

SECTION 04520
MASONRY RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Provide all masonry restoration Work as indicated on the Drawings and as specified herein.
- B. Replacement of parapet, chimney, or full depth walls is described in Section 04200.
- C. The work of this section (except for removal of masonry) shall not take place until all paint (as designated by the Authority) has been removed in accordance with Section 02085 - Exterior Paint Removal.

1.02 RELATED SECTIONS

- A. Unit Masonry..... Section 04200
- B. Terra Cotta Repair Work..... Section 04251
- C. Exterior Cut Stone..... Section 04420
- D. Stone Repair Work..... Section 04421
- E. Cast Stone..... Section 04435
- F. Joint Sealers..... Section 07900

1.03 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society for Testing and Materials (ASTM)
 - A240 Standard Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

- A580 Standard Specification for Stainless and Heat-Resisting Steel Wire.
- C67 Standard Methods of Sampling and Testing Brick and Structural Clay Tile.
- C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 MM Cube Specimens).
- C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
- C144 Standard Specification for Aggregate for Masonry Mortar.
- C150 Standard Specification for Portland Cement.
- C207 Standard Specification for Hydrated Lime for Masonry Purposes.
- C270 Standard Specification for Mortar for Unit Masonry.
- C404 Standard Specification for Aggregates for Masonry Grout.
- C476 Standard Specification for Grout for *Reinforced* and Nonreinforced Masonry.
- C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- C979 Standard Specification for Pigments for Integrally Colored Concrete.

B. Brick Industry of America (BIA): BIA Technical Notes

1.04 **SUBMITTALS**

A. Product Data

1. Portland Cement: Brand and manufacturer's name.
2. Lime: Brand and manufacturer's name.
3. Mortar Pigments: Brand and manufacturer's name.

4. Packaged Products: Manufacturer's specifications and application instructions.
5. Sand: Location of pit, name of owner, and previous test data.
6. Masonry reinforcement, anchors and helical masonry ties.

B. Shop Drawings

If bracing/shoring of the masonry is required, submit stability drawings and calculations prepared, signed and sealed by a New York State Professional Engineer or Registered Architect.

C. Samples

Deliver to the Site for comparison with existing masonry.

1. Mortar for Exposed Joints and Cracks: Each required type, minimum 12" long by full thickness, showing finish and color.
2. Masonry Units: Each required type, full size, showing finish and full color range. Remove one unit of each existing type in order to allow for full size comparison.
3. Masonry reinforcement, anchors and helical masonry ties.

D. Quality Control Submittals

1. Schedule of Uses: By mortar type.
2. Certificates
 - a. Furnish notarized Building Department affidavit from masonry manufacturer (Form 10H) stating materials delivered to project comply with the Specification requirements.
 - b. Furnish notarized Building Department affidavit from masonry supplier (Form 10J) stating materials delivered to project comply with the Specification requirements.

- c. Provide a letter signed and sealed by a New York State Professional Engineer or Registered Architect describing the Contractor's "Method of Operation" for removal and installation of masonry, and stating whether bracing/shoring for structural stability is required or not required. Provide calculations, if requested.
3. Tests
 - a. Provide test reports on masonry units utilized showing conformance to specification requirements. Reports shall be dated within two years of project.
 - b. Provide test results prepared by the helical masonry tie manufacturer's Company Field Representative (CFR) for the helical masonry tie pull out tests with recommendations.
 4. Contractor Qualifications: Provide proof of manufacturer and installer qualifications specified under "Quality Assurance".
 5. Mock-up: Provide mock-ups as indicated under Quality Assurance.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Company specializing in the Work of this Section shall have a minimum of three years experience and at least three successful projects with similar quantity of materials.
2. Technicians performing the work must pass the mock-up test indicated in Paragraph D.3 below.

B. Regulatory Requirements

Building Code: Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

C. Certification

Masonry construction shall conform to the material acceptance, certification and inspection requirements of Section BC 1701 of the 2014 NYC Building Code.

