Technical Bulletin

Increased Thermal Performance with James Hardie

JamesHardie
Engineered for Climate™

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A Complete Solution With James Hardie

Energy efficient home design is increasing in importance and is directly associated with utility costs and comfort. A home's heating and cooling costs can be substantially reduced through correct insulation, air sealing practices, incorporating the correct products and proper installation methods. If your home is as little as 5 to 10 years old, you likely have one of the 46 million under-insulated homes in the U.S., according to the Harvard University School of Public Health. Insulation is one of the lowest cost options for improving the energy efficiency of your home.

Heating and cooling account for 50 to 70% of the energy used in the average American home, according to the Department of Energy. Inadequate insulation and air leakage are leading causes of energy waste in most homes. Rigid foam insulation in conjunction with HardieWrap® weather barrier and James Hardie® siding provides a better solution:

- Better insulation value
- Increased air tightness
- Reduced heat transfer
- Lower energy costs
- More comfortable and healthier home

The house above shows how rigid foam insulation, HardieWrap® weather barrier and James Hardie® siding can eliminate air leakage and increase the whole wall R-value when properly installed, significantly decreasing energy costs.

Home Energy Audit

A home energy audit is the first step to assess how much energy your home consumes and to evaluate what measures you can take to make your home more energy efficient. An audit will show you problems that may, when corrected, save you significant amounts of money over time. During the audit, you can:

- Pinpoint where your house is losing energy
- Determine the efficiency of your home's heating and cooling systems
- Find ways to conserve hot water and electricity
- Determine the best approach to make your home more energy efficient

You can perform a simple energy audit yourself, or have a professional energy auditor carry out a more thorough audit.

Do-It-Yourself Home Energy Audits

With a simple but diligent walk-through, you can spot many problems in any type of house. When auditing your home, keep a checklist of areas you have inspected and problems you found. This list will help you prioritize your energy efficiency upgrades. The U.S. Department of Energy website can help direct you when doing an energy audit yourself:
http://www.energysavers.gov/your_home/energy_audits/index.cfm/mytopic=11170

Air Sealing

Air leakage occurs when air unintentionally and freely enters or exits the home through penetrations or openings throughout the structure. If exhaust vents, electrical outlets, and doors or windows are not sealed properly, the entire home's air tightness will be reduced. Air leakage will also occur between the laps and joints of all siding products if an air barrier is not properly created.

Air sealing is important, not only because drafts are uncomfortable, but also because air leaks carry both moisture and energy. For example, air leaks can carry hot humid outdoor air into your house in the summer, or carry warm indoor air out in the winter.

Most homeowners are aware that air leaks into and out of their houses through small openings around doors and windows and through fireplaces or chimneys, but air can also travel through any of the following locations if not properly sealed:

- Any openings or cracks where two walls meet
- Gaps around electrical outlets, switch boxes, and recessed fixtures
- Behind bath tubs and shower stall units
- Through floor cavities of finished attics
- Plumbing and electrical wiring penetrations

By installing HardieWrap, taping the seams, and flashing the windows you can create an air barrier to prevent air leakage.

Oak Ridge National Laboratory provides great information about air sealing in their Technology Fact Sheet: http://www.ornl.gov/sci/roofs+walls/insulation/fact%20sheets/Air%20sealing%20technology%20fact.pdf

How Insulation Works

Heat flows naturally from warmer to cooler spaces. In the winter, this heat flow moves directly from all heated living spaces to the outdoors through ceilings, walls and floors - wherever there is a difference in temperature. In the summer, heat flows from the outdoors to the interior of a house through these same channels. Properly insulating your home will decrease this heat flow by providing an effective resistance to the flow of heat.

Insulation is a material that has the ability to resist temperature change or the transfer of heat and cold. R-value is the measurement to evaluate a material's insulation characteristics. The overall R-value of a home design is the sum of the thermal resistance of all of the components in the assembly. Adding rigid foam insulation to the exterior of the home is a simple method of increasing the overall thermal resistance of the wall assembly beyond that possible with cavity insulations and thereby increasing the overall efficiency of the home.

