean mortar splatters from scaffolding at end of each day.

3.2 STONE REMOVAL AND REPLACEMENT

A. At locations indicated, remove stone, salvage for it to be reused. Carefully remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.

B. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole stone units as possible.

1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.

2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.

3. Store stone for reuse. Store off ground, on skids, and protected from weather.

4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

E. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Install salvaged stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.

1. Maintain joint width for salvaged stone to match existing joints.

2. Use setting buttons or shims to set stone accurately spaced with uniform joints.

G. Set salvaged stone with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors of size and type indicated.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.

2. Rake out mortar used for laying stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing stone, and at same time as repointing of surrounding area.

3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during stone removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Remove paint, rust, and other contaminants according to [SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning", as applicable to meet paint manufacturer's recommended preparation.

2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm), notify Architect before proceeding.

3.4 STONE PLUG REPAIR

A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.

B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive. Cut and install plug so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.

D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.

E. Clean adhesive residue from exposed surfaces.

3.5 STONE PATCHING

A. Patch the following stone units unless another type of replacement or repair is indicated:

1. Units indicated to be patched.

2. Units with holes.

3. Units with chipped edges or corners.

4. Units with small areas of deep deterioration.

5. Spalled units with visible deterioration

B. Remove and replace existing patches unless otherwise indicated or approved by Architect.

C. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch 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 (6 mm) thick, but not less than recommended by patching compound manufacturer.

D. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of stone unit.

E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.

F. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.

G. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch (6 mm) or more than 2 inches (50 mm) thick. Roughen surface of each layer to provide a key for next layer.

1. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.

2. Build patch up 1/4 inch (6 mm) above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.

H. Keep each layer damp for 72 hours or until patching compound has set.

I. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.6 CLEANING STONE, GENERAL

A. 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 will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each stone material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.

2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage stone.

a. Equip units with pressure gages.

3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.

4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.

5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F (60 and 71 deg C) at flow rates indicated.

7. For steam application, use steam generator capable of delivering live steam at nozzle.

C. 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 stone surfaces.

D. Water Application Methods:

1. Water-Soak Application: Soak stone 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 surface of stone and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Steam Cleaning: Apply steam to stone surfaces at the very low pressures indicated for each type of stonework. Hold nozzle at least 6 inches (150 mm) from surface of stone and apply steam in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

F. Chemical-Cleaner Application Methods: Apply chemical cleaners to stone surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

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.

3.7 CLEANING STONEWORK

A. Two-Part Brownstone Chemical Cleaning:

1. Wet stone with cold water applied by low-pressure spray.

2. Apply alkaline prewash cleaner to stone by brush or roller. Let cleaner remain on surface for period recommended by chemical-cleaner manufacturer unless otherwise indicated.

3. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.

4. Apply acidic afterwash cleaner to stone in two applications, while surface is still wet, using low-pressure spray equipment, deep-nap roller or soft-fiber brush. Let neutralizer remain on surface for period recommended by manufacturer unless otherwise indicated.

5. Rinse with cold water applied by medium-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.

3.8 REPOINTING STONEWORK

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

1. All joints in areas indicated.

2. Joints where mortar is missing or where they contain holes.

3. Cracked joints where cracks can be penetrated at least 1/4 inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.

4. Cracked joints where cracks are 1/8 inch (3 mm) or more in width and of any depth.

5. Joints where they sound hollow when tapped by metal object.

6. Joints where they are worn back 1/4 inch (6 mm) or more from surface.

7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.

8. Joints where they have been filled with substances other than mortar.

9. 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, but not less than 1/2 inch (13 mm) or not less than that required to expose sound, unweathered mortar.

2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.

3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

   a. Cut out 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.
   b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

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 (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 low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to 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. Completely remove such mortar and repoint.

3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.

2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

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

3.10 FIELD QUALITY CONTROL

A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

B. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

END OF SECTION 040122

SECTION 042113 – BRICK MASONRY

PART 1 - GENERAL

1.1 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. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Cavity wall insulation.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete"
2. Section 047200 "Cast Stone Masonry"
3. Section 072100 "Building Insulation"
4. Section 040110 “Masonry Cleaning”

1.2 ACTION SUBMITTALS

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

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Clay face brick
2. Stone trim.
3. Colored mortar.
4. Weep vents/cavity cell vents.

