

## **SECTION 04100 - MORTAR**

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions, Amendments to General Conditions, and Supplementary Conditions and Sections in Division 1 of the Specifications apply to work of this Section.

#### 1.2 DESCRIPTION

- A. Work included in this section:
  - 1. The work required under this specification consists of all mortar and grout for the masonry work under various sections of the specifications.
- B. Related work specified elsewhere:
  - 1. Concrete unit masonry (section 04220)
  - 2. Testing (section 01410)

#### 1.3 QUALITY ASSURANCE

- A. A representative sample of the sand shall be obtained for each job and tested as specified herein below by an independent testing laboratory selected by the Architect, and paid for by the Owner.

#### 1.4 DELIVERY AND STORAGE OF MATERIALS

- A. Portland Cement, lime, and/or prepackaged mortar cement mixes shall be delivered to the site and stored in unbroken bags or other approved containers. These materials shall be stored in dry, weather tight sheds or enclosures with elevated floors, which will prevent the inclusion of foreign materials and damage by water or dampness. Masonry sand shall be delivered and stored in a manner to prevent inclusion of foreign materials. Concrete masonry which is chipped, cracked, broken, or marred in other manner shall not be used where exposed to view.

#### 1.5 ENVIRONMENTAL CONDITIONS

- A. Hot Weather Installation: The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 37 degrees C (99 degrees F) in the shade and the relative humidity is less than 50 percent.
  - 1. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 1.2 m (4 feet) ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.
- B. Cold Weather Installation: Before erecting masonry when ambient temperature or mean daily air temperature falls below 4 degrees C, (40 degrees F,) a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.
  - 1. Preparation: Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.
  - 2. Air Temperature 4 to 0 degrees C (40 to 32 Degrees F): Sand or mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49

- degrees C. (40 degrees F and 120 degrees F).
3. Air Temperature 0 to minus 4 degrees C (32 to 25 Degrees F): Sand and mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.) Temperature of mortar on boards shall be maintained above freezing.
  4. Air Temperature minus 4 to minus 7 degrees C (25 to 20 Degrees F): Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.) Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 24 km/hour. (15 mph.)
  5. Air Temperature minus 7 degrees C (20 Degrees F) and Below: Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.) Enclosure and auxiliary heat shall be provided to maintain air temperature above 0 degrees C. (32 degrees F.) Temperature of units when laid shall not be less than minus 7 degrees C. (20 degrees F.)
  6. Completed Masonry and Masonry Not Being Worked On:
    - a. Mean daily air temperature 4 degrees C to 0 degrees C. (40 degrees F to 32 degrees F.) Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
    - b. Mean daily air temperature 0 degrees C to minus 4 degrees C. (32 degrees F to 25 degrees F.) Masonry shall be completely covered with weather-resistive membrane for 24 hours.
    - c. Mean daily air temperature minus 4 degrees C to minus 7 degrees C. (25 degrees F to 20 degrees F.) Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
    - d. Mean daily temperature minus 7 degrees C (20 degrees F) and below. Masonry temperature shall be maintained above 0 degrees C (32 degrees F) for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cement shall be Portland Cement, Type I or II, meeting Standard Specifications for Portland Cement (ASTM C-150).
- B. Sand shall meet the requirements of Standard Specifications for Aggregate for Masonry Mortar (ASTM C-144-81), with the gradation to satisfy paragraph 3, Grading, and with the omission of subparagraph 3.4.
- C. Hydrated Lime shall meet the requirements of the Standard Specifications for Hydrated Lime for Masonry Purposes (ASTM C-207), Type S.
- D. Hydraulic Hydrated Lime shall meet the requirements of the Standard Specifications for Hydraulic Hydrated Lime for Structural Purposed (ASTM C-141).
- E. Water shall be potable.
- F. Air-entraining admixtures may be utilized and shall conform to ASTM C-260, as shall admixture workability.
- G. Provide water resistant admixture.

