AWCI | ASSOCIATION OF THE WALL AND CEILING INDUSTRY
513 West Broad Street, Suite 210, Falls Church, VA 22046-3257 | 703.538.1600

Dear EIFS Mechanic,

In an industry with little regulation, your designation as a Certified EIFS Mechanic through AWCI's nationally recognized certification program holds special importance. Please note that your Mechanic certificate expires this year.

You can renew now for another five years by following these simple steps:

- ☐ Read the *EIFS Review and Update Digest.*
- ☐ Complete the open-book recertification quiz based on this digest.
- ☐ Complete the Application for EIFS Mechanic Recertification.
- ☐ Sign the Code of Conduct for EIFS Mechanics.
- ☐ Submit the renewal fee:
  $ 50 if your application is postmarked or faxed by Oct. 31, 2010; or
  $100 if your application is postmarked or faxed between Nov. 1 and Dec. 31, 2010.
- ☐ Fax your application, quiz, code of conduct and fee (if paying by credit card) to (703) 534-8307, or mail to: AWCI, 513 West Broad Street, Suite 210, Falls Church, VA 22046-3257

All documents can be downloaded from the AWCI Web site at www.awci.org/eifs-recert.

By renewing your EIFS Mechanic certificate for another five years, you will continue to:

- Hold a specialized credential recognized by the majority of EIFS professionals.
- Be listed on the EIFS Certification Roster on AWCI's Web site until Dec. 31, 2015.
- Demonstrate your commitment to stay up-to-date with industry standards.
- Help your employer meet the qualifications for EIF*Smart* Contractor status in order to receive insurance benefits and maintain a competitive edge. This corporate credential recognizes companies committed to quality by employing skilled EIFS installers.

Please note that if your certificate is not expires Dec. 31, 2010, and you want to be certified at a later date, you will be have to start the education and certification process over as if you had never been certified.

If you have any questions about the recertification process, please contact us at (703) 538-1612 or eifs@awci.org.

Sincerely,

Annemarie Selvitelli
Director of Education and Foundation Programs

AWCI | ASSOCIATION OF THE WALL AND CEILING INDUSTRY
513 West Broad Street, Suite 210, Falls Church, VA 22046-3257 | 703.538.1600

APPLICATION for EIFS MECHANIC RECERTIFICATION

Complete and return this application, along with the code of conduct, recertification quiz and payment, by Dec. 31, 2010 to ensure your certificate does not expire. Mail all materials to AWCI, 513 West Broad Street, Suite 210, Falls Church, VA 22046-3257, or fax to (703) 534-8307 if paying by credit card.

☐ I want to renew my EIFS Mechanic certification and have read the *Update Digest*.

Signature: _____ Date: _____

CONTACT INFORMATION: *Provide both home and work information.*
Which address should AWCI use as your primary mailing address? ☐ Work ☐ Home

Name (will be printed on wallet card)	EIFS Certificate Number / Last 4 Digits of SSN
Company	Home Street Address / Apt. #
Work Street Address	Home City, State and ZIP
Work City, State, and ZIP	Home Phone ( )
Work Phone ( ) / Work Fax ( )	Cell Phone ( )
Company Website Address	Preferred E-mail Address

PAYMENT INFORMATION: The renewal fee is:
☐ $50 if this application is postmarked or faxed by Oct. 31, 2010.
☐ $100 if this application is postmarked or faxed between Nov. 1 and Dec. 31, 2010.

Indicate payment method:
☐ Check (Payable to AWCI)
☐ Credit Card *Circle one:* Visa MasterCard American Express

Card number: _____ Exp. date: _____
Name on card: _____ Total charged: $_____

For office use only: Admin code: 345009 (20-5009) Date received: _____

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513 West Broad Street, Suite 210, Falls Church, VA 22046-3257 | 703.538.1600

Code of Conduct for EIFS Mechanics

The Code of Conduct lists principles of conduct and standards to be observed by holders of AWCI's mechanics' certificate. Failure to abide by the Code of Conduct may result in sanctions such as a reprimand, suspension or revocation of the certificate.

Holders of the mechanics' certificate:

- Shall use the knowledge gained from the AWCI EIFS– Doing It Right education program and employ current industry accepted application means and methods for EIFS applications.
- Shall advise the supervisor of the industry accepted application means and methods when directed otherwise.
- Shall instruct and/or demonstrate to others the correct industry accepted application means and methods when permitted.
- Shall stay informed of new guidelines, standards, codes and procedures for the application of EIFS.
- Shall notify AWCI of any occupation change that would affect the validity of the certificate.
- Shall act in a professional manner and correctly represent the extent of the education associated with the certificate and its purpose.

I have read and understand the above Code of Conduct and will strive to be aware of these situations and to abide by their intent.

Name (print) _____

Signature _____ Date _____

AWCI EIFS Doing It Right CERTIFICATION PROGRAM

Name: _____ Date: _____

EIFS MECHANIC RECERTIFICATION QUIZ

Required for Recertification

This quiz must be completed and returned with your recertification application, signed Code of Conduct, and payment to AWCI, 513 West Broad Street, Suite 210, Falls Church, VA 22046-3257 or faxed with your application materials to (703) 534-8307.

All of the information to answer these questions can be found in the EIFS Review and Update Digest. Use the Digest to answer the questions. Please read the questions carefully–some have multiple correct answers. A passing score is 16 out of 20 correct.

1. As a general rule, most material should be stored at or above a minimum temperature of _____. *Circle the correct answer.*

   A. 70° F
   B. 60° F
   C. 40° F
   D. 20° F

2. In general, what is the minimum amount of time that a base coat should be allowed to dry before finish is applied? *Circle the correct answer.*

   A. 48 hours
   B. 24 hours
   C. 12 hours
   D. 6 hours

3. *Circle the word that correctly completes the sentence.*
   When assessing gypsum sheathing, make sure that the paper is firmly attached to the core and that the paper laps to the inside/outside.

4. Which of the following EPS board characteristics affects water-resistance vapor diffusion/ability to breathe, crack resistance and insulation value? *Circle the correct answer.*

   A. Density
   B. Fusion
   C. Aging
   D. Surface area smoothness

5. Which of the following items may be components of a Class PB barrier EIFS? *Circle all correct answers.*

   A. Adhesive and/or mechanical fasteners
   B. EPS boards
   C. Fiberglass reinforcing mesh
   D. Base coat
   E. Primer
   F. Finish coat

6. _____ is typically used to attach EPS board to irregular unit masonry and/or concrete wall surfaces. *Circle the correct answer*.

   A. The ribbon-and-dab method
   B. A notched trowel
   C. The mechanical fastener method
   D. A nail

7. True or False? Mechanical fasteners must be long enough to pass through the EPS board, but should not pass into the framing or structural sheathing.

   A. True
   B. False

8. When cutting aesthetic reveals, there must be at least _____ between the bottom of reveals and the back of the EPS boards. *Circle the correct answer.*

   A. 1 inch
   B. 1/2 inch
   C. 3/4 inch
   D. 7/8 inch

9. True or False? When installing DEFS, the absence of insulation means that the lamina must withstand the full load of the sheathing and framing movement due to wind, live or thermal loads.

   A. True
   B. False

10. Standard reinforcing mesh must be lapped not less than _____ at normal system terminations. *Circle the correct answer.*

    A. 1 inch
    B. 1 1/2 inches
    C. 2 inches
    D. 2 1/2 inches

11. The EIFS expansion joint should be _____. *Circle <u>all</u> correct answers.*

    A. straight
    B. smooth
    C. roughly textured

12. Building paper should be lapped a minimum of _____ both horizontally and vertically, when installed over the substrate in an EIFS with Drainage.
    Circle the correct answer.

