

THE PROBLEM IS NOT EIFS — IT'S THE DETAILS

By Derek A. Hodgkin, PE, RRO, RRC

The controversy over Exterior Insulation and Finish System (EIFS) cladding is nothing new. Over the past several years, the construction industry (as well as attorneys, homeowners, architects, engineers, and anyone else who has been paying any attention) has recognized the importance of waterproofing details. In particular, it has clearly been demonstrated that certain areas such as wall openings and roof/wall intersections are susceptible to water intrusion. Installation of proper waterproofing details in these areas is essential to the long-term function of any building, regardless of the cladding type.

This paper discusses common details (or lack of details) observed on Type VI (wood frame) buildings that have caused the most significant damage reported in recent years. These details are also problematic on other types of buildings. However, the consequential damages vary depending on the underlying building materials (i.e., concrete, steel, etc.).

This author currently has no particular problems with any of the building products discussed by this paper — only with the details used in their installation. For example, it is nearly impossible to find water intrusion damage in the middle of an uninterrupted wall, regardless of the cladding. Damages are predominantly located where the cladding is interrupted and where waterproofing details are not adequate to prevent water intrusion.

DRAINAGE VS. BARRIER SYSTEMS

Most of the cladding systems discussed in this paper are drainage systems. As such, the cladding manufacturer anticipates water penetrating the outer "skin" of the wall assembly. Accordingly, provisions must be made for effective drainage and protection of underlying building components. This is typically accomplished by using an integrated system of a weather barrier and flashing.

EIFS was originally marketed as a barrier system, meaning that it was considered the primary line of defense against water intrusion and that water was not intended to penetrate behind it. Unfortunately, like drainage type claddings, the wall system is interrupted by openings and terminations. When inadequate waterproofing details exist, water can penetrate the cladding.

The recent focus on EIFS cladding has served to highlight the importance of waterproofing details. The illustrations in this paper clearly reveal that all buildings are vulnerable to water-related damage in the absence of proper waterproofing details, regardless of the cladding type.

THE EVIDENCE

This author has now surveyed hundreds of buildings clad with a variety of building products. These surveys have primarily included EIFS, conventional (hard coat) stucco, brick veneer,

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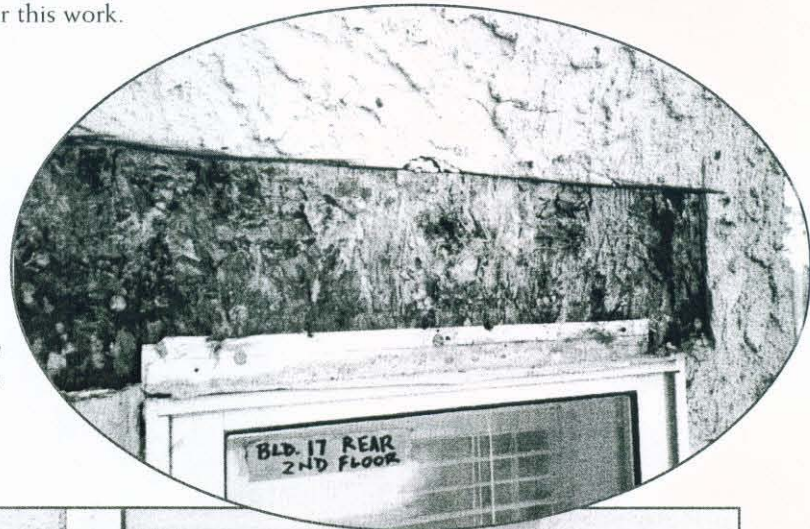
wood siding, and vinyl siding. Most of the buildings surveyed have been less than ten years old and have moderate-to-severe water-related damage to wood building components, including windows, sheathing, and framing. Regardless of the cladding type, the damages seem to occur in the same areas. In general, the damages correspond to wall interruptions such as windows, doors, decks, and roof intersections. Cladding manufacturers (particularly manufacturers of EIFS) have been blamed for many of the problems. However, evidence clearly suggests that the problems lie in the details, not the cladding product.

Windows

Water intrusion damages are frequently located adjacent to windows. The most common problems (which are often compounded by leaking windows) include improper wrapping of the rough opening and improper installation of head and sill flashing (*Photos 1 and 2*).

