SECTION 04 01 20

MASONRY RESTORATION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

A. Section includes:

1. Extract sample of existing mortar to determine composition and color.
2. Sawcutting of existing defective mortar joints.
3. Removal of cracked and broken brick as noted on drawings.
4. Clean existing brick to be re-used of mortar.
5. Installation of flashings.
6. Water cleaning of masonry prior to repointing.
7. Protection of adjacent surfaces, walkways, vehicles and people.
8. Toothing in of new brick.
9. Repointing mortar joints ensuring that new joint profile is concave.
10. Removal of debris and residue.
11. Final Cleaning.

B. Related work specified in other sections:

1. 07 65 00/13 - Flashings.
2. 07 92 00 - Sealants and Caulking

1.03 REFERENCES

A. The following specifications and standards are incorporated by reference. Materials and operations shall comply with requirement of latest issue of published reference. Where provisions of these Project Specifications are at variance with those reference specifications, the maximum criteria or requirements shall govern.

1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
2. ASTM C150 - Standard Specification for Portland Cement.
3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

5. ASTM C780 - Standard Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

6. ASTM C476 – Standard Specification for Mortar and Grout for Reinforced Masonry.

B. Contract shall meet the most current standards as set forth below, unless otherwise indicated:

1. BIA Technical Notes 20 Rev, "Cleaning Brick Masonry".

2. BIA Technical Notes 8 Rev, "Portland Cement - Lime Mortar for Brick Masonry".

3. BIA Technical Notes 8B, "Mortar for Brick Masonry - Selection and Controls".

4. When applicable, BIA Technical Notes 1A Rev, "Cold Weather Masonry Construction - Construction and Protection".

5. ASTM Standard C780 for preconstruction and construction evaluation of mortars for non-reinforced masonry.

6. All applicable American Society for Testing and Materials regulations.

7. All other applicable regulations and standards where indicated by provisions of the Contract and Architect's direction.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

1. Restoration Procedure: Submit written program for each phase of restoration process including protection of all surrounding materials on building and site during operations. Describe in detail, materials, methods and equipment to be used for each phase of restoration work.

2. Product Data: Submit manufacturers technical data as described below. Tests and compliance certification shall have been performed and presented by an independent testing laboratory and be less than one year old from the start date for the brick replacement phase of the project.

a. Mortar sand gradation and quality per ASTM C144 for each type of sand used within the mortars.

b. Mortar Samples: Submit, for verification purposes and prior to sample panel erection, samples of all types of mortar materials, colors, chemical cleaning solvents, sealants, adhesives, anchors, etc., as outlined in the Drawings and Provisions of the General Contract and subsequent conditions and specifications for approval by the Architect.

c. Mix Design: Mix mortar in the laboratory from representative samples of materials to be used in the Work, including selected colorants. Average compressive strength at 28 days shall be 750-1100 psi. Submit mix designs for each mortar type at least seven days prior to preparation of job mortar and delivery to the site. Include copies of test reports for aggregate and mortar strengths. Do not start masonry work until Architect has reviewed test reports and accepted mix design.

3. Shoring: Indicate details of all phases of masonry restoration, and supports for the work. Submit shop drawings showing shoring and bracing and temporary or permanent support structures, sealed by Professional Engineer registered in the State where work is being performed if requested by Architect.

B. Sample Panels

1. Prior to start of general tuckpointing operations, prepare two sample areas, 6'x6', where directed by the Architects; one panel shall demonstrate mortar joint removal, one panel shall demonstrate complete tuckpointing. Architect's acceptance of the visual qualities must be obtained before proceeding with the work.

2. In the event of the Architect's rejection of a sample area, the Contractor shall redo another area for review by the Architect. This process shall continue until mortar removal procedures, mortar placing and final tooling and cleaning meet Architect's approval, at which time work may proceed.

3. Accepted sample panels shall be retained in an undisturbed condition, suitably marked, during construction as a standard for judging completed work.

4. Provide report on modified ASTM C67 test for face brick as follows: Test to determine if the exterior face brick will meet the SW grade requirements of ASTM C216. Testing is recommended to document compressive strength, saturation coefficient, dimensions, distortion, and potential for efflorescence. For this testing, a total of 15 bricks will be required. Make the samples representative of the whole lot of brick from which they are selected and include specimens representative of the complete range of colors and sizes of the brick in the shipment. Upon completion of testing, cut several of the brick samples and observe the cross section for the presence of stratification.

1.05 QUALITY ASSURANCE

A. Contract Qualifications: Work shall be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration processes and operations indicated. Provide adequate references upon request of Architect.

B. Methods of Testing (As it applies to other related work that may be indicated.) - The Contractor shall perform and pay for the following tests as specified as source quality control and directed by the Architect:

1. Compressive Strength: Compressive strength shall be determined in accordance with ASTM Standard C109. The mortar shall be composed of materials and proportions that are to be used in the construction with mixing water to produce a flow of 110±5 percent.

