3.03 FIELD QUALITY CONTROL

A. Dowel Testing:

1. Test every dowel for the first ten dowels. Provided every dowel passes, frequency of test may be reduced to every other dowel for the next ten dowels. Provided every dowel passes, frequency of test may be reduced to every fourth dowel. Upon failure of test, previous ten dowels must be tested, and graduated frequency of tests must start over.

2. Dowels shall be tested to specified yield strength of reinforcing *bar.*

3. Testing apparatus shall not interfere with development of concrete failure cone at dowel.

4. Testing shall occur only after adhesive has achieved proper cure per manufacturer's requirements.

5. Failure of reinforcing bar or of base concrete will cause dowel to be rejected. Rejected dowels shall be reinstalled in sound concrete and retested.

6. If yield strength of reinforcing bar cannot be achieved when tested, manufacturer's representative shall recommend revised installation procedures or adhesive products. Modified installations must be tested at same frequency as specified herein.

B. Inspection:

1. Inspector shall be onsite during dowel installation.

2. Inspector shall observe installation and shall submit report containing the following:

   a. Drill bit compliance.

   b. Hole depth and cleanliness.

   c. Product Description: Product name, rod diameter, and length.

   d. Adhesive expiration date.

   e. Verification of dowel installation in accordance with manufacturer's published instructions.

   f. ICC-ES Report.

C. Manufacturer's Field Services: Provide manufacturer's representative at Site in accordance with Section 01 0001, General Requirements, for installation assistance, inspection, and certification of proper installation.

END OF SECTION

INDEX TO

SECTION 04 22 00 – CONCRETE UNIT MASONARY

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 – GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):

   a. 530.1/ASCE 6/TMS 602, Building Code Requirements for Masonry Structures and Specifications for Masonry Structures and Related Commentaries.

   b. ACI SP-66, ACI Detailing Manual

2. ASTM International (ASTM):

   a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

   b. A153, Standard specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

   c. A167, Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

   d. A615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

   e. C33, Standard Specification for Concrete Aggregates.

   f. C62, Building Brick (Solid Masonry Units Made from Clay or Shale)

   g. C67, Sampling and Testing Brick and Structural Clay Tile

   h. C90, Standard Specification for Loadbearing Concrete Masonry Units.

   i. C91, Masonry Cement

   j. C94, Ready Mixed Concrete

   k. C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

   l. C144, Standard Specification for Aggregate for Masonry Mortar.

   m. C150, Standard Specification for Portland Cement.

n. C270, Standard Specification for Mortar for Unit Masonry.

o. C476, Standard Specification for Grout for Masonry.

p. C494, Chemical Admixtures for Concrete

q. C578, Rigid, Cellular Polystyrene Thermal Insulation

r. C744, Standard Specification for refaced Concrete and Calcium Silicate Masonry Units.

s. C780, Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

t. C1019, Sampling and Testing Grout

u. C1072, Measurement of Masonry Flexural Bond Strength

v. C1142, Extended Life Mortar for Unit Masonry

w. C1289, Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

x. C1314, Standard Test Method for Compressive Strength of Masonry Prisms.

y. C2287, Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

z. E514, Standard Test Method for Water Penetration and Leakage through Masonry.

3. Brick Institute of America (BIA).

4. International Code Council (ICC):

a. International Building Code (IBC) Chapter 21.

b. ICC Evaluation Service (ICC-ES) Reports.

5. National Concrete Masonry Association (NCMA).

1.02 SUBMITTALS

A. Submittals for Review:

1. Product Data:

a. Accessories.

b. Concrete Masonry Units (CMU).

c. Mortar - include required environmental conditions, admixture limitations and manufacturer's instructions for packaged dry mortar installation.

d. Reinforcement.

2. Certificates:

a. Manufacturer letters of certification stating materials meet or exceed the specified requirements.

B. Informational Submittals:

1. Statement of Acknowledgement of Quality Assurance Plan in accordance with IBC Section 1705.3.

1.03 QUALITY ASSURANCE

A. Compliance: Comply with the requirements and criteria of the NCMA, BIA, ASTM C90, ASTM C216, and ACI 530.1 for masonry finish and appearance, dimension tolerances, tolerances of construction, joint tolerances, and wall plumb tolerances.

B. Spare Vibrator: Maintain at least one spare vibrator on site at all times.

C. Bracing and Scaffolding: Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Temperature: Do not lay masonry when ambient temperature is below 32 degrees F on a rising temperature, or below 40 degrees F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless written approval of procedure for protection from freezing is obtained from Engineer. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

B. Moisture Protection: Protect masonry construction from loss of moisture during curing period of 7 days when ambient air temperature is 90 degrees F or greater and when relative humidity is less than 50 percent.

