RRJ INSIGHT™

ISSUE NO. 17

A technical newsletter by Raths, Raths & Johnson, Inc. for the construction industry.

"Insight: to see into and understand; an item of knowledge gained by this power."

Exterior Insulation and Finish Systems (EIFS), also called synthetic stucco, continue to be a very popular cladding material for both commercial and residential buildings. Due to the variety of different EIF systems available to designers, this issue of *RRJ Insight* focuses on the fundamental rain control strategies that distinguish many of the systems. In the Technology News section, dry-out potential of materials in EIFS-clad walls are reviewed. Finally, we have included an announcement for a new ASTM Special Technical Publication on stone cladding, edited by Kurt R. Hoigard.

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Technical Publication
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Figure 1 – Example of EIFS clad residential building.

Technology Update

Rain Control for EIFS

Over the past decade, manufacturers of Exterior Insulation and Finish Systems (EIFS) have introduced systems utilizing various rain control design strategies. In addition to the barrier or face seal approach, designers have the option of specifying EIFS cladding which incorporates water management or drainage, and even pressure equalized rain screen EIFS. As with any exterior wall design, these systems depend on proper selection, and integration of all of the wall materials and components. Understanding the basic rain water control strategy for each system is the key to appropriate selection, detailing and installation.

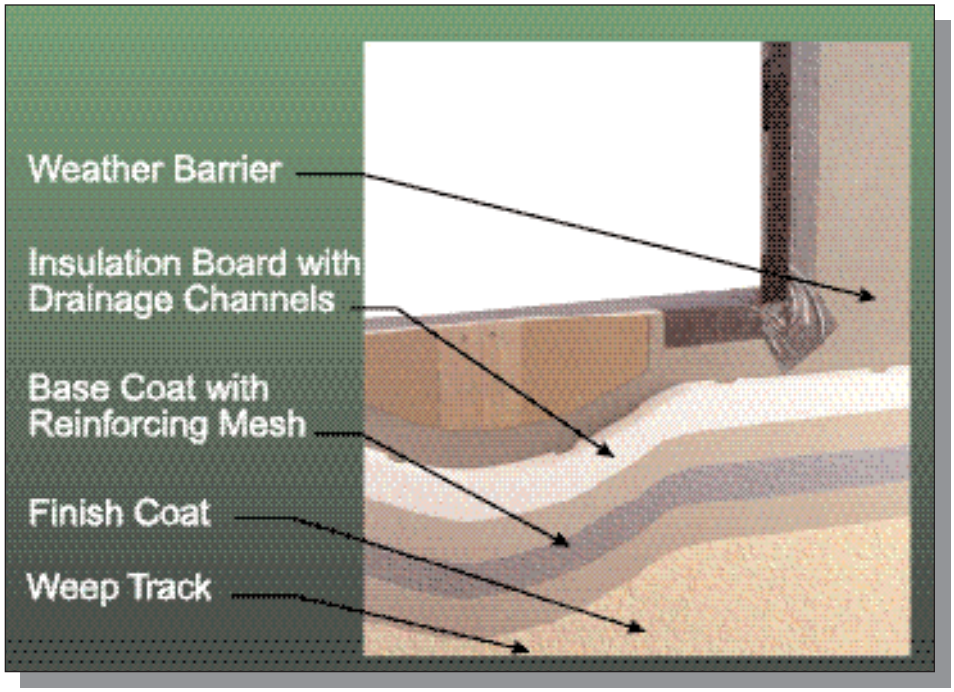


Figure 3 – Example of water managed or drainage systems.

Barrier Systems

Barrier claddings provide rain water protection by precluding water entry at the exterior face of the wall. EIFS has traditionally been detailed using this design approach. When properly applied per the manufacturer's installation instructions, an EIFS cladding provides an effective barrier to rain water penetration. Wall assemblies designed using the barrier concept must be detailed consistent with this philosophy. All wall components must either function reliably as barrier elements (preclude water entry) or be detailed with flashing to direct any water infiltration to the exterior at these discrete sources.

