



Designation: C 1397 – 05

Standard Practice for Application of Class PB Exterior Insulation and Finish Systems¹

This standard is issued under the fixed designation C 1397; 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 covers the minimum requirements and procedures for field or prefabricated application of Class PB Exterior Insulation and Finish Systems (EIFS). Class PB EIFS are systems applied over insulation board, in which the base coat ranges from not less than $\frac{1}{16}$ in. (1.6 mm) to $\frac{1}{4}$ in. (6.4 mm) in dry thickness, depending upon the number of nonmetallic reinforcing mesh layers encapsulated in the base coat. The base coat is then covered with a finish coat of various thickness in a variety of textures and colors.

1.2 This practice does not cover Class PB EIFS with drainage. Consult the EIFS producer for information.

1.3 The values stated in inch-pound units are to be regarded as the standard. The metric values given in parentheses are approximate and are provided for information purposes only.

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

1.5 *This standard may involve hazardous materials, operations, and equipment. 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:²

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems

¹ This practice is under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.05 on Application of Exterior Insulating and Finish Systems and Related Products.

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² 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.

- C 79/C 79M** Specification for Gypsum Sheathing Board³
- C 150** Specification for Portland Cement
- C 578** Specification for Rigid, Cellular Polystyrene Thermal Insulation
- C 1063** Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
- C 1177/C 1177M** Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- C 1186** Specification for Flat Non-Asbestos Fiber-Cement Sheets
- C 1278/C 1278M** Specification for Fiber-Reinforced Gypsum Panel
- C 1280** Specification for Application of Gypsum Sheathing
- C 1325** Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets
- C 1382** Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
- C 1472** Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width
- C 1481** Guide for Use of Joint Sealants With Exterior Insulation and Finish Systems (EIFS)
- E 1825** Guide for Evaluation of Exterior Building Wall Materials, Products, and Systems
- E 2110** Terminology for Exterior Insulation and Finish Systems (EIFS)

3. Terminology

3.1 Definitions used in this standard shall be in accordance with Terminologies **C 11** and **E 2110**.

4. Significance and Use

4.1 This practice provides minimum requirements for the application of Class PB EIFS. The requirements for materials, mixtures, and details shall be contained in the project plans and specifications. See Guide **E 1825** for guidance.

³ Withdrawn.

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

5. Delivery of Materials

5.1 All materials shall be delivered in packages, containers, or bundles with the identification and markings intact.

6. Inspection

6.1 Inspection of the materials shall be agreed upon between the purchaser and the supplier as part of the purchase agreement.

6.2 Inspection shall include the determination that the EIFS materials supplied are as required for the Class PB EIF System specified. Mixing of EIFS materials from different manufacturers is not allowed.

7. Rejection

7.1 Materials that are damaged, frozen or in any way defective shall not be used. Rejection of materials shall be promptly reported verbally to the producer and immediately reported in writing. The notice of rejection shall contain a statement documenting the basis for material rejection.

8. Certification

8.1 When specified in the contract documents, the producer shall furnish a report certifying that the materials are in conformance with product and material standards and contract documents.

8.2 Insulation Boards:

8.2.1 Insulation boards shall be Specification **C 578**, Type 1.

8.2.2 The insulation boards shall have been subjected to a third party quality control inspection and shall be marked as approved for use within the EIFS.

8.2.3 Prior to installation, the insulation board shall be inspected for conformance with contract documents. Nonconforming insulation board shall not be used.

8.2.4 The insulation board producer shall furnish, for each shipment, a written certificate of conformance with the EIFS producer's specifications.

9. Storage of Materials

9.1 All materials shall be kept dry by storage under cover and protected from the weather. When outside storage is required, materials shall be stacked off the ground, supported on a level platform and protected from the weather, surface contamination or physical damage in accordance with the EIFS producer's written instructions.

9.2 Materials shall be protected from exposure to direct sunlight and temperatures less than 40 °F (4 °C), unless otherwise specified by the manufacturer.

9.3 Portland Cement shall meet Specification **C 150** and shall be kept dry until ready for use. It shall be kept off the ground, under cover and away from damp walls and surfaces.

9.4 Insulation board shall be stacked flat with care taken to avoid damage to edges, ends, or surfaces; or exposure to direct sunlight (ultraviolet radiation).

10. Environmental Conditions

10.1 Cold Weather Conditions:

10.1.1 Wet materials shall not be applied when the temperature is less than 40 °F (4 °C), unless otherwise specified by the

manufacturer, unless temporary heat and enclosures are provided to maintain minimum 40 °F (4 °C) for a minimum period of not less than 24 h before, during, and after application (see Annex **A1.9.3**).

