IMPACT RESISTANT EIFS:
Tough and Tested
About EIMA

Sustainability and energy conservation are critical issues, and Exterior Insulation and Finish Systems (EIFS) are proven solutions to today’s design challenges. The mission of the EIFS Industry Members Association (EIMA) is the advancement and growth of EIFS in the United States. EIMA does this by promoting technical excellence through advocacy, industry standards, research, education and communication.

The only national organization solely dedicated to the EIFS industry, EIMA strives to provide a seamless flow of information to all of its stakeholders: suppliers, manufacturers, distributors, contractors, architects and owners.

Founded in 1981, the EIFS Industry Members Association (EIMA) is a national non-profit technical trade association comprised of leading suppliers, manufacturers, distributors, contractors, architects, related products manufacturers and suppliers, and other interested parties involved in the Exterior Insulation and Finish Systems (EIFS) industry.

Solving Industry Challenges...

EIMA’s core objective is to promote the advancement and growth of EIFS while providing outstanding industry representation and services to its members. EIMA develops technical, training, installation and design standards for use by architects, designers, code bodies and other technical associations.

EIMA monitors and positively influences government actions, and assures the long-term availability of qualified contractors. Over the years, many working relationships have been forged with national and regional contractor associations to address issues of common interest. In an effort to solve challenges facing the EIFS industry, EIMA actively encourages all elements of the construction community to work together and exchange information.

Assuring Standards of Quality...

As an accredited ANSI standards organization, EIMA helps develop industry standards in an advisory capacity and educational programs that enable members to address important issues facing the EIFS and construction industries. Its Technical and Research Committee deals with a broad range of technical issues and represents the EIFS industry in negotiations with national building codes and standards agencies, as well as government regulators. In addition, the committee plans and implements research and testing programs, develops industry guideline specifications for EIFS, and presents at technical symposiums.

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EIFS are sustainable, durable, and resilient. Highly impact resistant EIFS are easily achievable using industry standard application practices and products that are very effective and economical. The keys to high impact resistant EIFS are the same as for any quality construction: good design; firm and definitive specifications; use of the proper products; and proper construction. This document provides information and guidance to designers and specifiers regarding how to achieve impact resistant performance that is in line with project and owner expectations.

Impact Resistance Requirements

What level of impact resistance does your building require? Every project is different, but one common expectation of every owner is that they will have a durable cladding with little or no visible wear and tear from everyday activities. In some areas, particularly coastal environments subject to hurricane exposure, the expectations are not limited to visible damage, but include performance requirements to maintain occupant safety during a potentially catastrophic event. Still other projects have additional interests such as protection against swing stage damage or hail.

Each of these types of impact resistance can be easily addressed using EIFS industry standard designs, materials, and construction methods. One benefit of EIFS is that multiple impact resistance performance needs can be addressed within the overall cladding design without altering the aesthetics of the project. Another benefit is that the type and placement of impact resistant EIFS components can be optimized to address different performance requirements in different areas of the building envelope. This enhances the economics of the overall cladding installation – all areas of the wall are not required to be “overdesigned” to meet the performance requirements of certain limited areas.

Design and Specification Considerations

Designing and specifying impact resistance for EIFS is relatively simple. The design professional should assess the overall project and determine whether and where high impact resistance is required. The project specifications should specify that high impact components are to be used in locations designated on the project drawings. The contractor must be held firmly to the specification to achieve the desired performance. It sounds simple enough, but in the cost-competitive construction environment, deletion of high-impact systems and features is a very common occurrence. The result of removing these requirements from the construction is often a dissatisfied owner, unnecessarily increased maintenance costs, and a poor (and inaccurate) perception of EIFS durability and resilience.
The most basic impact resistance requirements are that high impact mesh (minimum 15 oz/yd² in combination with standard mesh) should be used for the first 6 feet (1.83 m) above finished grade, where pedestrian traffic and landscaping equipment are common potential sources of impact to the building façade. Elevations higher than 6 feet above grade require only standard mesh except where more stringent code requirements exist (i.e.: wind-borne hurricane debris zones).

Areas such as balconies and walls surrounding stairs, landings, and plaza decks should also receive high impact protection (minimum 15 oz/yd² in combination with standard mesh) due to high, frequent occupant exposure. Additional impact resistance is especially important in areas such as entrance ways and columns of porte-cochères where there is a high frequency of traffic and rolling carts can strike the building. It can be common for the high impact mesh to be “value engineered” out of the finished construction in these areas. This practice must be avoided to provide the best impact resistance performance and long-term owner satisfaction.

In geographical regions (typically coastal) where high impact resistance is mandated by code, EIFS manufacturers have developed and tested systems to meet the specific windborne debris and cyclic wind pressure requirements. The designer simply needs to understand where these systems are required and select from properly tested and approved systems. The specific impact testing requirements were developed in South Florida after Hurricane Andrew, thus the benchmark for testing and approval is the Miami-Dade County Notice of Acceptance (NOA). Florida Statewide Product Approvals are also available, but the designer must select a system that is identified as being approved for the “high velocity hurricane wind zone” (HVHZ). It is important to note that these systems are designed to maintain the integrity of the building envelope within defined limits, when subjected to windborne debris impact.