It has now become accepted knowledge (by most) that water can penetrate to the nailing flange of a window. While this condition may be acceptable to window manufacturers, it should not be acceptable to building designers in the absence of proper waterproofing details.

Window rough openings should be properly wrapped. Head and sill flashing should be installed and properly integrated with adjacent building components (i.e., weather barrier). The American Society for Testing and Materials (ASTM) International Standard E 2112, issued in 2001, and the American Architectural Manufacturers Association (AAMA) *Installer Training Manual*, published in 2000, serve as excellent references for this work.



Photos 1 and 2: Views of damage above and below a window in a building with hard coat stucco.



Doors

Entry doors and sliding glass doors can admit significant amounts of water behind a cladding system if proper waterproofing details are not present. The damages can be particularly devastating when large doors are used on walls with exposure to wind-driven rain. In these cases, the author has observed damages below the unsealed jamb/threshold intersection at the bottom corners of the door. This problem can be exacerbated when the door threshold is installed at the same elevation as an adjacent walkway, deck, balcony, or threshold if it is improperly integrated into the deck waterproofing system (Photo 3).



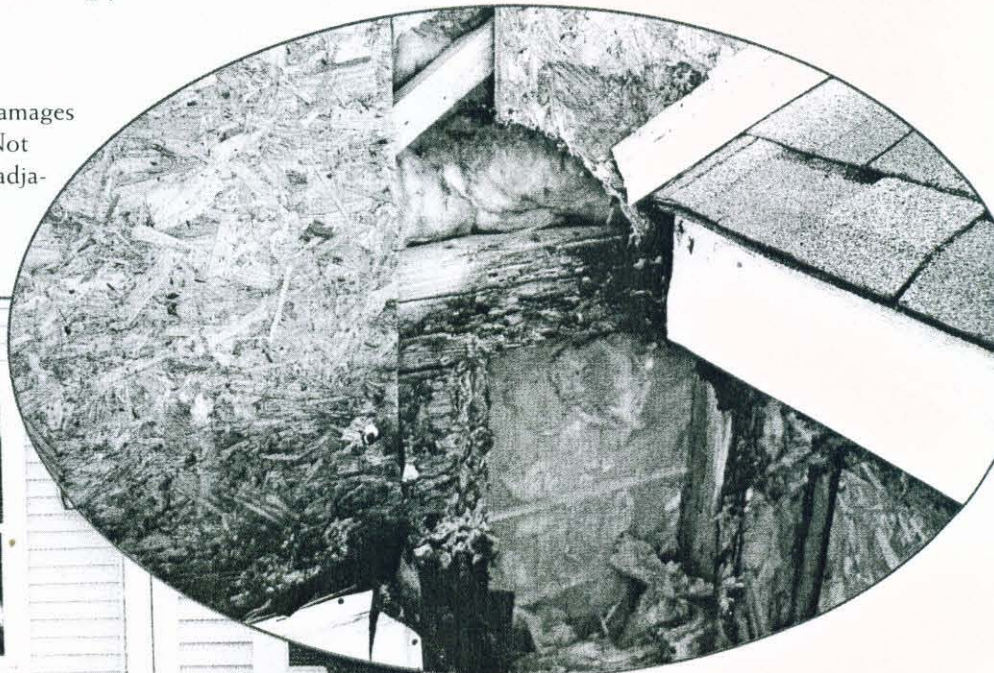
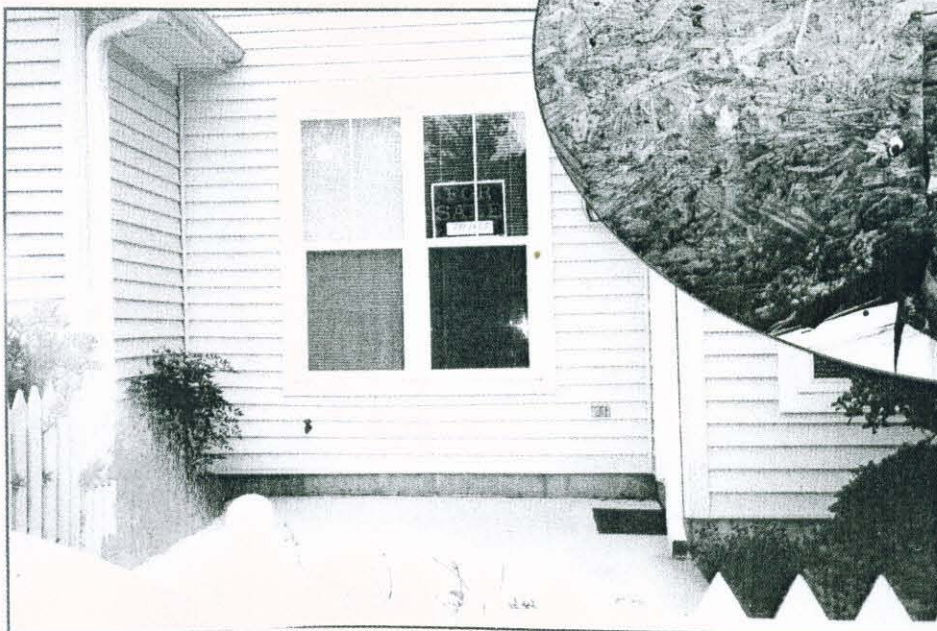
Photo 3: View of damages below a jamb/threshold intersection on a building clad with wood siding.