10.1.2 Materials shall not be applied to a base containing frost. Substrate surface temperature shall be not less than 40 °F (4 °C). Mixtures for application shall not contain any frozen ingredients.

11. Assessment of Condition of Substrates to Receive Exterior Insulation and Finish Systems

11.1 The substrate shall be as required by the project plans and specifications and as recommended by the EIFS producer for the particular system specified.

11.1.1 Insulation boards shall be as required by the EIFS producer's specification and in the thickness specified.

11.2 The substrate shall be inspected by the applicator and general contractor to ensure that it meets the project plans and specifications and the requirements of **11.3-11.8**.

11.3 Sheathing materials shall be inspected to ensure that:

11.3.1 The specified sheathing thickness has been installed for the stud spacing used.

11.3.2 Fastener type and fastener spacing are as specified.

11.3.3 All Specification **C 79/C 79M** gypsum sheathing boards shall have a water-resistant core.

11.3.4 Tongue and groove water-resistant treated core gypsum sheathing boards conforming to Specification **C 79/C 79M** shall be installed with the tongue edge oriented to the top.

11.3.5 Gypsum sheathing shall be installed with the face paper exposed in accordance with Specification **C 1280**.

11.3.6 Gypsum sheathing shall be protected from moisture at all penetrations and terminations.

11.3.7 Glass mat gypsum sheathing complying with Specification **C 1177/C 1177M** shall be installed in accordance with the sheathing producer's written installation instructions, which include details of framing type and spacing, fastener type and spacing, and sheathing orientation and spacing.

11.3.8 Plywood shall be not less than ½ in. (12.7 mm) nominal in thickness, exterior or exposure 1 wood-based panel sheathing. The plywood shall be installed with a ⅛ in. (3.2 mm) space between sheets.

11.3.9 Fiber-cement sheets complying with Specification **C 1186**, Type A, shall be installed in accordance with the sheet producer's written installation instructions, which include details of stud type and spacing, fastener type and spacing, and sheet spacing recommendations.

11.3.10 Water-resistant exterior fiber-reinforced gypsum sheathing complying with Specification **C 1278/C 1278M** shall be installed in accordance with the sheathing producer's written installation instructions, which include details of stud type and spacing, fastener type and spacing, and sheathing orientation and spacing.

11.3.11 Fiber-mat reinforced cement sheets complying with Specification **C 1325**, type A, shall be installed in accordance with the sheet producer's written installation instructions, which include details of framing type and spacing, fastener type and spacing, and sheet orientation and spacing.

11.3.12 Sheathing shall be continuous.

11.4 *Alignment*—All substrate surfaces shall be straight and true within $\frac{1}{4}$ in. (6.4 mm) in 10 ft (3048 mm). More stringent requirements by the EIFS producer shall supersede the above stated requirements.

11.5 *Suitability for Use*—The substrate surface shall be firm, sound, and undamaged in order to receive the EIFS.

11.5.1 Loose, spalling or crumbling concrete or masonry shall be removed by sandblasting or other appropriate means. If the surface condition of the substrate is at all in doubt, an alternative attachment surface or method shall be provided.

11.5.2 Broken, cracked or delaminated substrate boards shall be replaced or restored to a condition equal to adjacent undamaged boards.

11.5.3 All rotted, decayed, or delaminated wood and plywood sheathing shall be replaced.

11.5.4 Paper-faced gypsum sheathing that has been installed and exposed to the elements for more than 30 days shall be checked at not less than two locations, or every 5000 ft² (465 m²), whichever is greater, for integrity of the surface. The procedures for evaluating the gypsum sheathing are found in **Annex A2**.

NOTE 1—Gypsum sheathing conforming to Specification **C 79/C 79M** is sometimes not recommended for adhesive attachment by the gypsum sheathing producer. Consult with the gypsum board producer before use.

11.6 *Cleanliness*—The surface of all substrates shall be clean and free from any foreign materials such as paint, form release agents, curing compounds, dust, dirt, frost, oil or grease, efflorescence and laitance that would affect the EIFS application.

11.6.1 All sheathing board substrates shall have all loose dirt and dust removed by cleaning methods appropriate for the job and job conditions.

11.6.2 Efflorescence and laitance on concrete, masonry, stucco or clay tile substrates shall be removed prior to EIFS application. Concrete masonry shall be cleaned by light sandblasting, pressure washing, or brushing. Heavy deposits shall be removed through use of hand or power impact tools followed by washing with an appropriate cleaner. Light deposits shall be removed by washing with an appropriate cleaner. All loose particles and cleaner residue shall be removed by washing with clean, potable water. The surface shall be allowed to dry.