2. Water Retention: Water retention shall be determined in accordance with ASTM Standard C91, except in laboratory conditions or where otherwise indicated.

3. Air Content: Air entrainment shall be determined in accordance with Specification C91 except where otherwise indicated.

C. Mortar joints shall be deemed defective and shall be replaced if they are judged by the Architect to be loose, cracked, or deteriorated, miscolored, or otherwise poorly placed.

1.06 PROJECT CONDITIONS

A. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, protect building site and surrounding buildings from injury resulting from masonry restoration work.

1. Prevent damaging dust, debris, mortar and chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.

2. Dispose debris and run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

4. Protect sills, ledges and projections from mortar droppings by the use of plastic coverings, masking or other means, and remove protections upon completion of work.

B. Provide a quality control program which includes provisions for supervising performance and preventing damage due to worker fatigue.

C. Do not lay masonry, repoint, caulk, wash down or wet surfaces when temperature may drop below 40°F within 24 hours. Follow cold weather procedures as set out in ANSI A41.1 when temperatures may drop below 40°F.

D. Prevent mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove grout and mortar in contact with exposed masonry.

1.07 OWNER FURNISHES

A. The Owner shall supply the Contractor with a point of water and supply for his hook-up. The Owner shall supply water and electrical power, without cost to the Contractor. The Contractor shall be responsible for proper hook-up and maintenance of temporary electrical connections. The Contractor shall locate sufficient electrical circuits, protected by circuit breakers, to be certain that system overload shall not occur by Contractor's equipment usage. The Contractor shall use only electrical equipment that is fused or protected by circuit breakers from Owner's electrical system.

1.08 DELIVERY, STORAGE AND HANDLING OF MATERIALS

A. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

B. Cementitious materials and aggregates shall be stored in a manner as to prevent deterioration or contaminations by foreign materials.

C. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

PART 2: PRODUCTS

2.01 REQUIREMENTS

A. Provide masonry and mortar conforming to the requirements indicated in the Drawings, specifications and provisions of the Contract, and as approved by the Architect.

2.02 MATERIALS

A. Materials shall be as specified below unless otherwise indicated.

1. Facing Brick:

a. Quality: ASTM C216-85a, Grade SW.

b. Contractor to provide match with brick restoration occurring in.

2. Mortar Materials

   a. Portland Cement: ASTM C150, Type I

   b. Hydrated Lime: ASTM C207, Type S.

   c. Aggregate: ASTM C144

   d. Water: Clean, potable, free of deleterious amounts of acids, alkalies, or organic materials.

   e. Antifreeze Compounds: Not allowed in mortar to lower freezing point.

3. Colorants

   a. Aggregate for Mortar: ASTM C144, unless otherwise indicated.

      1) Nature or manufactured colored mortar aggregate selected to produce mortar color shall be used, if available and matches existing mortar.

      2) Size, texture and gradation of existing mortar must be matched.

4. Admixtures

   a. No calcium chloride or admixtures containing calcium chloride shall be used in the mortar.

   b. No air-entraining admixtures or material containing air-entraining admixtures shall be used in mortar without prior approval of the Architect.

   c. No antifreeze compounds or other substances shall be added to mortar.

   d. Water must be clean and free from deleterious amounts of acids, alkalis or organic materials.

   e. No admixtures shall be used without prior, written approval of the Architect.

5. Horizontal Wall Reinforcement: ASTM A-82, Dur-O-Wal or equivalent products by AA Wire, Hohmann & Barnard, or Heckman, as follows:

6. Veneer anchors: Veneer Anchor #D/A 5801 14 gauge galvanized with 3/16" ties.

7. Brick Expansion Joint: Dur-O-Wal "Rapid" Expansion Joint, Everlastic Neo-Seal IV or equal.

8. Compression Seal: Flexible semi-closed urethane, Brock White No. 4290 Shok Pak or equal. Installed ½" thicker than joint thickness.

9. Galvanized Items: Minimum ASTM A641 Class 3.

10. Flashings: Conform to requirements of Section 07 65 00 Flashings. Color: As selected by Architect from manufacturer's standard colors.

11. Cavity Weep/Vent: Dur-O-Wall cell vent D/A 1006. Color as selected from manufacturers full range of available colors.

12. Rope Wicks: ¼" cotton sash cord.

13. Mortar Net: 90% open weave, 200 denier 100% recycled polyester, dovetail/continuous bottom strip design, thickness to match cavity width x 5'-0" length as manufactured by Mortar Net USA, Ltd.

14. Bond Breaker: No. 15 building paper, red rosin, kraft paper, or 6 mil polyethylene.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verification of Condition: Examine areas and conditions under which work is to be performed. Notify the Architect, in writing, or conditions detrimental to proper and timely completion of the work. Work shall not proceed until unsatisfactory conditions have been corrected in an acceptable manner. All phases of verification and preparation shall meet Architect's approval.

