Exterior insulation finishing system

From Wikipedia, the free encyclopedia

Exterior insulation and finishing system (**EIFS**) is a type of building exterior wall cladding system that provides exterior walls with an insulated finished surface and waterproofing in an integrated composite material system.

A historic brick building in Germany covered with EIFS on the right side.

Contents

Terminology

According to the definitions of the International Building Code and ASTM International, an Exterior Insulation and Finish System (EIFS) is a nonload bearing, exterior wall cladding system that consists of an insulation board attached either adhesively or mechanically, or both, to the substrate; an integrally reinforced base coat; and a textured protective finish coat.[1]

EIFS with Drainage, another EIFS system, is the predominate method of EIFS applied today. As the name implies, EIFS with Drainage provides a way for moisture that may accumulate in the wall cavity to evacuate.[2]

Although often called "synthetic stucco", EIFS is not stucco. Traditional stucco is a centuries-old material which consists of aggregate, a binder, and water, and is a hard, dense, thick, non-insulating material. EIFS is a lightweight synthetic wall cladding that includes foam plastic insulation and thin synthetic coatings. There are also *specialty stuccos* that use synthetic materials but no insulation, and these are also not *EIFS*. A common example is what is called *one-coat stucco*, which is a thick, synthetic stucco applied in a single layer (traditional stucco is applied in 3 layers).

EIFS are proprietary systems of a particular EIFS manufacturer and consist of specific components. EIFS are not *generic* products made from common separate materials. To function properly, EIFS needs to be architecturally designed and installed as a system.

EIFS typically consist of the following components:

- An optional water-resistive barrier (WRB) that covers the substrate
- A drainage plane between the WRB and the insulation board that is most commonly achieved with vertical ribbons of adhesive applied over the WRB
- Insulation board typically made of expanded polystyrene (EPS) which is secured with an adhesive or mechanically to the substrate
- Glass-fiber reinforcing mesh embedded in the base coat
- A water-resistant base coat that is applied on top of the insulation to serve as a weather barrier
- A finish coat that typically uses colorfast and crack-resistant acrylic co-polymer technology.

[3]

The technical definition of "an EIFS" does not include wall framing, sheathing, flashings, caulking, water barriers, windows, doors, and other wall components. However, as of recently, architects have begun specifying flashings, sealants, and wiring fasteners (such as Viperstrap) as being a part of the EIFS scope of work, essentially requiring EIFS contractors to carry out that work as well. The technical national consensus standard for the definition of an EIFS, as published by ASTM International organization (http://www.astm.org), does not include flashing or sealants as part of the EIFS. Many of the EIFS manufacturers have their own standard details showing typical building conditions for window and door flashings, control joints, inside/outside corners, penetrations, and joints at dissimilar materials which should be followed for that manufacturers warranty.

How EIFS is installed

EIFS is typically attached to the outside face of exterior walls with an adhesive (cementitious or acrylic based) or mechanical fasteners. Adhesives are commonly used to attach EIFS to gypsum board, cement board, or concrete substrates. EIFS is attached with mechanical fasteners (specially designed for this application) when installed over sheet-good weather barriers such as are commonly used over wood sheathings. The supporting wall surface should be continuous (not "open framing") and flat.

EIFS today

EIFS today are one of the most tested and well researched claddings in the construction industry. Research, conducted by the Oak Ridge National Laboratory and supported by the Department of Energy, has validated that EIFS are the "best performing cladding" in relation to thermal and moisture control (http://www.eima.com/pdf/EIFS-Performance-and-Modeling-Study-Summary.pdf) when compared to brick, stucco, and cementitious fiberboard siding. In addition EIFS is in full compliance with modern building codes which emphasize energy conservation through the use of CI (continuous insulation) and a continuous air barrier. Both these components are built into today's EIFS products to provide maximum energy savings, reduced environmental impact over the life of the structure, and improved IAQ, Indoor Air Quality. Along with these functional advantages come virtually unlimited color, texture, and decorative choices to enhance curb appeal and enjoyment of almost any home or structure. [4]

EIFS before 2000 was a barrier system, meaning the EIFS system itself was the weather barrier. After 2000 the EIFS industry introduced the air/moisture barrier that resides behind the foam. In a study done by the The Department Of Energy's Office of Science - Oak Ridge National Laboratory it was found that the best air/moisture barrier was a fluid barrier. The Oak Ridge National Laboratory, ATLANTA, Oct. 28, 2006 — EIFS "outperformed all other walls in terms of moisture while maintaining superior thermal performance." The National Institute of Standards and Technology (NIST) have evaluated the 5 life cycle stages of the environmental impact of EIFS alongside brick, aluminum, stucco, vinyl, and cedar. Depending on a variety of site and project specific conditions, EIFS has the potential to save money in construction costs and contribute toward energy efficient operations and environmental responsibility when correctly designed and executed.