In the Florida HVHZ, large-missile impact resistant systems are required on the lower 30 ft (9.1 m) of the building. The height requirement is based on the likelihood of large debris striking the envelope. The large...
debris is not expected to be carried above 30 ft., thus less impact resistance is required at higher elevations.

Above 30 ft. small-missile impact resistance is required. The “small missile” debris is intended to replicate windborne roofing ballast. Standard EIFS with no additional reinforcement meets the Florida Building Code small-missile impact resistance requirements.

The primary “tool” that provides impact resistance in EIFS is the glass fiber reinforcing mesh. The mesh is available in different weights, and is embedded in the base coat, outbound of the insulation for typical EIFS. The mesh performs several functions, but this discussion is limited to impact resistance. Specialty EIFS used in windborne debris regions may have multiple layers of mesh and in many cases a base coat and mesh layer is applied directly to the sheathing to provide this function.  

Impact performance of EIFS is classified using ASTM E2486, Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS), which uses a falling mass to determine how much energy a particular EIFS assembly will resist without full breakage of the reinforcing mesh. The load is applied through a ½” (12.5 mm) diameter hemispherical head which produces a “punching” failure. This type of failure is not necessarily representative of all the impact damage that can occur in the actual service of a building, but the test provides a basis for determining and verifying the level of impact resistance of systems with different mesh weights and combinations.

### Table 1. ASTM E2486 Impact Classifications for EIFS

<table>
<thead>
<tr>
<th>Classification</th>
<th>Impact Range</th>
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<tbody>
<tr>
<td>Standard Impact Resistance</td>
<td>2.8 – 5.6 J (25 – 49 inch-lbs)</td>
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<tr>
<td>Medium Impact Resistance</td>
<td>5.7 – 10.1 J (50 – 89 inch-lbs)</td>
</tr>
<tr>
<td>High Impact Resistance</td>
<td>10.2 – 17.0 J (90 – 150 inch-lbs)</td>
</tr>
<tr>
<td>Ultra High Impact Resistance</td>
<td>Over 17.0 J (150 inch-lbs)</td>
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Multiple mesh weights and layers can be combined in a system to provide economical options for special conditions. For instance, a high-rise project may choose a combination of mesh to increase protection from impact of swing stages used for window cleaning and maintenance. In another case multiple layers of mesh that meet the Ultra High classification can be used to construct walls that are highly resistant to direct physical abuse. Many EIMA manufacturers have documented that EIFS can be constructed to resist hammer strikes and other similar stress with only cosmetic damage—all using readily available mesh products and typical EIFS construction techniques.
The design options offered by EIFS also provide opportunities to use EIFS as the workhorse cladding for buildings where a designer desires to use other, “harder,” surfaces in localized high-traffic areas or lower floors. This should always be an option, as it provides the building owner with the energy savings and aesthetic versatility of EIFS while protecting areas where all claddings are subject to high wear.

**Construction**

All EIFS reinforcing mesh is applied in the same manner. Base coat is troweled onto the insulation board, the mesh is placed into the fresh base coat, and then the base coat is worked with the trowel to embed the mesh fully and achieve a smooth, flat surface. In cases where heavy weight mesh is used, it cannot be overlapped. The heavy weight mesh is applied to the insulation board surface and fully embedded in base coat, and then a layer of standard weight mesh is embedded in a second application of base coat to provide a smooth base coat with continuous mesh reinforcement.

The combination of additional material cost and the added labor for high impact resistant EIFS cannot be ignored. Clear specifications and drawings, with the resolve to hold firm on these requirements during the bidding process, are needed to get comparable competitive bids and avoid the tendency to remove impact resistance from the system.

**Conclusion**

EIFS is a resilient, tough, and tested cladding system. To get the best impact resistance for any project:

- Understand the impact resistance requirements, including code mandated requirements and typical exposures to impact during service.
- Specify impact resistant EIFS.
- Hold firm to impact resistant requirements of the specifications.
- Use the tools and information available from EIMA members.
- Follow and verify proper construction practices for the installation of impact resistant materials and systems where they are used.

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**Notes**

1. Always comply with local building code requirements.
2. Consult EIMA manufacturers’ product and installation information, specifications and details for additional information. Contact an EIMA manufacturer’s technical staff for additional information.
3. Consult the current Florida Building Code and current provisions for specific information about code requirements. References to the Florida Building Code and HVHZ provisions in this document are for general information only.
4. Consult approved NOA or Florida Building Commission Statewide Approval list and your EIMA manufacturer for installation information about specific approved systems.
5. Reinforcing mesh and base coat that is applied to the sheathing in large missile impact resistant EIFS does not replace the mesh reinforcement in the exterior base coat.