B. The cutting out of joints shall be done in such manner as not to loosen adjacent joints or to damage the edges or corners of the masonry units. Where the mortar is tightly bonded at one side of the joint, and if the contour permits, cutting shall be done with portable electric grinders with abrasive wheels to minimize spalling at the edges of bricks. It is the Architect's prerogative to forbid the use of tools or methods which do not produce work of the quality that is expected, and to insist on the use of methods and tools which will do the work properly.

3.02 TUCKPOINTING METHODS

A. Contractor may access the exterior building elevations by the use of electrically powered swing staging or scaffolding. All equipment shall be supplied by the Contractor. Comply with all OSHA standards and governmental regulations regarding erection, maintenance and usage of equipment.

B. If roof is used to install swing stage, protect from damage by laying plywood over affected area.

3.03 PREPARATION

A. Protect elements surrounding the work from damage or disfiguration.

B. Carefully remove and store fixtures, fittings, finishing hardware and accessories as required.

C. Close off, seal, mask, or board up windows and doorway areas and surfaces not receiving work as necessary to protect them from damage. Apply masking agent to comply with manufacturer's recommendations and use as directed from Architect's approval.

D. Measurements of Materials: The method of measuring materials for the mortar used in construction shall be by either volume or weight, so that proportions of the mortar materials can be controlled and accurately maintained.

E. Mixing Mortars:

1. Mix mortar as required for immediate use only and discard any mixed for a period exceeding 2-1/2 hours.

2. Accurately maintain and control the specified proportions of the mortar materials during the entire progress of the work.

3. Thoroughly mix cementitious materials and aggregates with the amount of water to produce satisfactory workability. Machine mix all mortar.

4. Proportion colorant for mortar in accordance with printed instructions by pigment manufacturer to avoid reducing mortar properties, at a rate not to exceed 10 pounds per 94 pound bag of portland cement.

3.04 REPOINTING EXISTING MASONRY

A. All repointing work shall be performed in compliance with the Drawings, specifications, Contract conditions and match Architect's approved sample panel. Areas and elevations upon which tuckpointing are to be performed, are on the Drawings or noted herein.

B. Rake out deteriorated mortar from joints to a depth of 2½ times their widths but not less than ½" to expose sound, unweathered mortar. Remove mortar from surfaces within raked-out joints to provide reveals with square backs and to expose mortar bed surfaces of masonry for contact with pointing mortar. Power operated rotary hand saws and grinders may be used but only on specific written approval of Architect based on submission of satisfactory quality control program and demonstrated ability of operators to use power tools without damage to masonry by overcutting. Brush, air blast or flush joints to remove dust and loose mortar debris.

C. Do not spall edges of masonry units or widen joints during mortar joint removal process. Contractor is responsible to replace brick units which become damaged during the joint removal process as directed by the Architect.

D. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.

E. Measure and dry mix the cementitious materials. The tuckpointing mortar should be pre-hydrated to reduce excessive shrinkage. The proper pre-hydration process shall be as follows: All dry ingredients should be thoroughly mixed. Only enough clean water should be added to the dry mix to produce a damp, workable consistency which will retain its shape when formed into a ball. The mortar should stand in this dampened condition for 1 to 1½ hours.

F. Flexible Flashing:

1. Flashing Installation: Properly clean and dry backup prior to applying primer as recommended by flashing manufacturer. Lay one layer of flexible flashing on bed joint of brick. Install continuous metal flashing and adhere another layer of flexible flashing over metal and continue up vertical back-up material a minimum of 8 inches. Lap all flashing joints a minimum of 8 inches. Install flashing termination bar at top of flashing.

2. At heads, sills of masonry openings; carry head flashing 6" beyond ends of steel lintels; at heads, sills turn up ends to form pans, with corners folded, not cut.

3. Fully adhere flexible flashing to steel lintels.

4. Apply a bead or trowel coat of mastic along top of termination bar, seams, cuts and penetrations.

G. Lay bricks in 1/3 running bond and as shown on Drawings. Provide header courses, soldier courses and corbeling where shown on Drawings.

H. Provide continuous vertical 3/8" expansion joints in brick where shown on Drawings. Where not shown or in addition to those shown at a minimum, provide within two feet of outside corners, at inside corners, above windows and door jambs, between dissimilar materials and no more than 20 feet on center elsewhere. Verify location and alignment with Architect.

I. Provide weep vents 24 inches o.c. in exterior masonry in vertical joints immediately above all flashing, at base of cavity, veneer walls; use rope wicks where shown on Drawings.

J. Keep air space within cavity walls clean, free from obstruction. Provide positive means of catching mortar droppings, or cleanouts to remove mortar from base of cavity.

K. Inspect weep holes to determine if they are clogged. Clean out clogged weep holes by probing within a thin wood dowel or stiff wire. If the weep holes were not properly spaced and new weep holes must be drilled, initiate corrective placement only upon Architect's approval.

L. Install pea gravel to a minimum depth of 4" above all flashings. Lay bricks no higher than 8" above flashings until pea gravel is installed. If mortar net is used in lieu of pea gravel, install per manufacturer's instructions.

