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Standard Practice for Installation Methods for Cement-based Adhered Masonry Veneer[1]

This standard is issued under the fixed designation C1780; 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.

1. Scope*

1.1 This practice is intended to provide accepted procedures to designers and installers of cement-based adhered masonry veneer in residential and commercial construction. This information is meant to complement the specific installation instructions provided by manufacturers of cement-based adhered masonry veneers and recognized building codes, but is not meant to replace them. This practice does not address installation methods or techniques for all materials in the building envelope. This practice covers the installation of cement-based adhered masonry veneer units for application as adhered veneer to exterior and interior walls, columns, landscape structures and other structures suitable to receive adhered veneer. The units included in this practice are manufactured to meet the requirements of Specification C1670/C1670M or C1877. This practice is limited to the installation of units. This practice does not cover all flashing or moisture management requirements. Refer to the applicable building code and project documents for additional flashing and moisture management requirements.

NOTE 1—The National Concrete Masonry Association (NCMA) publication *Installation Guide and Detailing Options for Compliance with ASTM C1780 for Adhered Manufactured Stone Veneer* provides generally accepted methods and details for installation and flashing for manufactured stone veneer.

NOTE 2—This standard was developed for the installation of cement-based adhered veneer units manufactured from wet-cast concrete or dry-cast concrete. Refer to Guide C1242 for installation of adhered natural stone veneer.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 All workmanship and materials related to the installation of cement-based adhered masonry veneer units shall meet the requirements of the contract documents and building code having jurisdiction over the project.

1.4 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. (***Warning—***Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.*[2]*)*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

[1] This practice is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.05 on Masonry Assemblies.

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[2] Annual Book of ASTM Standards. Vol 04.01. See the section on Safety Precautions in the Manual of Cement Testing.

***A Summary of Changes section appears at the end of this standard**

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C90 Specification for Loadbearing Concrete Masonry Units
C270 Specification for Mortar for Unit Masonry
C482 Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
C847 Specification for Metal Lath
C926 Specification for Application of Portland Cement-Based Plaster
C932 Specification for Surface-Applied Bonding Compounds for Exterior Plastering
C933 Specification for Welded Wire Lath
C979/C979M Specification for Pigments for Integrally Colored Concrete
C1032 Specification for Woven Wire Plaster Base
C1059/C1059M Specification for Latex Agents for Bonding Fresh To Hardened Concrete
C1063 Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
C1180 Terminology of Mortar and Grout for Unit Masonry
C1232 Terminology for Masonry
C1242 Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems
C1325 Specification for Fiber-Mat Reinforced Cementitious Backer Units
C1384 Specification for Admixtures for Masonry Mortars
C1670/C1670M Specification for Adhered Manufactured Stone Masonry Veneer Units
C1714/C1714M Specification for Preblended Dry Mortar Mix for Unit Masonry
C1788 Specification for Non Metallic Plaster Bases (Lath) Used With Portland Cement Based Plaster in Vertical Wall Applications
C1861 Specification for Lathing and Furring Accessories, and Fasteners, for Interior and Exterior Portland Cement-Based Plaster
C1877 Specification for Adhered Concrete Masonry Units
D226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
E2556/E2556M Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment

2.2 *Other Standards:*

TMS 402 Building Code Requirements for Masonry Structures[4]
TMS 602 Specification for Masonry Structures[4]
ICC ES AC 376 Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling Sheathing and Floor Underlayment[5]

2.3 *ANSI Standards:*[6]

ANSI A118.1-2013.1 American National Standard Specifications for Dry-Set Cement Mortar
ANSI A118.4-2013.1 American National Standard Specifications for Modified Dry-Set Cement Mortar
ANSI A118.15-2012.1 American National Standard Specifications for Improved Modified Dry-Set Cement Mortar

2.4 *ICRI International Concrete Repair Institute:*[7]

No. 310.2–1997 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays (formerly No. 03732). Concrete Surface Profile Chips

2.5 *National Concrete Masonry Association:*[8]

Installation Guide and Detailing Options for Compliance with ASTM C1780 for Adhered Manufactured Stone Veneer

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *cement-based adhered masonry veneer, n*—the assembly of thin cement-based masonry units adhered to a backing with a cementitious mortar.

