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Standard Practice for Construction of Dry-Stacked, Surface-Bonded Walls¹

This standard is issued under the fixed designation C 946; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Keywords were added editorially in November 1996.

1. Scope

1.1 This practice covers material, workmanship, and construction procedures for applying surface bonded mortar to both sides of dry stacked concrete masonry units. It does not include grout, reinforcing, anchorage, or control joints since their use is essentially the same as conventional concrete masonry construction, unless specifically mentioned in this practice.

NOTE 1—Design and construction procedures for conventional concrete masonry construction have been written by the American Concrete Institute, “Building Code Requirements for Concrete Masonry Structures” and the National Concrete Masonry Associations, “Specification for the Design and Construction of Load-Bearing Concrete Masonry.”

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- C 55 Specification for Concrete Building Brick²
- C 90 Specification for Loadbearing Concrete Masonry Units²
- C 129 Specification for Nonloadbearing Concrete Masonry Units²
- C 145 Specification for Solid Load-Bearing Concrete Masonry Units³
- C 270 Specification for Mortar for Unit Masonry²
- C 887 Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar²

2.2 American Concrete Institute Standard:

- 531 Building Code Requirements for Concrete Masonry

¹ This practice is under the jurisdiction of ASTM Committee C-12 on Mortars for Unit Masonry and is the direct responsibility of Subcommittee C12.06 on Surface Bonding.

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² Annual Book of ASTM Standards, Vol 04.05.

³ Discontinued. See 1989 Annual Book of ASTM Standards, Vol 04.05.

Structures, Commentary-ACI 531R-79⁴

2.3 *International Masonry Industry All-Weather Council Standards:*

Recommended Practices and Guide Specifications for Cold Weather Masonry Construction⁵

2.4 *National Concrete Masonry Association Standard:*
Specification for the Design and Construction of Load-Bearing Concrete Masonry⁶

3. Storage

3.1 Deliver and store surface bonding mortar in original containers off the ground to prevent contact with water. Protect from rain with suitable covering.

3.2 Store concrete masonry units off the ground to prevent contamination by mud, dust, and materials likely to cause staining or other defects, and protect from rain.

4. Materials and Manufacture

4.1 Concrete masonry units shall be clean and dry, meeting the requirements of Type I, moisture-controlled units, of the applicable ASTM specification (Specifications C 55, C 90, C 129, and C 145). The surface to receive surface bonding mortar shall be free of paint, oil, efflorescence, or foreign materials that interfere with bonding.

4.2 Mortar shall be mixed in accordance with the proportion specification of Specification C 270 and shall be selected on the basis of Appendix X1 of Specification C 270.

4.3 Surface bonding mortar shall meet the requirements of Specification C 887. If the dry mix contains hard lumps, it shall not be used.

4.4 Shims shall be corrosion-resistant metal or plastic with a minimum compressive strength of 2000 psi (13.8 MPa), or steel protected from corrosion by a coating of zinc at least 0.8 oz/ft² (2.4 gm/mm²), or by a coating of cadmium or zinc of equivalent corrosion resistance.

5. Leveling Courses

5.1 Leveling courses, when needed, are to provide a smooth

⁴ Available from the American Concrete Institute, P.O. Box 19150, Detroit, MI 48219.

⁵ Available from the International Masonry Industry All-Weather Council, Mason Contractors Association of America, 17 W601 Fourteenth St., Oakbrook Terrace, IL 60181.

⁶ Available from the National Concrete Masonry Assn., P.O. Box 781, Herndon, VA 22070.

surface level within $\frac{1}{4}$ in. (6.35 mm) in 20 ft (6.1 m), for dry stacking concrete masonry units. Leveling courses shall be located whenever a vertical difference greater than $\frac{1}{2}$ in. (12.7 mm) in 10 ft (3.0 m) occurs within one course. Leveling courses are usually located on the first course above the foundation, because footings are not normally placed in a level condition, and at each floor level.

5.2 When mortar or surface bonding mortar is used a leveling course, concrete masonry units shall be set in a full bed of mortar, laid to a line with the top surface level, as defined in 5.1, and butted together with no mortar in the head joints. Bed joints shall be struck flush. If the cores are to be grouted, no mortar shall be placed in the space to receive grout.

5.3 Allow mortar to set sufficiently so no movement breaks the bond while dry stacking units in subsequent courses.

6. Dry-Stacking Concrete Masonry Units

6.1 Courses of concrete masonry units between the leveling courses shall be placed without mortar on the bed or head joints. Place units in running bond. Remove burrs and butt blocks tightly.

6.2 Use shims, mortar, or surface bonding mortar to plumb and level individual units when necessary.

6.3 Check the wall every fourth course to be certain it is plumb and level. If any course is out of level by more than $\frac{1}{2}$ in. (12.7 mm) in 10 ft (3.0 m) another leveling course shall be built.