M. Tuckpoint Procedures:

1. Moisten existing bricks prior to installing new bricks. Surfaces shall be damp without standing water.

2. Replace removed brick with new brick to match bonding and coursing pattern of existing brick.

3. Leveling Layer: Apply pointing mortar in not greater than 3/8" layers to form uniform base depth throughout the mortar joint. Provide concave joint profile at all exposed mortar joints.

4. Retempering shall be performed only upon approval of the Architect. Mortars that have stiffened because of evaporation of water from the mortar shall be retempered by adding water as needed to restore the required consistency. Do not retemper mortar more than once. Discard mortar that is over 2½ hours old.

5. Final tooling of mortar shall be concave profile as approved by the Architect.

N. Remove excess mortar from edge of joint by lightly brushing with natural bristle brushes.

O. Cure mortar by maintaining in a damp condition for 72 hours. Provide periodic mist spray directly to mortar joints and masonry. Take care not to wash out fresh mortar.

1. After mortar has fully hardened thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water, spray applied at low pressure. Do not use metal scrapers or brushes.

2. If stiff brushes, water do not suffice clean the surface on which no green efflorescence appears with Sure-Klean Vana-Trol as manufactured by Pro So Co., Inc.

3. Remove "problem" stains as follows with the as specified formulations of Pro So Co., Inc. or equal:

a. Green Efforescence – "Sure-Klean No. 800 Stain Remover".

b. Tar, Asphalt – "Sure-Klean Asphalt and Tar Remover".

4. Do not use acid solutions for cleaning masonry units unless specifically approved by Architect.

3.05 AGING OF NEW MORTAR TO BLEND IN WITH APPEARANCE OF ADJACENT WORK

A. Rug in or dust mortar joints, new brick masonry and stone work where deemed necessary by the Architect to match as closely as possible, after cleaning, adjacent original work.

B. Use carbon black or other approved materials in small amounts, rubbing in well with burlap rags or medium bristle brush.

C. After each application dust off surplus and wash down with medium pressure hose. Allow to dry thoroughly before proceeding with succeeding applications.

D. Continue process until acceptance of visual appearance by Architect is obtained.

3.06 FIELD QUALITY CONTROL

A. The Owner will employ a testing agency to perform the following:

1. Field test mortar for consistency and water content in accordance with ASTM C780. Make one test for each 2,500 square feet of wall area.

2. Provide test results to Architect for comparison with laboratory results.

3.07 FINAL CLEANING

A. The Contractor shall remove and dispose of all debris generated as a result of his work on a daily basis. No accumulation is allowed in the sidewalk, ramp, etc. Debris shall be disposed of in a manner complying with municipal, state and any other applicable regulatory requirements.

END OF SECTION 04 01 20

SECTION 04 20 00

NON-BEARING UNIT MASONRY

PART 1: GENERAL

1.01 RELATED DOCUMENTS

1. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

A. Section includes:

1. Furnish and install concrete masonry units, where shown on the drawings.

2. Furnish and install mortar, cavity insulation, masonry accessories, masonry reinforcing and loose steel lintels and other items embedded in masonry construction.

B. Related work specified in other sections:

1. Steel lintels and shelf angles – Section 05 50 00.
2. Insulation – Section 07 21 00.
3. Flashings – Section 07 65 00/13.

1.03 REFERENCES

A. The following specifications and standards are incorporated by reference. Where provisions of these Project Specifications are at variance with those reference specifications, the maximum criteria or requirements shall govern.

1. ACI 530.1/ASCE 6/TMS 602 – "Specifications for Masonry Structures"; American Concrete Institute International 2005.
2. ASTM A82/A 82M, "Steel Wire, Plain, for Concrete Reinforcement"; 2005a.
3. ASTM A153/A 153M, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware"; 2005.
4. ASTM A615/A 615M, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"; 2007.
5. ASTM C55 – "Concrete Building Brick"; 2006.
6. ASTM C67 – "Sampling and Testing Brick and Structural Clay Tile"; 2007.
7. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2004.
8. ASTM C150 - Standard Specification for Portland Cement; 2005.
9. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.
10. ASTM C216 – "Facing Brick (Solid Masonry Units Made From Clay or Shale)"; 2007.
11. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2007.
12. ASTM C387, "Packaged, Dry, Combined Materials for Mortar and Concrete"; 2006.
13. ASTM C780 - Standard Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2006a.
14. ASTM C1072 – "Measurement of Masonry Flexural Bond Strength"; 2006.
15. ASTM C1314 – "Compressive Strength of Masonry Prisms"; 2003b. AN
16. International Building Code (IBC) Edition enforced by local jurisdiction.

1.04 QUALITY ASSURANCE

A. Employ and pay for the services of an independent testing laboratory acceptable to the Owner and Architect to perform the specified Source Quality Control.

1.05 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

1. Mix Design: Submit mix designs for each mortar type at least seven days prior to preparation of job mortar and delivery to the site. Include copies of test reports for aggregate and mortar strength.

