



Building America Case Study

Cladding Attachment Over Mineral Fiber Insulation Board

Ontario, Canada

PROJECT INFORMATION

Project Name: Climate-Exposed Long-Term Testing of Mineral Fiber Insulation Board Under Cladding Attachment Load

Location: Ontario, Canada

Partners:

Building Science Laboratories,
buildingsciencelabs.com

Building Science Corporation,
buildingscience.com

Building Component: Above-grade frame wall

Application: Both new construction and retrofit; wood-framed buildings

Year Tested: 2012-2013

Applicable Climate Zone(s): Cold/very cold (3-8)

PERFORMANCE DATA

Mineral fiber insulation board at 8 lb/ft³ density performs comparably to XPS and polyisocyanurate rigid foam insulation under light and medium weight cladding load.

At 8 lb/fastener cladding load there is no discernable long-term creep.

At cladding load of 30 lb/fastener, there is a notable trend of downward deflection.

Exterior insulating sheathing for high performance building enclosures is an important strategy for meeting energy efficiency requirements in many climates and can position an existing building to perform at the level of best-in-class new construction. Insulation board is also important in high performance building retrofit situations where minimal disruption at the interior is typically desired.

High-density spray foam is increasingly used as an air sealing and insulation technique to the interior of rim joist constructed from engineered wood and as a cavity insulation in assemblies sheathed with oriented strand board (OSB). However, in these assemblies, moisture problems can arise when rim joists of engineered wood and OSB sheathing cannot dry inward because the high-density spray foam is impermeable. When assemblies are also coupled with foam plastic insulation boards, the result is often a double-vapor barrier that significantly limits drying.

In this project, the U.S. Department of Energy Building America team, Building Science Corporation (BSC), studied the performance of mineral fiber insulation sheathing as a viable solution for exterior insulation retrofits. The team found that mineral fiber insulation board provides a vapor-open insulation that is key to making wall assemblies moisture safe. Mineral fiber insulation board also avoids issues associated with foam plastic insulation such as flammability, petroleum and flame retardant content, global warming potential of blowing agents, and harboring of insects or pests.

Yet, as semi-rigid insulation provides a lower compressive strength than foam plastic insulation board, mineral fiber insulation board raises questions about cladding attachment, specifically: will the cladding sag or creep when attached to furring that is fastened to the structure through the mineral fiber insulation board?

Through long-term climate-exposure testing, BSC found that the performance of mineral fiber insulation board under typical cladding loads is comparable to that of foam plastic insulation boards of extruded polystyrene (XPS) and polyisocyanurate. Successful performance under cladding loads has long been demonstrated for assemblies using thick foam plastic insulation exterior of the sheathing and structure.

Field Testing Matters

Laboratory testing of cladding attachment loads over insulation board found very little deflection, even with large cladding loads.

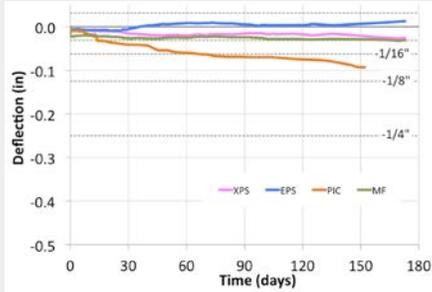


Figure 2: Vertical deflection over time of a wood furring strip over 4-in. insulation board and loaded to 30 lb/fastener in a controlled environment.

However, when the experiment was conducted in exposed conditions, the results were dramatically different.

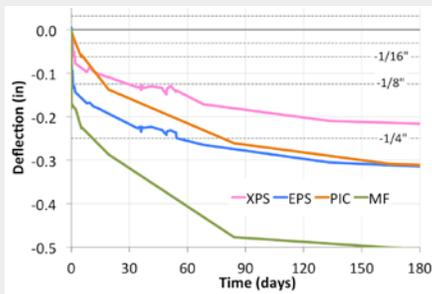


Figure 3: Vertical deflection over time of a wood furring strip over 4-in. insulation board and loaded to 30 lb/fastener in an exposed environment.

When subject to a heavy load and exposed conditions, the wood furring strip over each insulation board type deflected significantly.

For more information, see the Building America report, *Measure Guideline: Three High Performance Mineral Fiber Insulation Board Retrofit Solutions*, at: buildingamerica.gov.

Image credit: All images were created by the BSC team.

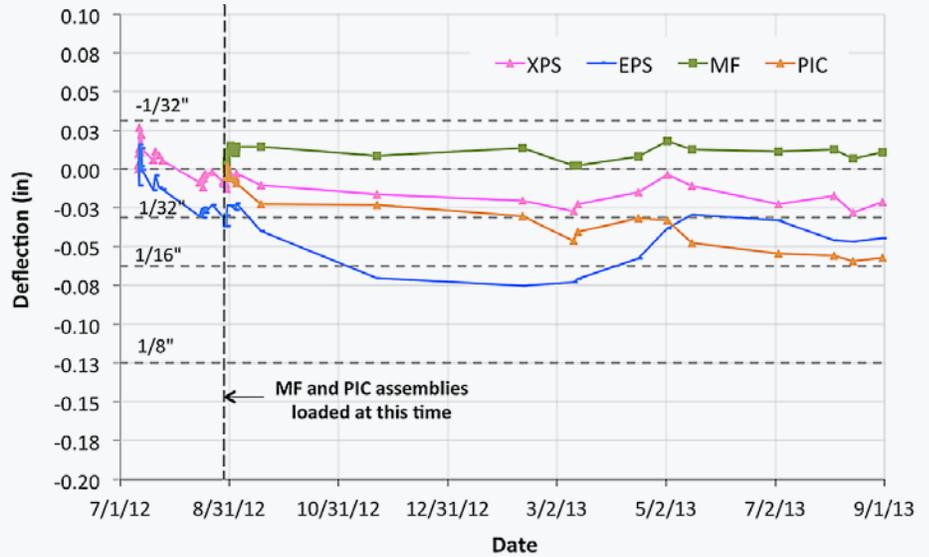


Figure 1: Long-term deflection results for strapping loaded at 8 lb/fastener and installed over various insulation boards.

Lessons Learned

- Performance of mineral fiber insulation board is comparable to that of XPS and polyisocyanurate under typical cladding loads.
- Current research affirms the use of mineral fiber insulation board with an installed cladding load of up to 10 lb/fastener (relative to fasteners attaching furring to the structure) over 4-in. mineral fiber insulation board. This supports the use of claddings such as wood, fiber cement, and vinyl siding.
- Further research is needed to confirm the suitability of thicker layers of mineral fiber insulation board as well as heavier cladding loads (e.g., three-coat stucco).

Looking Ahead

Mineral fiber insulation board is a viable solution for high performance home builders, designers, and clients who wish to avoid the use of foam plastic insulation. It also presents an interesting retrofit solution for historic structures as vapor-open insulation board that can significantly improve moisture durability of assemblies.

Implementation guidance as well as research into cladding attachment supported by the Building America program will encourage wider adoption of mineral fiber insulation board.

With new manufacturing facilities recently entering production in the United States, mineral fiber insulation board is likely to become more available to meet a growing demand.