D. Samples for Verification: For each type and color of the following:

1. Clay face brick
2. Special brick shapes.
3. Stone trim.

4. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
5. Weep holes and cavity vents.
6. Accessories embedded in masonry.

1.3 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, batch numbers, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.
d. For masonry units, include data and calculations establishing average net-area compressive strength of units.

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.

D. 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.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.4 QUALITY ASSURANCE

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

B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1.

1. Build sample panels for each type of exterior unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for each type of exposed exterior unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories. Additionally, provide mock-ups of locations listed in architectural drawings.

    a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
    b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 18-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include metal studs, sheathing, vapor barrier, veneer anchors, flashing, preformed corners and end dams, cavity drainage material, and weep vents in exterior masonry-veneer wall mockup.

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Clean one-half of 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 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 ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F 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 ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

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.

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

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 BRICK MASONRY

A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows.

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.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Clay Face Brick: Facing brick complying with ASTM C 216

1. Basis of Design Products

a. Brick Type A: Sierra Sandstone Smooth” modular size brick manufactured by Meridian Brick as distributed by Consolidated Brick, 860-355-4905. Contact: Leona Bohjalian.

2. Texture: Smooth
3. Grade: SW (severe weathering)
4. Type: FBX
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
8. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

D. 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.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cemex S.A.B. de C.V.
b. Essroc.
c. Holcim (US) Inc.
d. Lafarge North America Inc.
e. Lehigh Hanson; HeidelbergCement Group.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Lafarge North America Inc.
b. Approved EqualRetain first paragraph below for colored cement or for pigments added at Project site.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Davis Colors.
b. Lanxess Corporation.
c. Solomon Colors, Inc.

G. Mixes in first paragraph below allow better control of color than job-mixed colored mortar. If retaining, also retain paragraphs above that specify materials included in the mixes retained below.

H. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Essroc.
2) Holcim (US) Inc.
3) Lafarge North America Inc.
4) Lehigh Hanson; HeidelbergCement Group.

2. Colored Masonry Cement:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cemex S.A.B. de C.V.
2) Essroc.
3) Holcim (US) Inc.
4) Lafarge North America Inc.
5) Lehigh Hanson; HeidelbergCement Group.

3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
4. Pigments shall not exceed 10 percent of portland cement by weight.
5. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

I. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

J. Aggregate for Grout: ASTM C 404.

K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation; Construction Systems.
b. Euclid Chemical Company (The); an RPM company.
c. Grace Construction Products; W.R. Grace & Co. -- Conn.

L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ACM Chemistries.
    b. BASF Corporation; Construction Systems.
    c. Euclid Chemical Company (The); an RPM company.
    d. Grace Construction Products; W.R. Grace & Co. -- Conn.

M. Water: Potable

2.5 REINFORCEMENT

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

B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

2.6 TIES AND ANCHORS

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

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

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Masonry-Veneer Anchors:
1. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
2. Veneer Anchor
    a. Basis of Design: DW-10HS by Hohmann & Barnard, Inc.
3. Veneer Anchor with Pronged Legs
    a. Basis of Design: X-Seal Anchor by Hohmann & Barnard, Inc.
4. Materials Conformance:
    a. Wire (Carbon Steel): Prefabricated from cold-drawn steel wire conforming to ASTM A1064/A1064M.
        1) Tensile Strength – 80,000 p.s.i., Yield Point – 70,000 p.s.i. minimum.
        2) Zinc Coating: Hot-Dipped Galvanized after fabrication: ASTM A153/A153M-B (1.5 oz/ft2)
    b. Wire (Stainless Steel): ASTM A580/A580M – AISI Type 304 or Type 312
    c. Sheet Metal (Carbon Steel): ASTM A1008/A1008M
        1) Zinc Coating: Hot-Dip Galvanized ASTM A153/A153M Class B2 (1.5 oz/ft2). (Sheet metal ties and anchors galvanized after fabrication.
    d. Sheet Metal (Stainless Steel): ASTM A666, ASTM A480/480M, and ASTM A240/A240M, AISI Type 304 or 316.
    e. X-Seal Tape: ASTM D751-95, ASTM D4533-91, ASTM G154-98, ASTM E96-B
    f. Leg Depth: 1 ½” to 2” (Or equal to thickness of wallboard + insulation)
    g. Thickness: 14 Gauge
    h. Vee-Byna Tie Diameter: 3/16”ø
    i. Vee-Byna Tie Length: 4”

j. X-Seal Tape: Adhesive backed 3” x 75’ rolls

2.7 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Asphalt – Coated Copper Flashing: 5-oz./sq. ft. (1.5 – kg/sq.m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
   a. Products:
      1) Hohmann & Barnard, Inc.; H & B C – Coat Flashing C-FAB
      2) Sandell Manufacturing Co., Inc.; Coated Copper Flashing
      3) York Manufacturing, Inc.; Copperseal

B. Single – Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing panes have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging mortar.