2. Mortar Samples: Submit samples of manufacturer's standard colors for preliminary selection. If requested, prepare and submit custom-mixed samples to match materials or colors as directed by the Architect. Prepare custom color samples using specified mix design; make 3/8" wide, tool concave smooth. Up to two different custom mortar colors may be selected for brick, in addition to standard gray mortar and colored pointing mortar.

3. Mortar Mixes: Test mortar for consistency, compressive strength and water retentively in accordance with ASTM C780 recommendations for preconstruction testing.

   a. Preconstruction tests will be used to establish optimum mortar proportion and establish control values for construction testing. They are not required to meet the compressive strength requirements of ASTM C270.

4. Test Reports

   a. Submit reports on manufacturer's normal quality control.

   b. Provide report on modified ASTM C67 test for face brick as follows: Test to determine if the exterior face brick will meet the SW grade requirements of ASTM C216. Testing is recommended to document compressive strength, saturation coefficient, dimensions, distortion and potential for efflorescence. For this testing, a total of 15 bricks will be required. Make the samples representative of the whole lot of brick from which they are selected and include specimens representative of the complete range of colors and sizes of the brick in the shipment. Upon completion of testing, cut several of the brick samples and observe the cross section for the presence of stratification.

5. Submit samples of all specified masonry accessories for Architect's review.

6. Provide exterior elevation drawings showing all proposed brick expansion joints and floor plans with proposed block control joint location.

B. Masonry Samples

1. Manufacturer's samples: Preliminary selection of brick type and color has been based upon manufacturer's samples supplied to the Architect prior to bidding. Brick supplied to the site which, in the judgment of the Architect, varies significantly from these samples in color, color range or finish will be rejected.

2. Preliminary sample panels: At the site, erect a 2'-0" square panel of each brick type, incorporating the preliminary mortar selection(s) and the full range of brick color to be expected. After review by the Architect, construct additional sample panels to adjust brick range and mortar color. Do not begin final production and/or delivery of materials until acceptance of preliminary sample panel.

3. Composite sample panel: After acceptance of preliminary sample panel, construct a square panel as detailed incorporating all brick types, mortar colors and brick pattern shown on Drawings. Construct panel as a complete cavity wall system with weather barrier, insulation, flashing, rope wicks, cavity vents, ties and scored concrete block backup. Maintain panel as a quality control guide until completion of masonry work.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle, transport and store at the job site in a manner that will avoid damage.

B. Protect masonry units from water. Deliver the units to the job cubed on pallets.

C. Deliver and store scored masonry units with cardboard separators to reduce chipping and other damage to block surface and edges.

D. Store materials under cover in dry place; in manner to prevent damage, intrusion of foreign material. During freezing weather protect all masonry units with tarpaulins or other suitable material. Store concrete masonry under covers that will permit circulation of air, prevent excessive moisture absorption; protect against wetting prior to use.

PART 2: PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I. Use of masonry cement is not permitted.

B. Hydrated Lime: ASTM C207, Type S.

C. Aggregates: ASTM C144.

D. Water: Clean, potable, free of deleterious amounts of acids, alkalies or organic materials.

E. Pre-Mixed Mortar: ASTM C387. Specific property and material requirements of this Section shall govern.

F. Antifreeze Compounds: Not allowed in mortar to lower freezing point.

G. Mortar Colorant: Inert, sunfast, weather resistant, alkali resistant, water insoluble, free of deleterious fillers and extenders. By Solomon Grind-Chem Service, Inc., Euclid, Twin City Concrete Co., Tamms Industries Co. or Prism Pigments.

2.02 MORTAR MEASURING AND MIXING

A. Measure and mix mortar in accordance with ASTM C270 (Property Specifications) and as follows:

1. Component proportions by mortar type are as follows:

Mortar Type	Portland Cement	Hydrated Lime	Aggregate
M	1 part	1/4	See Below
S	1 part	1/4 to 1/2 part	See Below
N	1 part	1/2 to 1 1/4 parts	See Below

Volume of aggregate measured in a loose, damp condition shall be not less than 2 ¼ times and not more than 3 times the sum of the volumes of cement and lime used.

2. Accurately maintain and control the proportions of the mortar materials during the entire progress of the work.

3. Mix mortar as required for immediate use only and discard any mixed for a period exceeding 2 ½ hours.

4. Thoroughly mix cementitious materials and aggregates with the amount of water to produce satisfactory workability. Machine mix all mortar.

2.03 MORTAR SOURCE QUALITY CONTROL

A. Test proposed aggregate for conformance to ASTM C144 and these specifications.

B. Test each mortar mix design for water retentivity and compressive strength in accordance with ASTM C270.

C. Mix mortar in the laboratory from representative samples of materials to be used in the Work, including selected colorants. Average compressive strength at 28 days shall be as follows:

Mortar Type	Compressive Strength Range
M	2,500 psi - 3,000 psi
S	1,800 psi - 2,200 psi
N	750 psi - 1,100 psi

D. Adjust mix design so as to achieve compatibility with brick to be supplied, considering initial rate of absorption of brick and water retentivity of mortar.

