Wind Loads – EIFS and EIFS with Drainage

INTRODUCTION

Exterior Insulation and Finish Systems (EIFS) with Drainage can satisfy the demands of the Miami / Dade County Hurricane code when specified. Whatever performance requirements are needed for any given project, there are three basic parts to the wind load considerations for walls clad with EIFS and EIFS with Drainage.

- The EIFS and its attachment to the substrate must be strong enough to resist the design wind pressures.
- The substrate wall to which the EIFS is attached must be strong enough to resist the design wind pressures on it, and it must also be stiff enough to prevent excessive deflection under wind load, typically limited by design to L/240.
- The design wind pressures that the EIFS and substrate wall must resist are determined in accordance with the prescriptive building code provisions and accepted engineering practice.

EIFS ATTACHMENT STRENGTH

Wind loads act both positively as a force towards the wall and negatively as a force acting away from the wall. EIFS attachment is generally governed by negative wind loads which act to pull the system off the wall.

TESTING

EIFS are tested for attachment strength in accordance with building codes and industry standards such as ASTM E330 (Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure), ASTM C297, (Standard Test Method for Flatwise Tensile Strength of Sandwich Panels), E2134, (Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS), and ASTM D4541 (Standard Test Method for Pull Off Strength of Coatings Using Portable Testers).

Test specimens are generally taken to failure to determine the ultimate strength and mode of failure. The test results determine the strength of the system and its attachment to the substrate. Safety factors are applied to ultimate loads to establish allowable design loads.

TESTS OF ADHESIVELY ATTACHED EIFS

For adhesively attached EIFS, the ultimate (failure) tensile strength of the EIFS and its adhesive bond to the substrate is typically over 600 pounds per square foot. With a typical safety factor of 3 applied to the tensile strength, the allowable negative load for the system is over -200 PSF. This load for the EIFS is well in excess of most project negative and wind load requirements for an exterior wall assembly.

TESTS OF MECHANICALLY FASTENED EIFS

Where mechanical fasteners are used for EIFS attachment, it is the EIFS insulation board that is fastened to the substrate wall. Test results of mechanical fastening for ultimate strength under negative load are based on various factors including insulation board thickness, punching shear resistance of the insulation board, fastener plate circumference, and fastener spacing. The typical mode of failure is fracturing of the insulation board around the fastener plates.

The EIFS manufacturer's specific wind load resistance data for a mechanically attached EIFS should be consulted.

Mechanical attachment of the EIFS insulation board to the substrate wall typically has lower resistance to negative wind loads than adhesive attachment.

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SUBSTRATE WALL

The substrate wall to which the EIFS is attached must be designed and constructed to be strong enough to resist the design (positive and negative) wind loads and limit its deflection under wind load to no greater than L/240. On framed and sheathed construction, numerous tests of adhesively attached EIFS over many years have shown the ultimate test loads are limited by framing or sheathing failure, not detachment of the EIFS. The significance of this fact is that the project designer must assure that the framing, sheathing, and sheathing attachment to the framing, or other wall construction such as masonry, are sufficiently strong and stiff for the project design wind loads.

Laboratory testing of framed wall assembles with adhesively fastened EIFS has shown the critical location in the negative path load is the sheathing to framing screw connection, particularly for gypsum-based sheathings. The typical negative load failure mode in these assemblies is for the sheathing to pull over the screw head. The project designer should either obtain sheathing pullover resistance values from the sheathing manufacturer to use in the substrate wall design or consult the EIFS manufacturer for the data.

The EIFS itself is taken not to contribute to the strength or stiffness of the underlying wall.

WIND LOADS

Project design wind loads are determined by the project designer in accordance with the building code requirements for Components and Claddings.

SUMMARY

Once the design wind loads are determined for the project, the substrate assembly can be designed and the applicable EIFS requirements determined and matched with the EIFS manufacturer's allowable wind load data.

ABOUT EIMA

Founded in 1981, the EIFS Industry Members Association (EIMA) is a North American non-profit technical trade association dedicated to advancing and promoting the Exterior Insulation and Finish Systems (EIFS) industry. As a leading authority on EIFS, EIMA serves as a vital hub for leading suppliers, manufacturers, distributors, contractors, architects, and professionals in the industry. EIMA stands as a cornerstone for individuals and businesses seeking to thrive in the dynamic world of Exterior Insulation and Finish Systems. Learn more at www.eima.com.