6.4 Cut masonry units to fit openings. Minimum length of cut piece used in the wall shall be $1\frac{1}{4}$ in. (31.8 mm).

6.5 Precut units for inserts indicated on drawings.

6.6 Anchors, reinforcing, flashing, lintels, and other items to be built in shall be installed as the stacking progresses. Cut or notch masonry units as required.

NOTE 2—Special consideration must be given to the placement of built in items. Surface bonding mortar requires approximately $1\frac{1}{4}$ in. (31.8 mm) from the edge of a unit to develop tensile strength across the joint. Layout of the first course with respect to built in items is extremely important, it determines the size of the cut pieces for closure.

NOTE 3—Utilities such as electrical lines and plumbing located in the cores of the units are best placed prior to the application of surface bonding mortar while the concrete masonry units are visible.

6.7 Cores to be filled with grout shall be aligned to provide a continuous, unobstructed opening.

6.8 Where a horizontal change in wall thickness occurs, the thicker portion shall end with a solid surface. Use a leveling course for the first course in the upper portion.

NOTE 4—Dry-stacked, uncoated walls should be adequately braced.

7. Mixing Surface Bonding Mortar

7.1 Use clean mixing equipment and water free of deleterious amounts of acid, alkali, and organic materials.

7.2 Surface bonding mortar shall be mixed according to the manufacturer's instructions and used within the time recommended by the manufacturer.

7.3 Mix only full bag multiples of material to overcome any segregation of ingredients while in the package.

7.4 Mixing time shall be kept to a minimum, as over mixing may cause damage to the fibers.

7.5 *Hand Mixing:*

7.5.1 Place water in the mixing container.

7.5.2 Slowly add the dry surface bonding material.

7.5.3 Mix thoroughly.

7.6 *Machine Mixing:*

7.6.1 Place water in mixer.

7.6.2 Add the surface bonding material to the operating mixer.

7.6.3 Mix thoroughly, 1 to 3 min after all materials have been added.

7.7 The mixture should be creamy, nonlumpy, and easy to apply.

7.8 Admixtures may be permitted within the limits set by Specification C 887 and the manufacturer of the surface bonding mortar. If desired, admixtures must be specified in the contract documents.

8. Application of Surface Bonding Mortar

8.1 Wet the wall uniformly with water immediately before applying surface bonding mortar to prevent excessive suction of water from the surface bonding mortar. If the wall dries prior to application, rewet it. Avoid saturating the units.

8.2 Trowel- or spray-apply surface bonding mortar to both sides of the dry-stacked concrete masonry units.

8.3 Completely cover the wall surface with a minimum thickness of $\frac{1}{8}$ in. (3.2 mm) of surface bonding mortar by trowel or spray.

8.4 When a second coat of surface bonding mortar is to be applied, the first coat shall have taken its initial set but not be completely hardened or dried out. If the first coat has completely hardened or dried out, consult the manufacturer's recommendations for application of a second coat, since a bonding agent may be required.

8.5 Finish to the texture specified.

8.6 If application of surface bonding mortar is discontinued for more than 1 h, the *horizontal* joint between the two applications, other than at wall tops, must occur at least $1\frac{1}{4}$ in. (31.8 mm) from the horizontal edge of the concrete masonry unit.

9. Curing and Protection

9.1 Surface bonding mortar shall not be applied at temperatures below 40°F (4.4°C) unless the International Masonry Industry All Weather Council's "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction" are followed.

9.2 Dampen the wall with a water mist after 8 h, but within 24 h of application of the surface bonding mortar.

9.3 Fog spray twice within the first 24 h from application of the surface bonding mortar. With pigmented mortar the time may be extended to 48 h. With maximum temperature in excess of 90°F (32.2°C), wind speed greater than 20 mph (32.2 km/h), or mean relative humidity less than 50 % relative humidity, more frequent application of fog spray shall be necessary.

9.4 The top of the walls shall be covered with a nonstaining, waterproof covering, extending at least 2 ft (0.6 m) on each side of the wall to prevent moisture from entering the wall until the top is permanently protected.

10. Other Requirements

10.1 Requirements concerning grout, reinforcement, anchors, ties, corrosion resistance, dimensional tolerances, wall bracing after coating, and miscellaneous items unless specified by the manufacturer of the surface bonding mortar shall be outlined in the following:

10.1.1 Building Code Requirements for Concrete Structures and Commentary by the American Concrete Institute.

10.1.2 Specification for the Design and Construction of Load-Bearing Concrete Masonry.

10.2 *Control Joints:*

10.2.1 Location, spacing, and type of control joints shall meet the requirements of the standards referenced in 10.1.

10.2.2 Control joints shall be uniform in width, through the wall, and continuous from top to bottom of the wall.

10.2.3 Remove surface bonding mortar from the control joint.

11. Keywords

11.1 dry stacked; fiber reinforced; mortar; packaged; surface bonding

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