## 2.2 PREPACKAGED MORTAR MIXES

- A. Prepackaged mortar cements may be used with prior approval of the Architect. To be considered, the mortar cement manufacturer shall submit a request to the Architect in sufficient time for the proposed material to be tested and evaluated prior to its approval for a specific project. The mortar cement shall be in accordance with ASTM C-91-83, and meet the following minimum requirements:
1. Type S Mortar Cement. The masonry mortar made from the mortar cement shall have a compressive strength of 1800 psi minimum at 28 days when tested in accordance with ASTM C-270, with maximum air volume of 16%.
  2. The mortar cement shall contain Portland Cement, hydrated lime, plasticizing admixtures, and/or hydraulic hydrated lime. Mortar cement mixes which contain other materials, including ground limestone, ground slag or other cementitious or non-cementitious materials, are not acceptable.
- B. Instructions for mixing the mortar mix shall be published and accompany all shipments. The instructions shall be volumetric measurements, and shall be developed to show proper proportions of sand to one (1) bag of the prepackaged mortar cement with volume of water to produce a flow of the proper consistency.
- C. Freeze-thaw resistance: The mortar cement shall comply with the following requirements when subjected to 50 cycles of the freeze-thaw test:
1. Loss of compressive strength: 35% maximum
  2. Loss in dry weight: 1.0% maximum
- D. The test specimen shall be made in accordance with ASTM C-91, Paragraph 18, 19 and 20 and be tested in accordance with ASTM C-01, Paragraphs 22.1 and 22.2.1 and ASTM C-67, Paragraph 8.1, 8.3 and 8.4.
1. Colored mortar will be required for all split-faced concrete masonry. Colored mortar shall be field batched mortar with coloring agent added in field. Tests will be required to insure the coloring agent does not affect properties of the mortar. No prepackaged mortar with coloring agents are acceptable.

## 2.3 ON-THE-JOB-MORTAR CEMENT

- A. Type S. Mortar shall have a compressive strength of 1800 psi minimum at 28 days. The mortar shall be proportioned within the following volumetric limits:
1. 1 part Portland Cement
  2. 1/2 part Hydrated Lime
  3. Masonry sand measured in a damp loose condition is to be not less than 2-1/4 and not more than 3 times the sum of the volumes of cement plus lime used.
  4. Plasticizer per instructions of the manufacturer, the quantity of which is not to exceed 2% by volume of the cement and lime combination.

## 2.4 MEASUREMENT AND MIXING

- A. The method of measuring material shall be by volume and shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained. A measuring device to make consistent volume measurements shall be used throughout the project. Measurement of sand by shovel will not be permitted.
- B. Mortar Mixer shall be paddle-type mechanical mixer. It shall be of such design and size to accommodate the mix without overloading, and be adequately powered to vigorously mix the ingredients.

- C. The mortar mixer shall be charged in this order: add approximately one-half the water required, one-half the sand, the cement and lime (or prepackaged mortar cement), the remaining amount of sand, and then sufficient water to bring the mix to desired consistency. Mortar shall be mixed for a minimum of five minutes after all materials have been charged into the mixer with all batches being mixed to the same consistency.
- D. Mortars that have stiffened because of evaporation of water from the mortar may be retempered by adding water as frequently as needed to restore the required consistency. Mortars shall be used and placed in their final position within 2 hours after mixing. When the temperature is over 80 degrees F., the mortar shall be used within 1-1/2 hours of mixing. Mortar not used within these time periods shall be discarded.
- E. Pigmented mortar to be used at all split face CMU. Color to match CMU - submit samples for approval (Base Bid).
- F. All exterior mortar to have water resistant admixture.

END OF SECTION 04100

## **SECTION 04150 - MASONRY ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General Conditions, Amendments to General Conditions, and Supplementary Conditions and Sections in Division 1 of the Specifications apply to work of this section.

#### **1.2 DESCRIPTION**

- A. Work Included in This Section:
  - 1. Metal joint-reinforcement and anchors as specified herein.
- B. Related Work Specified Elsewhere
  - 1. Mortar (Section 04100)
  - 2. Concrete unit masonry (Section 04220)