    A. 2 ½ inches
    B. 1 inch
    C. 8 inches
    D. None of the above

13. The general requirements for the parapet cap flashing include the following:
    Circle all correct answers.

    A. The sections of flashing must be effectively sealed and sloped.
    B. Flashing should be a minimum of 2½ inches down over face of the EIFS as measured from the top of the EIFS, including the drip edge.
    C. Flashing must be tight against the face of the EIFS.
    D. Parapet cap flashing may be installed anytime.
    E. Sealant may be required (by the designer).

14. True or False? Cementitious base coats are mixed just like adhesives and are often the same product.

    A. True
    B. False

15. True or False? In a drainage system, reinforcing mesh across sheathing board joints is required for WRB coatings.

    A. True
    B. False

16. Flashing is critical to the success of the wall assembly and, in general, is required at _____. *Circle <u>all</u> correct answers.*

    A. Heads of doors
    B. Expansion joints
    C. Sills of windows
    D. All horizontal terminations

17. The use of untested, non-code compliant materials could increase the risk of _____. *Circle the correct answer.*

A. Water penetration
B. Efflorescence
C. Fire
D. Failure at expansion joints

18. The purpose of sealant backing is to _____. *Circle <u>all</u> correct answers.*

A. Limit the depth of the sealant
B. Provide proper sealant configuration
C. Act as a bond breaker
D. Improve appearance of expansion joints

19. True or False? OSB is permitted only if it is used in a drainage EIFS and immediately covered with sheathing membrane, or if approved by the manufacturer.

A. True
B. False

20. All through wall penetrations are required to be sealed to the water-resistive barrier. *Circle all the methods that are acceptable.*

A. Elastomeric sealants
B. Spray-applied polyurethane foam
C. Cellophane tape
D. Self-adhering membrane.

AWCI EIFS Doing It Right CERTIFICATION PROGRAM

EIFS Review and Update Digest 2010

For Recertification of EIFS Mechanics

This is a digest of the critical points of EIFS application and was updated based on the latest revision of the EIFS seminar content. Your review and understanding of this document is one of the two key requirements for recertification. The other is successfully completing the open-book recertification quiz for Mechanics.

AWCI ASSOCIATION OF THE WALL AND CEILING INDUSTRY
SERVING CONTRACTORS, SUPPLIERS AND MANUFACTURERS

Section 1

Critical Points for Correct EIFS Installations

Industry Standards and Specifications

An important source for guidelines and specifications is the information provided by manufacturers. Failure to follow manufacturer's specifications may lead to system failure and/or a manufacturer who will not provide a warranty because its specifications were not properly followed.

It should be understood manufacturers do not actually design projects. More so, they provide guidelines and recommendations for the project's designer to consider when incorporating EIFS into a building envelope. The graphic representations published and provided by manufacturers should be viewed as a guide to how various wall components are integrated with an exterior cladding and not as the specific plans for a project.

Another reliable source of information regarding the use and installation procedures for EIFS products can be found within Industry Standards, such as ASTM, EIMA and ANSI. These nationally recognized organizations provide published detailed information pertaining to such areas as, but not limited to, approved installation methods and approved substrate materials.

ASTM and ANSI Standards

Some of the ASTM standards that are particularly important to the EIFS industry include ASTM C1397-09, Standard Practice for Application of Class PB EIFS and EIFS with Drainage, and C1396, Specifications for Gypsum Board. ANSI/EIMA 99-A is produced by ANSI (American National Standards Institute). Similar to the requirements of ASTM C1397-09, the ANSI/EIMA document also addresses testing requirements for EIFS manufacturers.

EIMA Guidelines

EIFS Industry Members Association (EIMA) guidelines are very general in nature and are not product or job-specific. EIMA guidelines should be used only as a reference tool.

Building Codes

The International Code Council (ICC) produced the first set of International Codes in 2000. It consists of the International Building Code (IBC) and International Residential Code (IRC). The ICC has classifications for construction types, for which EIFS must be qualified in the Code Evaluation Report.

With regard to applicable code bodies, it should be understood there are also various drainage requirements that may be included in the various code bodies, such as the following:

- The IRC requires drainage on all residential construction.
- The IBC requires drainage on Type V, Group R1, R2, R3 and R4. Compliance with Section 1403.2 of the IBC, without the mandatory water-resistive barriers, is permitted with proper justification for Group R1 and R2 only.

It is the designer's responsibility to determine which type of system is required.

In the Code Evaluation Reports, components for each manufacturer's proprietary system are identified. EIFS inspectors and building officials can use these reports for cross-referencing during construction review.

In the actual Code Evaluation Reports, the following aspects of an EIFS manufacturer's proprietary system are identified in detail and include:

- Permitted substrates and water-resistive barriers (WRBs).
- Components (by name and properties):
  - Insulation boards (thickness, type, size)
  - Mechanical fasteners (type and spacing)
  - Adhesive/base coat (mixing ratio)
  - Reinforcing mesh (weight, strength)
  - Finish coat
  - Accessories (drainage track, etc.)
    - PVC accessories must be ultraviolet resistant for exterior use
- Materials listed by name and type on packaging (pails, bags, etc.).
- General mixing instructions for the wet-state materials.
- Installation methods, instructions and other requirements.

All materials must be furnished by the same manufacturer. Materials from different manufacturers must not be intermixed.

EIF systems applied onto non-combustible buildings require that the EIF system be fire-tested. The characteristics of a proprietary EIF system are actually cited in the fire test report, and include the following:

- EPS insulation board (maximum thickness)

- Adhesive and/or mechanical attachment of the insulation board to an approved substrate
- Base coat
- Glass fiber reinforcing mesh
- Textured, protective finish coat

In regard to material or component substitutions, any modification to a tested and approved design, such as adding trim accessories and horizontal terminations (expansion joints), should be made only after appropriate fire tests have been conducted with the modifications included as part of the EIF system and a copy of the fire test or code evaluation report is available to verify their inclusion.

The base coat and reinforcing mesh are the components that typically provide the greatest resistance to flame spread and help retard fire ignition by forming a protective barrier over the EPS insulation board.

The danger of untested materials is not just a breach of the code requirements, it could actually lead to an unsafe condition where a fire could spread and result in more significant damage. Many untested materials and practices that resemble EIFS cannot be easily distinguished by observation from fire-tested, code-compliant EIFS. Therefore, the use of untested, non-code–compliant materials could increase the risk of a fire. Any substitution, exclusion or hybrid installation is not a bona fide EIF system that has been tested for flame resist propagation and should be avoided.

Successful fire-rated testing of EIFS only warrants that it does not add or detract from the fire-resistance rating of the substrate. The fire rating must always be addressed separately. In a fire, gypsum board or concrete/masonry act as a heat sink, slowing the temperature increase and delaying ignition. When these traditional EIFS substrates are removed, ignition of the EPS insulation board can occur more quickly and may result in flame propagation.

The type of insulation board can also have an impact on system performance in a fire. For example, using a plastic insulation other than EPS insulation board could lower fire resistance. Regardless of the insulation type, the following criteria should be considered:

- It should never exceed the minimum and maximum thickness allowed.
- It should be identical to that used in the fire-tested system or listed in the manufacturer's current evaluation reports.
- Untested coatings (polyurethane or polyurea) have been shown to increase the flammability in a fire.

