

***** This Guide Specification is particular to projects under the jurisdiction of DSA or OSHPD 1 and 4. For brevity, 'DSA' is used within specifier notes to mean DSA and OSHPD 1 and 4, except where specific DSA publications are cited. *****

NOTE TO SPECIFIER: PLEASE ENABLE VIEWING OF HIDDEN TEXT! Notes are interspersed throughout to offer explanations or guidance, and indications on when or if to keep certain items.

Replace the term "Design Professional" with the identity of the design professional as defined in the General and Supplementary Conditions.

SECTION 042200 – CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Division 01 Specification Sections, Drawings, General Conditions, Supplementary General Conditions, and Special Conditions apply to this section.

1.2 REFERENCES

- A. TMS 602/ACI 530.1/ASCE 6 2008 Specification for Masonry Structures
- B. ASTM International (latest versions)
 - 1. ASTM A36/A36M Standard Specification for Carbon Structural Steel
 - 2. ASTM A82/A85M Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - 3. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4. ASTM A185/A182M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - 5. ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - 6. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 7. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - 8. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process
 - 9. ASTM A884/A884M Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
 - 10. ASTM A899 Standard Specification for Steel Wire Epoxy-Coated
 - 11. ASTM A951 Standard Specification for Masonry Joint Reinforcement
 - 12. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable
 - 13. ASTM C55 Standard Specification for Concrete Building Brick **Include only if specified in 2.2 B**

14. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units
15. ASTM C140 Standard Test Method for Sampling and Testing Concrete Masonry Units
16. ASTM C150 Standard Specification for Portland Cement
17. ASTM C270 Standard Specification for Mortar for Unit Masonry
18. ASTM C476 Standard Specification for Grout for Unit Masonry
19. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete [Include only if specified in 2.3 B](#)
20. ASTM C989 Standard Specification for Slag Cement for Use in Concrete and Mortars [Include only if specified in 2.3 B](#)
21. ASTM C1019 Standard Test Method for Sampling and Testing Grout
22. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms
23. ASTM C1586 Standard Guide for Quality Assurance of Mortars
24. ASTM C1611/C1611M Standard Test Method for Slump Flow of Self-Consolidating Concrete [Include only if specified in 2.3](#)
25. ASTM D2000 Classification System for Rubber Products in Automotive Applications [Include only if specified in 2.6](#)
26. ASTM D2287 Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds [Include only if specified in 2.6](#)

1.3 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Control joint materials.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Products installed, but not furnished, under this Section:

[Edit the following list as needed.](#)

1. Section 055000 Metal Fabrication for steel lintels and shelf angles for unit masonry.
2. Section 076200 Sheet Metal Flashing and Trim.

C. Related Sections:

[Edit the following list as needed.](#)

1. Section 040513 Masonry Mortaring
2. Section 040516 Masonry Grouting.
3. Section 040519 Masonry Anchorage and Reinforcing.
4. Section 040523 Masonry Accessories.
5. Section 042200.13 Concrete Unit Veneer Masonry.
6. Section 042223.23 Prefaced Concrete Unit Masonry for Astra-Glaze-SW glazed masonry units.
7. Section 042300 Glass Unit Masonry.
8. Section 047200 Cast Stone Masonry.
9. Section 071900 Water Repellents for application to unit masonry assemblies.

10. Section 076200 Sheet Metal Flashing and Trim for exposed sheet metal flashing.
11. Section 078413 Penetration Firestopping for firestopping at openings in masonry walls.
12. Section 078443 Fire-Resistive Joint Sealants for fire-resistive joint systems at heads of masonry walls.
13. Section 079200 Joint Sealants for sealing control and expansion joints in unit masonry.
14. Section 321413 Precast Unit Paving for interlocking concrete pavements.

1.4 SYSTEM DESCRIPTION

- A. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than 1500 psi f'_m .

Coordinate with Structural documents. Either insert design strength (e.g., 1500 psi f'_m) in paragraph above (A) as stated in structural documents (edit above as necessary), or insert a reference to its location within such documents below (B). Keep only one of these paragraphs.