#### **1.3 SUBMITTALS**

- A. Samples: Submit samples of the following:
  - 1. Joint Reinforcement:
    - a. Submit one piece of joint-reinforcement for wall intersections.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials for work of this Section in Manufacturer's original packaging and protection. Labels shall be intact and legible.
- B. Store materials under cover, and off the ground to protect from wetting, dirt and physical damage.
- C. For joint-reinforcement, anchors and ties, remove any loose rust, scale, dirt and other coatings that would reduce the bond to mortar. Remove by wire brushing prior to installation.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Masonry Joint Reinforcement:
  - 1. Types specified herein are as manufactured by AA Wire Products Co., Chicago, Illinois. Equivalent reinforcement will be acceptable as manufactured by Dayton Sur-Grip and Shore Co.; Conover Steel and Wire Co., Inc.; Dur-O-Wal, Inc., or approved equal.
  - 2. Reinforcement for concrete-unit-masonry walls and partitions of single thickness of masonry units shall be Blok-Lok (AS500), Extra Heavy, hot-dipped galvanized after fabrication.
  - 3. Width of reinforcement shall be 2" less than the nominal wall thickness.
  - 4. Provide prefabricated "Tees" at all abutting walls.

PART 3 - EXECUTION

3.1 ACCESSORIES

- A. Installation of masonry accessories shall be as specified in Section of the Project Manual on unit masonry.

END OF SECTION 04150

## **SECTION 04220 - CONCRETE UNIT MASONRY**

### **PART - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General Conditions, Amendments to General Conditions, and Supplementary Conditions and Sections in Division 1 of the Specifications apply to work of this section.

#### **1.2 DESCRIPTION**

- A. The work required under this Section consists of all concrete masonry.
- B. Related Work
  1. Mortar is specified under Section 04100.
  2. Masonry accessories is specified under section 04150.
  3. Insulation Section 7210.
  4. Alternate Section 00830.
  5. Painting Section 09900.

#### **1.3 SUBMITTALS**

- A. Comply with pertinent provisions of Section 01340,
- B. The Contractor shall submit a certificate signed by the concrete unit masonry manufacturer of compliance with the ASTM C 90 and Non Load Bearing C 129.
- C. When requested by the Architect, the Contractor shall submit to the Architect for approval duplicate samples of each and every kind and/or size of structural concrete block the contractor proposes to use. Each sample shall bear a label indicating the size, kind and quality of the product and the name of the manufacturer.

#### **1.4 QUALITY ASSURANCE**

- A. The manufacturer of the structural concrete block shall be subject to the approval of the Architect.
- B. Certificates:
  1. Prior to delivery of the concrete masonry units to Project Site, submit certificates from manufacturer of concrete masonry units stating compliance with requirements of the Contract Documents. Certificate shall be on firm's letterhead, signed by an officer of the company.
  2. At the completion of the job, the Contractor shall furnish a certificate acceptable to the North Carolina Fire Insurance Rating Bureau, certifying that these units meet their requirements.

#### **1.5 ENVIRONMENTAL CONDITIONS**

- A. Cold Weather and Hot Weather Installations: Comply with requirements specified in Section 04100, "Mortar."

## PART 2 - PRODUCTS

### 2.1 CONCRETE BLOCK

- A. Units for "Regular Dry Block Unit Masonry shall be 2-cell and designed for stacked cells to allow for filling of cores where required on the drawings, except where other shapes, or solid masonry units are called for. See Drawings for size and specific cell arrangement where such is required.
- B. Units for "Split-Face Dry Block masonry shall be equivalent to profile split face units as manufactured by Adams Products Company, Clayton Block, or approved equal. Provide sill blocks, lintel blocks, etc. where shown on drawing, provide corner blocks as required. Units to have through the body color. Color to be selected by the Architect. Provide water resistant add mixture to CMU and mortar. Submit for approval.
- C. Deliver concrete-masonry-units on pallets. Handle at Project Site on flat-bed wheelbarrows or pallets and forklift.

### 2.2 WALL REINFORCEMENT

- A. All exterior walls, foundations and back-up walls shall be reinforced with Dur-O-Wal, American or Wal-Lock truss-design deformed reinforcement hot-dip galvanized after fabrication with zinc coating ASTM A 116, Class 3. It shall be installed in every other course of block. Use corner and tee sections around corners and at intersections with other walls.

### 2.3 EMBEDDED ITEMS

- A. The Contractor shall furnish and install all bolts, anchors, etc., which are to be built into masonry. Coordinate all conduits, pipes etc. with other trades.