EIFS have also passed a variety of fire tests that range from resistance to ignitability, that include: ASTM E 119, NFPA 268, NFPA 285, ANSI FM 4880.[5]

Composition and types of EIFS

The most common type of EIFS used today is the system that includes a drainage cavity, which allows any and all moisture to exit the wall. EIFS with drainage typically consists of the following components:

- An optional water-resistive barrier (WRB) that covers the substrate
- A drainage plane between the WRB and the insulation board that is most commonly achieved with vertical ribbons of adhesive applied over the WRB
- Insulation board typically made of expanded polystyrene (EPS) which is secured with an adhesive or mechanically to the substrate
- Glass-fiber reinforcing mesh embedded in the base coat
- A water-resistant base coat that is applied on top of the insulation to serve as a weather barrier
- A finish coat that typically uses colorfast and crack-resistant acrylic co-polymer technology.

[6]

If an EIFS with Drainage, or water-managed EIFS is installed, a water resistive barrier (aka a WRB) is first installed over the substrate (generally glass faced exterior-grade gypsum sheathing, OSB or plywood). The moisture barrier is applied to the entire wall surface with a mesh tape over joints and a liquid-applied membrane or a protective wrap like Tyvek or felt paper. Then a drainage cavity is created (usually by adding some sort of space between the foam and the WRB). Then the other 3 layers, described above, are added. This type of EIFS is required by many building codes areas on wood frame construction, and is intended to provide a path for incidental water that may get behind the EIFS with a safe route back to the outside. The purpose is to preclude water from damaging the supporting wall.

Adhesives and Finishes are water-based, and thus must be installed at temperatures well above freezing. Two types of Adhesives are used with EIFS: those that contain Portland Cement ("cementitious"), or do not have any Portland Cement ("cementless"). Adhesives that contain Portland Cement harden by the chemical reaction of the cement with water. Adhesives and Finishes that are cementless harden by the evaporation of water – like house paint. Adhesives come in two forms. The most common is in a plastic pail as a paste, to which Portland Cement is added.

Adhesives are also available as dry powders in sacks, to which water is added. Finishes come in a plastic pail, ready to use, like paint. EIFS insulation comes in individual pieces, usually 2' x 4', in large bags. The pieces are trimmed to fit the wall at the construction site.

History of EIFS

EIFS was developed in Europe after World War II and was initially used to retrofit solid masonry walls. EIFS started to be used in North America in the 1960s, and became very popular in the mid- 1970s due to the oil embargo and the resultant surge in interest in high energy efficiency wall systems (such as EIFS provides). The use of EIFS over stud-and-sheathing framing (instead of over solid walls) is a technique used primarily in North America. EIFS is now used all over North America, and also in many other areas around the world, especially in Europe and the Pacific Rim.

In North America, EIFS was initially used almost exclusively on commercial buildings. As the market grew, prices dropped to the point where its use became widespread on normal single family homes.

In the late 1980s problems started developing due to water leakage in EIFS-clad homes and buildings. This created an international controversy and numerous lawsuits. Critics argue that, while not inherently more prone to water penetration than other exterior finishes, barrier-type EIFS systems (non-water-managed systems) do not allow water that may penetrate the building envelope to escape.[7]

The EIFS industry has consistently maintained that the EIFS itself was not leaking, but rather poor craftsmanship and bad architectural detailing at the perimeter of the EIFS was what was causing the problems. The building codes reacted by mandating EIFS with Drainage on wood frame building and additional on-site inspection.

Most homeowner insurance policies cover EIFS and EIFS-like systems. Though there are some cases where insurance companies may not offer coverage for EIFS several companies do.[8] Also, some facility owners have found that EIFS systems that are installed at lower building levels are subject to vandalism as the material is soft and can be chipped or carved resulting in significant damage. If these concerns exist specifying heavier ounce reinforcing mesh can be the answer, these specifications can drastically increase the durability of the EIFS system.[9]

EIFS installation was found to be a contributing factor in the multi-billion dollar problem known as the "Leaky condo crisis" in southwestern British Columbia and the "Leaky homes" issue in New Zealand that emerged separately in the 1980s and 1990s.[10][11][12][13]