PART 2 – PRODUCTS

2.01 MASONRY UNITS

A. General:

1. Furnish or cut special shapes for corners, jambs, lintels, and other areas shown or required.

2. Special units shall match properties of standard units.

3. Where units are placed so end of unit is exposed, such as at a corner or intersection, exposed end of that block shall have surface to match color and texture of sides of other units.

4. Furnish sound, dry, clean units free of cracks, prior to placing in structure.

5. Vertical Cells to be Grouted: Capable of alignment sufficient to maintain clear, unobstructed continuous vertical cell dimensions in accordance with ACI 530.1, Table 7.

6. Masonry unit size and shape shall allow for all placement patterns to prevent materials, such as grout or poured insulation, from escaping from cell being filled to adjacent cells where material is not intended to be placed.

B. Plain Face Concrete Masonry Units (CMU):

1. Load Bearing Units: ASTM C90: lightweight, hollow block, grouted as indicated.

2. Nominal Size: 16 inches long by 8 inches high by thickness shown on Drawings.

3. Minimum Compressive Strength, f'_m: 1,500 psi

4. Color of Units: Natural.

5. Surface Texture: Smooth.

C. Decorative Concrete Masonry Units:

1. Texture: Split face and smooth face, as indicated.

2. Colors: As selected by Architect.

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

a. Cemex.

b. Johnson Cement Co.

c. Trenwyth Industries/Oldcastle.

D. Integral Water Repellent for Decorative Concrete Units: Provide units made with integral water repellent for exposed units. Provide one of the following:

1. Headwaters Construction Materials; Eucon BlockTite.

2. Grace Construction Products; Dry-Block.

3. BASF; Rheopel.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM CI50, Type I.

B. Lime: ASTM C207, Type S hydrated.

C. Aggregates:

1. Mortar: ASTM C144, sand.

2. Grout: ASTM C404.

D. Water: Fresh, clean, and potable.

E. Colored Cement for Decorative Concrete Masonry: Packaged blend made from mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients. Provide one of the following:

1. Essroc; Flamingo Color Masonry Cement.

2. Holcim; Rainbow Mortamix Custom Color Masonry Cement.

3. Lehigh; Lehigh Custom Color Masonry Cement.

F. Mortar Mix:

1. Mortar for Unit Masonry, Type S in accordance with ASTM C270.

2. Minimum 28-day compressive strength of 2,100 psi.

G. Grout:

1. For bond beams, lintels and vertically reinforced cells.

2. Grout shall be in accordance with ASTM C476, premixed type in accordance with ASTM C94.

3. Consistency required to fill completely the volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less;

coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

4. Minimum 28-day compressive strength of 3,000 psi. Slump: 8 inches to 11 inches.

2.03 REINFORCEMENT

A. Horizontal Joint Reinforcement:

1. Truss or ladder type, ASTM A82, 9ga, galvanized.

2. Reinforcement: Clean and free from loose rust, scale, and coatings that reduce bond.

3. Furnish special manufactured corner and wall intersection pieces.

4. Manufacturer: Dur-O-Wal, Inc., Aurora, IL.

B. Deformed Bars: As specified in Section 03 30 00 Cast-In-Place Concrete.

2.04 PREFORMED CONTROL JOINTS

A. Solid rubber cross-shape extrusions as manufactured by:

1. Wire-Bond, Rubber Control Joint.
2. Hohmann and Barnard, Inc; RS Series.

PART 3 – EXECUTION

3.01 GENERAL

A. Protect masonry construction to prevent efflorescence. Provide measures to prevent moisture from entering incomplete walls.

3.02 PREPARATION

A. Prepare surface contact area of foundation concrete for initial mortar placement by one of following methods:

1. Sandblasting foundation and reinforcing dowels after concrete has fully cured to remove laitance and spillage and to expose sound aggregate.

2. Water blasting foundation and reinforcing dowels after concrete has partially cured to remove laitance and spillage and to expose sound aggregate.

B. Clean surfaces of loose material prior to initial mortar placement.

C. Prevent surface damage to foundation concrete that will be exposed to view outside of contact area.

3.03 LAYING MASONRY UNITS

A. General:

1. Conform to building code applicable to this Project and as supplemented by these Specifications.

2. Do not start laying masonry units unless foundation wall is plumb within 1/4 inch in 10 feet or not straight within 5/16 inch in 10 feet.

3. Finish Tolerances (Measured on Interior surfaces):

d. Maximum permissible variation from plumb of masonry wall or line of joints in masonry wall: 1/16 inch per foot of height and 1/4 inch in total height of wall.

e. Maximum permissible variation from horizontal line along base of wall or for lines of horizontal joints: 1/16 inch per block and 1/4 inch per 50 feet of wall with proportionately greater tolerance for longer walls up to 1/2 inch in total length of wall.