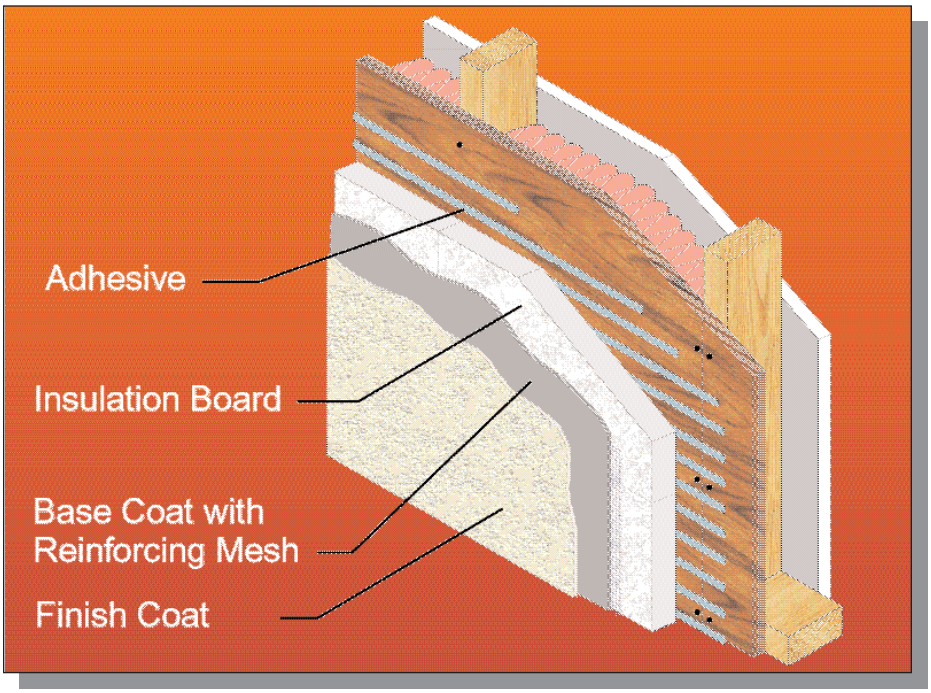


Figure 2 – Example of barrier system.

For barrier EIFS walls, the cladding is sealed at terminations with a weather seal which may be an engineered sealant joint, expandable pre-compressed sealant type, gaskets or flashing. All components and systems must be maintained to assure the water tightness of the wall assembly.

Water Managed or Drainage Systems

Primarily specified for use in open framed exterior walls, water managed, or drainage EIFS cladding designs include a concealed membrane such as building felt or a house wrap material behind the EIFS cladding.

The concealed membrane is intended to provide secondary moisture protection of the wall sheathing and framing behind the EIFS. It is not intended to be a primary flashing system for the wall. These systems are typically mechanically fastened, although manufacturers have introduced trowel-applied membranes which allow for the adhesive attachment of insulation board. Free drainage of water behind the EIFS is typically provided either by the use of grooved insulation board, installing a drainage mat behind the insulation using furring strips or applying adhesive in a vertical pattern using a notched trowel.

In order to function properly and fully realize redundant water protection, careful detailing and installation of the concealed membrane, necessary flashing, and weep systems must be achieved. Detailing of wall components and integration with adjacent materials is similar to that of the barrier approach in that flashing which directs water to the exterior should be installed under components that are not watertight.

Pressure Equalized Rain Screen

Pressure equalized rain screen EIFS wall assemblies were first introduced almost a decade ago primarily for use in highrise and complex commercial buildings. Conceptually this design approach has the added benefit that water penetration driven through the envelope by differential air pressure will be minimal. These wall assemblies require thoughtful design detailing and installation to assure that not only a concealed water membrane is achieved but also a relatively airtight barrier as well. The concealed membrane is typically a troweled-on membrane with sheet membrane and/or elastomeric seals at penetrations.

To achieve the full potential of pressure equalization on a given building, the entire wall envelope must be thoroughly engineered. The EIFS cladding includes baffles to compartmentalize the space behind the cladding as well as incorporates vents and weeps. Vents must be sized so that the pressure behind the cladding can adjust quickly to gusts and rapid pressure changes on the face of the cladding.

All of these rain water control strategies are viable approaches when detailed, installed, and maintained appropriately. The project team should consider the goals and constraints of the project before selecting the most appropriate system. Once an approach is selected, then detailing, selection of materials and components, and installation must be consistent with the chosen approach.