1. Product: Subject to compliance with requirements, provide “Blok-Flash” by Advanced Building Products, Inc.

C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashings and trim remain watertight.

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

E. Cavity Wall Drainage System:

a. Basis-of-Design Product: Mortar Net Solutions; TotalFlash unitized flashing and cavity drainage system or comparable product by one of the following:

1) Advanced Building Products Inc.
2) Hyload, Inc.

b. Flashing Membrane: Composite flashing product consisting of UV stable thermoplastic vinyl of an overall thickness of not less than 0.040 inch.

c. Termination Bars:

1) Stainless Steel: 1.25” high x 16 gauge thick, pre-drilled holes 6″ on-center, 100% recyclable

d. Drip Edges:

Material and finish per location as noted on architectural drawings.
1) Stainless Steel: 3.0″ high x 28 gauge, 3/8” hemmed edge, 100% recyclable

2) Cold-rolled Copper: 3.0″ high x 24 gauge, 3/8” hemmed edge, 100% recyclable
3) Kynar®-coated galvanized steel: 3.0″ high x 24 gauge, 3/8” hemmed edge, 4 color choices (Almond, Tan, Gray, Terra-cotta)

e. Complete Flash™: TPO, or synthetic rubber/polypropylene blend

1) 14″ High inside/outside Corner Boots
2) 14″ High inside/outside Corner Boots

f. Metal Drip Edge Corners:

1) 14″ High inside/outside Corner Boots
2) 14″ High inside/outside Corner Boots

g. Accessories: Provide preformed corners, end dams, and materials produced by flashing manufacturer.

1) Basis-of-Design Product: Mortar Net Solutions; CompleteFlash.

h. Sealants:

1) Basis-of-Design Product: Mortar Net Solutions; BTL-1, Butyl.

F. 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 a flexible flashing with a metal drip edge.

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

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated 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. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

a. Basis-of-Design Product: Mortar Net Solutions; CellVent or compatible product by one of the following:

1) Advanced Building Products Inc.
2) Heckmann Building Products, Inc.
3) Wire-Bond.

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net Solutions; WeepVent or comparable product by one of the following:

1) Advanced Building Products Inc.
2) Keene Building Products.
3) Wire-Bond.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Basis-of-Design Product: Mortar Net Solutions; Mortar Net with Insect Barrier or comparable product by one of the following:

a. Advanced Building Products Inc.
b. Heckmann Building Products, Inc.
c. Wire-Bond.

2.9 MASONRY CLEANERS

A. Refer to Spec Section 040110 “Masonry Cleaning”

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. Mixing: Use mechanical batch mixer and comply with referenced ASTM standards.

C. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.

1. Limit cementitious materials to lime and portland cement.
2. Masonry below grade and in contact with earth: Type M
3. Reinforced masonry: Type S.
4. Applications as follows: Type N.
a. Locations for which another mortar type has not been specifically indicated.

D. Grout: ASTM C 476; provide consistency required at time of placement to fill completely all spaces indicated to be grouted.

1. Use fine grout in spaces less than 2 inches in least horizontal dimension.

2. Use coarse grout in spaces 2 inches or more in least horizontal dimension.

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. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

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.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2

3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet 1/4 inch in 20 feet or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet 3/8 inch in 20 feet or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch 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, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch 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. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond as indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. 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.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Through Penetration Firestopping Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay brick as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural clay tile as follows:

1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- thick joints.

D. Set firebox brick in full bed of refractory mortar with full head joints. Form joints by buttering both surfaces of adjoining brick and sliding it into place. Make joints just wide enough to accommodate variations in size of brick, approximately 1/8 inch Tool joints smooth on surfaces exposed to fire or smoke.