E. Do not start masonry work until Architect has reviewed test reports and accepted mix design.

F. Prepare and test new mix designs if mortar does not meet specifications or if, during the course of the Work, significant changes occur in aggregate or other materials.

G. Use field measuring methods to accurately control mortar mix proportions.

2.04 MASONRY ACCESSORIES

A. Horizontal Wall Reinforcement and Masonry Veneer Anchors: ASTM A153 - Class B2 hot dipped, galvanized, Dur-O-Wal or equivalent products by AA Wire Products, Hohmann & Barnard, Wire Bond, as follows:

1. Non-load bearing partitions: "Ladur" type standard weight with No. 9 side and cross rods.

2. Exterior cavity wall reinforcing: "Ladur" type, No. 9 side and cross weight with 3/16" diameter adjustable brick tie, "Dur-O-Eye".

3. Width: Approximately 2 inches less than nominal thickness of wall or wythe.

4. Corners: Furnish pre-fabricated corners and tees except where masonry control and expansion joints indicated. Use for all corners and intersections of masonry walls, including intersections of exterior walls with partitions.

5. Veneer with steel back-up: 3/16" diameter wire adjustable anchor with 14 gauge plate. Anchor with corrosion resistant fasteners.

6. Anchors for dovetail slots by others: D/A 723.

7. Veneer anchors for steel studs or existing back-up: Veneer Anchor #D/A 213 14 gauge with 3/16" ties.

B. Reinforcing Steel: New billet stock, deformed bars, ASTM A615 Grade 60, free of mill scale, excessive rust or other coating that would prohibit proper bond with grout or mortar.

C. Concrete block control joint: Dur-O-Wal "Rapid" Control Joint, Rubber Compound, Regular D/A 2001 or equivalent product by Vinylex, Everlastic, or Vulcan Metal Products.

D. Brick expansion joint filler or material: Dur-O-Wal "Rapid" Expansion Joint #DA 2015 or equal. Size: thickness to match joint thickness x 3" wide. Constructed of closed cell neoprene.

E. Flashing: Conform to the requirements of Section 07 65 00 Flashings. Color: See Material Finish/Color Schedule on Architectural Drawings.

F. Cavity Wall and Perimeter Insulation: Conform to requirements of Section 07 21 00, Insulation.

G. Cavity Weep/Vent: Dur-O-Wall cell vent D/A 1006. Color as selected from manufacturers full range of available colors.

H. Rope Wicks: Conform to requirements of Section 07 65 00, Flashings.

I. Mortar Net: 90% open weave, 200 denier 100% recycled polyester, dovetail/continuous bottom strip design, thickness to match cavity width x 5'-0" length as manufactured by Mortar Net USA, Ltd.

J. Flashing Termination Bar and Fasteners: Conform to requirements of Section 07 65 00, Flashings.

K. Bond Breaker: No. 15 Building Paper, red rosin kraft paper or 6 mil polyethylene.

2.05 CONCRETE BLOCK

A. Units

1. Hollow load bearing units: ASTM C90, Grade N-1, normal weight. Type I.
2. Concrete building brick: ASTM C55, Grade N, normal weight. Type I.

B. Requirements

1. Prism strength: As shown on drawings. If not shown, provide f'm = 1,500 psi.

2. Compressive strength of individual masonry units shall be as shown for the respective prism strength

   a. f'm = 1,500 psi: required unit strength = 1,900 psi.

3. Shapes: Provide plain shapes for non-reinforced walls excluding lintel, cap, and sill block units.

4. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers and control joint edges.

5. Fire-Resistant Construction: Wherever a fire-resistant classification is indicated for unit masonry construction, provide concrete block units as tested and listed for the particular construction.

6. Provide bullnose corners at all exposed outside corners in finished rooms and as detailed on drawings.

7. Where exposed in interior spaces to receive paint. Provide single vertical "V" score in center of face.

C. Fabrication: Use clean, smooth forms to eliminate voids, ridges and other blemishes visible in the finished work or which might be subject to damage during shipping and installation.

2.06 GROUT FOR MASONRY

A. Grout for concrete masonry: Conform to ASTM C476 for site mixed grout. See section 03 30 00 for "ready-mixed" grout.

B. Aggregates: ASTM C404.

C. Proportion field mixed grout by volume and add sufficient water to produce consistency for pouring without segregation. Compose grout by volume of one part Portland cement, up to one-tenth part by volume hydrated lime or lime putty, and sand two and one-fourth to three times the sum of the volumes of the cementitious materials. Achieve grout slump of 8" to 9". Attain a minimum compressive strength of 3,000 pounds per square inch at 28 days.

D. Do not use any antifreeze compound in grout.

2.07 SOURCE QUALITY CONTROL

A. Perform tests of each brick type in accordance with ASTM C67 to determine compliance with ASTM C216, Grade SW. Document compressive strength, saturation coefficient, initial rate of absorption, dimensional tolerance and potential for efflorescence.