Beyond the fire safety issues concerning EIFS used in non-combustible construction, the code requires the following:

- Foam plastics must be separated from the occupied portion of the building (15 minute thermal barrier) with a material such as gypsum wallboard.
- Labeling of products/components.
- The manufacturer must approve the "applicators."
- Sign-off forms are provided in each Code Evaluation Report for *both* the EIFS and sealant contractors to verify that the appropriate components were used and that they comply with the requirements of the manufacturer and the Code Evaluation Report.

Installation of EIFS

Proper Storage of EIFS Materials

EIFS materials must be stored properly to prevent damage.

- All materials should be stacked off the ground and out of direct sunlight.
- All bag products must be stored off the ground and kept dry.
- Always check the manufacturer's specifications for the materials being used.
- As a general rule, most material must be stored at or above 40° F. The closer the materials are to freezing, the greater the chance that their performance characteristics will be adversely affected.

Environmental Considerations

Wet materials should not be applied when the temperature is less than 40° F and falling, unless temporary heat and ventilated enclosures are provided to maintain a minimum temperature of 40° F for a minimum of 24 hours. Environmental conditions may affect drying and curing time.

It is important not to apply materials to substrates, base coat, primer (if specified) or finishes that contain frost. Basically, the surface temperature of a substrate should not be less than 40° F (or 50° F, depending on the manufacturer). When materials are applied, the correct temperature of the ambient air and the substrate's surface must be maintained.

Humidity is another important environmental factor. EIFS materials must not be applied in the rain because humidity can retard the evaporation of water. Materials should never be applied during bad weather unless appropriate protection has been provided.

Make sure the substrate is dry before the attachment of the EPS. If there is a film of water on the wall, the adhesive will not stick to the wall. Also make sure the EPS board is dry before any rasping is performed and the base coat is applied. After applying the base coat, allow it to dry a minimum of 24 hours.

When running a finish coat, make sure the base coat is dry. Keep in mind that low temperatures and high humidity are going to affect the drying time. Generally, a finish coat should be protected and allowed a minimum of 24 hours to dry at 70°F and 50 percent humidity.

Temporary Protection

When temporary enclosures are used for protection, it is important to maintain a proper temperature in the enclosure around the clock through the use of heaters. If propane heaters are used, the enclosure should be properly ventilated as they give off moisture.

Thermometers should be located throughout a temporary enclosure. Temperatures can vary dramatically from the top to the bottom of an enclosure.

In general, whenever a heater is used in an enclosure, it is important to follow the OSHA regulations regarding heating equipment used during construction.

Substrates

There are several substrates recognized for use with EIFS.

Non-Combustible Steel-Framed Construction Typically Commercial

- Gypsum sheathing, a minimum ½" thick, on light gauge steel stud wall framing,
  - Paper Faced Exterior Grade Gypsum Sheathing with treated core, conforming to ASTM C1396.
  - Glass Mat Gypsum Sheathing conforming to ASTM C1177.
  - Fiber Reinforced Gypsum Sheathing conforming to ASTM C1278.

Combustible Wood-Framed Construction Typically Residential

- Wood sheathing on wood framing
  - Exterior plywood, or exposure grade 1, minimum ½ inch thick, conforming to APA guidelines.
  - Oriented Strand Board (OSB), minimum $^{7}/_{16}$ inch thick, exterior grade, conforming to APA guidelines. OSB is permitted only if it is used in a drainage EIFS and immediately covered with sheathing membrane or other form of protection.

The use of OSB as a sheathing for EIFS is subject to the approval of the EIFS manufacturer. Occasionally, wood sheathing may be used on steel framing, and gypsum may be used on wood framing. Wood sheathing may be required on steel-framed walls if the sheathing is to support the attachment of other wall elements such as signage. Also, on wood framed walls, gypsum sheathing may be needed if the wall requires a specific fire rating.

- Fiber Reinforced Cement Sheathing, conforming to ASTM C1186.

- Mass walls (concrete, masonry)
    - Unit Masonry— brick or concrete block.
    - Concrete— poured (cast) in place or pre-cast/tilt-up.

- Other Substrates
    - Stucco
    - Metal Lath— Self-furring, expanded diamond galvanized sheets (compliant with ASTM C847); ends and edges butted, not lapped, which is often used on painted block.
    - Plastic lath used in some proprietary EIFS is not included here. Consult manufacturer for more information about the use of plastic lath with specific systems.
    - Insulated concrete forms (ICFs). This is dependent on the type of ICF system, and on the EIFS manufacturer's guidelines.

Substrates (by code) are referred to as either being combustible (able to burn in a fire) or non-combustible (unable to burn in a fire).

In general, all substrates must be structurally sound; must always be straight and true within ¼ inch in 10 feet, and be clean, dry and free of all foreign material that could interfere with the attachment of the EIFS.

When adhesively attaching EIFS to concrete substrates, be careful of residual form release agents that may have been used. These release agents act as a bond breaker between the adhesive and concrete.

Another recognized EIFS substrate consists of mechanically fastened diamond mesh metal lath, minimum 2.5 or 3.4 pounds per square yard, self-furring galvanized sheets with the ends and edges abutted. Other types of metal lath acceptable as an EIFS substitute are 2.5-pounds-per-square-yard paper-backed, self-furring galvanized sheets. Do not lap the lath behind an EIF system. The industry uses mechanically attached metal lath as an alternative method to permit the adhesive attachment of EPS board over a painted substrate.

Exterior gypsum sheathing has an exterior face and an interior face. The paper wrap goes on the inside. The words "This side out" should face you. If the "outside" face is not marked, install the gypsum sheathing with the paper wrap toward the inside of the building.

When assessing gypsum sheathing, make sure the paper is firmly attached to the core and that the paper laps to the inside. The tongue and groove orientation should also be checked; the tongue goes up. This will enhance the ability of the gypsum sheathing to shed moisture.

When you are assessing wall mounted gypsum sheathing, make sure that all vertical end and edge joints abut over the centers of framing members and are offset a minimum of one framing space between adjacent rows of gypsum sheathing. After the sheathing has been dry for at least 24 hours, you should evaluate the bond of the paper to the core in at least two locations for each 5,000 square feet of sheathing.

Another important assessment for gypsum sheathing is to check the fastener spacing. Make sure that the spacing between fasteners is in accordance with the project contract documents. Typically these fasteners are spaced no more than 8 inches on center along each framing member. However, more fasteners may be required if specified by the design professional to meet wind load requirements.

When assessing unit masonry, concrete, stucco or sheathing, make sure it is straight and true— within ¼ inch for every 10 feet across the wall surface. Remedial work may be required to make it acceptable. Also make sure the substrate is clean and dry and free from any foreign materials such as clay, mud, sand, efflorescence, or roofing tar. Any paint or coating must be removed, or you must use an alternative attachment method such as metal lath or mechanical fasteners. Sandblasting can be used to remove the paint or coating.

When assessing plywood sheathing, make sure it is exterior grade or exposure 1, not less than ½ inch thick. Any rotted, decaying, or delaminated sheathing must be replaced before EIFS is applied.

When assessing fiber cement sheathing, make sure it is clean and dry and free from any foreign materials. Any paint or coatings must be removed, or alternative attachment methods must be used.

Efflorescence

Efflorescence is a white, powdery substance associated with cementitious materials such as a base coat, stucco, concrete and masonry. Efflorescence must be removed before an adhesive or a finish coat is applied. If you don t remove it, efflorescence may act as a bond breaker and cause a failure within

the system, such as the finish coat falling off. You can remove efflorescence by scrubbing the wall using cleaning solutions and following safety precautions.

