



## Standard Practice for Application of Class PB Exterior Insulation and Finish Systems<sup>1</sup>

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 1/16 in. (1.6 mm) to 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:

- C 11 Terminology Relating to Gypsum and Related Building Materials and Systems<sup>2</sup>
- C 79/C 79M Specification for Treated Core and Nontreated Core Gypsum Sheathing Board<sup>2</sup>
- C 150 Specification for Portland Cement<sup>2</sup>

C 578 Specification for Rigid, Cellular Polystyrene Thermal Insulation<sup>3</sup>

C 1063 Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster<sup>2</sup>

C 1177/C 1177M Specification for Glass Mat Gypsum Substrate for Use as Sheathing<sup>2</sup>

C 1186 Specification for Flat Non-Asbestos Fiber-Cement Sheets<sup>4</sup>

C 1278/C 1278M Specification for Fiber-Reinforced Gypsum Panel<sup>2</sup>

C 1280 Specification for Application of Gypsum Sheathing<sup>2</sup>

C 1382 Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints<sup>5</sup>

C 1472 Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width<sup>5</sup>

C 1481 Guide for Use of Joint Sealants With Exterior Insulation and Finish Systems (EIFS)<sup>5</sup>

E 1825 Guide for Evaluation of Exterior Building Wall Materials, Products and Systems<sup>6</sup>

E 2110 Terminology for Exterior Insulation and Finish Systems (EIFS)<sup>6</sup>

### 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.

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.06.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 04.05.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 04.07.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 04.12.

## 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 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 Sheathing shall be continuous.

11.4 *Alignment*—All substrate surfaces shall be straight and true within ¼ 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 ft<sup>2</sup> (465 m<sup>2</sup>), 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 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 or Furring and Accessories*—If metal lath or furring and accessories are used, they shall be installed in conformance with Specification C 1063, except butt-lapped, or as otherwise noted. Metal lath shall be 3.4 lb/yd<sup>2</sup> (1.3 kg/m<sup>2</sup>), self furring, 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 ¼ in. (6.4 mm) for factory mixed adhesive and ⅜ 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 ⅜ in. (9.5 mm) thick. Dabs not less than 4 in. (101.6 mm) in diameter by not less than ⅜ 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 ⅝ 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 jamps 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. All vertical insulation board joints shall fall upon a framing member.

15.7 When attachment is by adhesive or adhesive and mechanical fasteners, each board shall be installed by sliding it into place until it abuts the adjoining board tightly. Pressure shall be applied over the entire surface of the 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 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.

17.11 *Reinforced Base Coat*—The reinforcing mesh shall be fully encapsulated in the base coat throughout the field of the wall, at corners, edges, and joints. The surface shall be free of voids, projections, trowel marks and other surface irregularities.



17.12 *Special Insulation Shapes*—When special insulation shapes are installed over EIFS, nonmetallic reinforcing mesh encapsulated in the base coat shall be used to cover the shape.

## **18. Finish Coat Application**

18.1 The reinforced base coat shall be allowed to dry and harden for not less than 24 h prior to finish coat application, unless specifically allowed by the EIFS producer.

18.2 *Material Preparation*—The finish coat shall be mixed in accordance with the EIFS producer's specifications. Only clean potable water shall be added to adjust workability. Always add the same amount of water to each container within a given lot of finish.

18.3 *Execution*—Finish shall be applied with a stainless steel trowel or appropriate equipment as specified by the EIFS producer. Tools and equipment shall be kept clean at all times. Finish shall be applied continuously to a natural break such as corners, joints or tape line. Apply finish to the base coat maintaining a wet edge. Sufficient manpower and scaffolding shall be provided to continuously finish a distinct wall area. Scaffolding shall be spaced a distance from the wall, consistent with safety standards, that will allow uniform texturing of the finish without staging marks. On hot windy days, misting is permitted with clean, potable water to cool the wall. Work shall precede the sun whenever possible. Water shall not be added to the finish once it is applied to the wall. Use the same tool and hand motion and match the texture of the surrounding area. The finish coat thickness shall be as specified by the EIFS producer. Protect all finish work from damage until fully dried.