Legal issues

EIFS systems have been the subject of several lawsuits, mostly related to the installation process and failure of the system causing moisture buildups and subsequent mold growth. The most notable case concerned the former San Martin, California courthouse. This case was settled for 12 million dollars.[1] (http://www.stuccolaw.com/news/santaclara.html)

The basic underlying problem behind EIFS litigation was that EIFS was marketed as a cost-effective replacement for stucco. Stucco is expensive to install because it must be carefully applied by skilled craftsmen and takes a month to cure between coats. General contractors switched to EIFS because it was supposed to be easy to install with unskilled or semi-skilled labor and would not crack like traditional stucco will if it is not cured properly. Although EIFS *if properly installed* according to the manufacturer's directions should not have water intrusion problems,

many GCs cut corners by using insufficiently trained labor and also failed to adequately supervise their work. In turn, thousands of EIFS installations were noncompliant and suffered severe water intrusion and mold as a result. While the EIFS industry has consistently tried to shift the blame to GCs, the construction industry has retorted that using professional unionized journeymen carpenters in turn eliminates the cost advantage of EIFS over stucco, and that the EIFS industry should have anticipated this issue and engineered its products from the beginning to be installed by unskilled labor or semi-skilled labor (that is, it should have been a fault-tolerant design).

Marketing of EIFS and the EIFS industry

EIFS accounts for about 10% of the US commercial wall cladding market. There are several dozen EIFS manufacturers in North America. Some sell nationwide, and some are regional in their area of business operations. The EIFS manufacturers sell the various system components (adhesives, coatings, etc.) through specialty building product distributors who in turn resell the components to local EIFS installers. The top 5 EIFS producers account for about 90% of the US market. These producers include Dryvit Systems, STO Corp., BASF Wall Systems, Master Wall, and Parex.

EIFS architectural details

Another benefit of EIFS is the option to add architectural details that are composed of the same materials. EIFS mouldings or as they are commonly referred to, stucco mouldings, come in a large variety of shapes and sizes. They are widely used on residential/commercial projects in North America and are gaining popularity worldwide. Production methods have come a long way since their inception which allow manufacturers to create with great efficiency in a cost effective manner. The production of architectural foam mouldings was recently showcased on How It's Made airing on The Discovery Channel Network. (http://www.youtube.com/watch?v=MAT2-H8NESQ)

References

1. ^ "About EIFS" (http://www.eima.com/about-eifs.shtml). *EIMA.com*. EIMA. Retrieved 2014-09-10.
2. ^ "About EIFS" (http://www.eima.com/about-eifs.shtml). *EIMA.com*. EIMA. Retrieved 2014-09-10.
3. ^ "About EIFS" (http://www.eima.com/about-eifs.shtml). *EIMA.com*. EIMA. Retrieved 2014-09-10.
4. ^ "About EIFS" (http://www.eima.com/about-eifs.shtml). *EIMA.com*. Retrieved 2014-09-10.
5. ^ "Fire Testing" (http://www.eifsforchicago.com/pdf/Fire-Testing.pdf). *EIFSforChicago.com*. Retrieved 2014-09-10.
6. ^ "About EIFS" (http://www.eima.com/about-eifs.shtml). *EIMA.com*. Retrieved 2014-09-10.
7. ^ "AnimasInsurers Slapping EIFS Exclusions on Insurance Policies" (http://www.acppubs.com/article/CA447443.html). Associated Construction Publications.
8. ^ "EIFS Insurance" (http://www.eima.com/eifs-insurance.shtml). *eima.com*.
9. ^ "Video Gallery" (http://www.eifsforchicago.com/videos.shtml). *EIFSforChicago.com*.
10. ^ *Setting standards*, Building Magazine, 2007-02-01 (http://www.building.ca/news/setting-standards/1000213085/?&er=NA). Retrieved 2013-11-30
11. ^ *Condo nightmare: buyer beware of leaky rotten condos*, Vancouver Courier, September 22, 2011 (http://www.vancourier.com/living/travel/condo-nightmare-buyer-beware-of-leaky-rotten-condos-1.378410#). Retrieved 2013-11-30
12. ^ *Musings of an energy nerd*, Green Building Advisor, November 23, 2012

(http://www.greenbuildingadvisor.com/blogs/dept/musings/all-about-wall-rot). Retrieved 2013-11-30

13. ^ Leaky Buildings, New Zealand Parliament, 06 November 2002 (http://www.parliament.nz/resource/0000000237). Retrieved 2013-11-13

Categories: Building materials | Building insulation materials

---