D. Mock-ups

1. Prior to performing the Work of this Section, prepare at the job site sample panels of not less than 12 sq ft for each type of masonry restoration Work required, including cutting of joints prior to and after pointing. Sample panels shall be at locations indicated on the Drawings or where directed by the Authority's Representative. Inconspicuous locations will be chosen, except where it is necessary to choose other locations to be representative of brick color, joint size, mortar color, and other aspects of masonry appearance.
2. Clean masonry and mortar of the mock-up area and surrounding area to expose the true color of the masonry prior to preparing sample panels. Cleaning materials shall not damage masonry surface. Do not proceed further with the Work until the sample panel has been approved by the Authority's Representative. Approved samples will be used as quality standards for the Work. Maintain approved samples at the Site until the Work is completed. Once the panel is approved, do not change materials or proportions of mortar mixes unless approved by the Architect or Engineer of Record. Sample panels may be a portion of existing masonry that is to be restored, at a location directed by the Authority's Representative.
3. All technicians performing masonry removal and joint cutting must successfully complete five linear feet of cutting and raking of mortar joints in the presence of the Authority's representative. Unsuccessful performance of this test is grounds for the rejection of the technician for this project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaged Products

1. Deliver materials to the site in manufacturer's original, sealed containers. Do not deliver materials that have exceeded shelf life limitation set forth by the manufacturer. Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable). This includes individual bags of pre-bagged mortar mixes.
2. Comply with manufacturer's printed instructions for storing and protecting materials.

B. Bulk Aggregate

Store in a manner which will keep aggregate clean and protected from the weather elements.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Construction Requirements

1. Per Section BC 2104.3, cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F or the temperature of masonry units is below 40°F.
2. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.

C. Hot Weather Construction Requirements

Per the requirements of Section BC 2104.4, hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when temperatures exceed 100°F, or 90°F with a wind velocity greater than 8 mph.

C. Wetting of Clay Masonry Units

Provide prewetting of masonry for units with initial rates of absorption that require their wetting before laying (21.42 grams per 30 square inches or 0.025 ounce psi).

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

A. Reinforcement and Ties

1. Hohmann & Barnard, Inc., Hauppauge, N.Y.
2. Dur-O-Wall, Arlington Heights, IL.
3. Helifix North America Corporation (Rep.: Patrick Sweeney, 888 992-9989)
4. Blok-Lok Ltd. (Rep.: Scott Burns, 800 561-3026),

B. Mortar Coloring

1. "SGS" Mortar Colors, Solomon Grind-Chem Services, Inc.
2. "True Tone Mortar Colors", Davis Colors, Rockwood Industries, Inc.
3. "Flamingo Colors ", The Riverton Corporation.

C. Masonry Cleaner

1. ProSoCo, Inc., South Plainfield, N.J.
2. Sure-Kleen

D. Restoration Mortar

1. Cathedral Stone Products
2. Conproco
3. Edison Coatings, Inc.

2.02 FACE BRICK MANUFACTURERS/DISTRIBUTORS

- A. Consolidated Brick and Building Supplies Inc., New York, NY
- B. Glen-Gery Corporation, New York, NY

If the Contractor cannot obtain a brick match deemed to be acceptable by the AOR, the Contractor is to obtain a custom brick match from:

C. Stone Art Inc., 295B California Ave. Church Hill, TN
37642

2.03 MATERIALS

A. Base Materials

1. Portland Cement: Type I ASTM C150
2. Sand for Mortar Mix ASTM C144
Sand shall be natural sand matching the gradation and color of the existing mortar aggregate.
3. Hydrated Lime ASTM C207
Type "S"
4. Water: Shall be clean potable water free of injurious foreign matter conforming to the requirements of Section BC 1903.4.
5. Mortar Coloring: Provide pure mineral pigments, natural and synthetic iron oxides, and chromium oxides compounded for use in mortar mixes. Material shall conform to ASTM C979. Coloring shall not contain alkalyde salts. No liquid colorants shall be permitted.
6. Premixed sand and lime for mortar mixes is not permitted. The use of batched material by Spec-Mix and factory-packaged cement-lime-pigment by major mortar manufacturers is permitted. Each individual bag of material shall have the manufacturer's label identifying the mortar type.
7. No air-entraining admixtures or material containing such shall be permitted in the mortar. Also, no anti-freeze compounds, calcium chloride, or other compounds, unless expressly permitted otherwise, shall be permitted in the mortar.

B. Masonry Units

1. Match existing units in type, grade, size, appearance, texture, and color unless otherwise indicated. Provide multiple types, sizes, and colors of brick to match existing brick patterns.
2. In addition to 1. above, brick shall be clay or shale, ASTM C216, grade SW, solid. Brick shall be tested for efflorescence in accordance with ASTM Test Methods C67 and the rating shall be "Not Effloresced".
3. Lip brick are to be factory manufactured only. Do not use field cut lip brick.
4. Use 100% solid brick over exterior relieving angles/lintels or other brick projections on exterior face of building. (Use of solid brick with cores is acceptable if cores are filled solid with mortar and the cores are not visible to view.)