E. Install clay flue liners to comply with ASTM C 1283. Install flue liners ahead of surrounding masonry. Set clay flue liners in full bed of refractory mortar 1/16 to 1/8 inch thick. Strike joints flush on inside of flue to provide smooth surface. Maintain expansion space between flue liner and surrounding masonry except where surrounding masonry is required to provide lateral support for flue liners.

F. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4. Rake out mortar joints for pointing with sealant.

G. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

H. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

I. Cut joints flush where indicated to receive cavity wall insulation and vapor barriers unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors through sheathing to wall framing with metal fasteners of type indicated in Part 2. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 24 inches o.c. vertically and 16 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 8 inches of openings and at intervals, not exceeding 8 inches around perimeter.

B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 MASONRY-CELL FILL

A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

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 flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch 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 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Steel Lintels:
1. Install steel lintels where indicated on structural drawings.

B. Concealed Brick Lintel System:
1. Install Concealed Arched Spline Lintel System by Hohmann & Bardard where indicated on structural drawings. Hot-Dipped Galvanized or Stainless Steel.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, 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 masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches with upper edge tucked under

vapor barrier lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

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/cavity vent 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 o.c. unless otherwise indicated.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for [mortar air content] [and] [compressive strength].

Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match 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.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.14 MASONRY WASTE DISPOSAL

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

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042113

SECTION 042200 – CONCRETE UNIT MASONRY

PART 1- GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Concrete masonry units.
2. Mortar and grout.
3. Reinforcing steel.
4. Control joint materials.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Miscellaneous masonry accessories.

B. Related Sections:

1. Division 7 Section: "Flashing and sheet metal"
2. Division 7 Section: "Joint sealants"

1.2 REFERENCES

A. TMS 602/ACI 530.1/ASCE 6 Specification for Masonry Structures

1.3 SYSTEM DESCRIPTION

A. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than 2000 psi f'm.

1.4 SUBMITTALS

A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements.

B. Mix design and test reports for pre-blended mortar indicating types and proportions of materials according to proportion specification of ASTM C270.

C. Mix design and test reports for conventional grout indicating types and proportions of materials according to proportion requirements of ASTM C476.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing.

1. Owner will select a qualified independent testing agency to perform preconstruction testing indicated below.
2. The compressive strength of masonry shall be determined based on strength of the unit and type of mortar.
3. Concrete Masonry Units: Test per ASTM C140.
4. Sample Panels: Construct a panel for representation of completed masonry, joint tooling, design details, and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means which will prevent mechanical damage and deterioration due to moisture, temperature changes, and contamination by other materials.

1. Provide protection which will limit moisture absorption of concrete masonry units to the maximum percentage specified for Type I units at a relative humidity which is normal for the project site.

B. Protect cementitious materials from precipitation and absorption of ground moisture.

C. Store masonry accessories to prevent corrosion, dirt accumulation, and other deterioration.

1.7 FIELD CONDITIONS

A. Construction Protection: Cover tops of incomplete masonry elements with waterproof sheet material at end of each work day and when masonry work is not under way.

1. Secure weather protection in place with weights or by use of temporary fasteners.
2. Immediately remove mortar, soil, and other such materials from exposed masonry faces to prevent staining.

B. Loading Protection: Do not apply uniform floor or roof loads for at least 12 hours, or concentrated loads for at least 3 days, after completion of masonry elements.

C. Cold-weather procedures when ambient temperature falls below 40°F or the temperature of masonry units is below 40°F:

1. Wet or frozen units shall not be laid.
2. Implement cold weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 C.

D. Hot-weather procedures when ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:

1. Implement hot weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 D.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: ASTM C90, and as follows:

1. Weight Classification: Medium weight unless otherwise indicated.
2. Type I: Moisture controlled units.
3. Size: Standard units with nominal face dimensions of 16 inches long and 8 inches high (15-5/8 by 7-5/8 actual), with nominal thicknesses as indicated on drawings.
4. Exposed faces: Manufacturer’s standard color and texture, except where special finish is indicated on the drawings.

B. Special shapes: Provide special block types where required for corners, control joints, headers, lintels, and other special conditions, whether or not specifically indicated on the drawings as special.

C. Outside corners: Square-edged units except where otherwise indicated.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150 Type 1.

1. Type III may be substituted during cold-weather construction.
2. Provide Portland cement of color required to produce approved mortar sample.

