RESEARCH in Progress

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

Moisture Performance in Walls Containing Wood-Based Sheathing

Moisture dynamics in modern residential exterior wall assemblies are not well understood. Wall construction techniques and materials are numerous, but direction as to what moisture management approaches are appropriate in each climate is minimal. In addition, walls are exposed to a variety of interior conditions. This project involves investigation of the moisture performance of walls in the mixed-humid climate of the Chesapeake Bay region. It includes monitoring eight wood-framed wall configurations with various common cladding systems, including manufactured stone, stucco, fiber-cement, and vinyl. It also includes investigation of moisture performance of wall assemblies following simulated rainwater leakage.

Test Buildings Nos. 1 (on the right) No. 2.

Background

Previous research on these wall assemblies involved winter relative humidity levels of around 30%, a relatively normal level. Results of this research showed that although moisture levels recorded in the wall sections represented a wide range, none of the walls had enough moisture for decay or reduced structural performance to be a concern. However, newer, tighter homes often experience higher wintertime humidity, which is expected to raise the moisture content of the wood-based materials in the wall assembly.

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. As a continuation of existing research, this study focuses on measuring the impact of increased indoor relative humidity on the performance of the wood-based materials within the wall assemblies.

Approach

The research involves intensive monitoring of eight test wall pairs installed in two temperature and wintertime humidity-controlled test structures near suburban Washington, D.C. The eight test wall pairs are of eight different designs—four have cement-plaster stucco cladding, one has manufactured stone cladding, one has insulated vinyl siding, one has fiber cement siding, 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, relative humidity, and moisture conditions are monitored, in addition to interior and exterior conditions. Driving rain against each wall and solar radiation are among the outdoor conditions being monitored. Throughout the monitoring period, quarterly simulated

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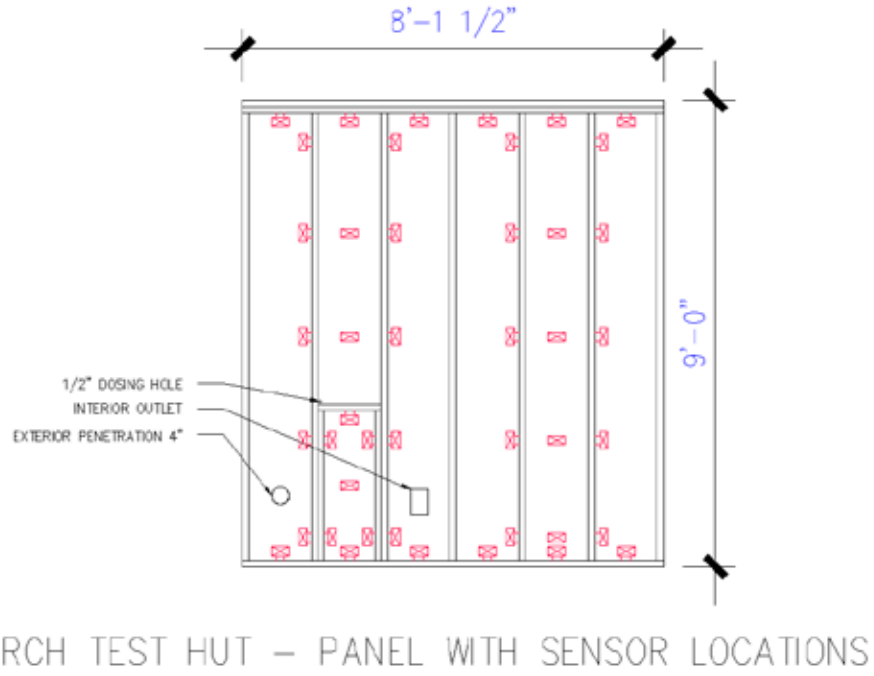

Sensor locations and wall framing.

rainwater leakage events will be performed by injecting a metered amount of moisture behind the water resistant barriers to monitor the ability of each wall to dry.

Expected Outcomes

Project results will provide design guidance for builders and building scientists on how to specify more moisture-tolerant wall assemblies and the influence of indoor relative humidity on the moisture performance of the wall assembly.

Timeline

Monitoring is ongoing and will continue through December 2010. Moisture injections will be done seasonally. A final report is expected third quarter 2011.

Cooperators

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