C. Accessories:

1. Material

a. Reinforcement and anchors

- 1) Stainless Steel: 18-8, type 304
- 2) Sheet Steel: (No. 2B finish), cold-rolled, annealed, ASTM A240.
- 3) Wire Steel: ASTM A580

b. Manufactured Units: All manufactured units shall be as follows:

- 1) LOX-ALL #120 Truss-Mesh, 9 gage, of proper width for the wall thickness.
- 2) Veneer Anchor: DW-10HS Manufacturers Hohmann & Barnard or approved equal. Stainless steel Type 304, ASTM A580.
- 3) Vee Tie: Stainless steel, masonry wire ties. Manufacturer - Hohmann & Barnard or approved equal.

- 4) Anchors: Manufacturers - Rawlplug; RKL. 1/4" diameter, 2" long flat head stainless steel Zamac Nailing Fastener by Rawlplug Company Inc. of approved equal.
 - 5) Wire: Stainless steel continuous wire by Hohmann & Barnard or approved equal.
 - 6) If the actual space between wythes of solid masonry limits the use of a particular anchor, notify the Engineer of Record for an acceptable alternate anchor.
 - 7) Seismicclips: #187 by Hohmann & Barnard or approved equal.
- c. Electrode for Welding to Stainless Steel to carbon steel: E309-16. Keep electrode dry. Oven dry electrode after exposing it for more than 6 hours.
 - d. Mortar mesh: "Mortar Net" high density polyethylene or nylon, full width of cavity, with stepped top to catch mortar droppings.
- D. Helical Masonry Ties for Stabilization of Existing Masonry Walls:
1. Ties shall be fabricated from round stock stainless steel, Type 304, subject to the requirements specified herein. Tie diameters available: 8mm, 10mm. Sizes, type and length of ties shall be as recommended by the helical tie manufacturer's Company Field Representative (CFR) based on pull out load tests performed at the site and field conditions. A minimum 10mm diameter ties shall be used for cinder block.
 2. Where necessary, as in ties installed through mortar joints into concrete backup, provide asymmetric helical ties.
- E. Masonry Repair Mortar:
1. Material shall be capable of filling the holes created due to the installation of the helical masonry ties in bricks. Material shall match properties of the existing natural material, be

freeze-thaw resistant and shall be color to match the existing bricks.

2. Masonry repair mortar for bricks shall be Jahn Repair Mortar M100 as manufactured by Cathedral Stone Products, Matrix by Conprocco, or Custom Series 45 as manufactured by Edison Coatings, Inc.

2.04 MIXES

A. Mortar Types

1. All Mortar:
 - a. Comply with ASTM C270 and BIA-M1-88.
 - b. Provide Type I Portland cement. Masonry cement shall not be used as a substitute.
 - c. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range of the mortar, which should generally be near the minimum strength of the next higher strength mortar.
 - d. The maximum strength of each mortar shall generally not exceed the minimum strength of the next higher strength mortar type. The preconstruction testing will determine the general range of strengths to be found and may end up higher than the threshold above.
 - e. Air content of mortar shall be less than 12%.
2. Rebuilding/Setting Mortar; Type N: 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.
3. Repointing Mortar: Comply with ASTM C 270, X3 Tuck Pointing Mortar.
 - a. Brick: (Type O) 1 part Portland cement, 2 parts lime, 7 parts dry sand. Minimum compressive strength shall be 350 psi.
 - b. Stone: (Type N) 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.

- c. Terra Cotta: (Type N) 1 part white Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.

B. Mortar Color

For exposed mortar, select materials (complying with the requirements) and proportion pigments with other ingredients as necessary to match the color and texture of existing corresponding materials. White Portland cement and colored aggregates similar to the existing may be used as required to accomplish the matching of mortar color desired.

2.05 SOURCE QUALITY CONTROL

- A. The Authority will assign a Special Inspector who will inspect the masonry construction under the requirements of Section BC 1704.5.