11.6.3 Existing paint on concrete or masonry surfaces shall be removed by sandblasting or grit blasting. If removal of existing paint is not practical, an alternate attachment surface or method shall be provided.

11.7 *Dryness*:

11.7.1 Newly constructed concrete or masonry surfaces shall be allowed to cure not less than 28 days prior to application of the EIFS. Repaired areas on existing (aged) walls shall meet the same 28-day curing time.

11.7.2 Sheathing must be dry prior to EIFS application.

11.7.3 Substrate surfaces shall be free of visible water.

11.8 *Metal Lath*—If metal lath is used, it shall be installed in conformance with Specification **C 1063**, except lath edges shall be butted, not lapped. Metal lath shall be 3.4 lb/yd² (1.3 kg/m²) or 2.5 lb/yd² (1.0 kg/m²), self furring or flat, G 60 galvanized.

11.8.1 Metal members shall be properly attached, straight, and true unless required by the system design.

11.8.2 Metal members shall be free of rust, oil, or other foreign matter or contaminants, which cause bond failure or unsightly discoloration.

12. Insulation Board Installation

12.1 Method of attachment shall be approved by the system producer.

12.2 *Adhesive Attachment Method*—The adhesive shall be applied to the back of the insulation board by one of the following methods:

12.2.1 *Notched Trowel*:

12.2.1.1 When applied, and before the insulation board is placed, the height of the adhesive measured from the surface of the insulation board shall not be less than $\frac{1}{4}$ in. (6.4 mm) for factory mixed adhesive and $\frac{3}{8}$ in. (9.5 mm) for field mixed adhesives.

12.2.2 *Ribbon and Dab*:

12.2.2.1 The adhesive shall be applied to the entire perimeter of the insulation board in a ribbon fashion that is not less than 2 in. (50.8 mm) wide by not less than $\frac{3}{8}$ in. (9.5 mm) thick. Dabs not less than 4 in. (101.6 mm) in diameter by not less than $\frac{3}{8}$ in. (9.5 mm) thick shall be applied not more than 8 in. (203.2 mm) on center over the remainder of the board.

13. Adhesive and Mechanical Attachment Method

13.1 Adhesive shall be applied using the ribbon and dab method, the notched trowel method, or in accordance with system producer's current published instructions.

13.2 Mechanical fasteners shall be installed into the framing or nailable substrate.

13.3 Fasteners shall penetrate not less than $\frac{5}{16}$ in. (8.0 mm) into steel framing members, 1 in. (25 mm) into wood framing members, and 1 in. (25.4 mm) into masonry substrates.

13.4 Mechanical fasteners shall be corrosion resistant. Fastener type and spacing shall be in accordance with system producer's current published instructions.

13.5 Selection and frequency of fasteners and fastener type will vary depending on substrate type, insulation board thickness and design wind load and whether used in combination with an adhesive attachment. Therefore fastener type, patterns, and use shall be in accordance with the EIFS producer's written instructions and shall be included in the project plans and specifications.

14. Mechanical Attachment Method

14.1 Mechanical fasteners shall be installed into the framing or nailable substrate.

14.2 Mechanical fasteners shall be corrosion resistant. Fastener type and spacing shall be in accordance with the EIFS producer's current published instructions.

NOTE 2—Wind-load requirements shall be considered for mechanically fastened systems.

15. General Requirements

15.1 Insulation boards shall be placed from a level base line with vertical joints staggered in a running bond pattern and butted tightly.

15.2 Insulation board joints at all inside and outside corners shall be staggered and interlocked.

15.3 Insulation boards must abut without gaps, eliminating space for adhesive or base coat intrusion between the board edges and ends.

15.4 Fenestration openings and other wall openings shall be cut out of a single insulation board. Board joints shall not be aligned at corners with head, sill or jambs of windows, doors, similar openings, and aesthetic reveals.

15.5 *Adhesively Attached:*

15.5.1 The insulation board thickness shall be not less than $\frac{3}{4}$ in. (19.1 mm).

15.5.2 Insulation board joints shall be offset not less than 6 in. (152.4 mm) from horizontal sheathing board joints.

15.6 *Mechanically Fastened:*

15.6.1 The insulation board thickness shall be not less than 1 in. (25.4 mm).

15.6.2 Insulation board joints shall be offset from horizontal sheathing board joints.

15.7 When attachment is by adhesive or adhesive and mechanical fasteners, each insulation board shall be installed by sliding it into place until it abuts the adjoining insulation board tightly. Pressure shall be applied over the entire surface of the insulation board to achieve uniform contact and an overall level surface. The insulation board shall be occasionally checked for proper contact with the substrate by removing a piece of insulation board. Proper contact has been achieved when approximately equal portions of the adhesive remain on both the substrate and the insulation board when the board is removed from the wall. The insulation board shall remain undisturbed for no less than 24 h prior to proceeding with the installation of mechanical fasteners or the base coat. Cool, damp weather conditions extend minimum curing or drying time.