4. Place units with chipped edges or corners such that chipped area is not exposed to view.

B. Wall Units:

1. General:

a. If necessary to move a unit after set in-place, remove from wall, clean, and set in fresh mortar.

b. Toothing of masonry units is not permitted.

2. Running Bond:

a. Unless otherwise shown, lay up walls in straight, level, and uniform courses using a running bond pattern.

b. Place units for continuous vertical cells and mortar joints to prevent materials, such as grout or poured insulation, from escaping from cell being filled to adjacent cells where material is not intended to be placed.

3. Corners: Lay standard masonry bond for overlapping units and grout solid.

4. Intersecting Walls: Bond with reinforcement, not with masonry bond.

C. Special Shapes:

1. Provide and place such special units as corner block, doorjamb block, lintel block fillers, and similar blocks as may be required.

2. Use required shapes and sizes to work to corners and openings, maintaining proper bond throughout wall.

3.04 BUILT-IN ITEMS

A. Position door frames, windows, vents, louvers, and other items to be built in wall, and construct wall around them.

B. Install masonry anchors to secure items to wall.

C. Fill spaces around items with mortar or grout.

D. Do not place electrical, instrumentation, or water conduits in a cell containing reinforcement, unless approved in writing by Engineer. Pipes, sleeves, and conduits shall not be placed closer than three diameters, center-to-center, nor shall they impair strength of construction.

3.05 MORTAR JOINTS

A. General:

1. Straight, clean, with uniform thickness of 3/8 inch.

2. Horizontal and vertical mortar joints shall have full mortar coverage on face shells.

3. Vertical Head Joints:

a. Butter well on each unit for a width equal to face shell of unit, shove tightly so mortar bonds well to both units.

b. Solidly fill joints from face of block to at least depth of face shell.

4. As units are laid, remove excess mortar from grout space of cells to be filled.

5. Place mortar before initial setting of cement takes place. Do not retemper mortar that has started to set or is not used within one hour. Retempering of colored mortar is not allowed.

B. Exposed Joints:

1. Tool joints exposed to view after final construction, unless otherwise noted or shown.

2. Cut joints flush and as mortar takes its initial set tool to provide a concave joint.

3. Perform tooling when mortar is partially set but still sufficiently plastic to bond.

4. Perform tooling with tool that compacts mortar, pressing excess mortar out rather than dragging it out.

5. Rake out joints that are not tight at time of tooling, point, and then tool.

6. Rake and tool joints at split-face surfaces interior and exterior.

C. Concealed Joints: Strike flush with no further treatment required.

3.06 CONTROL JOINTS

A. Preformed Control Joints:

1. Omit mortar from vertical joints.

2. Place rubber control joint material as wall is built.

3. After wall is grouted, cured, and cleaned, install backing rod and sealant as specified in Section 07 92 00, Joint Sealants.

4. Place and tool sealant to match depth of typical joint.

5. Maximum spacing from all corners shall be 20 times wall thickness, maximum spacing between joints shall be 40 times wall thickness.

3.07 REINFORCING

A. Foundation Dowels:

1. Size, number, and location of foundation dowels shall match vertical wall reinforcing, unless otherwise noted.

2. When foundation dowel does not line up as intended, with vertical core, do not slope more than 1 horizontal to 6 vertical to bring it into alignment.

B. Vertical Reinforcing:

1. Use deformed bars.

2. Hold in position near the ends of bars by wire ties to dowels or by reinforcing positioners.

3. Lap reinforcing bars as shown, where spliced and wire tie together.

4. Minimum Bar Clearance: One bar diameter from masonry and from additional parallel bars in same grout space.

5. Hold in position at maximum intervals of 160 bar diameters by reinforcing positioners.

C. Horizontal Reinforcing:

1. Use deformed bars.

2. Lay on webs of bond beam units and place as wall is built.

3. Lap reinforcing bars as shown, where spliced and wire tie together.

4. Minimum Bar Clearance: One bar diameter from masonry and from additional parallel bars in same grout space.

5. Terminate reinforcing bars 2 inches clear from control joints as shown.

D. Horizontal Joint Reinforcement:

1. Use for stack bond.

2. Provide in addition to typical wall reinforcing steel.

3. Space maximum 16 inches apart, vertically.

4. Lap ends 6 inches minimum.

5. At control joints make reinforcement discontinuous.

6. Use manufactured corner and other wall intersection pieces.

3.08 MORTAR PRODUCTION

A. General:

1. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use. Mix ingredients 3 minutes to 5 minutes after all ingredients are introduced.

2. Provide volumetric control by using batching box or similar measuring device. Do not use shovel to introduce materials directly into batch.

3. Maintain sand uniformly damp immediately before the mixing process.

4. Use cool mix water.

5. Do not use anti-freeze compounds to lower the freezing point of mortar.

6. If water is lost by evaporation, re-temper only within two hours of mixing.

3.09 GROUTING

A. General:

1. Do not mix, convey, or place with equipment constructed of aluminum.

2. Secure vertical and horizontal reinforcement, ties, bolts, anchors, and other required embedments in place; inspect and verify before placing grout.