Door openings should be wrapped in the same manner as window openings. Additionally, a more significant waterproofing membrane, metal pan, or both should be installed below the threshold. All waterproofing materials should be properly integrated with adjacent building products to provide a continuous drainage path.

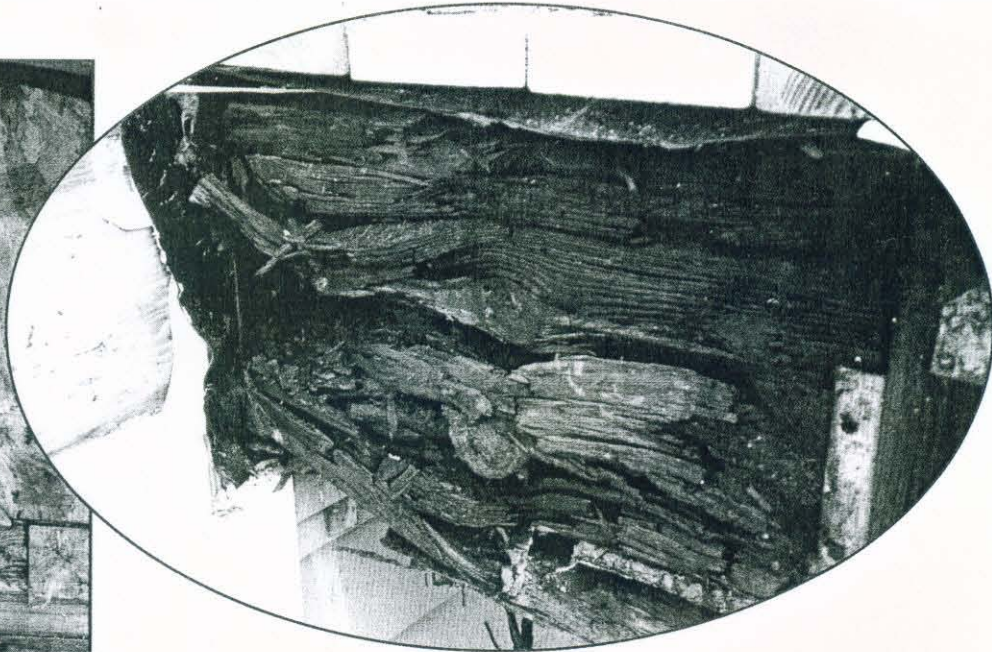
Roof/Wall Intersections

Some of the most significant water-related damages exist at roof/wall intersections (Photos 4 and 5). Not only does this area collect the most water from adjacent roof areas, it can distribute the water over great vertical distances with the help of gravity.

In some instances, a small roof area can serve to rot three stories of wood framing due to a lack of proper waterproofing.



Photos 4 and 5: Views of significant damages below a roof/wall intersection on a building clad with vinyl siding.



Photos 6 and 7 show water-damaged building components caused by improper waterproofing details at a deck. These buildings were clad with wood siding.