- B. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than the f'_m as indicated [insert reference location].

1.5 SUBMITTALS

- A. Obtain written acceptance of submittals prior to use of the following:
 1. Submit mix designs
 - a. Preblended mortar
 - 1) Mix design indicating types and proportions of materials according to proportion requirements of ASTM C270, or
 - 2) Mix designs and mortar tests performed in accordance with the property specification of ASTM C270
 - b. Conventional grout
 - 1) Mix design indicating types and proportions of materials according to proportion requirements of ASTM C476, or
 - 2) Mix design and grout strength test performed in accordance with ASTM C476.

Include the following if self-consolidating grout is specified.

- c. Self-consolidating grout
 - 1) Compressive strength tests performed in accordance with ASTM C1019, and slump flow and visual stability index (VSI) as determined by ASTM C1611/C1611M.
2. Submit material certificates for each of the following certifying compliance.
 - a. Concrete masonry units.
 - b. Steel reinforcing bars.
 - c. Anchors, ties, fasteners, and metal accessories.
 - d. Preformed control joint gaskets.

For samples required below, state quantity of each.

- B. Samples for Verification: For each type and color of the following:
 1. Exposed concrete masonry units.

Include subparagraph below if colored mortar is specified.

2. Mortar, for color selection or confirmation.

1.6 QUALITY ASSURANCE

Preconstruction verification of f'_m is required for engineered masonry by the 2010 CBC for Verification and Inspection Levels 1 and 2, by means of either the unit strength method or prism test method. The unit strength method is allowed where $f'_m = 1500$ net psi.

When f'_m values exceed 1500 net psi, projects MUST verify by prism test.

A. Preconstruction Testing.

1. Owner will select a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.

Specify only one verification method – either Unit Strength OR Prism Test – not both!

Unit Strength Method:

If $f'_m = 1500$ psi, specify the unit strength method and delete the subparagraph for prism testing (3, below).

2. The compressive strength of masonry shall be determined based on strength of the unit and type of mortar specified (Unit Strength Method) per CBC Table 2105A.2.2.1.2.
 - a. Concrete Masonry Units: Test per ASTM C140.

Mortar and grout tests are required for the unit strength method (Section 2105A.2.2.1.4)..

- b. Mortar and grout tests: At beginning of work, sample mortar and grout on three successive working days per CBC Section 2105A.2.2.1.4.
 - 1) Test mortar specimens per ASTM C1586.
 - 2) Test grout specimens per ASTM C1019.

OR - Prism Test Method:

If $f'_m > 1500$ psi, the prism test method is required; delete the unit strength paragraph 2. above.

3. The compressive strength of masonry shall be determined by the prism test method in accordance with ASTM C1314. Schedule masonry procurement sufficiently in advance to allow for prism construction and curing.
 - a. Prism Test: For each type of construction required, construct and test five prisms per ASTM C1314.

Only if $f'_m > 1500$ psi, mortar and grout tests are also required along with the prism test (CBC Section 2105A.2.1 Exception paragraph 2, Section 2105A.2.2.1.4). Include the following subparagraph.

Otherwise, where $f'_m = 1500$, delete it.

- b. Mortar and grout tests: At beginning of work, sample mortar and grout on three successive working days per CBC Section 2105A.2.2.1.4.
 - 1) Test mortar specimens per ASTM C1586.
 - 2) Test grout specimens per ASTM C1019.

- B. Sample Panels: Construct an approximate [Width:] long by [Height:] panel for representation of completed masonry, joint tooling, design details, and workmanship. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.

If it is desirable to demonstrate particular units or areas of critical detailing, specify them in the following subparagraph, otherwise delete it.

- 1. The following shall be installed in the sample panel:
 - a. [Specify units]
 - b. [Specify details or conditions]

It is typically good practice to conduct preinstallation meetings to provide opportunity to clarify critical details, schedules, specification intent, inspections, etc. If the work under this section is of a minor nature, the following subparagraph may be deleted.

- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. All materials of this section shall be protected to maintain quality and physical requirements.
- B. All masonry units shall be stored on the jobsite so that they are protected from rain, stored off-ground and kept clean from contamination. Prevent units from being otherwise wetted.
- C. Store Spec Mix preblended mortar mix in manufacturer's original, unopened, undamaged containers with identification labels intact, covered and protected from weather, or in a Spec Mix dispensing silo.

1.8 FIELD CONDITIONS

- A. Securely cover tops of all unsheltered walls and partially completed walls when work is not in progress.

Cold-weather and hot-weather masonry construction is addressed in CBC Sections 2104A.3 and 2104A.4, referring to TMS 602/ACI 530.1/ASCE 6 Article 1.8 C and 1.8 D respectively. Include and modify below as necessary.

- B. Cold-weather procedures when ambient temperature falls below 40°F (4°C) or the temperature of masonry units is below 40°F (4°C):
 - 1. Wet or frozen units shall not be laid.
 - 2. Implement cold weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 C.
- C. Hot-weather procedures when ambient temperature exceeds 100°F (38°C), or exceeds 90°F(32°C) with a wind velocity greater than 8 mph:
 - 1. Implement hot weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 D.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Concrete masonry units.
 - 1. Angelus Block Co., Inc.
 - a. Sun Valley, CA (818) 767-8576
 - b. Orange, CA (714) 637-8594
 - c. Fontana, CA (909) 350-0244
 - d. Gardena, CA (310) 323-8841
 - e. Oxnard, CA (805) 485-1137
 - f. Indio, CA (760) 347-3245
 - 2. Desert Block Co., Inc.
 - a. Mojave, CA (661) 824-2624
 - b. Bakersfield (661) 858-2848

- B. Preblended mortar.
 - 1. Spec Mix Preblended Mortar Mix, by E-Z Mix, Inc.
 - a. Sun Valley, CA (818) 768-0568
 - b. Rialto, CA (909) 874-7686

- C. Grout additive.
 - 1. PRE-MIX Products Grout Additive, by E-Z Mix, Inc.
 - a. Sun Valley, CA (818) 768-0568
 - b. Rialto, CA (909) 874-7686

2.2 CONCRETE MASONRY UNITS

- A. Concrete Masonry Units: ASTM C90.

The majority of structural design is based on the mediumweight classification; therefore, the greatest availability in Southern California of architectural cmu is in mediumweight. Edit below if structural design considers a different weight classification.

- 1. Weight Classification: Mediumweight unless otherwise indicated.

Although it is common to call out colors and textures on elevation drawings or legend tables within the drawings set, it is helpful to also coordinate and list them here. Examples of Color: Sandstone, Warm Gray. Examples of Texture: Precision, Split Face, Burnished. If compatible mortar color other than natural gray is intended, specify in Article 2.3 A.

- 2. Color(s) and texture(s):
 - a. [Color] [Texture]

Concrete building brick, below, is listed by DSA for "reinforced grouted masonry", i.e., multiwythe composite masonry – two wythes tied together and the space between grouted. If that wall type is not applicable to this project, delete the reference. See also references to solid-unit multiwythe masonry in articles 3.3 and 3.7, and delete those as well if not used.

- B. Concrete Building Brick: ASTM C 55.

2.3 MORTAR AND GROUT MATERIALS

The following paragraphs may instead be included in their respective specification Sections: 040513 Masonry Mortaring, 040516 Masonry Grouting. If so, replace details below with a reference to the appropriate Section.

Preblended mortar below provides greater control and consistency than field-mixed. Spec Mix meets both proportion and properties requirements of ASTM C270.

- A. Spec Mix Masonry Mortar preblended factory mix: ASTM C270, proportions (or, if a separate Section is included for mortar, append the foregoing with ", in accordance with Section 040513 Masonry Mortaring", and delete the following subparagraph).

Natural gray is often used, including use with colored cmu. If compatible mortar colors are desired, specify here. Where used with Angelus CMU fields, simply specify the Angelus CMU color. For example, for "Shoreline" cmu color fields, specify "Shoreline" Spec Mix mortar. For stock colors (Sandstone, Spice, and Harvest), specify the stock mortar color, "Medium Tan".