3.1.1.1 *Discussion*—

Thin cement-based masonry units include those covered under Specifications C1670/C1670M and C1877.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.
[4] Available from The Masonry Society (TMS), 105 South Sunset Street, Suite Q, Longmont, CO 80501, http://www.masonrysociety.org.
[5] Available from ICC Evaluation Service, 3060 Saturn Street, Suite 100 Brea, California 92821, http://www.iccsafe.org.
[6] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[7] Available from International Concrete Repair Institute (ICRI), 38800 Country Club Drive Farmington Hills, MI 48331, http://www.icri.org.
[8] Available from National Concrete Masonry Association (NCMA), 13750 Sunrise Valley Drive Herndon, VA 20171, http://www.ncma.org.

3.1.2 *back butter, v*—the act of applying a setting bed mortar to the back of a masonry unit.

3.1.3 *brown coat, n*—in multiple coat stucco work, the second coat, applied over the scratch coat.

3.1.4 *drainage wall system, n*—a system installation that creates a physical planar air gap between cladding system and water resistive barrier.

3.1.5 *foundation weep screed, n*—an accessory used to terminate cement-based adhered masonry veneer at the bottom of exterior framed walls.

3.1.5.1 *Discussion*—
This accessory shall have a sloped, solid, or perforated, ground or screed flange to facilitate the removal of moisture from the air gap and a vertical attachment flange not less than 3½ in. (89 mm) long.

3.1.6 *full setting bed, n*—mortar bed of specified thickness, covering the complete back of units and free of voids.

3.1.7 *scratch coat, n*—the first coat of mortar or hydraulic cement based plaster applied to a base and then scratched to create additional bonding area and mechanical interlock.

3.1.8 *setting bed, n*—the mortar used to bond units to a prepared surface or scratch coat.

3.1.9 *sheathed frame substrate, n*—wood or metal/steel framing covered by a building code approved sheathing material.

3.1.10 *thumb-print hard, adj*—description of mortar joints to determine their readiness for tooling determined when the mortar will retain the imprint of a thumb but no mortar is transferred to the thumb.

3.1.11 *tight fit joint, n*—a joint created when units are installed with edges touching or less than ⅜ in. (10 mm) distance between units.

3.1.11.1 *Discussion*—
Many units have varied and random edges which make it impossible to define specific minimum or maximum joint space.

3.1.12 *water resistive barrier (WRB), n*—a material behind an exterior wall covering that is intended to resist liquid water that has penetrated the exterior covering from further intruding into the exterior wall assembly.

3.2 Refer to Terminology C1180 for additional terminology for mortar and Terminology C1232 for additional terminology for masonry.

4. Materials

4.1 Cement-based adhered masonry veneer shall comply with the following requirements:

4.1.1 Units shall comply with Specification C1670/C1670M or C1877.

4.2 Water Resistive Barrier shall comply with one of the following:

4.2.1 No. 15 felt complying with Specification D226, Type 1.

4.2.2 Specification E2556/E2556M, Type I or II.

4.2.3 Other approved materials installed in accordance with the manufacturer's installation instructions (See Note 3).

NOTE 3—Other materials may be acceptable as the water resistive barrier when approved by the building official and installed in accordance with the manufacturer's recommendations. Some (such as liquid-applied or pre-coated sheathing) may only be acceptable for use as the inner layer of water resistive barrier. Climatic conditions should be taken into account when specifying or selecting the water-resistive barrier to be installed.

NOTE 4—Some cement-based adhered masonry veneer systems utilize a liquid-applied water resistive barrier as part of their proprietary systems. These materials are not discussed in this Practice, and users are encouraged to perform their own evaluation of these proprietary systems for suitability.

4.3 Lath shall comply with one of the following:

4.3.1 Expanded metal lath shall be corrosion resistant, shall have a minimum weight of 2.5 lb/yd^2 (1.4 kg/m^2) and shall comply with the requirements of Specification C847.

4.3.2 Woven wire mesh shall be corrosion resistant, shall be a minimum of 18 gauge, and shall comply with the requirements of Specification C1032.