B. Hydrated Lime: ASTM C207, Type S.

C. Aggregate for Mortar: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Pigments for Colored Mortar: Iron oxides and chromium oxides with demonstrated record of satisfactory performance in mortar mixes.

F. Provide grout with a slump of 8 to 11 inches per TMS 602/ACI 530.1/ASCE 6 Article 2.6 B.

G. Water: Potable.

H. Accelerating Admixtures: Nonchloride type for cold weather mortar mixes, in proportion recommended by manufacturer.

I. Air-entraining Admixtures: Not permitted.

2.3 REINFORCEMENT AND METAL ACCESSORIES

A. Steel Reinforcing Bars: ASTM A615.

B. Masonry Joint Reinforcement: ASTM A951 welded-wire units prefabricated into straight lengths of not less than 10 feet, with deformed continuous side rods and plain cross rods.

1. Width: Approximately two inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.
2. Wire sizes:
   a. Side rod diameter: 0.1875 inch.
   b. Cross rod diameter: 0.1483 inch.
3. Configuration:
   a. Applications of single unit width: Truss design, diagonal cross rods at not more than 16 inches on center.
   b. Corners: Prefabricated L- and T-shaped units.

C. Anchors, ties, and accessories:

1. Plate and bent-bar anchors: ASTM A36.
2. Sheet-metal anchors and ties: ASTM A1008.
3. Wire mesh ties: ASTM A185.
4. Wire ties and anchors: ASTM A82.
5. Headed anchor bolts: ASTM A307, Grade A.

D. Coatings for corrosion protection. Unless otherwise required, protect carbon steel joint reinforcement, ties, and anchors from corrosion by galvanizing or epoxy coating in conformance with the following minimums:

1. Mill galvanized coatings:
   a. Joint reinforcement: ASTM A641 (0.1 oz/ft2)
   b. Sheet metal anchors and ties: ASTM A653 Coating Designation G60.

2. Hot-dipped galvanized coatings:
   a. Joint reinforcement, wire ties, and wire anchors: ASTM A153 (1.50 oz/ft2).
   b. Sheet metal anchors and ties: ASTM A153 Class B.

2.4 MISCELLANEOUS MASONRY ACCESSORIES

A. Rubber Preformed Control-Joint Gaskets: per ASTM D2000, Designation M2AA-805.

B. PVC Preformed Control-Joint Gaskets: per ASTM D2287, Type PVC 654-4.

C. Bond Breaker Strips: ASTM D 226, Type I; No. 15 asphalt felt.

D. Sealant and Backer Rod: As specified in Division 7

2.5 MORTAR AND GROUT MIXES

A. General: Do not use admixtures unless indicated as acceptable in the contract documents.

1. Do not use calcium chloride in mortar or grout mixture.

B. Mixing: Use mechanical batch mixer and comply with referenced ASTM standards.

C. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
1. Limit cementitious materials to lime and Portland cement.
2. Masonry below grade and in contact with earth: Type M.
3. Reinforced masonry and exterior above grade walls: Type S.
4. Applications as follows: Type N.
   a. Interior walls.
   b. Locations for which another mortar type has not been specifically indicated.

D. Grout: ASTM C 476; provide consistency required at time of placement to fill completely all spaces indicated to be grouted. Grout shall be either fine or coarse depending on space to be grouted. Minimum grout strength shall be 2500 psi at 28 days as measured by ASTM C1019 “Standard Method of Sampling and Testing Grout.” Slump shall be a minimum of 8-inches as measured by slump cone test. Higher slump shall be provided for masonry units with high IRA (initial rate of absorption) and smaller grout spaces.

PART 3 - EXECUTION

3.3 PREPARATION

A. Clean reinforcement and shanks of anchor bolts by removing mud, oil, or other materials that will adversely affect bond to mortar or grout.

B. Reinforcement with rust and/or mill scale is acceptable provided attributes of a cleaned sample are in accordance with the applicable ASTM specification.

C. Prior to laying masonry, remove laitance, loose aggregate, and any other material that would prevent mortar from bonding to the foundation.

D. Do not wet units prior to laying.

E. Cut units as required to fit; use motor-driven masonry saw. Install cut units with cut surfaces concealed as much as possible.

3.4 INSTALLATION

A. Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.