B. Preconstruction Testing

1. Preconstruction testing of mortar properties will be done in accordance with ASTM C780. The Contractor shall assist the Authority's laboratory by any means necessary and shall provide the mock-up prior to beginning the installation work to allow for adjustments of the mix if necessary. Do not proceed with masonry work until the preconstruction testing is completed. Contractor shall mix mortar as it intends for the actual construction.
2. Compressive strength tests of field mixed mortar and factory batched/prepackaged mortar are to be done during construction of the mock-up, or earlier if desired by the Contractor, to provide a benchmark for the strength based on actual field conditions and proportioning of the mortar. If mortar strengths are too high or too low, proportions and material source may be required to be modified if directed by the Architect or Engineer of Record.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine all adjoining Work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Authority any conditions that prevent the performance of this Work.

3.02 PREPARATION AND PROTECTION

A. Protection

1. Protect adjacent surfaces not being restored. Protect sills, ledges, and projections from material droppings. Also protect any painted surfaces that are not included in the Work from impact or damage.
2. Cover top of masonry wall with waterproof plastic membrane at the end of the work period and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.
3. During cold weather, do not use wet masonry units and frozen masonry units.
4. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.
5. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.
6. Brace walls as needed until sufficiently set, or until intersecting walls provide lateral support.
7. Scaffolding shall not be supported from a parapet wall on which work is being performed.
8. Work on the exterior face of a parapet wall shall not be done concurrently with work on the interior face of the parapet wall.

B. Surface Preparation

1. Prepare surfaces to be restored in compliance with product manufacturer's printed instructions and as specified.

2. Remove dirt, dust, and foreign material from surfaces to be restored.
3. Clean areas to be restored with compressed air or water flushing, except as otherwise recommended by the mortar manufacturer.

C. Material Preparation

1. Do not further wet concrete masonry units and stone that are already wet.
2. Wet bricks that have a high initial absorption rate (greater than 20 g/min). Wet bricks until water runs off. Install bricks when surface is slightly damp.
3. Prepare exposed mortar to match the color and appearance of existing adjoining mortar.

3.03 MIXING PROCEDURE FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, use a container to measure ingredients. Do not measure by shovel.

B. Rebuilding/Setting Mortar

1. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.
2. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Use mortar within 2¹/₂ hours of its initial mixing; tempering is permitted only once and during the first hour only. Limit amount of mortar batched at one time to stay within these requirements.

C. Pointing Mortar

1. Add sufficient water to dry mix to produce a damp mix that will retain its shape when pressed into a ball by hand. Mix from 3 to 7 min. in a mechanical mixer.

2. Let mortar stand for not less than 1 hour nor more than 1½ hours for prehydration. Add sufficient water to bring mortar to proper consistency for tuck-pointing, somewhat drier than mortar used for laying units.
 3. Use mortar within 2½ hours of its initial mixing; tempering is permitted only once after bringing mortar to proper consistency. Limit amount of mortar batched at one time to stay within these requirements.
- D. For prepackaged masonry repair mortar, mix with water or manufacturer's polymer in proportions defined by manufacturer to provide the required consistency.

3.04 REPOINTING JOINTS

- A. The Contractor shall take all precautions required to ensure the original appearance of the building is maintained (not changed) and the existing brick is not damaged. The new mortar shall match the original in color & texture and the new joint shall match the existing joint tooling, size and profile. For joints that are set back from the brick face (raked joints), provide a sloping joint starting at the original depth at the top and sloping to the brick face at the bottom that will prevent water sitting on the brick while maintaining the intended shadow line.
- B. Rake or cut out joints to a minimum uniform depth of 3/4" and until sound surface is reached. Do not spall edges of masonry units or widen joints. Replace all brick damaged by such operations with new to match color, size, and texture.
1. Mortar Removal

Where cutting is required to remove existing mortar and joint filler, use a rotary power masonry saw wherever possible without damaging masonry. Masonry saw shall have a vacuum attachment to reduce dust. Use non-power tools for vertical brick joints or where rotary power masonry saw will damage joint.
 2. Cut the mortar and joint filler cleanly from the sides of the joints, leaving square corners. Flush joints clean with water or compressed air.

- C. Dampen joints slightly before application of mortar, making sure there is no free water. Pack pointing mortar tightly in joints in thin layers (1/4" max.), with each layer "thumbprint hard" before applying the next layer. Tool joints to match existing adjoining joints.
 - 1. Where joint sealant is required, backpack the joints tightly out to a uniform depth of 1/4", or as indicated on Drawings. Refer to Section 07900 for sealants. Apply bondbreaker tape prior to installing sealants.
- D. Cure mortar by maintaining in a damp condition for at least 72 hours.