EPS Board Overview

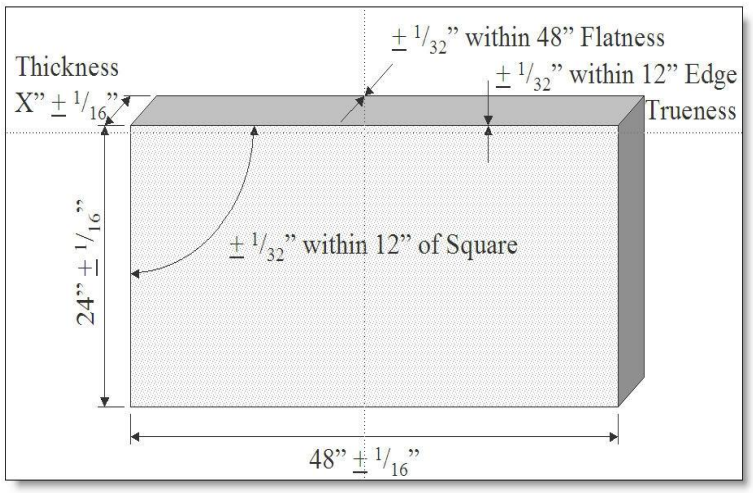
Once the substrate is ready, the first step of EIFS is to install the EPS boards. The EPS board diminishes thermal shock and helps prevent cracking of the EIFS lamina. These boards are anchored to substrate material with adhesive, mechanical fasteners, or both adhesive and fasteners, depending on the particular system. EPS boards have an insulation value, are water-resistant and are flexible. Some EPS boards, for use with water-managed EIFS, are manufactured with drainage channels.

Evaluating EPS Board

Before the installation, make sure EPS boards are properly labeled. Each package should be marked with lot numbers, and each individual board edge should be marked with a third-party certification stamp to verify that ASTM standards have been met. These markings show that the EPS boards meet the EIFS manufacturer's specifications.

Class PB EIFS EPS insulation board dimensions and tolerances:

- Width: Maximum 24 inches (+/– 1/16 inch)
- Length: Maximum 48 inches (+/– 1/16 inch)
- Thickness: Minimum ¾ inch + 1/16 inch (not less than ¾ inch after rasping), or minimum 1 inch +/– 1/16 inch to allow for rasping
- Maximum thickness: 4 inches or as allowed by building code +/– 1/16 inch.
- Edge trueness: +/– 1/32 inch per 12 inches
- Squareness: Not to vary more than +/– 1/32 inch per 12 inches of total length or width.
- Flatness (vs. Bowing): Not more than +/– 1/32 inch per 48 inches
- Surface projections or wire marks: Not more than +/– 1/16 inch
- Voids: Not more than one void larger than 1/16 inch per 1 ft^2 (that is, not more than 8 voids per 2 foot x 4 foot board)
- Crushing depressions: No areas on any surface exceeding 1/16 inch in depth on more than 5 percent of the total surface area.



Dimensional Tolerances For EPS Board

EPS Board Characteristics

Two important EPS board characteristics that affect system performance are density and fusion. Density affects the insulation value of EPS board. EIMA guidelines specify a minimum density of 0.9 pounds per cubic foot. Fusion is a major determination of insulation quality. It affects four important EPS board characteristics: water resistance; vapor diffusion or the ability to breathe; crack resistance; and insulation value.

Another factor that affects EPS quality is aging. "Green boards," or EPS boards that are installed before they have aged for at least six weeks, can shrink and later cause cracks in the finished wall. Check EPS boards for the third-party stamp certifying that the boards have been aged properly.

Class PB Barrier EIFS Components

When applying EIFS, it is important to use only the manufacturer's required components, as they have been designed to work together to produce the most consistent results. Never mix and match components from different EIFS manufacturers. EIFS manufacturers will not provide a warranty if components are mixed. Class PB barrier EIFS may consist of adhesive and/or mechanical fasteners; EPS boards; fiberglass reinforcing mesh; base coat; primer, if specified; and finish coat.

EPS boards may be applied to the substrate with adhesive, mechanical fasteners, or both, depending on the substrate. After the boards are securely attached, the entire EPS board surface is rasped and aesthetic reveals are cut if applicable. Then a fiberglass reinforcing mesh is embedded in a base-coat material for impact resistance. After the base coat has dried, a primer, if specified, may be used. Finally, a colored acrylic finish coat is applied and textured to meet the owner's specifications. Some finishes may require that a sealer be applied.

Adhesives

Remember to check environmental conditions and to inspect the substrate surface before adhesive is mixed. There are three types of adhesive or base coats: cementitious field mix; cementitious factory mix or bag mix; and non-cementitious factory mix (not generally used over masonry). Each should be mixed according to recommended manufacturer instructions.

Flashing Checks

Before attaching EPS boards, make sure that flashing has been installed at the proper locations. Flashing is critical to the success of the wall assembly. Flashing directs incidental moisture to the exterior of the wall assembly. Generally, flashing is required at all horizontal terminations, such as the heads of doors and sills of windows.

Board Installation

Before you begin, snap a chalk line to identify the level baseline where the first course of EPS boards will be installed. The installation of EPS boards must always begin at the bottom of the wall. Now you can prepare system terminations for back wrapping.

Back Wrap

The first step in the back-wrapping technique is to anchor detail mesh to the substrate along the level baseline and at all openings and terminations on the wall.

Adequately attach the mesh to the substrate material with adhesive or staples to prevent the mesh from wrinkling when it is wrapped. Remember to attach mesh wherever the insulation system starts or stops—for example, at door and window frames and on both sides of expansion joints. Mesh must be lapped a minimum of 2½ inches. Also make sure that the mesh fully encapsulates not only system terminations but decorative trim and EPS insulation as well. After back wrapping, the EPS boards may be installed.

Attaching EPS Boards with Adhesive

Before attaching the EPS board with adhesive, make sure the substrate is clean and dry.

Ribbon and dab is typically used to attach EPS board to irregular unit masonry and/or concrete wall surfaces. The notched trowel should be used for sheathing substrates. It's important to follow the EIFS manufacturer's requirements.

The ribbon-and-dab method requires a perimeter ribbon not less than 2 inches wide with a minimum thickness of 3/8 inch. Dabs should be not less than 4 inches in diameter and 3/8 inch thick, approximately 8 inches on center or approximately eight dabs per 2 feet x 4 feet EPS board.

When using the notched trowel to apply adhesive, apply firm pressure so that the EPS board's surface is visible between the ribbons. Apply the adhesive so that the ribbons will run vertically when the board is installed. Use only trowels with notch shape, depth and spacing as recommended by the EIFS manufacturer. Control the angle of the trowel to produce the required ribbon depth.

EPS board joints must be staggered from sheathing joints. The EPS board joints should be offset from the sheathing joints not less than 6 inches. Next, apply the adhesive pattern to the back of the EPS board, taking care not to get any adhesive on the edges or the exposed back wrapping mesh.

Next, place the board on the substrate ½ inch away from the adjacent board, and nudge it into place. This will keep board joints tight and eliminate gaps. With a trowel, remove all excess adhesive from the substrate surface and the face of EPS boards. Next, secure boards by firmly tamping them with a rasp, taking care not to create depressions.

Also, make sure the edges of EPS boards are clean before they are put up and abut them tightly together to avoid gaps. Adhesive stuck between EPS board joints can cause cracking in the lamina and thermal bridging. It is very important that the EPS boards are well bonded to the substrate.

You should use a running bond pattern when installing the rest of the EPS boards, making sure that EPS board joints and sheathing joints are offset.