4.3.3 Welded wire lath shall be corrosion resistant and shall comply with Specification C933.

4.3.4 Non-metallic lath material shall be corrosion resistant and shall comply with Specification C1788.

NOTE 5—It is acceptable to use lath materials that comply with 4.3 that also provide a paper backing which complies with the requirements of 4.2.

4.4 *Cement Board*—Cementitious Backer Units shall comply with Specification C1325. Cement boards shall have been evaluated for interior or exterior use in accordance with ICC-ES Acceptance Criteria AC 376 by an ANSI-accredited evaluation service.

4.5 *Mortar:*

4.5.1 Mortar shall comply with one of the following:

4.5.1.1 Type N or Type S of Specification C270.

4.5.1.2 Type N or Type S of Specification C1714/C1714M.

4.5.1.3 ANSI A118.1-2013.1, ANSI A118.4-2013.1, or ANSI A118.15-2012.1.

NOTE 6—Mortar may be specified by the proportion method or the property method of Specification C270.

4.5.2 Admixtures shall comply with Specification C1384.

4.5.3 Bonding agents shall comply with Specification C1059/C1059M or Specification C932.

4.5.4 Mortar coloring pigments shall comply with Specification C979/C979M.

4.6 Lath fasteners shall comply with Specifications C1063 and C1861.

4.7 Foundation weep screed shall comply with Specification C1063.

4.8 Stucco system scratch or brown coat, when used as the cement-based adhered masonry veneer scratch coat, shall comply with Specification C926 up to the brown coat without application of the finish coat.

4.9 Water used for mixing mortar or dampening units, scratch coat, or masonry surface shall be clean and free of amounts of oils, acids, alkalies, salts, organic materials, or other substances that are deleterious to mortar or any metal in the wall.

5. Ambient Conditions

5.1 *Hot and Dry Conditions*—If the ambient conditions exceed 100°F (37°C) or 90°F (32°C) with a wind velocity greater than 8 mph (12.9 km/h) comply with the hot weather construction requirements of local building code, the recommendations of cement-based adhered masonry veneer unit manufacturer and hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6. If there is a contradiction among documents, local building code shall prevail.

5.1.1 When cement-based adhered masonry veneer is applied in hot or dry weather, before applying mortar, moisten the scratch

coat with a fine spray of water or a wet brush to prevent excessive absorption of water from the mortar. The scratch coat shall appear wet but without free water on the surface. Units shall also be moistened following the requirements of 7.2.1.

5.2 *Freezing or Low Temperatures*—Accelerating admixtures shall comply with Specification C1384. Anti-freeze admixtures to lower freezing point of mortar shall not be used. Accelerating admixtures containing calcium chloride shall not be used. If the ambient conditions are below 40°F (4°C), the installation shall comply with the cold weather construction provisions of TMS 602.

6. Substrate/Surface Preparation

6.1 The substrates and preparation that follow are typical and field proven applications. Installation over any other substrate requires the approval of the unit manufacturer.

6.1.1 Alternative surface preparation shall be tested in accordance with Test Method C482 as modified by this practice. The minimum shear bond strength between the unit and the prepared surface shall be 50 psi (0.34 MPa). Refer to the modifications outlined in Appendix X1.

6.2 *Masonry:*

6.2.1 Install units directly on masonry that is clean and free of paint, dirt, sealers, loose or spalling material.

6.2.2 All masonry surfaces that are dirty, painted, coated with curing compounds or surface sealed, shall be cleaned by power washing, sandblasting, beadblasting or appropriate solvent to form a substrate suitable for bonding. If the surface condition cannot support direct application, install lath. If masonry wall exhibits spalling, cracking or general deterioration, the wall shall be evaluated by the designer of record for integrity before proceeding.

6.3 *Wood/Metal Framing:*

6.3.1 *Water Resistive Barrier (WRB) Installation*—Install two separate layers of WRB outboard of the sheathing material, in accordance with the WRB manufacturer's installation instructions. Each layer is not required to be the same material. The WRB shall be integrated with all flashing materials in such a manner that prevents penetration of water beyond the WRB. Overlaps in WRB shall be provided in accordance with the WRB manufacturer's installation instructions. For D226 WRB materials, WRB shall overlap a minimum 6 in. (152 mm) at vertical joints and a minimum 2 in. (50 mm) at horizontal joints and shall be applied in shingle fashion. WRB fasteners shall be spaced in accordance with the water resistive barrier manufacturer's installation instructions.