3.05 REPLACING MASONRY UNITS

- A. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other supports as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain. Follow method of operation and/or bracing scheme required to be provided in Article 1.04 titled "Submittals".
- B. Remove the deteriorated and damaged masonry units to their full depth, including the surrounding joint mortar. Wet masonry to reduce dust. Install helical masonry ties at perimeter of replacement prior to removal as indicated in details on the Drawings. Wherever possible without damaging masonry, use a rotary power masonry saw for cutting Work. Masonry saw shall have a vacuum attachment to reduce dust. For SHPO designated/landmark buildings, removal of perimeter brick in the area designated for removal shall be done by first cutting the joint utilizing methods specified in Art. 3.04,B.,2. Leave square corners at adjoining masonry that is to remain. Clean joints and cavities by flushing with water or compressed air.
- C. Dampen contact surfaces slightly before application of mortar, making sure there is no free water. Install matching masonry units with Type N mortar. Install units to match and align with existing masonry. Maintain bonding and coursing pattern of existing masonry. Use presoaked wood wedges where necessary to properly set the units and maintain uniform matching joints. Backpack and

fill joints full of mortar. Finish joints to match existing adjoining joints as described in Art. 3.04-Repointing Joints. Fill open joints in backup. In solid masonry construction, ensure that entire collar joint is filled between the backup and the face masonry. Collar joint is likely to vary substantially, up to 3" in locations.

D. Install accessories as indicated on Drawings. In cavity wall construction provide mortar mesh directly on flashing, such as at base of wall, and at relieving angles and lintels, with flashing extending at least 6" above top of mortar mesh.

E. Area Face Brick Replacement

1. Single wythes of brick shall be replaced in 4 foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer as required to be submitted in the Article 1.04 titled "Submittals".

2. Install reinforcement every 16" each way and secure it to backup masonry as indicated on Drawings.

F. Replacement by Brick Stitching

Remove and replace existing brick to their full depth with new face brick, one brick each on both sides of crack in masonry. Also, remove and replace all existing pushed-out, missing, split or otherwise defective face bricks to match the adjoining existing good sound masonry. If the existing masonry work has a solid masonry common-bond pattern, existing sound header bricks shall remain. However, any cracked, defective or loose header brick shall be replaced. All new brick work shall be toothed into existing good work. At horizontal and diagonal cracks, the replacement of bricks shall be done in 4-foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer as required to be submitted in Article 1.04 titled "Submittals". Existing mortar bed for replaced brick shall be thoroughly removed and the back parged with a coat of new mortar to fill the collar joint.

3.06 STABILIZATION OF EXISTING MASONRY WALLS

A. The existing face masonry shall be stabilized to the backup material by means of helical masonry ties. The

installation and procedure shall be inspected by the Authority's Representative and the Company Field Representative to verify proper installation of the helical ties.

- B. Prior to start of the Work, the existing conditions shall be examined by a Company Field Representative (CFR) authorized in writing by the manufacturer of the helical ties (see Art. 2.01, Par. F.) The CFR shall instruct the Contractor in the installation of the ties. The CFR shall recommend the diameter, length, type, and spacing of ties and drill bits to be used at each location and masonry condition, based on tests described in paragraph C., below. The CFR shall submit this information in written or graphic form, through the Contractor, to the Authority for review and approval by the Architect or Engineer of Record.
- C. The design spacing of the ties shall typically be 16" vertically and 16" horizontally. Spacing shall be closer where required because of existing conditions, and where pull-out load tests show it to be necessary. Pull-out tests shall be performed at each masonry condition by the CFR prior to the start of the Work, and the results of the tests shall be submitted to the Authority. Separate pull-out tests shall be performed on the face masonry, mortar joints and on the backup material. For tie spacing of 16" x 16" a load of 300 lbs. shall be achieved for the face masonry and for the backup material separately, without failure by loss of resistance or slippage. Where a 500 lbs. test load is achieved for each material separately, it will be permissible to increase spacing of ties to 16" x 24".
- D. A pilot hole shall be drilled through the face masonry and into the backup material using a high-speed rotary percussion drill (Bosch model 1194VSR, or equivalent), 3-jaw chuck type. If acceptable pullout results are achieved through the mortar joints, this shall be the preferred method of installation of the ties rather than through the face masonry, particularly for SHPO eligible buildings. At certain conditions, as recommended by the CFR, the drill bit used for the face masonry shall be of different diameter than the bit used in the backup material. The helical tie shall be driven into position using an electric hammer drill with SDS type chuck and specialized insertion tool. The electric hammer drill with SDS type chuck shall not be used for drilling pilot holes in face masonry. The electric hammer drill with SDS type chuck shall only be used for drilling pilot

holes in backup material when recommended by the manufacturer such as in concrete.