## PART 3 - EXECUTION

### 3.1 LAYING

- A. All masonry shall be laid true to dimensions, plumb, square, in bond and properly anchored. All courses shall be level with joints of uniform width. No joints shall exceed the size specified. Faces of walls shall be laid to a line. All masonry shall be laid uniformly one scaffold-height at a time except when otherwise specially approved. Whether masonry is laid from an outside or an inside scaffold rests with the Contractor, but the governing requirement shall be a first class job of masonry in every respect.
- B. Work required to be built into the masonry including loose lintels, angles, special metal work, flashings, anchors, wall plugs, grounds blocking, and other accessories shall be built in as the masonry work progresses. Unless otherwise shown all spaces about built-in work shall be completely and solidly filled in with masonry. Bucks, frames, and similar built-in items shall be maintained in their proper positions, and no braces or stays shall be removed from same until they are securely supported and fastened by the masonry.
- C. Carefully cover all walls each night during inclement weather or during delays in the work to prevent water from rains getting into the masonry. When starting work at a new level, the existing masonry shall be cleaned of all loose mortar, or other materials, and shall be thoroughly welded.

- D. Pickets, chases, recesses and other breaks in masonry shall be constructed where and as shown on the drawings or in accordance with instructions given prior to the laying of the masonry.
- E. Cutting of Units: Where cuffing is necessary, make all cuts with a motor-driven masonry saw. Units with chips or irregular cuts will not be accepted.
- F. Coursing: Masonry work is laid out on a nominal 3/8" wide joint for concrete-unit-masonry work.
- G. Where masonry units are disturbed, or must be moved after the mortar has begun to lose its moisture, the masonry unit and all adjacent mortar shall be removed and reset completely.

### 3.2 INSTALLING REINFORCEMENT

- A. Partitions shall have a continuous strip of reinforcing installed not more than every 16" vertically.
- B. All reinforcing strips shall be laid in 10'-0" lengths and lapped a minimum of the width of the reinforcing.
- C. In splicing vertical reinforcement, or attaching to dowels, the bar shall be placed in contact and wired. When it is necessary to splice reinforcement at points other than shown on the Drawings, the character of the splice shall be approved by the Architect.

### 3.3 GROUTING OF REINFORCED MASONRY WALLS

- A. Install masonry grout in all walls indicated or noted as reinforced and/or filled walls and all reinforced masonry lintels, beams, etc.
- B. Keep cores completely free of masonry mortar.
- C. Walls will be grouted by the Low-Lift method only to ensure positive filling of all cores and/or cavities to prevent mortar build-up in cavities as follows:
  1. Dowels from foundation or footings will extend up a minimum of 48 bar diameters or 30" to lap with wall reinforcing steel.
  2. See drawings for required lap splices.
  3. This process will be repeated by alternately laying-up units and then inserting reinforcing and grouting at successive heights not to exceed 5'-0".
  4. Vibrate and rod grout to insure complete filling of all spaces, however, over vibration must be avoided to prevent blow out, broken ties, cracked units and segregation of grout.
  5. Where possible install grout with tremie to prevent segregation.
  6. Stop grout 1-1/2" below top of last course when additional reinforced masonry is to be subsequently installed on top. At top of walls the grout will be level or slightly higher than block shell to ensure roof structure bearing on grout fill rather than on the block shell.

### 3.4 EXPANSION MATERIAL

- A. Install as masonry work proceeds, and as shown on drawings. Joints are to be kept clean and free of all mortar as work progresses.

### 3.5 BUILT-IN WORK

- A. Consult other trades in advance and make provisions for installation of their work in order to avoid cutting and patching. Build in work specified under other sections of the specifications as the work progresses.
- B. Set steel lintels in beds of mortar.
- C. Grout heads and jambs of hollow metal frames fully. Observe requirements of UL for grouting frames in Fire-Rated opening assemblies.

