## SECTION 04 20 00

## NON-BEARING UNIT MASONRY

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

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

B. Related work specified in other sections:

1. Insulation – Section 07 21 00.

### 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.

## 1.06 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.

1. Colors: See Material Finish/Color Schedule on Architectural Drawings.

### 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 anchors for steel studs: Hohmann & Barnard: HB-200 X adjustable veneer anchor with contact prongs, stainless steel or Wire-Bond HC 711, stainless steel.

6. Veneer anchors (hot dipped galvanized) for existing masonry or concrete back-up: Hohmann & Barnard: HB-200 Adjustable Veneer Anchor; Wire-Bond: RJ 711 Adjustable Veneer Anchor; Dura-A-Wall: Brick Replacement Anchors DA5213.

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

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

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

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

F. 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 FACE BRICK

A. Quality: ASTM C216, Grade SW. Type FBS.

B. Type, Manufacturer, Size

1. Brick No. 1:

## 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 metal tool to form a "V" joint. In non-scored exposed units, finish joints with metal tool to form 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. Scored block to have stack bond appearance.

**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.

B. Install masonry core insulation in walls per manufacturers instructions where shown on drawings. Patch mortar joints with mortar after insulation installation.

**3.09 BRICK**

A. Clay Masonry Erection, Workmanship: Conform to latest recommended standard specifications for clay masonry as published by the Brick Institute of America (BIA).

B. Moisten brick with absorption rates in excess of 20g/30 sq. in./min. as determined by ASTM C67, so that rate of absorption when laid does not exceed this amount.

C. Finish face joints exposed on exterior walls with metal tool to form concave joint, close hairline cracks, crevices.

D. Finish face joints on interior walls with metal tool to form raked joint, ¼" deep.

E. Remainder of Joints: Cut off flush.

F. Lay bricks to match existing bond. Provide header courses, soldier courses and corbeling as required and where shown on Drawings.

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

H. Provide rope wicks as shown on drawings in exterior masonry in vertical joints immediately above all flashing, at base of cavity, veneer walls at top of all cavity walls; use weep vents where shown on drawings.

I. 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.

J. Install mortar net so it is snug between insulation and back face of brick. Install in layers if needed to fill cavity.

**3.10 POINTING AND CLEANING**

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

B. Point all joints, including scores, of glazed masonry units with colored pointing mortar. Tool joints concave smooth.

C. Thoroughly clean exposed masonry. Before applying any cleaning agent to entire wall, apply to sample wall area or sampe panel 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.

D. 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.

E. 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**