RESEARCH in Progress

Coalition for Advanced Wood Structures
a university, industry, government partnership

Moisture Conditions in Wood-Based Sheathing in Walls with Absorptive Exterior Claddings

Moisture dynamics in modern residential exterior wall assemblies with absorptive cladding materials are not well understood. Wall construction techniques and materials are numerous, but direction as to what approaches are appropriate in each climate is minimal. This project involves investigation of the issue in the mixed humid climate of the Chesapeake Bay region. It includes monitoring five common cladding systems, including manufactured stone and stucco. It also includes investigation of moisture performance of wall assemblies following simulated rainwater leakage of windows.

Test hut viewed from the southwest in early spring of 2008.

Background

Excessive moisture accumulation in recently constructed wood-frame walls with absorptive exterior cladding systems has been a well-recognized problem for roughly two decades. The accumulation typically occurs first in the sheathing, but can extend to the lumber framing. Deterioration of sheathing and framing often results in costly repairs. Coastal regions of the Pacific Northwest, northern California, and the southeastern states are the most likely areas to experience this problem, but within the last decade, the problem has also been observed in the Upper Midwest and in the Mid-Atlantic states. Absorptive exterior cladding systems generally are aesthetically pleasing, reasonably affordable to install, and fire-resistant.

Objective

The objective of this research is to identify robust design rules and construction practices that will mitigate excessive moisture accumulation in exterior walls that are sheathed with wood-based material and clad with absorptive siding material in a mixed humid climate.

Approach

The research involves intensive monitoring of 10 test wall sections installed in a climate-controlled test hut near suburban Washington, DC. The 10 wall sections are composed of 5 wall pairs (5 different designs). Of the five designs, three have cement-plaster stucco cladding, one has manufactured stone cladding, and one is a comparative baseline design, which has a non-absorptive cladding (vinyl siding). Each design is exposed in the north-facing wall and in the south-facing wall of the hut. Within each wall section, temperature, humidity, and moisture conditions are monitored, as are interior conditions, and exterior conditions. Driving rain against each wall and solar radiation are among the outdoor conditions being monitored. Material properties of the cladding systems are also being identified by laboratory test procedures. Wall performance will be compared with results predicted by hygrothermal simulation modeling, using material properties and monitored interior and exterior conditions as inputs. During the later part of the

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Datalogger to monitor weather conditions and control indoor temperature and humidity.

monitoring period, simulated rainwater leakage of windows will occur.

Expected Outcomes

The project results will provide design guidance for builders and building scientists on how to specify more moisture-tolerant wall assemblies.

Timeline

The test hut with installed instrumented wall sections was completed in December 2007. Data will be collected for 1 year. Data analysis will be completed in 2009.

Cooperators

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