In order to provide maximum strength at the corners of penetrations, it is important to cut L-shaped boards to fit around rectangular openings for a stronger corner.

Remember to leave a gap, as specified by the EIFS manufacturer, between the edges of the EPS board and system penetrations. Closed-cell backer rod and sealant will be installed in these gaps after the EIFS is complete. Also, interlock EPS boards at all inside and outside corners taking care to sliver any gaps. This will create a stronger corner. When possible remember to keep the more precise, factory-cut edges at openings and terminations.

Mechanical Attachment

Mechanical fasteners can be used to attach EPS board over a weather barrier such as felt, building paper or painted substrates. Remember to inspect the substrate and apply fiberglass reinforcing mesh or vinyl track along all EIFS terminations before you install the EPS boards with mechanical fasteners.

The fasteners must be long enough to pass through the EPS board and into the framing or structural sheathing. Typically, fasteners must penetrate into steel framing members at least 5/16 inch and into wood framing, masonry, and

concrete at least 1 inch. The fasteners should be tightened so the washer is slightly below the EPS surface. This will prevent interference while rasping.

Over tightening can fracture EPS boards. Under tightening will result in raised surfaces that will make reinforcing mesh installation difficult and show through the finish coat. With this method, it is critical that the correct number of fasteners is used and that they are spaced correctly for the design wind load. Fastener spacing depends on wind-load requirements and should be specified in the contract documents.

With the mechanical attachment method, EPS board must be at least 1 inch thick. However, some manufacturers recommend 1½-inch-thick boards because they provide a uniform wall plane and increased wind load resistance. If an adhesive and mechanical fastening system is specified, check with the manufacturer to determine how long the adhesive must dry before the fasteners are installed.

After EPS Board Installation

After installing all of the EPS boards, inspect the surface for gaps larger than 1/16 inch. Fill all gaps using EPS slivers or spray foam. Gaps must not be filled with adhesive or any other material. Once all gaps have been filled, use a rasping board to sand the entire surface level. It is important to remove all loose EPS beads from the rasped surface. Ensure that the adhesive is dry.

At this point, cut aesthetic reveals, if applicable, into the EPS surface. Remember to leave at least ¾ inch between the bottom of reveals and the back of the EPS boards.

After the EPS board has been installed, the next step is to install any EPS shapes called for in the design. Slope all surfaces for positive drainage according to the EIFS manufacturer's requirements.

Reinforcing Mesh

Reinforcing mesh embedded in base coat resists cracking of the entire system surface and provides impact and water resistance. Most EIFS manufacturers supply color-coded mesh specifically designed with its system's components. Never mix mesh from different EIFS manufacturers.

Designers may specify high-impact reinforcing mesh in project documents for high-traffic areas. Generally, nominal 4-ounce or "standard" mesh is applied over the entire EPS surface. Different weights of reinforcing mesh may be layered for higher impact resistance requirements. Always follow EIFS manufacturer specifications when combining mesh of different weights.

Base Coats

Correctly placed reinforcing mesh floats in the middle of the base coat. Cementitious base coat may also double as EPS board adhesive in some systems. Base coats are mixed just like adhesives and are often the same product. Follow manufacturer's instructions when mixing base coat material.

Remember to always use manufacturer-specified mixing paddles and mixing speeds when preparing base coat, and mix only as much material as can be conveniently used during a work period.

Embedding Reinforcing Mesh

Before starting to embed the mesh, make sure the EPS boards have been rasped, the surface is dry and clean and any yellowing from UV exposures has been removed.

Embed all mesh that was previously installed for back wrapping EPS board. To do this, apply the base coat material to the exposed edges and face of the EPS board. Wrap the mesh around the edge onto the face, making sure to embed it in the base coat. Reinforce the corners of all openings— doors, windows, mechanical equipment and all penetrations— with detail mesh placed diagonal to the opening. This adds crack resistance at high-stress areas.

Designers may specify high-impact reinforcing mesh for high-traffic areas such as ground floors. A complete second layer of reinforcing mesh is applied over the layer of high-impact mesh. Do not lap high-impact mesh. The edges must be tightly abutted. The high-impact base coat layer must be completely dry before the standard mesh can be applied.

If corner mesh is specified for impact resistance at outside corners, the corner mesh should be embedded in base coat and allowed to dry prior to installing the standard layer of mesh.

At this point, the standard mesh can be embedded over the entire wall. The minimum required thickness of base coat for standard mesh is 1/16 inch. Standard reinforcing mesh must be double-wrapped a minimum of 8 inches around all inside and outside corners and must be lapped at all other system terminations a minimum 2½ inches. Trowel away from corners and from the center to the edge to avoid creating wrinkles in the mesh. In general, reinforcing mesh must be lapped a minimum of 2½ inches.

The base coat material is applied to fully embed the reinforcing mesh so that, according to ASTM C-1397-09, "Bare mesh shall not be visible and the mesh pattern shall not be tactile."

Using a stainless steel trowel, apply the first pass of base coat to the surface of the EPS board. This pass must be uniform and should cover an area slightly

larger than the dimensions of the piece of mesh. Then immediately place the reinforcing mesh against the wet base coat. Avoid wrinkles by troweling from the center to the edges until the mesh is completely embedded. If a wrinkle develops, slice the wrinkle and re-mesh, being careful to ensure a 2 ½-inch overlap on each side of the cut.

Allow the base coat to set until it is firm to the touch. If the mesh is not fully embedded, then trowel a second pass of base coat over the first pass to fully cover the reinforcing mesh. Allow the base coat to dry a minimum of 24 hours before applying the finish coat or specified primer.

Preparation and Application of Finish Coat

Make sure that the environmental conditions are appropriate for application and drying. Also, before applying the finish coat, make sure that the base coat is dry, and that any irregularities are corrected. In addition, make sure that the base coat is clean and free of efflorescence, dust, dirt or other debris.

The finish may need to be tempered with small amounts of clean, potable water, depending on environmental conditions.

It's important to anticipate what the weather conditions are going to be when applying a finish.

When applying a finish coat, make sure to apply it to the proper thickness and texture to match the approved sample. Also, while applying the finish, make sure to maintain a wet edge and to stop at corners to prevent cold joints. It is also important to complete the application of finish over an entire wall. If the finish application is stopped in the middle of a wall, it can cause cold joints.

Expansion Joints

At a minimum, EIFS expansion joints must be located at all building expansion joints, at intersections of dissimilar material and at floor lines in wood-frame construction. The design professional is responsible for determining the size and location of expansion joints.

The EIF system starts or stops at both sides of an expansion joint. As with all EIFS terminations, each side of the joint must be back wrapped, or encased in the proper accessory. Because the EIFS expansion joint will receive the sealant, it is imperative that the reinforcing mesh at the inside edges of the joint be embedded in the base coat. Sealant should not be bonded to the finish material in an expansion joint.

The EIFS expansion joint should be straight and smooth. Proper preparation improves joint performance. Follow the contract document's specifications for the location and width of expansion joints.

Sealants

The sealant in an EIFS expansion joint plays an integral part in the wall assembly's ability to repel water. Before applying sealant, the sealant contractor inspects joint surfaces for base coat and EIFS primer, if required. Clean joints to remove any debris.

Compress the closed-cell backer rod into the joint or install bond breaker tape to provide backing for the sealant. The purpose of the sealant backing is to assist in providing the proper sealant configuration, to limit the depth of the sealant, and in some cases, to act as a bond breaker. Install sealant primer if required by the sealant manufacturer.