B. Mix units from several pallets or cubes as they are placed.

C. Comply with construction tolerances in TMS 602/ACI 530.1/ASCE 6, Article 3.3F.

D. Construct grout spaces free of mortar dropping, debris, and any material deleterious to grouting.

E. All masonry shall be laid true, level, plumb, and in accordance with the drawings.

F. Ensure all vertical cells to be grouted are aligned and unobstructed openings for grout are provided.

G. Masonry shall be laid in running bond unless otherwise indicated in the drawings.

H. Brace masonry during construction to assure stability. Design, provide, and install bracing.

3.5 MORTAR BEDDING AND JOINTING

A. Place mortar in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.3 B.

B. Initial bed joint shall not be less than 1/4 inch nor more than 3/4 inch.

C. All head and bed joints, except as in 3.4 B., shall be a nominal 3/8 in. thick, unless otherwise required.

D. Lay hollow units with head and bed joints filled with mortar for the thickness of the face shell.

E. Remove mortar protrusions extending 1/2 in. or more into cells to be grouted.

F. Fully mortar webs in all courses of piers, columns and pilasters, in the starting course on foundations, and when necessary to confine grout.

G. All mortar joints on exposed walls shall be concave, unless otherwise indicated, and struck to produce a dense, slightly concave surface well bonded to the surface of the masonry unit.

H. Remove and re-lay in fresh mortar any unit that has been disturbed to the extent the initial bond is broken.

I. Unless other conditions are specifically detailed, solidly grout cores for at least 24 inches below bearing plates, lintels, and similar features and conditions.

3.6 EMBEDDED ITEMS AND ACCESSORIES

A. Construct control joints as detailed in the drawings as masonry progresses.

1. Install preformed control-joint gaskets designed to fit standard block.

B. Construct chases as masonry units are laid.

C. Install pipes and conduits passing horizontally through masonry as indicated.

D. Install steel lintels at all openings.

1. Bearing: Provide not less than 8 inches of bearing at each jamb. Grout cells solid under bearing for full height of opening (16 inches wide).
2. Reinforcement: At masonry openings greater than one foot in width, install horizontal joint reinforcement immediately below sill. Except at control joints, install opening reinforcement to extend not less than 24 inches beyond jamb on each side.

E. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories as required.

3.7 REINFORCING STEEL, WALL TIES, AND ANCHORS

A. Install reinforcing steel, wall ties, and anchors in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4

B. Place reinforcement as detailed on the drawings.

1. Support and fasten reinforcement at intervals not exceed 72" to prevent displacement beyond specified tolerances during construction and grouting operations.
2. Maintain clear distances between reinforcement and any interior face of masonry unit or formed surface, but not less than 1/4 in. for fine grout, or 1/2 in. for coarse grout.
3. Completely embed reinforcing bars in grout.
4. Provide lapped splices of 48 bar diameters minimum. Provide lap-joint tie for each splice
5. Embed joint reinforcement with minimum 5/8 inch cover to faces exposed to weather or earth, and 1/2 inch elsewhere.
6. Provide minimum 12-in. lap splices and ensure that all ends of longitudinal wires are embedded in mortar at laps.
7. Foundation dowels that interfere with unit webs are permitted to be bent to a maximum of 1 in. horizontally for every 6 in. of vertical height.

C. Install wall ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 C. Anchor masonry to structural framework at points of adjacency, and as follows:

1. Maintain open space of 1 inch or more between face of framing member and masonry elements or as shown on the drawings.
2. Fasten anchors to structure and embed in mortar joints as masonry is laid.

3. Space anchors at maximum of 24 inches on center horizontally and 24 inches on center vertically.

3.8 GROUTING

A. Comply with grout placement requirements in TMS 602/ACI 530.1/ASCE 6 Article 3.5.

B. Place grout within 11/2 hr from introducing water in the mixture and prior to initial set.

C. Grout pour height: do not exceed maximum grout pour height as given in TMS 602/ACI 530.1/ASCE 6 Table 7, or as otherwise specified.

D. Grout lift height: Place grout in lifts not to exceed 60 inches.

E. Grout consolidation: Consolidate grout pours by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

3.9 CONCEALED MASONRY FLASHING

A. General: Install flashing at all conditions such as lintels and shelf angles, where the downward flow of water within the masonry will be interrupted, so that such water will be diverted to the exterior. Extend flashing full width at such obstructions and at least 4 inches into adjoining masonry and turn up to form watertight pan or provide pre-fabricated end dam. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.