B. Perform tests of each brick/mortar combination to determine flexural bond strength in accordance with ASTM C1072.

PART 3: EXECUTION

3.01 LAYOUT

A. Unless noted on Drawings as "clear", all dimensions on Drawings are modular, from center to center of vertical joints and from bottom to bottom of horizontal joints.

B. Lay out exposed masonry to achieve joint pattern shown on Drawings. Where not shown, lay out exposed masonry to minimize cutting of units. Where possible, provide full 8" wide units at outside corners, jambs, and other openings.

3.02 MORTAR

A. Mortar proportioning and mixing as specified.

B. Tempering: The consistency of mortar may be adjusted to the satisfaction of the mason. Use mortar within two and one half (2-1/2) hours after mixing.

C. Type: Lay masonry in mortar of the type specified below, as adjusted for compatibility with masonry units.

Kind of Masonry	Mortar Type
Exterior walls, non-load bearing at or below grade.	M
Exterior walls, non-load bearing, above grade; Brick veneer.	S
Interior non-load bearing partition walls.	N

3.03 PRECAUTIONS

A. Cold Weather Requirements

1. Cold weather conditions exist when temperature is 40 degrees F. or below.

2. Keep masonry units dry. Do not use wet or frozen masonry units.

3. Following general rules may be modified as approved by Architect to suit project conditions.

AIR TEMP. (Degrees F.)	CONSTRUCTION REQUIREMENTS
40 - 32	Heat mixing water or sand to produce mortar temperature between 40 degrees F. and 120 degrees F. Heat grout materials when their temperatures are below 32 degrees F. Do not heat water or aggregates used in mortar or grout above 140 degrees F.

32 - 25	Comply with construction requirements above. Heat grout materials so grout is at a temperature between 70 and 120 degrees F. during mixing and placed at a temperature above 70 degrees F. Maintain temperature of mortar on boards above 40 degrees F. Employ windbreaks when wind is in excess of 15 MPH.
25 - 20	Comply with construction requirements above. Heat masonry units so their temperature when laid is not less than 20 degrees F. Heat masonry to a minimum of 40 degrees F. prior to grouting. Utilize sources of heat on both sides of wall under construction.
20 and below	Comply with construction requirements above. Provide enclosure and auxiliary heat to maintain air temperature above 32 degrees F. for 24 hours. Extend time period to 48 hours for grouted masonry.

MEAN DAILY AIR TEMP. (Degrees F.)	PROTECTION REQUIREMENTS
40 - 32	Protect masonry from rain or snow for 24 hours.
32 - 25	Completely cover masonry for 24 hours.
25 - 20	Completely cover masonry with insulating blankets or approved equal protection for 24 hours. Extend time period to 48 hours for grouted masonry.
20 and below	Maintain masonry temperature above 32 degrees F. for 24 hours by enclosure and approved supplementary heat. Extend time period to 48 hours for grouted masonry.

B. Hot Weather Requirements

AIR TEMP (Degrees F.)	PROTECTION REQUIREMENTS
Greater than 110 or 90 with 8 mph wind velocity	Maintain the temperature of mortar and grout below 120°F; flush mixers, mortar transport containers and mortar boards with cool water before they come into contact with mortar ingredients or mortar; maintain mortar consistency by retempering with cool water; and use mortar within 2 hours of initial mixing.

C. Protect facing material against staining; keep top of walls covered with non-staining waterproof coverings when work is not in progress.

D. Where fresh masonry joins partially or totally set masonry, clean, roughen, lightly wet set masonry before new masonry is joined. Make necessary horizontal stop-offs by racking back masonry; do not tooth.

E. Where units are specified to be wetted, uniformly wet units 3 to 4 hours before using.

3.04 LAYING MASONRY UNITS

A. Lay masonry plumb, true to lines. Unless noted on drawings as "clear", all dimensions on drawings are modular, from center to center of vertical joints and from bottom to bottom of horizontal joints.

B. Lay hollow masonry units 4 inches or less in thickness, all solid masonry units in full beds of mortar with full head joints.

C. Lay hollow masonry units exceeding 4 inches in thickness with divided bed, head joints.

D. Avoid over-plumbing, pounding of corner, jambs after setting masonry in position. Where an adjustment must be made after mortar has started to harden, remove mortar, replace with fresh mortar.

E. Lay masonry within one minute of placing mortar.

3.05 BONDING AND ANCHORAGE

A. Anchor abutting or intersecting non-load bearing walls, partitions at vertical intervals of 2 feet with corrugated ties.

B. Where indicated anchor walls, partitions abutting or facing against steel columns, beams with flexible anchors. Unless indicated otherwise, maximum spacing; 16 inches vertically at columns, 16 inches horizontally at beams.

C. Anchor exterior walls, veneer facing against concrete beams, columns, walls with dovetail anchors spaced 16 inches vertically, 16 inches horizontally.

D. Anchor exterior walls parallel to open web joists with prefabricated anchoring and reinforcing assembly with adjustable rectangular ties welded to structural steel as indicated.

