THE BRICK INDUSTRY ASSOCIATION

Builder Notes

ISSUE 7

WHY BRICK IS THE BEST WALL CLADDING MATERIAL TO CONTROL BUILDING ENVELOPE MOISTURE

THE IMPORTANCE OF MOISTURE CONTROL IN TODAY'S BUILDING CLIMATE

Moisture issues have become an increasing concern in residential construction. While builders address growing demands for occupant comfort and energy-efficiency, modern construction practices have resulted in tight walls that are highly insulated and sealed against air filtration. When moisture is not sufficiently controlled with these lighter, tighter building methods, the risk of mold growth, wood rot, infestation by insects, reduced efficiency of insulation, and corrosion of fasteners embedded in wood all increase dramatically. Consequently, proper specification of materials and building practices not only impacts a home's value at the point of sale (and resale), but it also impacts your long-term reputation as a quality builder.

DETERMINING THE MOST EFFECTIVE COMBINATION OF STRUCTURAL SHEATHING AND EXTERIOR CLADDING TO HELP AVOID EXCESS MOISTURE IN EXTERIOR WALLS

To help provide an understanding of how wall cladding materials and systems perform over a period of time, the NAHB Research Center, a wholly-owned subsidiary of the National Association of Home Builders, recently completed a year-long field moisture study entitled "Moisture Performance Comparison of Typical Residential Wall Assemblies." The project's objective was to determine how exterior cladding can impact the moisture content of the wooden components in the wall construction. The test was funded by the U.S. Department of Agriculture's Forest Products Laboratory and the U.S. Department of Housing and Urban Development, with contributions from the Brick Industry Association.

The field study, which was conducted in a mixed-humid climate 20 miles east of Washington, D.C., was designed to collect moisture performance values at regular intervals from key components within a pair of wall assemblies constructed with each of eight different cladding types as shown in Photo 1. Weather conditions over the test period were near 30-year historical average conditions of the area with the exception of a somewhat milder summer and 5% less rainfall. Each wall assembly consisted of interior gypsum board and wood studs with fiberglass insulation between the studs. This assembly was sheathed with either oriented strand board or plywood and clad with brick veneer, vinyl siding, fiber cement siding, manufactured stone or stucco as described in Table 1.

Photo 1. South-facing walls of test structures. (Building 1 right, Building 2 left)

Each wall assembly was then subjected to ambient weather conditions over a one-year period. In addition, a portion of the water-resistive barrier was compromised, and the wall assembly behind it was subjected to a daily water injection over a five-day period to evaluate its ability to dry after a leak. The data recorded for each wall assembly included wood stud moisture content, wood-based sheathing moisture content, stud bay relative humidity, and stud bay temperature.

Wall Assemblies

Wall Assembly #	Sheathing	Water-Resistive Barrier	Exterior Finish
1	7/16-in. OSB	Spun Bonded Polyolefin WRB	Vinyl Siding
2	7/16-in. OSB	1 Layer No. 15 Felt	Stucco
3	7/16-in. OSB	2 Layers No. 15 Felt	Stucco
4	7/16-in. OSB	WRB 3/8-in. Air Gap No. 15 Felt	Stucco
5	7/16-in. OSB	2 Layers No. 15 Felt	Manufactured Stone
6	7/16-in. OSB	Spun Bonded Polyolefin WRB	Fiber Cement Siding
7	1/2-in. Plywood	2 Layers No. 15 Felt	Stucco
8	7/16-in. OSB	Spun Bonded Polyolefin WRB	Brick with 1-in. Air Space

[Drumheller, 2010]

Table 1

WHAT WERE THE RESULTS?

While in all of the tested assemblies the wood studs and wood-based sheathings were below 16% moisture content under normal conditions, the walls with brick veneer performed significantly better overall. The report attributes the lower moisture content in the wood components to brick's inherent thermal mass properties, the one-inch air space in the brick veneer wall, and the increased thermal absorptance of the test brick due to its red color.