Insert the closed-cell backer rod into the joint to a depth in accordance with the sealant manufacturer's specifications. Then apply a sealant that has been specified in the contract documents. The sealant will absorb the shock of movement at joint locations while preventing air and moisture penetration.

EIFS with Drainage – Concepts and Requirements

There are many different versions of EIFS with Drainage, which are all based on the same general concepts. There are additional components to what would normally be defined as part of a Class PB EIFS. A number of different examples of EIFS with Drainage are covered under this section.

Drainage - Systems Hierarchy

- Class PB (or other EIFS) applied over:
    - Water-resistive barrier (WRB) coatings.
        - Trowel or roller-applied coatings (supplied by the EIFS manufacturer)
        - Elastomeric polymer coatings
        - Flashings
        - Membrane (peel and stick)
    - Water-resistive barrier sheet membranes such as
        - Synthetic building paper (standard or patterned)
        - Building paper
        - Asphaltic felt
        - Flashings
        - Membrane (peel and stick)
- In addition to the water-resistive barrier, the following could be required:
    - Means of drainage, which may include one of the following:

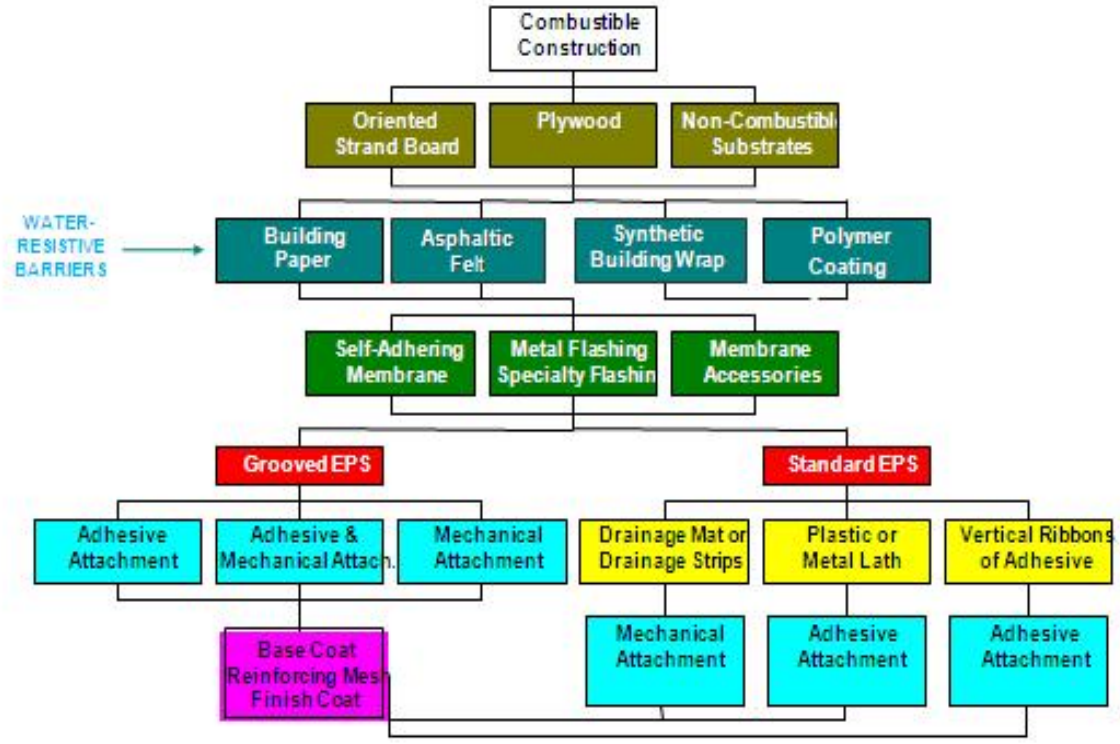
        - Drainage mat, geotextile, etc. (mechanically fastened).
        - Grooved insulation (adhesive or mechanically fastened).
        - Metal or plastic lath (adhesive).
        - Notched (vertical) ribbons of adhesive.
    - Various accessories such as drainage track.

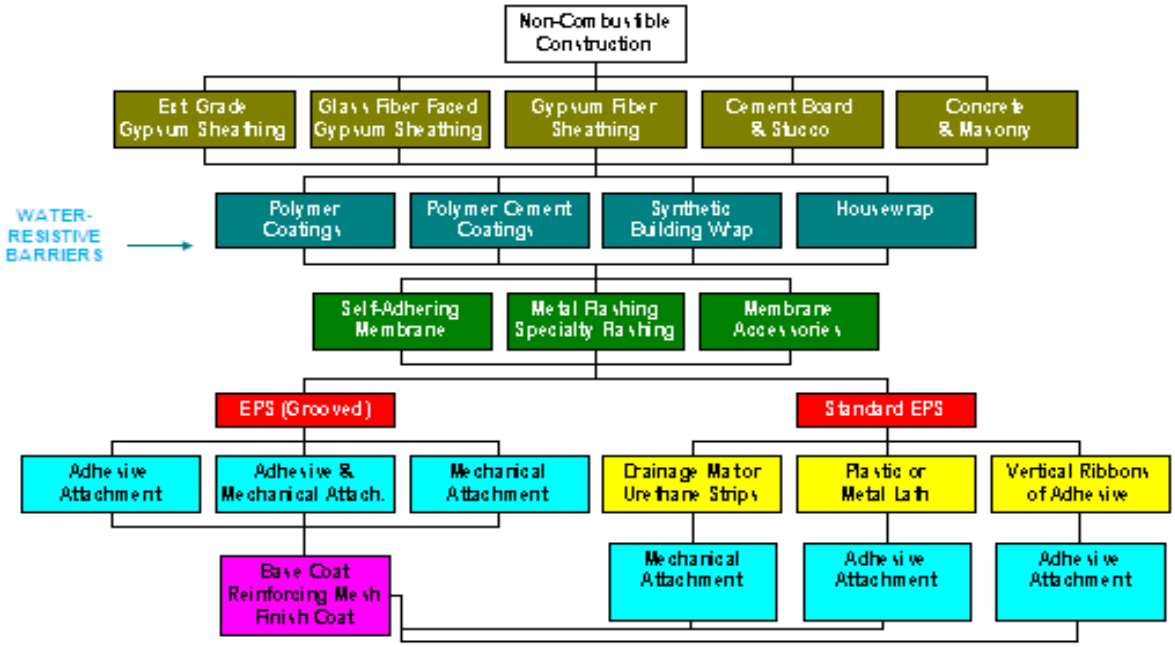
The installation of the WRB requires that it be overlapped onto the upturn (vertical leg) of all through-wall and window-head flashing to ensure that incidental moisture can drain out of the wall assembly.

Depending on how EIFS with Drainage is configured, it could be designed to be a drained cladding or also to provide some degree of venting.

- Drained cladding is intended solely to drain incidental moisture.
- Rainscreen drains are also designed to vent air into the cavity to balance wind pressure against the exterior of the wall facade, thus reducing potential moisture intrusion.

The charts on the following page are provided to illustrate the potential configurations of EIFS with Drainage, for both combustible and non-combustible construction.





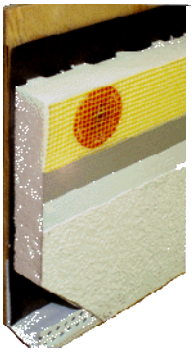
These flow charts are based on commonly available systems and do not reflect every type of system currently available. They are provided as an educational guide.

Air and vapor barriers are part of the wall design, but not necessarily a part of the EIFS, and must be selected and specified by the designer.

Air barriers must be continuous and be an assembly of materials selected and designed to resist air and wind pressures.