E. Bond non-bearing walls, partitions of more than one wythe with wire ties; use at least one tie for each 3½ sq. ft. of wall surface; spaced maximum of 16 inches vertically, 36 inches horizontally, stagger alternate rows. Embed ties in horizontal joints.

F. Anchor veneer to backup with ties spaced 16" horizontally and vertically.

G. Bond bearing walls of more than one wythe as required for non-bearing walls. Fill all collar joints between all wythes with mortar.

3.06 BUILT-IN WORK

A. Consult other trades in advance, make provision for installation of their work in order to avoid cutting, patching. Build-in work specified under other sections as work progresses.

B. Set steel lintels in beds of mortar. Fill door and borrowed light frames solid with grout around jambs, heads of bucks, frames.

C. Flexible Flashing:

1. Apply where concealed wall flashing is indicated; at heads; sills of exterior masonry openings; at exterior wall damp courses; under all precast concrete copings; as otherwise indicated.

2. Flashing Installation: Properly clean and dry backup prior to applying primer as recommended by flashing manufacturer. Lay one layer of flexible flashing on bed joint of brick. Install continuous metal flashing and adhere another layer of flexible flashing over metal and continue up vertical back-up material a minimum of 8 inches. Lap all flashing joints a minimum of 8 inches. Install flashing termination bar at top of flashing.

3. At heads, sills of masonry openings; carry head flashing 6" beyond ends of steel lintels; at heads, sills turn up ends to form pans, with corners folded, not cut.

4. Fully adhere flexible flashing to steel lintels.

5. Apply a bead or trowel coat of mastic along top of termination bar, seams, cuts and penetrations.

D. Where masonry is built around steel columns, wrap columns with 1½" thick batt insulation or No. 15 asphalt-impregnated building paper and remove mortar droppings from around columns.

3.07 CONCRETE MASONRY UNITS

A. Concrete masonry erection, workmanship: Conform to requirements of ACI 530.1.

B. Do not wet concrete masonry units.

C. Make necessary cuts of concrete masonry with motor driven masonry saw.

D. Units with open cells exposed in wall will not be permitted.

E. Provide reinforced cast-in-place lintels over square head openings where indicated; formed in place with special shaped load bearing bond beam or lintel units; jointing, texture to match adjacent wall units. Fill lintels solid with grout; reinforce as indicated. Provide minimum of 8 inches bearing at ends. Provide temporary support under lintels as necessary.

F. Provide continuous vertical control joints in concrete masonry walls where indicated; where joints are not indicated, locate maximum of 20 feet on center. Locate joints a minimum of 4'-0" beyond lintel bearing. Form joints as indicated. Bond beam reinforcing shall be continuous through control joints.

G. Finish face joints in scored concrete masonry units with concave joints.

H. In unexposed units or in block scheduled for tile or veneer plaster make joints uniform, approximately 3/8" wide, cut flush.

I. Lay concrete masonry in running bond unless indicated or hereinafter specified otherwise.

3.08 RIGID INSULATION

A. Install cavity wall insulation against face of concrete block with boards horizontal, tight butted joints. Fasten with adhesive or mechanical fasteners. Stagger end joints and seal joints with sheathing tape. Insure that insulation is clean and dry prior to placing tape. Carefully seal up to and around reinforcing penetrating insulation. Fit tightly around reinforcing, wall penetrations.

3.10 POINTING AND CLEANING

A. Point up exposed masonry, fill holes, joints, remove loose mortar, cut out defective joints, repoint with mortar.

B. Thoroughly clean exposed masonry. Before applying any cleaning agent to entire wall, apply to sample wall area of approximately 20 sq. ft. in location approved by Architect. Do not proceed with cleaning work until sample area is approved. Use approved cleaning material, method on remaining wall area.

C. If stiff brushes, water do not suffice clean the surface on which no green efflorescence appears with Sure-Klean Vana-Trol as manufactured by Pro So Co., Inc.

D. Remove "problem" stains as follows with the as specified formulations of Pro So Co., Inc., or equal:

1. Green Efflorescence - "Sure-Klean No. 800 Stain Remover".
2. Tar, Asphalt - "Sure-Klean Asphalt & Tar Remover".
3. Ferrous Stains - "Sure-Klean Ferrous Stain Remover".

F. Do not use acid solutions for cleaning masonry units unless specifically approved by Architect.

G. Clean off loose mortar, remove stains from concrete masonry units.

H. Schedule, complete cleaning work as soon as possible; in any event, before Owner's signage work is commenced.

3.11 MORTAR FIELD QUALITY CONTROL

A. The Owner will employ a testing agency to perform the following:

1. Field test mortar for consistency, water content, mortar aggregate ratio, air content (only for those mixes with entrained air), and compressive strength in accordance with ASTM C780. Make one test for each 2,500 square feet of wall area.

2. Test brick prisms for flexural bond strength in accordance with ASTM C1072. Make one test for each mortar/brick combination.

3. Provide test results to Architect for comparison with laboratory results.

END OF SECTION 04 20 00