18.4 *Joints*—The application of finish into the joints shall be consistent with the EIFS producer's recommendations and job conditions.

18.5 *Sealant Joints*—The application of finish into the sealant joint is not allowed.

## **19. Curing Time Between Application Steps**

19.1 Manufacturer's recommendations for climatic conditions, mixing, and application practices shall be followed to allow respective coats sufficient time to cure or dry before any subsequent coats are applied. Each application step shall be permitted to cure or dry to prevent degradation to the system integrity with subsequent steps.

19.2 Auxiliary protection (tenting, supplemental heat, shading) from adverse environmental conditions shall be utilized to minimize deviations from standard, expected cure or dry times. (See Annex A1.9.3.)

19.3 All substrates shall be sound and cured or dry before continuing on to the next application step.

## **20. Cleanup**

20.1 Adjacent materials, surfaces, and the work area shall be cleaned of foreign materials resulting from the work.

20.2 All excess EIFS materials shall be removed from the job site.

## **21. Keywords**

21.1 class PB; EIFS; exterior insulation and finish system

# **ANNEXES**

## **(Mandatory Information)**

### **A1. GENERAL INFORMATION**

#### **A1.1 General:**

A1.1.1 The work includes all labor, materials, services, equipment and scaffolding required to complete the EIFS installation on the project in accordance with the project drawings and specifications, except electrical power and potable water.

A1.1.2 Where a specific fire resistance rating is required for the EIFS assemblies and construction, details of construction shall be in accordance with official reports of tests conducted by recognized testing laboratories and a part of approved plans and specifications.

A1.1.3 The installation of the EIFS is to be coordinated by the owner's authorized agent with work of other trades.

A1.1.4 Surfaces and accessories to receive EIFS components shall be examined and accepted as provided in 11.2 before the EIFS components are installed thereto. The proper authorities shall be notified about unacceptable conditions. The unsatisfactory conditions shall be corrected prior to the application of the EIFS components. Unsatisfactory conditions shall be corrected by the party or parties responsible for such conditions.

A1.1.5 The construction specifier shall describe, in the proper section of the project specifications, the physical characteristics of the surfaces to receive the EIFS.

#### **A1.2 Design Considerations:**

A1.2.1 EIFS are attached to outside surfaces of all types of structures to provide weather resistant, energy efficient, and durable claddings. The claddings will be subjected to various exposures such as abrasion, vibration, moisture, freezing, thawing, negative and positive wind loading, ultraviolet light, acid rain, thermally induced expansion and contraction, and impact.

A1.2.2 Provide sufficient slope on faces of EIFS surfaces to prevent water, snow or ice from accumulating or standing. A minimum 6 in. (152.4 mm) in 12 in. (304.8 mm) (1:2) pitch is recommended. Length of sloped surfaces shall not be more than 12 in. (304.8 mm).

A1.2.3 Provide parapet cap made only from corrosion resistant materials. The parapet cap shall extend not less than 2½ in. (63.5 mm) over the faces of the EIFS, not including wood blocking and shall include a drip edge detail. Detailed

requirements for furnishing and installing the parapet cap shall be in the appropriate section of the project specifications. Parapet caps shall be clearly shown in large scale details. Parapet caps shall be installed as soon as practical after the installation of the EIFS.

A1.2.4 Provide for sealing of expansion joints, panel joints, system terminations and all interfaces of the EIFS with other building components.

A1.2.5 At soffits, window and door heads provide for a drip edge.

A1.2.6 Windows installed in EIFS walls shall have metal sill flashing.

A1.2.7 The specifier shall evaluate the potential of the EIFS surface being subjected to abnormal stresses or impacts.

A1.2.8 Wall assemblies have properties that in certain applications make a dew point analysis critical to ensure successful performance of the wall system. The specifier shall evaluate these conditions.

A1.2.9 Sheathing must be continuous over floor slabs, intersecting walls, columns, beams and similar constructions. The EIFS shall not be installed over areas without sheathing. If the sheathing cannot be continuous, the installation of expansion joints shall be considered.

A1.2.10 Where the sheathing is interrupted or out of plane, corrections must be made prior to EIFS application.