1. Natural gray color.

- B. Grout for masonry: ASTM C476 (or, if a separate Section is included for grout, append the foregoing with ", in accordance with Section 040516 Masonry Grouting", and delete the following subparagraphs).

Fly ash, or fly ash combined with ground granulated blast furnace slag (GGBFS), may be used as a partial Portland cement replacement, and is a practical means of introducing significant recycled content into the masonry wall without adversely affecting aesthetic control of exposed masonry units. And, since grout is approximately 50% and more of the volume of solid grouted concrete masonry, the sustainability benefit is substantially greater than recycled content in cmu alone. Studies undertaken by numerous industry organizations have shown:

- Grouts with up to 30% by weight of Portland cement replaced with Class F fly ash can be treated as conventional masonry grout.
- Grouts with 40% to 50% by weight of Portland cement replaced with Class F fly ash are viable; compressive strength should be tested at 42 days, and should not have a significant effect on the overall project schedule.
- Grouts with 50% to 80% by weight of Portland cement replaced by fly ash (25%) and GGBFS (varying %) are also viable.
- These grouts have other benefits, such as increased workability.

Availability and specific mix designs will vary by local grout suppliers, who should be consulted for specifications. Please contact the Concrete Masonry Association of California and Nevada (CMACN), www.cmacn.org, or your Angelus Block representative for more information.

1. Fly ash: ASTM C618.
2. Ground granulated blast furnace slag: ASTM C989.

Grout for masonry requires more water than other types of concrete. A significant amount of water is absorbed by the cmu; sufficient water must remain in the grout to facilitate flow, consolidation, and hydration.

3. Provide grout other than self-consolidating grout with a slump of 8 to 11 inches per TMS 602/ACI 530.1/ASCE 6 Article 2.6 B.
- C. Water: Potable.
- D. Admixtures:
1. The use of admixtures shall not be permitted except as specified herein, or as approved by the Architect or Engineer of Record and the Building Official.

The admixture below is of the type required for high-lift grouting (see specifier notes below related to grouting), to decrease grout shrinkage and compensate for volume loss due to water absorption. Field addition of admixtures is not permitted for self-consolidating grout.

2. PRE-MIX Products Grout Additive manufactured by E-Z Mix, Inc. Use per manufacturer's specifications.

2.4 REINFORCEMENT AND METAL ACCESSORIES

The following paragraphs may instead be included in their respective specification Sections: 040519 Masonry Anchorage, 040523 Masonry Accessories. If so, replace details below with a reference to the appropriate Section.

Items below are typically used. Revise as required by structural design.

- A. Metal reinforcement and accessories shall conform to TMS 602/ACI 530.1/ASCE 6 Article 2.4 (if separate sections are included for these items, append the foregoing with ", in accordance with Section 040519 Masonry Anchorage and Reinforcing and Section 040523 Masonry Accessories", and delete the remainder of this article).
- B. Steel Reinforcing Bars: ASTM A615, Grade 60.
- C. Masonry Joint Reinforcement: ASTM A951. Maximum spacing of cross wires in ladder-type and points of connection of cross wires of truss-type joint reinforcement shall be 16 in.
- D. Anchors, ties, and accessories:
 1. Plate and bent-bar anchors: ASTM A36/A36M.
 2. Sheet-metal anchors and ties: ASTM A1008/A1008M.
 3. Wire mesh ties: ASTM A185/A185M.
 4. Wire ties and anchors: ASTM A82/A82M.
 5. Headed anchor bolts: ASTM A307, Grade A.
- E. Coatings for corrosion protection. Unless otherwise required, protect carbon steel joint reinforcement, ties, and anchors from corrosion by galvanizing or epoxy coating in conformance with the following minimums:
 1. Mill galvanized coatings:
 - a. Joint reinforcement: ASTM A641 (0.1 oz/ft²)
 - b. Sheet metal anchors and ties: ASTM A653 (1.50 oz/ft²)
 2. Hot-dipped galvanized coatings:
 - a. Joint reinforcement, wire ties, and wire anchors: ASTM A153 (1.50 oz/ft²)
 - b. Sheet metal anchors and ties: ASTM A153 Class B
 3. Epoxy coatings:

- a. Joint reinforcement: ASTM A884 Class A Type 1 — ≥ 7 mils
- b. Wire ties and anchors: ASTM A899 Class C — 20 mils
- c. Sheet metal anchors and ties: 20 mils per manufacturer's specification

2.5 FLASHING MATERIALS

- A. Provide metal flashing in accordance with Section 076200 Sheet Metal Flashing and Trim.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. Rubber Preformed Control-Joint Gaskets: per ASTM D2000, Designation M2AA-805.
- B. PVC Preformed Control-Joint Gaskets: per ASTM D2287, Type PVC.

2.7 MASONRY CLEANER

- A. Use potable water and detergents to clean masonry unless otherwise approved.
- B. Do not use acid or caustic solutions unless otherwise approved.

2.8 MIXING

- A. Mortar:
 - 1. Mix Spec Mix Masonry Mortar preblended factory mix per manufacturer's recommendations.
- B. Conventional grout:
 - 1. Mix grout to a consistency that has a slump between 8 and 11 in.
- C. Self-consolidating grout:
 - 1. Job-site proportioning of self-consolidating grout is not permitted.
 - 2. Do not add water at the job site except in accordance with the manufacturer's recommendations.

2.9 Fabrication

- A. Fabricate reinforcement per TMS 602/ACI 530.1/ASCE 6 Article 2.7 A.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to the start of masonry installation, verify all conditions pertinent to the performance of work in this Section are acceptable.

1. Verify foundations are constructed with tolerances conforming to requirements of ACI 117.
 2. Verify that reinforcing dowels are positioned in accordance with Project Drawings.
- B. Masonry work shall not proceed until unsatisfactory conditions have been corrected or approved by the Design Professional.

3.2 PREPARATION

- A. Clean reinforcement and shanks of anchor bolts by removing mud, oil, or other materials that will adversely affect bond to mortar or grout.
1. Reinforcement with rust and/or mill scale is acceptable provided attributes of a cleaned sample are in accordance with the applicable ASTM specification.
- B. Prior to laying masonry, remove laitance, loose aggregate, and any other material that would prevent mortar from bonding to the foundation.
- C. Do not wet units before laying, unless otherwise required. Wet cutting is permitted.
- D. Cut units as required to fit; use motor-driven masonry saw. Install cut units with cut surfaces concealed as much as possible.

3.3 INSTALLATION

- A. Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.
1. Mix units from several pallets or cubes as they are placed.
- B. Comply with construction tolerances in TMS 602/ACI 530.1/ASCE 6.
- C. Construct grout spaces free of mortar dropping, debris, and any material deleterious to grouting.
- D. Construct cleanouts in the bottom course of masonry for each grout pour when the grout pour height exceeds 4 ft.
1. Hollow-unit masonry:
 - a. Create cleanout by cutting off entire the face shell of the cmu. Replace face shell after inspection and before grouting.
 - b. Construct the bottom course of the grout pour with inverted open end bond beam units. Construct cleanouts at every reinforced cell.
 2. Solid-unit multiwythe masonry: create cleanout by leaving out every other unit. Install unit after inspection and before grouting.
 3. Brace cleanout closure to resist grout pressure.
- E. All masonry shall be laid true, level, plumb, and in accordance with the drawings.
- F. Ensure all vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with Project Drawings.

DSA allows cleanouts only at reinforced cells if the bottom of the pour is constructed with inverted open end bond beam units. Otherwise, a cleanout is required at every cell at the bottom of the pour. Therefore, include the following.

Running bond is the typical pattern. If stack bond or another pattern is to be used, edit paragraph below, or refer to drawings.

- G. Exposed masonry shall be laid in running bond unless otherwise indicated in Project Drawings.
- H. Concealed masonry with shall be laid in running bond unless otherwise indicated.
- I. Brace masonry during construction to assure stability. Design, provide, and install bracing.