NOTE 7—Some building code jurisdictions allow a single layer WRB when a drainage wall system is used. This is an acceptable installation when the drainage wall system meets the requirements of Section 10 of this practice.

NOTE 8—When the WRB is installed inboard of cement board in accordance with 6.4.1, a single layer of WRB is permitted since there is not a need for a sacrificial layer of WRB.

6.3.2 *Sheathed Frame Substrate:*

6.3.2.1 *Foundation Weep Screed*—Install foundation weep screed in accordance with Specification C1063.

6.3.2.2 *Lath*—Install lath which meets the requirements of 4.3 in accordance with Specification C1063, or the alternate lath manufacturer's installation instructions, or the project design documents.

NOTE 9—In order to facilitate embedment of lath in mortar, some lath products will require furring. Furring and self-furring lath are addressed in Specification C1063, Table 3.

6.3.2.3 *Scratch Coat*—Install a scratch coat with a minimum thickness of ½ in. (13 mm). The scratch coat shall be applied with sufficient material and pressure to fully engage and encapsulate the lath and with sufficient thickness of material to allow for scoring the surface. As soon as the scratch coat becomes somewhat firm the entire surface shall be scored in the horizontal direction only.

6.3.3 *Open Studs, Non-Solid Sheathing and Metal Building Panels:*

NOTE 10—Non-solid sheathing description is intended to address products such as foam sheathing, fiberboard sheathing, and other sheathing products that would not resist the force used to press units onto scratch coat, resulting in detrimental lath movement.

6.3.3.1 *Foundation Weep Screed*—Install foundation weep screed in accordance with Specification C1063.

6.3.3.2 *Lath*—Install paperbacked 3.4 lb (1.54 kg) ⅜ in. (10 mm) rib lath in accordance with Specification C1063 unless the design documents provide other criteria. Paper backing must meet 4.2 to be considered one of the WRB layers.

NOTE 11—Paperbacked lath is an effective method to prevent mortar from reaching insulation cavity in open stud construction or space between ribs in metal building panels. A separately applied layer of WRB can serve the same purpose. Non-solid sheathing applications do not require paperbacked lath as there is no air space to be filled by mortar.

6.3.3.3 *Scratch Coat*—Install a scratch coat with a minimum thickness of ½ in. (13 mm). The scratch coat shall be applied with sufficient material and pressure to fully engage and encapsulate the lath and with sufficient thickness of material to allow for scoring the surface. As soon as the scratch coat becomes somewhat firm, the entire surface shall be scored in the horizontal direction only. This scratch coat shall be cured for at least 48 hours prior to the unit installation. Scratch coats shall be evenly dampened with water just prior to placing units. There shall be no free water on the surface when units are applied.

NOTE 12—The purpose of a 48 hour cured scratch coat in the applications outlined in 6.3.3 is to assure a firm surface to install the units. These applications would otherwise not have a firm substrate to resist the force of pressing units into place, leading to lath movement, causing bond failure on previously installed units.

6.4 *Cement Board Installations:*

6.4.1 *Cement Board Exterior Installations*—Exterior cement boards as described in 4.4 shall be installed over approved sheathing and WRB (see 6.3.1). A single layer of WRB is permitted. Cement board shall be installed per design requirements and manufacturer's recommendations. Modified mortars meeting ANSI A118.4 or ANSI A118.15 as specified in 4.5.1.3 shall be used for application of cement-based adhered masonry veneer units over cement board.

6.4.1.1 *Joint Treatment for Exterior Installations*—Joints in cement board shall be treated per manufacturer's recommendation with polymer modified mortars meeting ANSI A118.4 or ANSI A118.15 as specified in 4.5.1.3 and 4-in. wide alkali-resistant fiberglass mesh tape.

6.4.2 *Cement Board Interior Installations*—Interior or exterior cement boards as described in 4.4 shall be installed over approved framing. Cement board shall be installed per design requirements and manufacturer's recommendations. Modified mortars meeting ANSI A118.4 or ANSI A118.15 as specified in 4.5.1.3 shall be used for application of cement-based adhered masonry veneer units over cement board.