Waterproofing at roof/wall intersections is somewhat dependent on the cladding type. However, the waterproofing concepts are all the same. The adjoining roof and wall areas must be protected using underlayment (typically asphalt-saturated felt or self-adhering membrane). Additionally, metal flashing should be used to prevent water penetration and to divert water away from the wall assembly. This flashing detail is commonly referred to as a "kickout."

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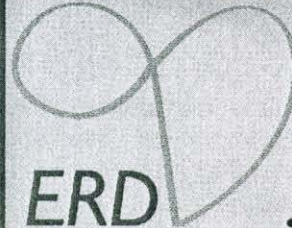
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Decks

Special attention must be paid to areas where decks interrupt wall cladding systems. The concept is simple: maintain a continuous drainage plane behind the deck. However, due to the number of building components (and trades) located in a relatively small area, the best efforts may be compromised by the end of a project (Photos 6 and 7). The trades (framer, waterproofer, door installer, siding installer, and deck builder) must coordinate their efforts to achieve the desired leak-free assembly.

The drainage plane must not be interrupted. The building components in the area must be properly integrated (i.e., wall cladding components, wood deck members, metal flashing, weather barrier, waterproofing membrane, and doors). Adequate space between products must be provided such that water can flow along an uninterrupted and unrestricted path. These details should be considered in conjunction with other waterproofing details such as the door details described previously.

CONCLUSIONS

Proper waterproofing details must be incorporated into exterior walls to deal with water intrusion that will inevitably occur. In the absence of proper waterproofing details, damages will result and the construction should be considered as temporary.

As the construction industry has seen with EIFS, omission or improper installation of waterproofing details can result in significant damages. As outlined in this paper, the same damages may result, regardless of the cladding type. From observations made to date, it does not appear that the construction industry has learned from these experiences. This article should serve as a "red flag" that an industry-wide problem exists. With any luck, building professionals (code officials, manufacturers, design professionals, contractors, etc.) will recognize that we can improve our current practices and reduce future damages. ■

REFERENCES

The table below provides a summary of resources for various building products. Publications (including details) are available from each of the resources listed.

Building Product	Industry Resource
EIFS	EIFS Industry Members Association (EIMA) Morrow, Georgia 30260 (770) 969-7945; (800) 294-3462 www.eifsfacts.com
Conventional (Hard Coat) Stucco	Portland Cement Association (PCA) Skokie, Illinois 60077-1083 (847) 966-6200 www.portcement.org
Brick Veneer	Brick Industry Association (BIA) Reston, Virginia 20191 (703) 620-0010 www.brickinfo.org
Wood Siding	Western Red Cedar Lumber Association (WRCLA) Vancouver, British Columbia V7X 1S7 (604) 684-0266 www.wrcla.org APA – The Engineered Wood Association (APA) Tacoma, Washington 98466 (253) 565-6600 www.apawood.org
Vinyl Siding	Vinyl Siding Institute (VSI) Washington DC 20006 (202) 974-5200 (888) 367-8741 www.vinylsiding.org
Windows	American Society for Testing & Materials (ASTM) 100 Barr Harbor Drive West Conshohocken, PA (610) 832-9500 www.astm.org American Architectural Manufacturers Association (AAMA) Schaumburg, Illinois 60173 (847) 303-5664 www.aamanet.org
Metal Flashing	Sheet Metal & Air Conditioning Contractors National Association (SMACNA) Chantilly, Virginia 20151 (703) 803-2980 www.smacna.org

ABOUT THE AUTHOR

Derek A. Hodgin, PE, RRO, RRC, is a forensic engineer employed by Campbell, Schneider and Associates, LLC (CSA), an architectural/engineering consulting firm based in Charleston, SC. Hodgin is licensed as a professional engineer in 14 states, registered as a Roof Observer and Roof Consultant with RCI, and certified as a Third Party EIFS Inspector and Moisture Analyst with the Exterior Design Institute (EDI). He currently manages a branch office for CSA in Westminster, SC (near Clemson). Hodgin specializes in failure investigations of all types of building envelopes and roof systems. He has investigated numerous types of residential and commercial building failures related to hurricanes, tornadoes, hail, fire, ice, and deficient construction. He has also designed high wind resistant roof assemblies for projects in the southeastern United States and Caribbean. His technical articles have appeared in numerous trade publications and symposia proceedings.



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