3. Grout beams over openings in one continuous operation.

4. Maintain vertical alignment in ACI 530.1, Table 7.

5. Maximum grout pour shall be 5'-0", unless otherwise approved, in writing, by Engineer.

6. Place grout as soon as possible after mortar has set to reduce shrinkage cracking of vertical joints.

7. Vertical Reinforcement:

   a. First wire tie to foundation dowels, then build wall around it.

   b. Provide reinforcing positioners or a proved cross bracing to secure top of steel in place.

   c. Do not drop in vertical steel after block is laid, unless reinforcing positioners are provided in the course above previously grouted course.

B. Grouting Requirements:

1. Brace masonry to resist wet grout pressure.

2. Do not start grouting until wall has cured for 24 hours, minimum.

3. Partial Grouting Requirements:

   a. Walls Not Requiring Solid Grouting: Fill cells containing reinforcing steel, anchor bolts, and other embedded items as shown with grout.

   b. Construct cells to be filled to confine grout within cell.

   c. Cover tops of unfilled vertical cells under a bond beam with metal lath to confine grout fill to bond beam section.

4. Form horizontal construction joints between pours by stopping grout pour 1–1/2 inches below a mortar joint, except at a bond beam; stop pour 1/2 inch below top of masonry unit.

5. Partial Grouting with Insulation Fill:

   a. Where cells of masonry units are to receive masonry fill insulation in some cells and to receive grout in some cells, provide continuous

mortar on block webs on each side of cells to be filled with grout to ensure insulation without enter grout cells.

b. Where bond beams are required with masonry fill insulation and grout, limit pours to less than 5 feet in height.

6. Fully embed horizontal steel with grout in an uninterrupted pour.

7. Do not construct wall more than one course above top of grout pour prior to placing grout.

8. Vibration:

a. Use internal "pencil" type, low energy vibrator to thoroughly consolidate grout and reduce amount of air voids. Do not use concrete vibrators.

b. After waiting sufficient time to permit grout to become plastic, but before it has taken any set, reconsolidate grout.

c. Waiting period will vary depending upon weather conditions and block absorption rates, but under "normal" weather conditions with average masonry units the waiting period should be between 30 minutes to 60 minutes.

9. Cleanouts:

a. Provide for grout pours over 5 feet in height.

b. Provide for sufficient size to permit cleaning of cell, positioning of reinforcing, and inspection at bottom of every vertical cell containing reinforcing.

c. Location: Concealed from view after final construction, unless otherwise approved by Owner.

d. After wall has been inspected and approved and prior to grouting, cap cleanouts in a manner that will seal them from grout *leakage* and provide a flush finish.

3.10 FIELD QUALITY CONTROL

A. Masonry shall be tested by independent testing agency, retained by Owner, in accordance with ASTM C1314, Method B, as modified by ACI 530.1/ASCE 6.

B. Masonry test samples, when required, shall be constructed onsite with same materials and workmanship to be used for Project.

C. Provide adequate facilities for safe storage and proper curing of masonry prisms, mortar samples, and grout samples, as applicable, onsite for first 24 hours, and for additional time as may be required before transporting to test lab.

D. Masonry Testing:

1. Unit Strength Method:
   a. Method and frequency for mortar, grout, and masonry unit sampling and testing in accordance with IBC 2105.2.2.1.

   b. Provide masonry units for test samples required.

E. Corrective Action:

1. If compressive strength tests made prior to construction of permanent structure fail to meet Specifications, adjustments shall be made to mix designs for mortar, or grout, or both, as needed to produce specified strength. Masonry units shall also be tested to verify compliance to requirements of ASTM C90, Type 1.

2. If strength tests performed on materials representative of in-place construction fail to meet Specifications, prisms or cores shall be cut from constructed walls in sufficient locations to adequately determine strength in accordance with IBC 2105.3.

3.11 CLEANING

A. Immediately after completion of grouting, clean masonry surfaces of excess mortar, grout spillage, scum, stains, dirt, and other foreign substances using clean water and fiber brushes.

3.12 PROTECTION OF INSTALLED WORK

A. Do not allow grout and mortar stains to dry on face of exposed masonry.

B. Protect tops of walls at all times. Cover tops of walls with waterproof paper when rain or snow is imminent and when the Work is discontinued.

C. Adequately brace walls until walls and roof are completed.

D. Provide sufficient bracing to protect walls against damage from elements, including wind and snow.

E. Protect masonry against freezing for minimum 2 hours after being laid.

F. Protect masonry from damage until final acceptance of the Work. Damaged units will not be accepted.

END OF SECTION