### 3.6 BOND AND JOINTS

- A. All blocks, unless otherwise shown on the Drawings or herein excepted, shall be laid in running bond with all intersections of walls bonded every second course or keyed every course with galvanized corrugated steel wall ties. Blocks shall be cut accurately to fit around all pipe, ducts, openings, etc., and all voids slushed full. Unless otherwise shown or directed, all blocks shall be laid with the cells vertical. All walls and webs of blocks shall be carefully buttered, full-joint, with mortar. All solid blocks shall be laid in full beds of mortar. All blocks shall be laid with 3/8" bed and head joints. Except where plaster occurs, as shown on details and in Finish Schedule masonry block walls shall have concave mortar joints. Where plaster is to be applied, mortar joints shall not be tooled, but shall be flush with face of block. Wherever concentrated loads occur, all cells of blocks shall be carefully and solidly filled with concrete or mortar. Units shall be set tightly against the inside of bucks and all voids slushed full.

### 3.7 DISTURBED UNITS

- A. Where concrete masonry units are disturbed or must be moved after the mortar has begun to lose its moisture, the masonry units and all adjacent mortar shall be removed and reset completely.

### 3.8 TOOLING

- A. Where joints are to be tooled they shall be tooled to a uniform concave, head joints first and the bed joints. All joints shall be tooled at approximately the same degree of moisture content and firmness to achieve a uniform color and texture.

### 3.9 CONSTRUCTION TOLERANCES

- A. Variations from Plumb: For lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', 3/8" in a story height of 20' maximum, nor 1/2" in 40' or more. Except for external corners, expansion joints and other conspicuous lines, do not exceed 1/4" in any story of 20' maximum, nor 1/2" in 40' or more.
- B. Variations from Level: For grades shown for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines do not exceed 1/4" in any bay of 20' maximum, nor 3/4" in 40' or more.

### 3.10 POINTING OF MASONRY

- A. At the completion of the masonry work, all holes in the exposed masonry shall be pointed. Defective joints shall be cut out and tuckpointed solidly with mortar. Pointing and tuckpointing shall be done with a pre-hydrated mortar. The mortar cement shall be

controlled so that after curing of the mortar no difference in texture or color exists with that of adjacent masonry.

### 3.11 COLD WEATHER

- A. No laying of masonry units shall be performed unless the temperature of the surrounding air is 40 degrees F and rising. The use of "anti-freeze" or accelerating admixtures is not permitted. Provide temporary protection of masonry to ensure a minimum 48 hours curing at a minimum 40 degrees F.

### 3.12 MASONRY CLEANING

- A. While laying the concrete masonry, good workmanship and job housekeeping practices shall be used so as to minimize the need for cleaning the concrete masonry. Protect the base of the wall from mud splashes and mortar droppings, protect the wall by setting scaffolding boards so that mortar is not deflected on the wall, and at end of each day set the scaffolding boards so they do not deflect rainfall onto newly laid masonry. The concrete masonry technique shall be such that mortar does not run down the face of the wall, or smear the mortar onto the brick face. After the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of concrete masonry. Do not bag or sack the wall, but use a bricklayer's brush made with medium soft hair.
- B. Remove all large mortar particles with a hardwood scraper.
- C. If, after using the above outlined techniques, additional cleaning of the walls is found necessary, allow the walls to cure one month prior to initiating further cleaning processes.
- D. Saturate the wall with clean water. The wall shall be thoroughly saturated prior to and at the time the cleaning solution is applied.
- E. Clean the wall only with an approved cleaning solution applied with a brush, starting at the top of the wall. Approved cleaning solutions are: Sure-Klean 600, Vanatrol, Superior 800, or approved equal. Approved cleaners shall be composed primarily of detergents, wetting agents, buffering agents, and a maximum of 10% muriatic acid. The use of any of the above cleaning agents shall first be approved in writing by the manufacturer of the concrete masonry being cleaned, and by the Architect. The concentration, method of application of the cleaning solution, and method of scraping shall be as outlined on the container by the manufacturer.
- F. High pressure water and sandblasting shall not be used for cleaning except with the recommendations of the concrete masonry manufacturer, and the written approval of the Architect.
- G. Immediately after cleaning a small area, the wall shall be rinsed thoroughly with quantities of water.
- H. Protect adjacent surfaces and materials during brick cleaning operations.
  - 1. After the walls are cleaned, take necessary precautions to insure that other contractors and subcontractors do not damage or soil the walls. Mud protection around the base of walls shall be left in place until the final grading work is done.

END OF SECTION 04220