— Kenneth M. Lies, AIA

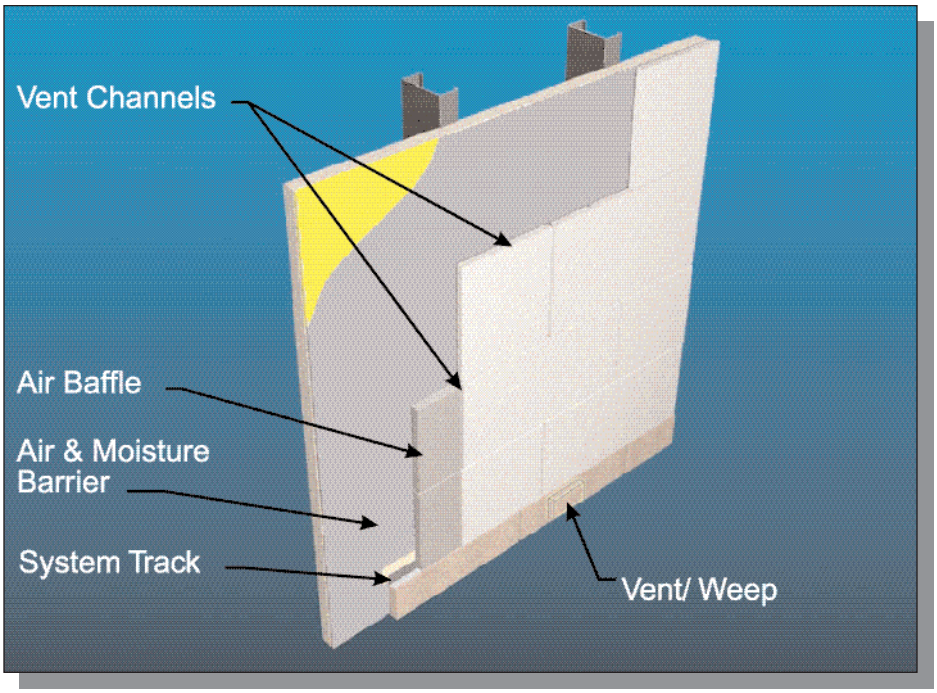


Figure 4 – Example of pressure equalized rain screens

Technical News

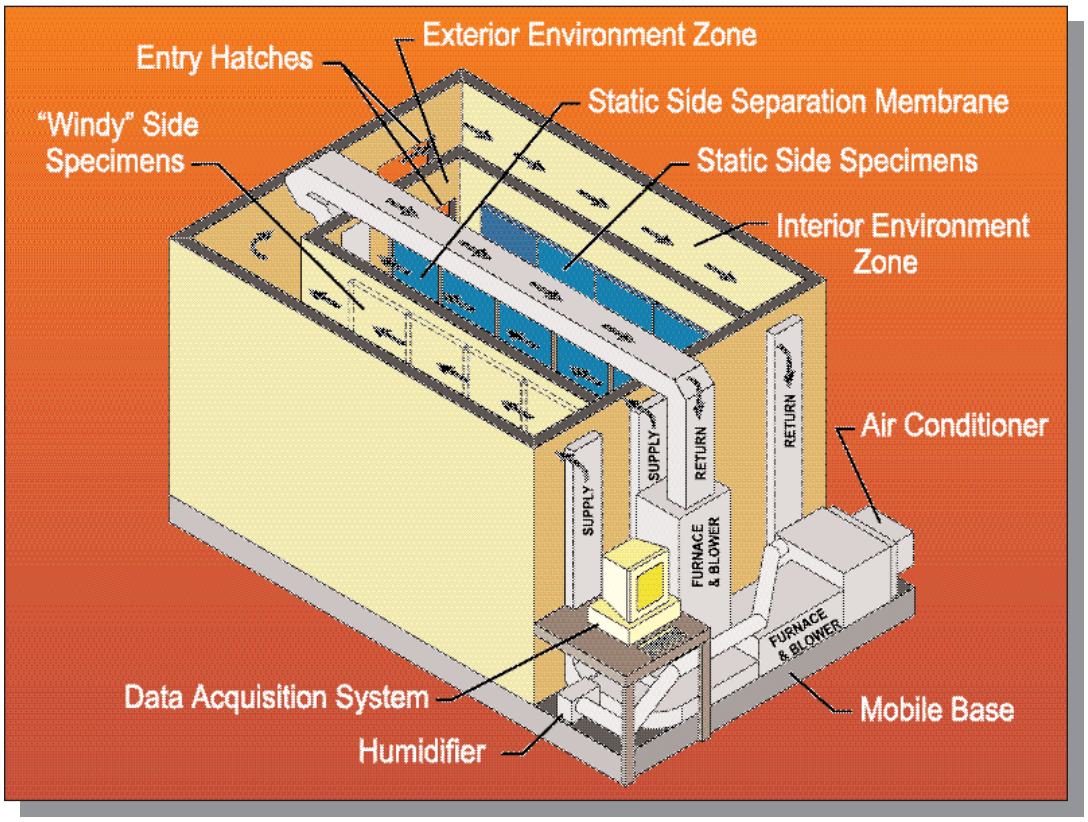


Figure 5 – RRJ's climatic test chamber used to compare dry-out potentials for various cladding materials.