15.8 When the boards are attached only with mechanical fasteners, they shall be affixed to a nailable substrate or structural members with the proper fasteners, ensuring that all insulation boards abut tightly. Fastening patterns shall be in accordance with the EIFS producer's recommendation. When installed, the portion of the fastener left flush with the face of the insulation board shall not fracture the insulation board.

16. Aesthetic Reveals

16.1 Aesthetic reveals shall be cut into the insulation board prior to applying the reinforcing mesh.

16.2 The insulation board thickness in the bottom of a reveal shall be not less than $\frac{3}{4}$ in. (19.1 mm).

16.3 Aesthetic reveals shall be cut true and straight.

16.4 Horizontal aesthetic reveal configuration shall provide for outward positive drainage.

16.5 Aesthetic reveals shall not occur at the abutment of two pieces of insulation board.

16.6 The reveal shall be reinforced with base coat and reinforcing mesh prior to application of the full base coat and reinforcing mesh.

17. Reinforced Base Coat Application

17.1 Inspect the insulation board surface to ensure that it is clean, dry, free of all foreign materials, and damage of any

type. Insulation board planar irregularities of more than $\frac{1}{16}$ in. (1.6 mm) shall be corrected. All board joints shall be tightly abutted or shall be filled with an insulating material. The entire wall area shall be sanded or rasped to minimize any irregularities.

17.2 *Base Coat Preparation*—All materials requiring field preparation shall be mixed in accordance with the EIFS producer's specifications.

17.3 *Base Coat Application*—The prepared base coat shall be uniformly spread over the entire surface of the insulation board.

17.4 *Nonmetallic Reinforcing Mesh*—The single layer reinforcing mesh shall be fully encapsulated in the field of the wall, at corners, edges, and joints. Trowel from the center to the edge of the reinforcing mesh to avoid wrinkles. The single layer reinforcing mesh shall be continuous at all corners.

17.4.1 The surface shall be free of voids, projections, trowel marks and other surface irregularities. The base coat thickness shall be not less than $\frac{1}{16}$ in. (1.6 mm) dry as measured from the surface of the insulation board. The base coat shall be applied in two applications unless otherwise recommended by the EIFS producer.

NOTE 3—The recommended method is to apply the base coat in two applications.

17.5 *Reinforcing Mesh Overlap*—All reinforcing mesh edges shall be overlapped not less than $2\frac{1}{2}$ in. (63.5 mm).

17.6 *Impact Layers*—When required, higher impact performance shall be achieved with multiple layers of reinforcing mesh or by incorporating heavier weight reinforcing mesh. All areas requiring higher impact performance shall be detailed on the project plans and specifications. When overlapping of high impact mesh is not required, a complete second layer of reinforcing mesh shall be applied over the layer of high impact mesh.

17.7 *Corners*—Reinforcing mesh shall not be lapped within 8 in. (203.2 mm) of any corner.

17.8 *Wall Penetrations*—All edges of the insulation board at penetrations of the EIFS, such as at windows, doors, HVAC, pipes, ducts, electrical boxes, and at the base of the wall shall be wrapped with either the base coat and reinforcing mesh or trim, or as specified by the project plans and specifications. Wall openings such as doors, windows, and HVAC sleeves shall be diagonally reinforced at corners with mesh not less than 9 in. (228.6 mm) by 12 in. (304.8 mm).

17.8.1 The corners of returns to windows, doors, and similar wall openings shall have reinforcing mesh the full width of the return and extending not less than $2\frac{1}{2}$ in. (63.5 mm) on both sides of the corner.

17.9 *Expansion Joints*—All edges of the insulation board at expansion joints shall be wrapped with either the base coat and reinforcing mesh or trim as specified by the EIFS producer for the particular EIFS. The reinforcing mesh shall be fully encapsulated.

17.10 *Aesthetic Reveal*—The reinforcing mesh shall be continuous and care shall be taken to ensure that the reinforcing mesh is fully encapsulated into the reveal and that the reinforcing mesh shall not be cut during application of the base coat.