- E. Each wall condition shall be examined by the Architect or Engineer of Record and the CFR to determine specific installation requirements. The following is presented as an example of a 10mm diameter tie in face brick with concrete block backup. The installation shall be performed in the following manner, subject to actual project conditions and modification by the CFR:
1. For use of 10 mm helical ties, drill an 8mm-entry\ hole through face brick using high speed rotary percussion drill. (Where location is a mortar joint, drill a 6.5mm hole near the approximate center point of the brick, not at T-joints or ends).
 2. Change bits and drill a 6.5mm entry hole through the concrete block backup to a minimum of 3 inches, using high-speed rotary percussion drill.
 3. Drive helical tie into place, recessed for final patching, using a setting tool mounted on an electric hammer drill with an SDS type chuck.

3.07 FIELD QUALITY CONTROL

- A. The Authority will assign under the requirements of Section BC 1704.5 a Special Inspector who will inspect the masonry construction. Post installed anchors are subject to Special Inspection as per Section BC 1704.32. If the masonry work is not designated for Special Inspection, the masonry work will be subject to Quality Control Inspection, with testing and inspection similar to that listed below for Special Inspection. Inspections performed by the Authority do not relieve the Contractor of its obligation to conform to all requirements specified in this Section.
- B. The Special Inspector will make inspections and any testing deemed necessary. Mortar suspected or tested to be too strong or too weak will be subject to petrographic analysis or other methods deemed necessary by the Engineer of Record and Special Inspector. The Contractor shall pay for all tests if they verify improper work. Inspections will include, but not be limited to, the following:

1. Proper installation of reinforcement of brick on angles.
 2. Proper depth of mortar cutting for pointing.
 3. Proper installation of mortar, including proportioning and mixing. Those mortar properties listed in the Appendix of ASTM C780 are to be tested at the discretion of the Special Inspector or the Architect/Engineer of Record. Mortar strengths, when tested, will be determined in accordance with ASTM C780 using cylinders.
 4. Proper installation of weeps, flashing, drip edges, mortar mesh, cleaning of cavity (if cavity wall construction), etc.
 5. At solid masonry construction, all bed, head, and collar joints are filled completely. For cavity wall construction, all bed and head joints are filled completely.
- C. The Architect or Engineer of Record will analyze any results not found to be in conformance with the applicable ASTM, industry practice, and the Specifications and determine if the masonry in question is to be removed and redone.
- D. Cooperate with the Special Inspector and the Testing Laboratory performing Special Inspection testing.
- E. The Contractor's engineer shall monitor the restoration procedure to ensure compliance with the "methods of operation" and to ensure safety of the structure.

3.08 PROTECTION AND CLEANING

- A. Protect face of adjacent walls and surfaces from water, mortar, and grout used for terra cotta installation.
- B. Remove excess mortar and mortar smears as work progresses.
- C. After mortar has cured (a minimum of 30 days), clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools or acids. Perform a mock-up of the cleaning procedure.

END OF SECTION

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Product Data:	_____	_____
1. Portland Cement Mfr & Brand		
2. Lime Mfr & brand		
3. Mortar Pigments Mfr & Brand		
4. Packaged Products: Mfr's specs & application instructions		
5. Sand: Location of pit, Owner's name, & previous test data		
6. Masonry reinforcement, anchors, helical masonry ties		
Shop Drawings:	_____	_____
1. Bracing/Structural Stability		
Samples:	_____	_____
1. Exposed joint mortar		
2. Masonry Units: each type, full size		
3. Masonry reinforcement, anchors, helical masonry ties		
Schedule of Uses:	_____	_____
1. Mortar type		
Certificates	_____	_____
1. Notarized Bldg Dept. affidavit re: Mas. Producer, Materials comply		
2. Notarized Bldg Dept. affidavit re: Mas. Supplier, Materials comply		
3. Letter from Contractor's Engineer		

Tests:

1. Helical tie pullout test for each condition and separately for face masonry, mortar joints & back up material.

Qualifications

1. Manufacturer
2. Installer
3. Engineer

Mock Up:

1. Cutting of Joints
2. Pointing of Joints
3. Face brick replacement

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