EIFS and Wall Dry-Out Potential

Theories and debates continue over the ability of wood sheathing to dry out within an EIFS clad wall assembly. Opinions have been expressed on this subject suggesting that the sheathing simply will never dry out or may dry but at a much reduced rate compared to other conventional cladding assemblies that include a concealed waterproofing membrane such as #15 felt. Experience of RRJ and others conducting numerous field investigations and moisture analyses of EIFS-clad residences tells us that the sheathing and framing do dry out once the source of water intrusion is stopped or controlled.

At the request of clients representing several EIFS manufacturers, RRJ along with other building scientists conducted a series of laboratory tests to demonstrate and quantify the dry-out potential of wood sheathing for a number of different wall claddings. Included in the study was adhesively attached EIFS, wood lap siding and vinyl siding over #15 felt. The program included conducting tests using the ASTM E96 method for determining vapor transmission on the individual materials as well as the composite cladding assemblies.

In addition, RRJ conducted tests using an environmental test chamber which simulated summer temperature and humidity conditions in the southeastern United States. This test including pre-wetting the wood sheathing and daily weighing the specimens to determine water loss through drying.

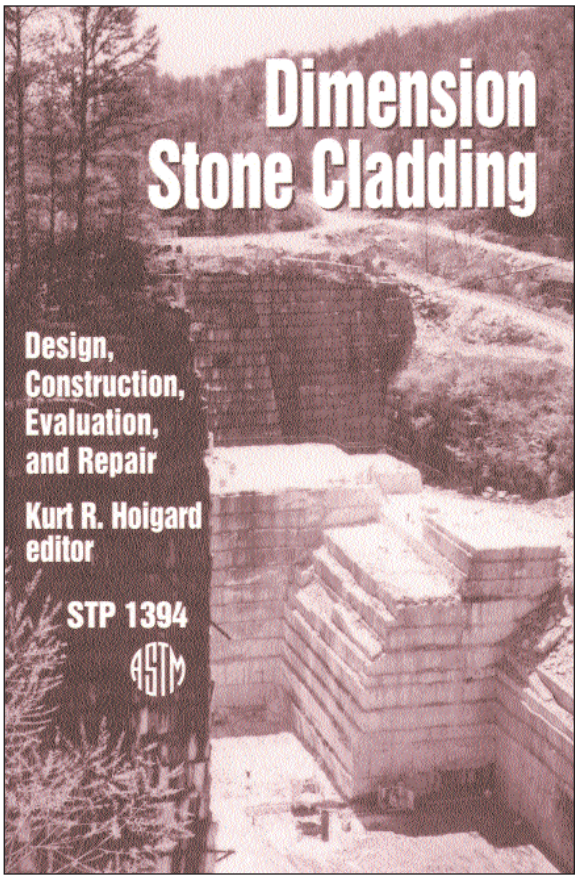
The results of the laboratory tests demonstrated that the sheathing behind EIFS clad wall assemblies did in fact dry out. The mechanism for drying was largely by diffusion which occurred both inward and outward from the sheathing. Finally, the rate of drying was found to be very similar for all of the wall assemblies tested in this study, regardless of cladding type.

— Kenneth M. Lies, AIA
— Robert J. Kudder, S.E.

Newly Published by ASTM:

Dimension Stone Cladding: Design, Construction, Evaluation, and Repair STP 1394

Kurt R. Hoigard, Editor



This book represents the efforts of a number of authors that presented papers at the ASTM Symposium on Dimension Stone Cladding: Design, Evaluation, Construction, and Repair held in New Orleans. The purpose of the symposium was to promote an exchange of information on the state of the art in stone cladding applications. Sixteen presentations covering case histories, original research, and new concepts were grouped into four sessions:

Stone Cladding Preconstruction Evaluation — examines doctoral thesis research work performed at the University of Illinois regarding the use of impulse-generated stress waves as a nondestructive means of determining stone properties.

Stone Weathering and Durability — details methods of durability assessment, discusses the relationships between crystalline structure, thermal hysteresis, and bowing of Carrara marble panels; offers a case history assessing the root causes of weathering induced damage to an 80 year old granite facade, and explores a variety of restorative treatment methods.

Design of Stone Cladding Systems — addresses granite design issues involving wind and gravity support systems.

Investigation and Restoration of Existing Stone Cladding Installations — offers a variety of case studies, observations, and specific recommendations regarding investigative means and repair methods used to address distressed stone facades.

This book contains written versions of the presentations. For a copy of the book contact ASTM at 610/832-9500 or service@astm.org.

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