Oak Ridge National Laboratory provides great information about wall insulation in their Technology Fact Sheet: http://www.ornl.gov/sci/roofs+walls/insulation/fact%20sheets/wall%20insulation%20technology.pdf

Adding Insulation to Your Home

The easiest and most convenient time to add insulation to your home is when you replace the siding. During the re-side you will be able to assess how much insulation you currently have, determine your insulation needs, and add additional insulation as needed, all before the new siding is installed. Many older homes have less insulation than homes built today, but adding insulation to a newer home may also pay for itself within a few years. Properly insulated exterior walls in your house will not only increase comfort but also help you save on heating and cooling costs. Half-inch thick rigid foam insulation has an R-value of R-2 to R-3.5. Foam thicker than a half-inch will yield even higher R-values. Adding ½ inch of rigid foam insulation (R-2 in this example) will increase a 2x6 stud wall from an effective R-15 to an effective R-17. This is an increase of 13% of effective thermal resistance.

Wall Assembly R-Value

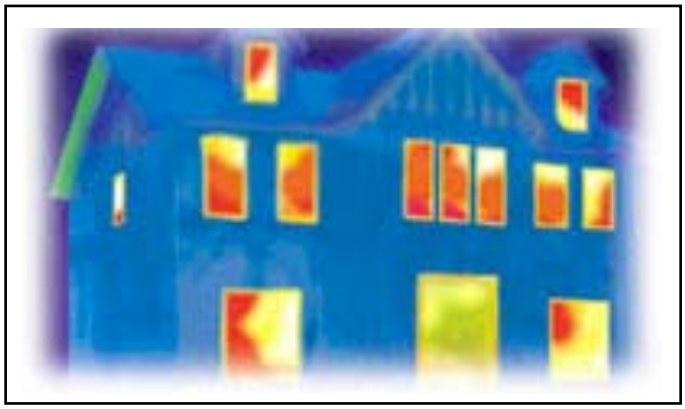
	Typical Wall	Wall with 1/2 foam
2 X 4 framing	R - 11	R - 13
2 X 6 framing	R - 15	R - 17

Benefits of Using James Hardie® siding with HardieWrap® weather barrier and rigid foam insulation:

- Increased thermal performance
- High performance
- Installation ease
- Air infiltration reduction
- Strength and durability
- Comfort and peace of mind

The images below *(Copyright © 2009 UJ Robichaud TIMBR Mart)* show how effective just a ½ inch of rigid foam insulation is at reducing heat loss versus the same home with OSB sheathing and R-13 batt insulation. Heat loss is indicated on a scale of red, the most heat loss, to purple/blue — minimal heat loss.

House with OSB and R-13 batts



House with OSB and R-13 batts, covered with 1/2" rigid foam insulated sheathing and James Hardie Fiber Cement

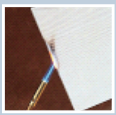
NOTE: The leakage of air through all the normal seams and tiny cracks of the exterior walls can account for as much as 30 percent of the heat loss in a typical home. Due to their profile, installation, and physical properties, foam backed vinyl products are not designed to reduce air leakage and therefore may not provide the increase in thermal performance claimed.

Types of Rigid Foam Insulation

There are three main types of rigid foam insulating sheathing currently being used in the industry: Expanded Polystyrene (EPS), Extruded Polystyrene (XPS), and Polyisocyanurate (Polyiso) which each exhibit varying R-values, a wide variation in vapor permeability and drainage characteristics. Building science experts have recognized that the type of rigid foam insulation needs to be selected based on specific climatic variables in conjunction with the specific wall assembly components. Similarly, James Hardie has recognized the need for climate specific siding products with the HardieZone™ System. Refer to http://www.jameshardie.com/ for your correct HardieZone and see the chart below for general product properties and climate recommendations for rigid foam insulation:

Type	R-Value (inches)	Permeance (perms)	Climate Use	Special Considerations
Expanded Polystyrene (EPS)	3.2 - 4.4	2.0 - 5.0	All Climates, Cold Climates	Interior vapor retarder recommended in cold climates.
Extruded Polystyrene (XPS)	4.6 - 5	1.0	All Climates, Cold Climates	Interior vapor retarder recommended in cold climates. Drainage space recommended in cold climates when there is no interior vapor retarder
Unfaced Polyisocyanurate	6.0	2.8 - 4.5	All Climates	Interior vapor retarder recommended in cold climates.
Foil Faced Polyisocyanurate	6.5	0.0	All Climates, Hot Humid	Drainage space recommended in cold climates when there is no interior vapor retarder.