6.4.2.1 *Joint Treatment for Interior Installations*—Joints in cement board shall be treated per manufacturer's recommendation with modified mortars meeting ANSI A118.4 or ANSI A118.15 as specified in 4.5.1.3 and 2-in. wide alkali-resistant fiberglass mesh tape.

6.5 *Existing Cured Stucco (as a replacement for cement-based adhered masonry veneer scratch coat):*

6.5.1 An analysis and assessment shall be conducted by a design professional to verify the assembly configuration, condition, and capacity of structural backing and attachments against the additional load imparted by the new assembly.

NOTE 13—An analysis includes, but is not limited to: the existing configuration (stucco thickness, depth of embedment of lath, type of fastener, and fastener spacing) and the strength of the structural backing. An assessment of corrosion on embedded metals and structural integrity of the stucco should be undertaken to estimate residual design service life.

6.5.2 Install units over an un-modified stucco scratch or brown coat that has not been slicked or burned. All materials and installation must meet the requirements of Section 4.

6.5.3 Any existing cured stucco system that does not meet the surface requirements of 6.2 and 6.3 shall have lath and scratch coat applied for unit installation.

NOTE 14—The purpose of 6.5.3 is to ensure the bonding surface is clean and bond ready and that water management systems are present in the existing stucco system. The steps required to treat as a new installation include installation of any or all of the following: weep screed, WRB, lath, scratch coat.

6.6 *Cast-in-Place Concrete or Precast Concrete Tilt-up Walls:*

6.6.1 Install units over concrete surfaces that are rough, clean, and free of paint, dirt, sealers, curing compounds, release agents, loose, or spalling material. If a bond-ready surface cannot be achieved, install lath and scratch coat.

NOTE 15—Roughness of the surface can be evaluated using ICRI No. 310.2–1997 Concrete Surface Profile chips equal to or greater than two.

6.7 *Lath:*

6.7.1 Lath shall be furred away from vertical supports or solid surfaces at least ¼ in. (6 mm). Self-furring lath meets this furring requirement.

6.8 *Clearances:*

6.8.1 When installing on exterior stud walls, adhered cement-based masonry veneer shall comply with the following clearances:

6.8.1.1 Not less than 4 in. (102 mm) above the earth;

6.8.1.2 Not less than 2 in. (51 mm) above paved areas, or

6.8.1.3 Not less than ½ in. (12.7 mm) above exterior walking surfaces that are supported by the same foundation that supports the exterior wall.

NOTE 16—Clearances are important to ensure performance of both the veneer and the exterior stud wall. Considerations include, but are not limited to moisture wicking, frost heave, and exposure to de-icing salts.

7. Application of Units

7.1 *General Installation:*

7.1.1 Except as required in 6.3.3.3, apply the units after the scratch coat becomes thumb-print hard. Scratch coats that have become dry shall be evenly dampened with water prior to placing units. There shall be no free water on the surface when unit is applied.

7.1.2 Set the units in a full setting bed mortar. Mortar between the unit and the prepared backing surface shall be a minimum thickness ½ in. (13 mm).

7.1.3 The total thickness to include setting bed mortar and scratch coat shall not exceed 1¼ in. (32 mm).

NOTE 17—Varying of setting bed mortar thickness may be required to adjust uneven substrate or compensate for a fading surface when installing units on curved surfaces.

7.2 *Setting the Units:*

7.2.1 Bonding surface of unit shall be moistened prior to application. Units shall appear wet but without free water on any surface.

7.2.2 *Setting Standard Units with Mortar Joint Width ⅜ in. (10 mm) or Greater*—Units shall be installed using Method A (see 7.2.2.1) or Method B (see 7.2.2.2) or a combination of A and B to achieve setting bed with complete coverage of the back of the unit and full contact between the mortar settings bed, unit, and prepared backing surface.

7.2.2.1 *Method A*—Back butter the unit, using sufficient mortar and pressure to fill texture and voids in back of unit. While setting bed mortar is wet, press and work the unit onto the backing with enough pressure to force mortar to squeeze out around the entire perimeter of the unit.