A1.2.11 A weather-resistive barrier and flashing may be required as specified in moist and water sensitive applications. The EIFS producer, design professional, and specifier shall evaluate the conditions and the need.

#### A1.3 *Relief from Stress:*

A1.3.1 Where the EIFS and dissimilar types of substrates, materials and building components interface, provide for appropriate size and location of expansion joints.

A1.3.2 Where roof elevations change, provide for appropriate size and location of expansion joints.

#### A1.4 *Bonding Agents:*

A1.4.1 Bonding compounds or agents are sometimes applied to a substrate surface to receive base coat adhesive. Follow the EIFS producer's instructions and specifications for their use.

#### A1.5 *Adhesives:*

A1.5.1 The types of adhesives and the methods of installation used will vary depending on the substrate to which the insulation boards will be attached. Therefore, the adhesive type and application method used shall be in accordance with the EIFS producer's written instructions.

#### A1.6 *Mechanical Fasteners:*

A1.6.1 The types of mechanical fasteners used and the methods of installation will vary depending on the substrate to which the insulation boards are to be fastened.

A1.6.2 Fastener washers shall be installed flush with the insulation board surface.

A1.6.3 Fastener spacing shall be specified by the design professional consistent with wind load requirements on the specific project.

#### A1.7 *Reinforced Base Coats:*

A1.7.1 Base coat thickness is permitted to exceed  $\frac{1}{16}$  in. (1.6 mm) dry depending on the type of base coat used and the impact resistance specified.

A1.7.2 A small amount of base coat shrinkage is normal. Due to color variations, it shall not be unusual to see a very slight telegraphing of the reinforcing mesh pattern after the base coat cures. Bare mesh shall not be visible and the mesh pattern shall not be tactile.

A1.7.3 The producer's instructions shall be followed to ensure that the base coat cement is properly proportioned. The proper portioning of cement based material is important. Excess cement may cause the base coat to become hard and stiff as the cement hydrates over time.

A1.7.4 The minimum amount of mix water to form a workable mix shall be used. Excess mix water will cause the base coat to be porous and less weather resistant. Never add more water than recommended by the producer. Measure water in containers of known volume.

A1.7.5 Mix materials only at low speed with paddles designed to reduce air entrapment.

A1.7.6 Generally, when applying two layers of mesh, the second base coat layer is applied as soon as the first layer has dried sufficiently enough to receive the second base coat application. Depending upon material composition and weather conditions, this sometimes occurs within the first 4 to 8 h after the completion of the application of the initial base coat, or, in some cases, it will require waiting until the following day.

A1.7.7 Trowel aesthetic reveals and corners with a trowel shaped to fit the profiles.

#### A1.8 *Finish Textures:*

A1.8.1 Textures, as a description of surface appearance, generally are identified with the method and tools used to achieve the finish appearance. Texture is sometimes varied by the size and shape of the aggregate contained in the finish, equipment or tools employed, the consistency of the finish mix, the condition of the base to which it is applied and by decorative and protective treatments.

A1.8.2 With almost limitless variations possible for finish appearance or texture, the same term sometimes does not have the same meaning to the specifier, contractor or applicator. Sample panels of sufficient size including components and features specified shall be constructed using the methods, tools and techniques to be used in the actual construction. It is recommended that in the case of prefabrication, two panels be constructed. One panel remains at the jobsite. One panel remains at the fabrication site. The samples shall be approved by the architect and owner in writing.

A1.8.3 To provide some guidance, the following categories are generally understood and recognized to imply a particular method of application or finished appearance.

A1.8.3.1 *Sand Finish*—A finish material devoid of coarse aggregate applied in a thin coat completely covering the base coat and floated to a true plane, yielding a relatively fine-textured finish.

**A1.8.3.2 Trowel Texture**—A freshly applied finish is given various textures, designs or stippled effects by hand motion and trowel used. The effects achieved are individualized and it is sometimes difficult for different applicators to duplicate.

**A1.8.3.3 Standard Finish**—A finish with various size aggregates, applied in a thin coat completely covering the base coat and floated in a random pattern. The applicators are cautioned to use the same type texturing tools to help ensure a consistent texture.