James Hardie vs. Foam Backed Vinyl

	James Hardie Siding Over Rigid Foam Insulated	Foam Backed Vinyl Siding
Flame Resistance	 James Hardie Siding is non-combustible and approved for fire-rated construction.	 Vinyl siding will melt or burn when exposed to heat or flame.
Fade Resistance	 Factory applied, baked on finish provides up to 30% better fade resistance than competitive products.	 Color can't be changed and is susceptible to fading. Vinyl siding is difficult to match when repairs are necessary.
Weather Resistance	 Resists rotting, warping, cracking, hail and high winds up to 150 MPH.	 Insulated vinyl siding can be damaged by hail, tree limbs and other flying debris.
Air Filtration	 HardieWrap combined with rigid foam creates a continuous air barrier outside of the insulation retaining the insulation value.	 Air penetration behind siding and attached foam compromises advertised insulation value.
Energy Efficiency Tax Credit	 Use of rigid foam insulation qualifies for a tax credit of up to $1500.	 Insulated vinyl siding does not qualify for any type of tax credit.

**The Existing Home Retrofit Tax Credit (Tax Code Section 25C): Tax credits are available at 30% of the cost, up to a $1500 limit, for installations of external rigid foam insulation. For insulation to qualify its primary purpose must be to insulate, insulated siding does not qualify.*

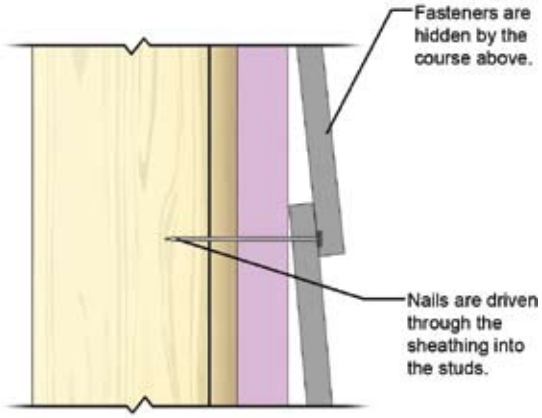
HardiePlank® lap siding is the most popular brand of siding in America and can be found on over 4 million homes. You want the strength, beauty and durability that lasts for years. James Hardie siding enhances and protects homes in all kinds of climates - and now, with the HardieZone™ System, James Hardie provides siding with specific performance attributes relative to the climate where the product is being used. James Hardie now gives you the optimum siding for your project and climate, regardless of the location. HardiePlank® lap siding comes with a 30-year nonprorated transferable, limited product warranty - our strongest warranty ever.

General requirements and installation guidelines:

- All James Hardie product specific installation requirements must be followed, please refer to www.JamesHardie.com for the most up to date Installation Requirements and Best Practice Guide.
- All national, state, and local building code requirements must be followed and where they are more stringent than the James Hardie installation requirements, state and local requirements will take precedence.
- James Hardie® siding and trim products can be installed over solid-foam insulation board up to 1-in. thick. Caution should be taken as irregularities and unevenness in framing, sheathing, foam and other wall assembly components, including under driven nails, can telegraph through to the finished siding and trim. These irregularities should be corrected before the siding is installed.
- When reviewing the following details for attaching over foam an important consideration is that the fastener chosen must be adequately encompassed by a wood substrate - the foam will not count as part of the necessary penetration, therefore the length of the chosen fastener must be extended by the thickness of the foam.

Fastener Selection:

When attaching lap siding products over foam, the length of the chosen fastener must be extended in length by the thickness of the foam.



When attaching lap siding products over foam the length of the chosen fastener must be extended by the thickness of the foam to achieve the same required holding power.