The studs in the brick wall assembly had the lowest moisture content overall in both north and south exposures

Even though the moisture content of studs in all wall cavities remained below the maximum level that is not conducive to mold or rot, the studs in the brick wall assemblies had the lowest moisture content overall. As shown in Figure 1, the studs in the brick assembly were 16% drier than those in the unvented stucco walls during the winter months. Additionally, walls clad with manufactured stone and stucco with plywood sheathing not only had the highest initial moisture contents, but they were also the slowest to dry.

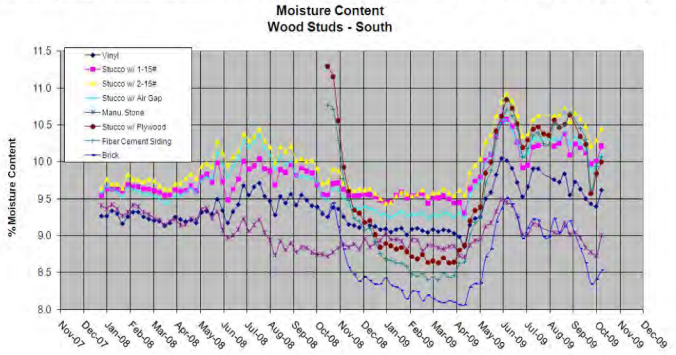

Figure 1

The wood-based sheathing of the south facing brick wall assembly was drier than any other wall assembly tested

In Figure 2, the south facing brick veneer wall had the driest sheathing of all of the wall configurations. This is likely due to the darker color of the brick, which increased its ability to absorb heat from the sun while the significantly higher thermal mass of the brick increased its capacity to store heat. After the brickwork had cured, the sheathing in the south facing brick veneer wall was consistently drier than recorded for the sheathing behind any other cladding.

Brick with a one-inch air space is proven to be effective in keeping the wall assembly dry

As shown in Figure 3, each wall assembly was subjected to a daily intrusion of water over five consecutive days to assess its ability to dry after wetting due to a leak. Each water intrusion consisted of injecting 30 milliliters of water into each of two ¼-in. dosing tubes which directed water to opposite sides of the water-resisitive barrier. According to the test results, with the exception of a ten hour short spike, the brick veneer walls were mostly unaffected by the moisture injections. In fact, the 1-in. air space - with the ability to exhaust moisture laden air - is effective in keeping the wall assembly dry.

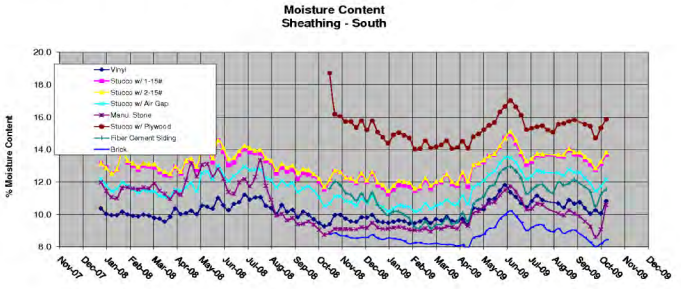

Figure 2

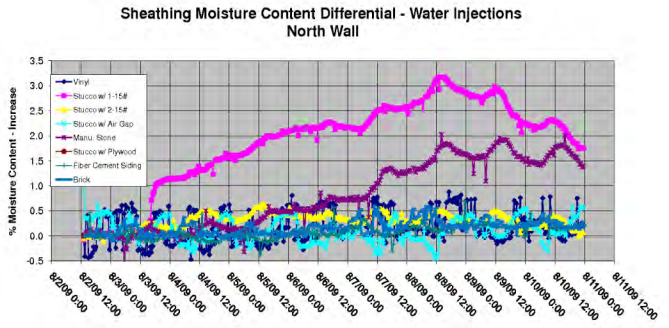

Figure 3

WHAT DOES THIS MEAN FOR BUILDERS?

Builders have another reason to choose brick if they wish to provide their customers the protection of a superior wall system that homeowners want, instead of one that merely meets minimal thresholds. Clay brick is made from naturally abundant materials, and brick's thermal mass properties promote energy efficiency because of its ability to absorb and retain heat to release at a later time. Combined with brick's superior performance, you owe it to your customers and your reputation by building with brick.

Get the full story and learn about another reason to use brick by downloading a complete copy of this report at www.gobrick.com/nahbrcreport.

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