Vapor barriers are not necessarily required by all manufacturers, but they are required by certain building code requirements. Since the requirements for these barriers will vary and may or may not form part of the EIFS or water-resistive barrier, the local code authority should be consulted for the requirements on each job, or it may be determined by the designer.

Examples of two types of drainage systems are illustrated below:



PB EIFS - Grooved EPS mechanically fastened over building paper.

PB EIFS- Drainage mat mechanically fastened over building paper, EIFS applied with adhesives.

Fire tested EIFS (for non-combustible construction) require that only the correct components be used as part of EIFS with drainage and use of a drainage track is limited to the base of walls (at grade), not at window heads, etc.

Synthetic Building Paper and Building Paper

The code permits the use of building paper as a water-resistive barrier (WRB). Synthetic building paper may also be used. It is up to each municipality to determine whether or not synthetic building paper can be used in lieu of building paper. Either of these sheet materials can be referred to generically as *sheathing* membrane.

Synthetic building paper may be evaluated by the ICC Evaluation Service or by the code authority having jurisdiction. Synthetic building paper must be:

- Overlapped, shingle-fashion (meaning bottom working up), minimum 8 inches both horizontally and vertically, or
- Overlapped and taped with tape specifically designed for use with the synthetic building paper.

Building paper must also be overlapped, shingle-fashion, minimum 2½ inches both horizontally and vertically, or as required by the code.

Water-Resistive Barrier (WRB) Coatings

Trowel- or roller-applied coatings can be installed onto substrates forming a water-resistive barrier. These coatings are a proprietary component of an EIFS manufacturer's system, applied over the substrate, forming a continuous layer, flashed out where required, and typically incorporating a self-adhering membrane or other type of WRB sealant material.

Reinforcing mesh across sheathing board joints is required for WRB coatings. The WRB coating is applied over the mesh to achieve a continuous coating.

Check with manufacturer regarding the spotting of sheathing fasteners prior to the WRB coating application.

Also, check with the manufacturer about whether or not the WRB coating applied to overlap the through-wall or head flashing must incorporate reinforcing mesh.

Sealants for Water-Resistive Barriers

Water-resistive barriers may require the use of sealants and/or self-adhering membranes to maintain continuity of the WRB in the wall. These may be part of an EIFS manufacturer's system. All through-wall penetrations are required to be sealed to the water-resistive barrier. These include elastomeric sealants, spray-applied polyurethane foam, cellophane tape and self-adhering membrane.

Self-Adhering Membrane: It is very common to use rubberized (SBS modified) asphalt membrane, often referred to as peel-and-stick, for the transition details between the substrate water-resistive barrier and adjacent elements. Self-adhering membrane is typically backed with cross-linked polyethylene film, polyethylene and glass fiber or fabric.

Flashing

Types of flashing include parapet cap flashing, roof diverter "kick-out" flashing, saddle flashing, window flashing, deck flashing and through-wall flashing.

Parapet cap flashing must be installed as soon as practical after completion of the EIFS application. This flashing must be sloped to provide positive drainage toward the roof.

Where the cap flashing intersects with vertical walls, ensure that saddle flashing (upturns) are included.

General requirements for the parapet cap flashing include the following:

- The sections of flashing must be effectively sealed and sloped.
- Flashing should be a minimum of 2½ inches down over face of the EIFS as measured from the top of the EIFS, including the drip edge.
- Flashing must be tight against the face of the EIFS.
- Sealant may be required by the designer.

Kick-out flashing should be stepped in with the roof step flashing, prior to the EPS installation. It should have a closed corner, and the upturn should extend beyond the face of the EIFS at least 1 inch. The EIFS should terminate approximately 2 inches above shingles (to allow for inspection of step flashing and future shingle replacement). This is to prevent moisture intrusion from the water shedding surface of the roof.

The flashing around dormers must extend around the full perimeter of the wall, and the flashing work should be completed by the roofer as part of the shingle installation. Like the roof kickout detail, the EIFS should terminate above the roofing approximately 2 inches.

Saddle flashing details are required where parapet cap flashings intersect with vertical wall areas, and, in some cases, this includes balcony guards.

Window sill flashing should be installed as required by project plans, specifications or shop drawings, and should be a pan flashing. End-dams prevent the spill-over of rainwater on the field of the finished wall by forming an upturn at the edges of the sill flashing.

Window head flashing should be included for windows. Sealant is not recommended between window head flashing and EIFS that has been designed to drain.

Deck flashing must be continuous through the supporting framing intersection. It should be designed with minimal surface sealant.

Through-wall flashing must be continuous through the supporting framing intersection. It should be designed with minimal surface sealant. Sealant may not be recommended at the top interface of a through-wall flashing and the EIFS above.

Other Systems and Coatings

Class PM EIFS or Hard Coat

Class PM is a polymer-modified, mechanically fastened EIF system with base coats ranging in thickness from 1/4 to 3/8 inches nominal. The base coat is covered with a primer, if specified, and a finish coat that is available in a variety of colors and textures. These systems typically use trim accessories.

Class PI EIFS

This is a polymer-based system applied over polyisocyanurate board attached over open framing or solid substrates. The base coat ranges in thickness depending on the number of glass fiber reinforcing layers encapsulated in the base coat over the entire surface, but should be at least 1/16 inch dry thickness. The base coat is then covered with a primer, if required by the specification, and a finish coat available in a variety of textures and colors. There are considerable differences between EIF systems with EPS board and polyisocyanurate insulation board.

DEFS (Direct-Applied Exterior Finish System)

DEFS is a system comprised of sheathing board, which is covered with a Class PB type of lamina. DEFS is not a type of EIFS; however, it is an exterior finish system that is sometimes installed in combination with EIFS, or where a stucco finish is required without having the insulation component.

DEFS is comprised of a base coat applied directly to the sheathing, ranging from not less than 1/16-inch up to ¼-inch in dry thickness, depending upon the number of reinforcing mesh layers encapsulated in the base coat. The base coat is then covered with a finish coat of various thicknesses in a variety of textures and colors. A color-matched primer may be used. The sheathing is typically cement board on framing, or it may be glass fiber faced gypsum in some applications. It is recommended that the entire surface and the sheathing be covered with base coat and reinforced with mesh.

Typically, DEFS incorporates fiber cement board, and has seen increased usage over the last two decades. There is no definitive geographical limitation; the cement board sheathing is preferred for vertical applications.

The framing that supports the sheathing shall have horizontal blocking between framing members to reduce the chance for flexural fracture of the lamina. The absence of insulation means that the lamina must withstand the full load of the sheathing and framing movement due to wind, or live or thermal loads.

General requirements for DEFS are that a water-resistive barrier must be installed between the sheathing board and the framing member with proper flashing and weep at the bottom of walls and penetrations. The water-resistive

barrier shall be continuous behind accessories and across dissimilar substrates and it should be vapor permeable. Control joints should be required for DEFS, as per the manufacturer's recommendations.

DEFS require that sheathing be attached in accordance with sheathing manufacturers' recommendations and ASTM C1280 and fasteners be corrosion resistant and properly seated. Sheathing edges do not align with the corners of penetrations. Sheathing should be cut in an "L" shape.

Base coat, reinforcing mesh and finish coat are to be applied following the manufacturer's installation instructions. The application of base coat, mesh and finish should follow the same requirements as for Class PB EIFS.

Finish Coat on Portland Cement Stucco

Base coat plaster should be flat and free of trowel marks and ridges. Moist curing of base coat plaster shall be in accordance with ASTM C926. Repair cracks and voids before applying primer or finish. The base coat plaster should be aged in accordance with the finish coat manufacturer prior to application of the finish coat as per finish coat manufacturer's requirements.