1. Extend metal flashings through exterior face of masonry and turn down to form drip.
2. Extend fabric or laminated flashings to within 1/4 inch of exterior face of masonry.

B. Head and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.

C. Sealing: Seal all joints in flashing to assure watertight integrity.

1. Lap end joints on non-deformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.
2. Lap end joints of flexible flashings at least 4 inches; seal in accordance with manufacturer's instructions.

D. Weep Holes: Provide weep holes in head joints of the first course of masonry immediately above concealed flashings. Space at intervals of 24 inches on center.

E. Reglets and Other Accessories: Install to receive flashing where indicated.

3.10 PARGING

A. Mortar: Parge in two coats, using Type S or Type N mortar, to total thickness of not less than 1/2 inch.

B. Finishing: Trowel to dense, hard surface.

C. Curing: Damp-cure for at least 24 hours.

3.11 FIELD QUALITY CONTROL

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

B. Testing agency will report inspection results promptly and in writing to Contractor and Architect

C. Remove and replace work that does not comply with specified requirements.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.12 POINTING AND CLEANING

A. Point and tool holes in mortar joints to produce a uniform, tight joint.

B. During construction, minimize any mortar or grout stains on the wall. Immediately remove any staining or soiling that occurs.

1. For precision or textured units, except as noted below, clean masonry by dry brushing before tooling joints.
2. For burnished, glazed, or pre-finished concrete masonry units, immediately remove any green mortar smears or soiling with a damp sponge.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry surfaces of stains, efflorescence, mortar or grout droppings, and debris.

1. Use appropriate masonry cleaner as tested on a sample panel, strictly following manufacturer's recommendations.
2. Do not use acid based cleaning solutions.

D. At completion of masonry work, remove all scaffolding and equipment used during construction, and remove all debris, refuse, and surplus masonry material from the site.

E. Sprayed-on water repellent shall be applied after masonry units are cleaned and thoroughly dry in strict accordance with manufacturer's instructions.

END OF SECTION 042200

SECTION 047200 – CAST STONE MASONRY

PART 1 - GENERAL

1.1. SECTION INCLUDES - Architectural Cast Stone.

A. Scope - All labor, materials and equipment to provide the Cast Stone shown on architectural drawings and as described in this specification.

1. Manufacturer shall furnish Cast Stone covered by this specification.
2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal (optional) the Cast Stone as required.

1.2. RELATED SECTIONS

A. Section – 042113 Brick Masonry

B. Section – 042200 Concrete Unit Masonry

C. Section – 079200 – Joint Sealants

1.3. REFERENCES

A. ACI 318 – Building Code Requirements for Reinforced Concrete.

B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.

D. ASTM C 33 – Standard Specification for Concrete Aggregates.

E. ASTM C 150 - Standard Specification for Portland Cement.

F. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.

G. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units

H. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.

I. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

J. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.

K. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.

L. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.

M. ASTM C 1364 - Standard Specification for Architectural Cast Stone.

N. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

O. Cast Stone Institute Technical Manual (Current Edition)

1.4. DEFINITIONS

A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.

1. Dry Cast Concrete Products – manufactured from zero slump concrete.
   a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.
   b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

1.5. SUBMITTAL PROCEDURES

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.

C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.

D. Custom Package Shop Drawings: Submit manufacturer's shop drawings including profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of components, and their locations in project as indicated on the drawings.

E. Standard Package Shop Tickets: Submit manufacturer's shop tickets including profiles, cross sections, modular unit lengths, reinforcement, exposed faces, and annotation of components proposed for use in project according to cross sections as indicated on the drawings.

F. *Signature Series* ™Package Catalog Cuts: Submit manufacturer's catalog cuts showing page and part numbers of units proposed for use in project.

1.6. QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
2. Manufacturer shall submit a written list of projects similar in scope and at least five (5) years of age, along with owner, architect and contractor references.

B. Standards: Comply with the requirements of the Cast Stone Institute Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

C. Mock-ups: Provide mock-ups of locations listed in architectural drawings. Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

PART 2 - PRODUCTS

2.1. MANUFACTURER

A. Basis of design Manufacturer: Corinthian Cast Stone Inc. 115 Wyandanch Ave, Wyandanch NY 11798. Phone 860-355-4905 Fax 860-633-0099 E-Mail lbohjalian@consolidatedbrick.com Web – www.CorinthianCastStone.com

2.2. ARCHITECTURAL CAST STONE

A. Comply with ASTM C 1364

B. Physical properties: Provide the following:

1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
2. Absorption - ASTM C 1195: 6% maximum by the cold water method.
3. Air entrainment is not required for VDT products.
4. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.