3.4 MORTAR BEDDING AND JOINTING

- A. Place mortar in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.3 B (or, if a separate Section is included for mortar, append the foregoing with ", and with Section 040513 Masonry Mortaring", and delete the following subparagraphs).
- B. Initial bed joint shall not be less than 1/4 inch nor more than 3/4 inch.
 - 1. The maximum thickness of the initial bed joint in fully grouted masonry wall shall not exceed 1¼ in.
- C. All head and bed joints, except as in 3.4 B., shall be a nominal 3/8 in. thick, unless otherwise required.

If the unit strength method is used for verification of f'_m in Article 1.6 A, include the following provision:

- D. Thickness of bed joints shall not exceed 5/8 inch.
- E. Lay hollow units with head and bed joints filled with mortar for the thickness of the face shell.
- F. Lay solid units with full head and bed joints. Do not fill head joints by slushing with mortar. Bed joints shall not be furrowed deep enough to produce voids.
- G. Remove mortar protrusions extending 1/2 in. or more into cells to be grouted. 1/4 in. for high lift grouting [DSA differentiates between "low-lift" and "high-lift" grouted construction, and has guidelines for solid-unit masonry high-lift grouting in its Interpretation of Regulations Document IR 21-2].
- H. Fully mortar webs in all courses of piers, columns and pilasters, in the starting course on foundations, and when necessary to confine grout.

If another joint profile is used, revise first paragraph below or show on Drawings. For example, flush joints may be used for masonry walls that are to receive plaster. Note that some decorative joint profiles are not recommended for weather exposure; consult your Angelus Block representative.

- I. All mortar joints on exposed walls shall be concave, unless otherwise indicated, and struck to produce a dense, slightly concave surface well bonded to the surface of the masonry unit.
- J. Remove and re-lay in fresh mortar any unit that has been disturbed to the extent the initial bond is broken.

3.5 EMBEDDED ITEMS AND ACCESSORIES

- A. Construct control joints as detailed in the drawings as masonry progresses.
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- B. Construct chases as masonry units are laid.
- C. Install pipes and conduits passing horizontally through nonbearing masonry partitions as indicated.
- D. Place pipes and conduits passing horizontally through piers, pilasters, or columns as indicated.
- E. Place horizontal pipes and conduits in and parallel to plane of walls.
- F. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories as required.

3.6 INSTALLATION OF REINFORCING STEEL, WALL TIES, AND ANCHORS

- A. Install reinforcing steel, wall ties, and anchors in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 (or, if a separate Section is included for reinforcement, append the foregoing with ", and with Section 040519 Masonry Anchorage and Reinforcing", and optionally delete the following paragraphs).
- B. Place reinforcement as detailed on the drawings.
 - 1. Support and fasten reinforcement to prevent displacement beyond specified tolerances during construction and grouting operations.
 - 2. Maintain clear distances between reinforcement and any face of masonry unit or formed surface, but not less than ¼ in. for fine grout, or ½ in. for coarse grout.
 - 3. Completely embed reinforcing bars in grout.
 - 4. Embed joint reinforcement with minimum 5/8 inch cover to faces exposed to weather or earth, and 1/2 inch elsewhere.
 - a. Provide minimum 6-in. lap splices and ensure that all ends of longitudinal wires are embedded in mortar at laps.
 - 5. Tolerances for placement of reinforcing bars in walls and flexural elements shall be ± ½ in. when the distance from the centerline of reinforcing bars to the opposite face of masonry, d , is equal to 8 in. or less, ± 1 in. for d equal to 24 in. or less but greater than 8 in., and ± 1 ¼ in. for d greater than 24 in.
 - 6. Foundation dowels that interfere with unit webs are permitted to be bent to a maximum of 1 in. horizontally for every 6 in. of vertical height.
- C. Install wall ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 C..
- D. Install anchor bolts ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 D.
 - 1. Embed headed and bent-bar anchor bolts in grout. Anchor bolts of ¼ in. or less may be placed in mortar bed joints at least ½ in. in thickness.