Color matched primer coat is strongly recommended. There should be no irregularities, dirt or visible water on the surface of the base coat plaster when applying primer or finish. Maintain proper temperature during application and curing.

Insulated Concrete Forms (ICFs)

Another common application for Class PB lamina is over of ICFs, insulated concrete form systems.

ICFs are typically constructed of expanded polystyrene blocks that are filled with concrete on site. The outer face of insulation may be a viable substrate for a Class PB lamina. Since each foam block system is different, and many of these blocks have plastic or metal webs or spacers that are exposed on the outer face of the insulation, the EIFS manufacturer supplying the base coat, reinforcing mesh and finish should be consulted for a specific recommendation on each type of ICF.

Typically, the application of Class PB lamina to ICFs requires the following:

- The concrete must already be placed and has cured for at least 28 days.
- Spray polyurethane insulation can be used to repair the voids in the ICF block coursing, as typically is required for EIFS.
- The surface of the ICF must be rasped before the base coat is applied.

- Reveals can be cut, but ensure the minimum EPS foam thickness is at least ¾ inch.

- Apply Class PB lamina and shapes as per requirements of ASTM C1397-09.

Section 2

Keeping Up with the Industry

To keep up-to-date with the EIFS industry, it is important to attend continuing education events, read trade journals and review related websites.

Two significant events occurred in 2008 to further advance the EIFS industry:

- The International Code Council (ICC) approved the inclusion of EIFS in the 2009 International Building Code and International Residential Code. These model building codes are the foundation for local building regulations throughout the United States and in other parts of the world. Most municipalities adopt these codes in their entirety or in part. Always check the local building codes that apply to your jurisdiction. For more information about ICC or to purchase a copy of the 2009 building codes, go to www.iccsafe.org.

- The U.S. Department of Energy released a study showing that EIFS performed better than brick, stucco and fiber cement siding in key areas such as energy efficiency, temperature control and moisture control in mixed, coastal Zone 3 climates. For a copy of the executive summary of the study, go to www.eima.com.

AWCI's Construction Dimensions is a leading monthly magazine specifically geared to the wall and ceiling industry. AWCI's Web site, www.awci.org, has industry news and updates with a search feature for magazine articles and other items of interest.

The EIFS Industry Members Association has a Web site, www.eima.com, with a variety of information to help the industry professional keep up with new EIFS case studies and technical information, such as the Department of Energy study mentioned above.

Websites

www.awci.org— The Association of the Wall and Ceiling Industries has been providing services to the industry for more than 90 years. Technical assistance, news, education.

www.eima.com— EIFS Industry Members Association. EIFS performance, construction guides, news, members.
www.redvector.com— Site for online continuing education courses.

www.eifsweb.com— online community for EIFS.

www.constructioneducation.com— offers a variety of opportunities.

www.csinet.org— knowledge for creating and sustaining the built environment.

www.iccsafe.org — International Code Council. International standards, areas of adoption, news, committees.

www.astm.org— American Society for Testing and Materials. Standards, publications, membership, training, news.

www.ansi.org— American National Standards Institute. Standards, organization, reference library.

www.icc-es.org— ICC-ES. Nonprofit, public-benefit corporation. Technical evaluations of building products, components, methods, and materials.

www.ncsbcs.org— National Conference of States on Building Codes and Standards. State contacts, new technical information.

www.nfpa.org— National Fire Protection Association. Codes and standards, research and reports, news.

www.statelocalgov.net/index.cfm— Lists each state's government site.

Reference List of Standards

1. ANSI / EIMA 99-A *Exterior Insulation and Finish Systems (EIFS)*
2. ANSI A118.9 *Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets*
3. ASTM C 150 *Specification for Portland Cement*
4. ASTM C 390 *Sampling and Acceptance of Preformed Insulation Lots*
5. ASTM C 514 *Standard Specification for Nails for the Application of Gypsum Board*
6. ASTM C 578 *Specification for Rigid, Cellular Polystyrene Thermal Insulation*
7. ASTM C 847 *Standard Specification for Metal Lath*
8. ASTM C 920 *Standard Specification for Elastomeric Joint Sealants*
9. ASTM C 926 *Standard Specification for Application of Portland Cement-Based Plaster*
10. ASTM C 954 *Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in.(0.84 mm) to 0.112 in. (2.84 mm) in Thickness*
11. ASTM C 955 *Standard Specification for Load-bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases*
12. ASTM C 1007 *Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories*
13. ASTM C1056 *Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber*
14. ASTM C 1063 *Standard Specification for Installation of Lathing and Furring for Portland Cement-Based Plaster*
15. ASTM C 1177 / C 1177M *Standard Specification for Glass Mat Gypsum Substrate used as Sheathing*
16. ASTM C 1186 *Standard Specification for Flat, Non-Asbestos Fiber Cement Sheets*
17. ASTM C 1193 *Standard Guide for Use of Sealants*
18. ASTM C 1278 / C 1278M *Specification for Fiber-Reinforced Gypsum Panel*
19. ASTM C 1280 *Specification for Application of Gypsum Sheathing*
20. ASTM C 1289 *Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*
21. ASTM C 1325 *Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets*

22. ASTM C 1396 / C 1396 M *Standard Specification for Gypsum Board*

23. ASTM C 1397-09 *Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage*

24. ASTM C 1382-05 *Test Method for Determining Tensile Adhesion Properties of Sealants When Used in (EIFS) Joints*

25. ASTM C 1472 *Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width*

26. ASTM C 1481 (2006) *Standard Guide for Use of Joint Sealants With Exterior Insulation and Finish Systems (EIFS)*

27. ASTM C 1516 *Standard Practice for Application of Direct-Applied Exterior Finish Systems*

28. ASTM C 1535-05 *Standard Practice for Application of Exterior Insulation and Finish Systems Class PI*

29. ASTM E 1105 *Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference*

30. ASTM E 2098 (2006) *Standard Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to a Sodium Hydroxide Solution*

31. ASTM E 2110-03 *Standard Terminology for Exterior Insulation and Finish Systems (EIFS)*

32. ASTM E 2112 *Standard Practice for Installation of Exterior Windows, Doors and Skylights*

33. ASTM E 2134-01 *Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)*

34. ASTM *E 2273-03 Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall*

35. ASTM E 2321-03 *Standard Practice for Use of Test Methods E 96 for Determining the Water Vapor Transmission (WVT) of Exterior Insulation and Finish Systems (EIFS)*

36. ASTM E 2359-06 *Standard Test Method of Field Pull Testing of an In-Place Exterior Insulation and Finish System Clad Wall Assembly*

37. ASTM E 2430-05 *Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for Use in Exterior Insulation and Finish Systems (EIFS)*

38. ASTM E2485-06 *Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings*

39. ASTM E 2486-06 *Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)*

EIFS GUIDELINES

40. AWCI's EIF Systems Forensics Inspection Protocol Manual

41. EIMA Guide to EIFS Construction

42. EIMA Tech Note W101- Selection of Sheathing for Class PB EIFS

EIFS REFERENCE MATERIAL

43. ASTM STP 1187 Development, Use & Performance of EIFS, Piper & Raab, ©1992

44. ASTM MNL 16 – EIFS: Current Practices & Future Considerations, M.F. Williams and B. Lamp-Williams, © 1994.

45. ASTM STP 1269 – EIFS: Materials, Properties & Performance, P.E. Nelson and R.E. Kroll, Editors, © 1996.