C. Job site testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m 3) delivered to the job site.

1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.3. RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.

B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.

C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures- Comply with the following:

1. ASTM C 260 for air-entraining admixtures.
2. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
3. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

F. Water – Potable

G. Reinforcing bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless-steel Type 302 or 304.

2.4. COLOR AND FINISH

A. Match sample on file in architect's office – match existing

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 $in.^2$ and not obvious under direct daylight illumination at a 5 ft distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.

1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
   a. Total color difference – not greater than 6 units.
   b. Total hue difference – not greater than 2 units.

D. Minor chipping resulting from shipment and delivery is not grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.

E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.5. REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross-section area.

C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.

2.6. CURING

A. Cure units in a warm curing chamber approximately 100ºF at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70ºF for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F or 5 days @ 70°F) prior to shipping. Form cured

units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.7. MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than ±1/8 in. from approved dimensions.

B. Length of units shall not deviate by more than length/ 360 or ±1/8 in., whichever is greater, not to exceed ±1/4 in..

1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp bow or twist of units shall not exceed length/ 360 or ±1/8 in. (3 mm), whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. maximum deviation.

2.8. PRODUCTION QUALITY CONTROL

A. Testing.

1. Test compressive strength and absorption from specimens selected at random from plant production.
2. Samples shall be taken and tested from every 500 cubic feet of product produced.
3. Perform tests in accordance ASTM C 1194 and C 1195.
4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.9. DELIVERY, STORAGE AND HANDLING

A. Mark production units with the identification marks as shown on the shop drawings.

B. Package units and protect them from staining or damage during shipping and storage.

C. Provide an itemized list of products to support the bill of lading.

PART 3 EXECUTION

3.1. EXAMINATION

A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units. Notify Architect if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2. SETTING TOLERANCES

A. Installation Tolerances: Comply with requirements of Cast Stone Institute Technical Manual.

1. Variation from Plumb: Do not exceed 1/8 inch in 5 feet 1/4 inch in 20 feet or more.
2. Variation from Level: Do not exceed 1/8 inch in 5 feet 1/4 inch in 20 feet, or 3/8 inch

maximum.

3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch or 1/4 of nominal joint width, whichever is greater.
4. Variation in Plane Between Adjacent Surfaces: Do not exceed 1/8-inch difference between planes of adjacent components or adjacent surfaces indicated to be flush with components.

3.3. JOINTING

A. Joint size:

1. At stone/brick joints 3/8 in.
2. At stone/stone joints in vertical position 1/4 in. (3/8 in.).
3. Stone/stone joints exposed on top 3/8 in.

B. Joint materials:

1. Mortar, Type N, ASTM C 270.
2. Use a full bed of mortar at all bed joints.
3. Flush vertical joints full width mortar.
4. Leave all joints with exposed tops or under relieving angles open for sealant.
5. Leave head joints in copings and projecting components open for sealant.

C. Location of joints:

1. As shown on shop drawings.
2. At control and expansion joints unless otherwise shown.

3.4. SETTING

A. Drench Cast Stone components with clear, running water immediately before installation.

B. Do not use pry bars or other equipment in a manner that could damage Cast Stone components.

C. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

D. Set Cast Stone components in a full bed of mortar, unless otherwise indicated on the drawings.

E. Fill vertical joints with mortar.

F. Make joints 3/8 inch, unless otherwise indicated on the drawings.

G. Leave head joints in copings and similar components open for sealant.

H. Rake mortar joints 3/4 inch for pointing. Sponge face of each stone to remove excess mortar.

I. Tuck point joints to a slight concave profile.

3.5. JOINT PROTECTION

A. Comply with requirements of Section 07 92 00.

B. Prime end of units, insert properly sized backing rod and install required sealant.

3.6. REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7. INSPECTION AND ACCEPTANCE

A. Inspect finished installation according to Bulletin #36.

B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

3.8 WATER REPELLANT

A. Apply silane or siloxane water repellant for weatherproofing Cast Stone in accordance with manufacturer's instructions.

B. Apply water repellant after pointing, patching, cleaning, and inspection are completed

END OF SECTION 047200