Fastener Selection

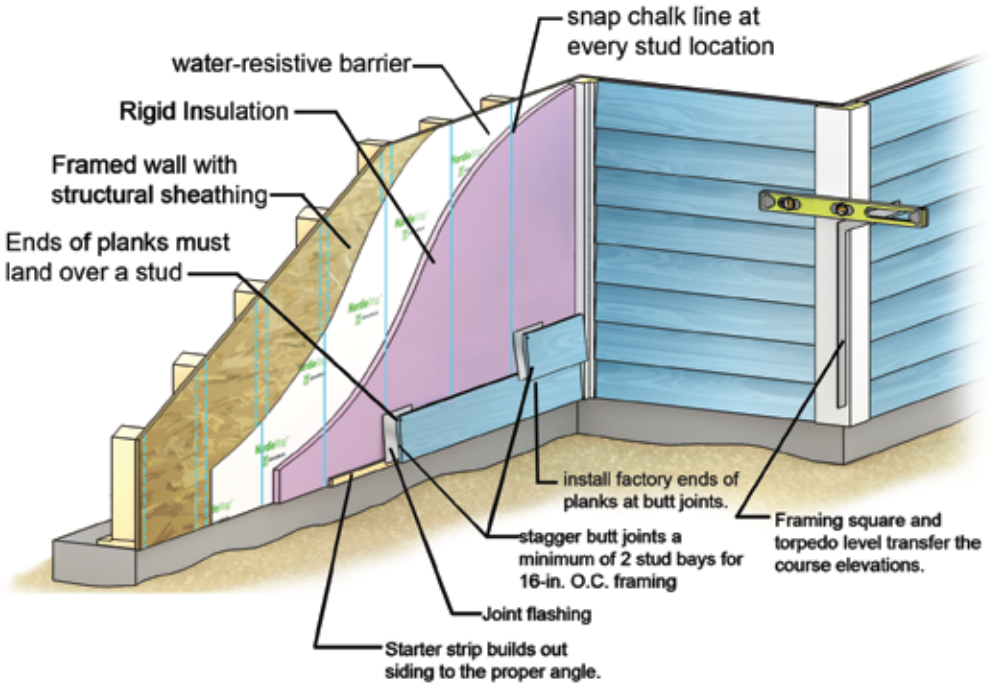
Normal Fastener	Fastener for additional 1/2" of foam
6d Common **2"** Long	8d Common **2 1/2"** Long
11 ga. **1 1/4"** long roofing nail	11 ga. **1 3/4"** long roofing nail
8-18 x **1 5/8"** x .323" HD ribbed bugle head screw	8-18 x **2 1/8"** x .323" HD ribbed bugle head screw

Refer to the NER-405 or other code compliant documentation for proper fastener selection based on specific product, stud spacing, building height, and exposure category.

James Hardie does support the use of its exterior siding products installed over rigid foam insulation, but it does not take responsibility for the entire wall assembly or system. James Hardie expects the designer, contractor, or builder using our components as part of the insulated wall assembly to:

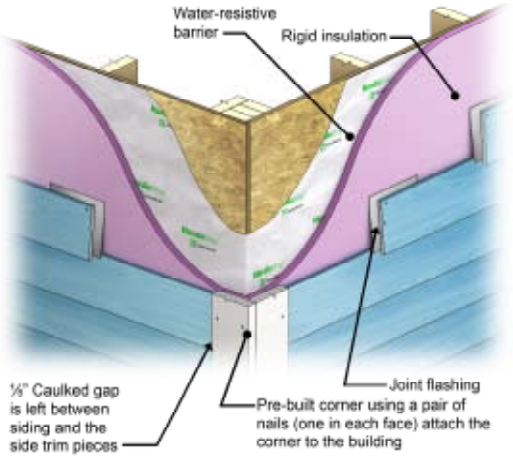
- Adhere to all the installation requirements listed in the relevant product installation instructions.
- Provide adequate details for water management.
- Make the decision about the use and type of rigid foam insulation.
- Understand the interaction between system components and how each of the components in the system interacts.
- Design the building envelope to account for both interior and exterior moisture control.

NOTE: When attaching lap siding products over foam the length of the chosen fastener must be extended by the thickness of the foam to achieve the same required holding power.

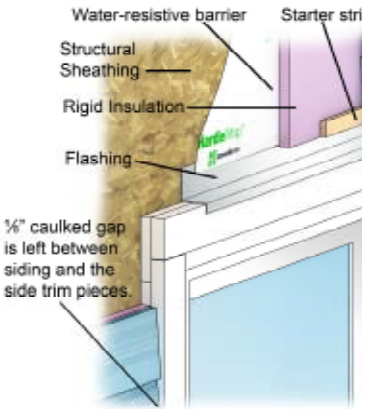


Weather Barrier and Rigid Foam:

- When using a weather resistive barrier (WRB) in conjunction with rigid foam installation, the WRB can be installed over the top as shown, or underneath if more convenient.
- Regardless of where the WRB is placed all flashings must be incorporated into the WRB and drainage plane.
- Some rigid foam insulation products are manufactured with tongue and groove or shiplap joints and can be used as the WRB when properly installed and sealed. When using rigid foam insulation as the WRB refer to manufacturers installation instructions.



Trim: Depending upon the reveal around windows, doors, & penetrations, thickness of foam and the type and thickness of trim used there will be different techniques to install the siding and trim to ensure that the foam is completely concealed.



Flashings: The Z flashing above all horizontal trim must be incorporated into the WRB regardless of WRB position. If the foam is being used per manufacturers instructions as the WRB, all flashings must be incorporated into the drainage plane in such a way that allows moisture to drain down and out.

NOTE: It is recommended to layout the rigid foam insulation such that vertical joints do not occur at the corners of window and door openings or over window heads if possible.