

Building America Case Study

Incorporating Thick Layers of Exterior Rigid Insulation on Walls

PROJECT INFORMATION

Project Name: Incorporating Thick Layers of Exterior Rigid Insulation on Walls

Partner: Building Science Corporation, buildingscience.com

Building Component: Building envelope component

Application: New or retrofit; single-family or multifamily

Year Measure Guideline Developed: 2014

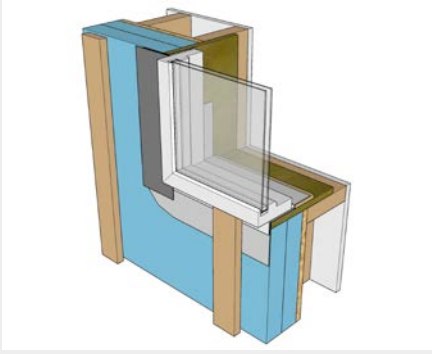
Climate Zones: All

Installing exterior insulation on wall assemblies is an effective strategy for addressing many common building enclosure energy and durability issues. It can increase the overall thermal resistance of the assembly (beyond what is possible with cavity fill insulation) and provides increased condensation resistance in cold climates.

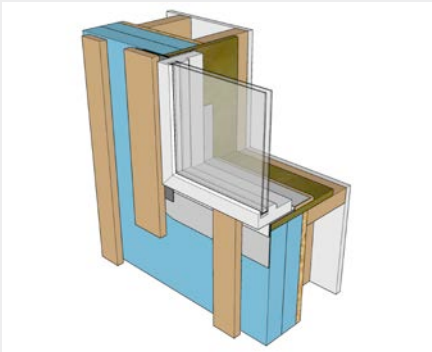
The U.S. Department of Energy's Building America research team Building Science Corporation researched the use of rigid exterior insulation boards installed on wall assemblies and focused on layers of insulation thicker than 1.5 inches. This thickness exceeds the practical limit of directly attaching siding through the insulation back to the structure, which requires a secondary cladding attachment location exterior to the insulation. This case study describes the cladding attachment strategy, which is the use of wood furring strips attached back through the insulation to the house.

Exterior rigid insulation on wall assemblies is becoming more common in the building industry and is even part of the prescriptive requirements of the 2012 International Energy Conservation Code; however, information about incorporating it effectively is lacking. Therefore, this energy-efficiency measure has not been broadly adopted in the marketplace. Not surprisingly, gaps in the building codes that do not explicitly provide guidance about the implementation cause designers, builders, and building code officials—all of whom take some responsibility for the construction—to resist trying this strategy. Guidance is necessary to prevent improper detailing and construction, which can lead to water management and other building durability problems.

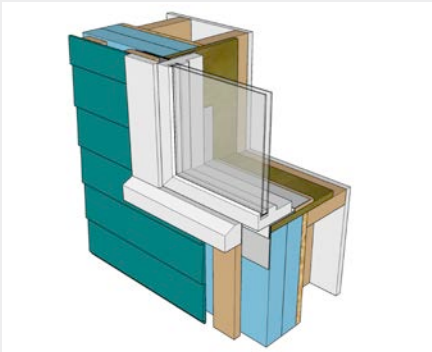
Trim Installation Sequence



Step 1: Install furring strips back to structural frame of the wall assembly.



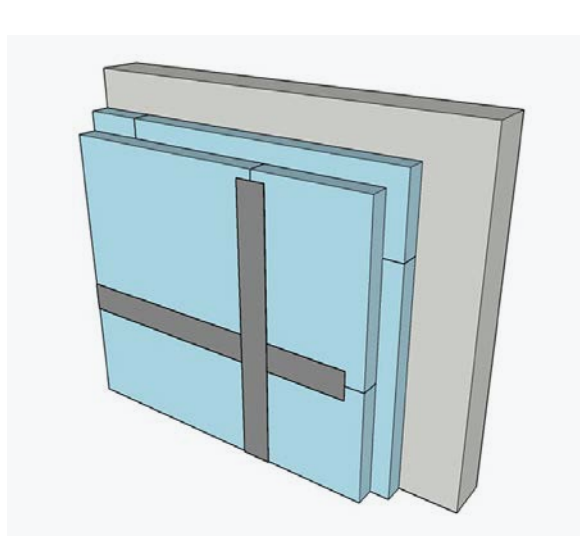
Step 2: Install furring strips at jambs to provide attachment locations for trim and siding.



Step 3: Install trim and siding attached to the wood furring strips.

For more Information see the Building America Measure Guideline *Incorporating Thick Layers of Exterior Rigid Insulation on Walls* at buildingamerica.gov.

Image credit: All images were created by Building Science Corporation.



Placing the water-control layer to the exterior of the rigid insulation generally provides the most straightforward installation because most integration details about other enclosure elements follow standard construction procedures. These details occur at the face of the insulation rather than at the face of the structural sheathing.

Lessons Learned

- Layers of exterior rigid insulation thicker than 1.5 inches usually require that an alternative cladding attachment location be incorporated because few commonly available cladding nails are long enough to penetrate through the insulation and back to the house.
- The use of 1 × 3 or 1 × 4 wood furring strips is an effective way to provide an alternative cladding attachment location for walls that have thick layers of exterior rigid insulation.
- Two water management strategies are commonly used with exterior rigid insulation:
 - Place the water-control layer in front of the insulation.
 - Place the water-control layer behind the insulation.
- Each strategy requires a set of specific details. Building Science Corporation recommends choosing a single strategy for an entire project to avoid confusing details and to reduce the risk of water infiltration concerns.
- Often the choice about where the water-control layer is placed is a function of where windows are placed in the wall assembly. New residential window systems often incorporate a nailing flange that provides a simple tie-in location for the wall water-control layer. Aligning the nailing flange with the water-control layer can simplify the window installation.

Looking Ahead

Current energy code requirements are beginning to use exterior rigid insulation as part of the prescriptive thermal resistance requirements. More and more buildings will need to incorporate exterior insulation. Specific information about the simple incorporation and detailing will continue to be developed to accommodate this need.