**A1.8.3.4 Exposed Aggregate**—Varying sizes of natural or manufactured stone, gravel, shell or ceramic aggregates are embedded by hand or by machine propulsion into a freshly applied “bed coat.” The size of the aggregate shall not be more than ½ in. (12.7 mm) in diameter. The size of the aggregate determines the thickness of the bedding coat. The bedding coat shall be no less than one-half the thickness of the aggregate to be embedded.

**A1.8.3.5 Spray Texture**—A machine applied finish material. The texture achieved depends on many factors some of which are the consistency of the sprayed mixture, the angle and distance of the spray nozzle to the surface, the pressure of the machine, orifice size used, operator expertise, climatic conditions (wind specifically), and base coat conditions.

**A1.8.3.6 Miscellaneous Types**—Similar to trowel textures except that the freshly applied finish is textured with instruments other than a trowel, such as swept with a broom or brush, or corrugated by raking or combing. A variation of texturing a finish involves waiting until the applied finish has partially dried and then lightly troweling the unevenly applied finish.

The effects achieved are sometimes difficult for different applicators to duplicate.

#### **A1.9 Conditions for EIFS Application:**

**A1.9.1** The amount of water used to mix materials is to be within the allowable range published by the EIFS producer. Factors such as the drying conditions and finishing operations must be considered in determining water usage. The applicator is cautioned that the use of excessive water results in fall off or slide off, excessive shrinkage, higher porosity, lower strength, and inconsistent color.

**A1.9.2** Timing between coats will vary with climatic conditions and types of materials used. Temperature and relative humidity extend or reduce the curing and drying time. Cold or wet weather lengthens, and hot or dry weather shortens the drying period. Moderate changes in temperature and relative humidity are overcome by providing additional heating during cold weather and by pre-wetting the base during hot, dry weather.

**A1.9.3** Heated enclosures require adequate air circulation to prevent hot or cold spots that allow too rapid drying or freezing. When using heated enclosures it is important to control the relative humidity as well as the temperature. Maintain relative humidity at not more than 90 %.

**A1.9.4** Staining and discoloration of finishes or other building components that are caused by free water draining from one plane to another, dissimilar materials, or other building components, are minimized by providing sufficient depth and angle for drip caps and drip edges.

## **A2. EVALUATION OF GYPSUM SHEATHING FOR SURFACE ACCEPTABILITY**

**A2.1** The following procedure is valid only if, at the time of the test, the gypsum sheathing has not been wetted or exposed to high humidity in the previous 24 h.

**A2.2** Using a sharp knife or razor blade, cut a 3-in. (76.2-mm) long diagonal in the middle of the gypsum sheathing. The cut must be sufficient to cut through the paper face and just into the underlying gypsum. Make a 3-in. (76.2-mm) cut at a right angle to the first, forming an “X”.

**A2.3** Using the sharp edge of the cutting tool, peel the paper face (in one quadrant) back approximately ¼ in. (6.4

mm) from the intersection of the two lines.

**A2.4** Firmly holding this peeled edge between the thumb and forefinger, lift the paper face and continue removing the facing material.

**A2.5** If the paper splits cohesively so that part is still adhering to the underlying gypsum, the gypsum sheathing has not been overly exposed to the weather or moisture. If the paper lifts and directly exposes the gypsum, the gypsum sheathing has been exposed to the weather beyond the required limit and shall be replaced.

## **A3. SEALANT SYSTEMS**

**A3.1** The size and location of joints and selection of the sealant to be used is the responsibility of the design professional and shall be consistent with project conditions and guidelines of the EIFS producer. See Guide C 1472 for guidance.

**A3.2** The sealant system must be tested for compatibility with the specified EIFS by an independent laboratory and found to be compatible with the EIFS. See Test Method C 1382 for guidance.

**A3.3** The sealant system is recommended by the EIFS and sealant producer. Non-recommended sealant systems must be jointly approved by the design professional and the sealant producer.

**A3.4** Base the joint design and surface preparation on the sealant producer’s recommendations and project conditions. See Guide C 1481 for guidance.

A3.5 Allow the EIFS material to cure prior to sealant system installation.

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