2. Maintain clear distance between anchor bolts and any face of masonry unit or formed surface of at least $\frac{1}{4}$ in. when using fine grout, and of at least $\frac{1}{2}$ in. when using coarse grout.
3. Maintain a clear distance between parallel anchor bolts not less the diameter of the anchor bolt, nor less than 1 in.

3.7 GROUTING

- A. Comply with grout placement requirements in TMS 602/ACI 530.1/ASCE 6 Article 3.5 (or, if a separate Section is included for grout, append the foregoing with ", and in accordance with Section 040516 Masonry Grouting", and delete the following paragraphs).
- B. Place grout within 1 $\frac{1}{2}$ hr from introducing water in the mixture and prior to initial set.
 1. Discard field-mixed grout that does not meet specified slump without adding water after initial mixing.
 2. For transit-mixed grout:
 - a. Addition of water is permitted at time of initial discharge to adjust consistency to a slump between 8 and 11 in.
 - b. Discard transit-mixed grout that does not meet specified slump without adding water, other than as allowed in 3.7 B. 2.a above.
 - c. Transit-mixed grout may be used beyond the time limit as long as it meets the specified slump.
- C. Grouting of any section of wall shall be completed in one day with no interruptions greater than 1 hour.

DSA differentiates between "low-lift" and "high-lift" grouted construction, and has guidelines for solid-unit masonry high-lift grouting in its Interpretation of Regulations Document IR 21-2.

- D. Grout pour height, unless otherwise required:
 1. Hollow-unit masonry:
 - a. Low-lift grouted construction per CBC 2104A.5.1.2.2:
 - 1) Maximum pour height is 4 feet.
 - b. High-lift grouted construction per CBC 2104A.5.1.2.3 and DSA IR 21-2:
 - 1) For walls with nominal thickness less than 12 inches, the maximum pour height is 12 feet.
 - 2) For walls with nominal thickness of 12 inches or more, the maximum pour height is 16 feet.
 2. Solid-unit multiwythe masonry:
 - a. Low-lift grouted construction per CBC 2104A.5.1.1.2.
 - b. High-lift grouted construction per CBC 2104A.5.1.1.3
- E. Grout space for multiwythe masonry: build vertical grout barriers of solid masonry across the grout space the entire height of the grout pour to control the flow of grout horizontally. Grout barriers shall not exceed 30 ft. apart.
- F. Grout lift height:
 1. Hollow-unit masonry:
 - a. Low-lift grouted construction per CBC 2104A.5.1.2.2:
 - 1) Grout each 4 feet of grout pour.

- b. High-lift grouted construction per CBC 2104A.5.1.2.3 and DSA IR 21-2:
 - 1) Place grout in lifts not exceeding 4 ft. [with written DSA approval, 5 ft.](#)
 - 2) Place successive lifts within 1 hour of preceding lifts.
 - 2. Solid-unit multiwythe masonry:
 - a. Low-lift grouted construction per CBC 2104A.5.1.1.2.
 - b. High-lift grouted construction per CBC 2104A.5.1.1.3:
 - 1) Place grout in lifts not exceeding 4 ft.
 - 2) Place successive lifts within 1 hour of preceding lifts.
- G. Grout consolidation:
 - 1. Conventional grout:
 - a. Consolidate grout pours 12 in. or less by mechanical vibration or puddling.
 - b. Consolidate grout pours exceeding 12 in. by mechanical vibration, and reconsolidate after initial water loss and settlement has occurred.
 - 2. Self-consolidating grout: consolidation or reconsolidation is not required.
- H. Grout keys are required between grout pours, or between lifts when the previous lift is permitted to set prior to placement of the subsequent lift.
 - 1. Form grout key by terminating the grout a minimum of 1½ in. below a mortar joint.
 - 2. Do not form grout keys within beams.
 - 3. At beams or lintels laid with closed bottom units, terminate the grout pour at the bottom of the beam or lintel without forming a grout key.

3.8 FIELD QUALITY CONTROL

The Statement of Special Inspections per CBC Sections 1704A.1.1, 1704A.5, and 1705A should specify tests required during construction.

- A. Inspection tasks and frequency shall be performed in accordance with the Statement of Special Inspections. [\[Reference may also be made to Section 014300 Quality Assurance and/or 014500 Quality Control, or their subsections as appropriate, as included in the Project Documents.\]](#)

[Retain the following paragraph only if the Verification and Special Inspection requirements are at Level 2.](#)

- B. Unless indicated otherwise, perform one set of tests for each 5000 sq. ft. of wall area or portion thereof.

[Keep the following paragraph only if the Unit Strength Method is specified in Part 1 Quality Assurance. Delete if prism testing.](#)

- C. Concrete Masonry Units: test per ASTM C140.

[Mortar and grout tests are required for the unit strength method, or for the prism test method only when \$f'_m\$ is > 1500 net psi \(Section 2105A.2.2.1.4, Section 2105A.2.1 Exception paragraph 2\).](#)

- D. Mortar and grout tests: At beginning of work, sample mortar and grout at one-week intervals per CBC Section 2105A.2.2.1.4.
 - 1. Test mortar specimens per ASTM C1586.
 - 2. Test grout specimens per ASTM C1019.

If prism testing is specified, retain the following subparagraph. If the unit strength method is specified, delete the following subparagraph.

- E. Prism Test: For each type of construction indicated, construct and test three prisms per ASTM C1314.
- F. Masonry Core Test: Core and test per CBC Section 2105A.4 from locations selected by the Design Professional.

3.9 POINTING, AND CLEANING

- A. Point and tool holes in mortar joints to produce a uniform, tight joint.
- B. During construction, minimize any mortar or grout stains on the wall. Immediately remove any staining or soiling that occurs.
 - 1. For precision or textured units, except as noted below, clean masonry by dry brushing before tooling joints.
 - 2. For burnished, glazed, or pre-finished concrete masonry units, immediately remove any green mortar smears or soiling with a damp sponge
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry surfaces of stains, efflorescence, mortar or grout droppings, and debris as follows:

Light sandblasting is a common, non-chemical means of final cleaning of stains and efflorescence prior to the application of water repellents. Other non-silica media blasting utilizing soda, walnut shells, plastic, etc., are becoming more available as alternatives to sandblasting. Water blasting is sometimes used, but saturating the unprotected masonry can often lead to further development of efflorescence, especially if weather is cool or damp for extended periods.

If other chemical means are desired, edit this subparagraph according to manufacturer's recommendations, and specify the product in Part 2.

- 1. Clean exposed cmu walls with a light sandblast. All nonmasonry work near the area to be sandblasted shall be covered or protected before the sandblasting starts. Care shall be taken to avoid contamination to areas that are not to be sandblasted.
 - a. Burnished, glazed, or pre-finished masonry units, shall be protected from sandblast operations.
- D. At completion of masonry work, remove all scaffolding and equipment used during construction, and remove all debris, refuse, and surplus masonry material from the site.
 - 1. Comply with Construction Waste Management plan.

Include the following article for jobsite sandblasting only when a sandblasted texture is specified for design purposes. This is different than light sandblasting for cleanup; sandblasting for textural effects is incorporated with the cleanup sandblasting. Specify "light", "medium", or "heavy" texture, or other defined reference for the desired effect, or as shown in an approved demonstration panel.

3.10 JOBSITE SANDBLASTING

- A. Sandblast for textural effects as indicated on the drawings.
- B. Apply ["medium" or other definition] sandblasting to precision masonry walls at indicated areas, as demonstrated on approved samples, in uniform and consistent texture.

An application of water repellent is a critical component of the masonry wall and may be included here for emphasis, coordinated with Section 071900 Water Repellents.

3.11 WATER REPELLENT APPLICATION

- A. Cleaning shall be complete and accepted by the Architect, and wall surfaces shall be thoroughly dry.
- B. Apply water repellent in strict accordance with Section 071900 and the water repellent manufacturer's instructions.

END OF SECTION 042200