

# Continuous Insulation Using Polyiso Wall Sheathing

## What it is, what it does, and why you need it

### About Polyiso Insulation

Polyiso is a rigid foam insulation used in more than 70% of commercial roof construction and offers a continuous insulation solution for commercial and residential wall assemblies. As one of North America's most widely used and readily available building products, Polyiso is a cost-effective insulation option for reducing building energy use and improving the overall service-life of roofs and walls.

The benefits of using Polyiso include:

- High R-value per inch of thickness
- Excellent fire test performance
- Extensive building code approvals
- Cost-effective continuous insulation (ci) solution
- Compatible with most roof and wall systems
- Dimensional stability
- Compressive strength
- Moisture resistance
- Thinner walls and roofs with shorter fasteners
- Long service life
- Preferred insurance ratings
- Virtually no global warming potential
- Zero ozone depletion potential
- Recyclable through reuse
- Recycled content (amount varies by product)
- Regional materials (nationwide production network)

### Introduction

National model energy codes are advancing the way we approach building commercial and residential exterior walls by emphasizing the use of continuous insulation systems, which provide a continuous insulation layer over an entire wall, not just in the wall cavities. Building science experts have known for some time that continuous insulation is a very effective way to insulate building envelopes for energy savings. Now, modern building codes are putting this knowledge into practice.

### What is continuous insulation?

Continuous insulation is defined as “insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building envelope.”<sup>1</sup> Figure 1 shows several common applications of continuous insulation.

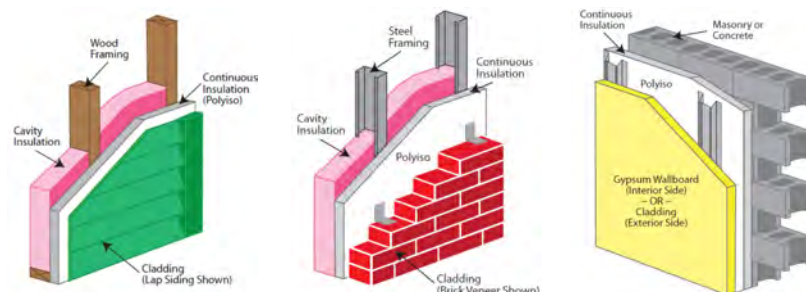


Figure 1. Light frame and mass wall systems with continuous insulation for code-compliant residential and commercial building construction.

As shown in Figure 1, continuous insulation can be used with variety of wall structural systems and cladding materials such as cement board, PC stucco, wood lap, brick veneer, stone, and vinyl siding. Furthermore, continuous insulation can be placed on the interior or exterior side of the wall with proper consideration of climate-dependent moisture vapor control code requirements. For example, it is common to place continuous insulation on the inside face of foundation walls and also above-grade masonry walls, which is considered a typical practice in Florida where the exterior masonry wall face is coated with stucco or parging. Finally, it is possible to use continuous insulation alone to meet energy code without any cavity insulation for the ultimate “warm wall” design.

1. ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., Atlanta, GA.



Surround yourself with the best.

## What does it do?

Continuous insulation can serve several important functions in a high-performing wall system including continuous thermal insulation, moisture vapor control, water resistive barrier and air barrier. These capabilities provide the following benefits:



Figure 2. Thermal bridging through wall framing causes a disproportionate amount of heat loss. With continuous insulation, heat loss from thermal bridging is minimized providing a favorable economic and environmental benefit over use of cavity insulation alone.

- **Increased thermal performance**  
By blocking thermal bridging, a continuous insulation system increases the overall thermal performance of a wall assembly and a building.
- **Reduced operating costs**  
Continuous insulation keeps energy and heat loss to a minimum, increasing the building's energy efficiency and leading to lower monthly operating costs.
- **Reduced air infiltration and exfiltration**  
Continuous insulation with taped or sealed joints restricts air movement through the wall, helping to further reduce building heat loss.
- **Reduced risk of water condensation and moisture intrusion**  
Continuous insulation is a very moisture-resistant system, guarding the thermal and structural performance of the building.
- **Efficient installation**  
When used as a multi-function sheathing, continuous insulation can simplify the steps to construct a code-compliant wall assembly.
- **Dimensional Stability**  
Polyiso insulation has excellent dimensional stability and meets ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

### Get-R Done TIP#1:

Many methods of attaching cladding materials over continuous insulation to a variety of wall substrates are available. For information on a variety of practical solutions, refer to:

[http://www.foamsheathing.org/images/TM\\_Cladding\\_Attachments\\_Through\\_Thick\\_Foam\\_Sheathing.pdf](http://www.foamsheathing.org/images/TM_Cladding_Attachments_Through_Thick_Foam_Sheathing.pdf)

## Get-R Done TIP#2:

Specify continuous insulation to serve multiple wall assembly functions, including energy code R-value compliance and the building code's water resistive barrier (WRB) requirements. A continuous insulation WRB also provides an effective air barrier required by the energy code when taped sheathing joints are used. Be sure to install continuous insulation in a code-compliant overall wall assembly and follow manufacturer instructions and approved building plans.

## Why you need it

As noted above, continuous insulation is needed to achieve high-performance wall assemblies. More importantly, it will be increasingly needed for energy code compliance (see Figure 3 below) as mandated to all states that have accepted federal economic stimulus funds. As newer national, state and local energy codes continue to place a greater emphasis on energy conservation, code developers and experts are turning to a greater use of continuous insulation for its known ability to reduce thermal bridging and increase energy efficiency at reasonable first cost while providing operating cost paybacks through reduced energy bills. Examples of modern energy code requirements for wall insulation using continuous insulation are shown in Figure 3. A color-coordinated U.S. climate zone map is provided in Figure 4. Voluntary energy efficiency programs, such as the EPA's EnergyStar program, have been encouraging and rewarding use of continuous insulation for some time. Model building and energy codes are finally catching up with this **best practice** for wall insulation.

**2012 IECC Residential Wall R-value**

Installation Climate Zone	Wood Frame R-value	
	2009 IECC	2012 IECC
1	R13	R13
2	R13	R13
3	R13	R20 or R13+5
4 exc. Marine	R13	R20 or R13+ <b>R5ci</b>
4 Marine & 5	R20 or R13+ <b>R5ci</b>	R20 or R13+ <b>R5ci</b>
6	R20 or R13+ <b>R5ci</b>	R20+ <b>R5ci</b> or R13+ <b>R10ci</b>
7 & 8	R21	R20+ <b>R5c</b> or R13+ <b>R10ci</b>

**2012 IECC Commercial Wall R-value**

Climate Zone	Wood Frame	Metal Frame	Metal Bldg	Mass
1	R13+R3ci or R-20	R13+R5ci	R13+R6.5ci	R5.7ci
2	R13+R3ci or R-20	R13+R5ci	R13+R6.5ci	R5.7ci
3	R13+R3.8ci or R-20	R13+R7.55ci	R13+R6.5ci	R7.6ci
4	R13+R3.8ci or R-20	R13+R7.5ci	R13+R13ci	R9.5ci
5/4 Marine	R13+R3.8ci or R20	R13+R7.5ci	R13+R13ci	R11.4ci
6	R13+ <b>R7.5ci</b> or R20+R3.8ci	R13+R7.5ci	R13+R13ci	R13.3ci
7	R13+ <b>R7.5ci</b> or R20+R3.8ci	R13+R7.5ci	R13+R13ci	R15.2ci
8	R13+ <b>R15.6ci</b> or R20+R10ci	R13+R7.5ci	R13 +R13ci	R25ci

Figure 3. Modern energy code R-value requirements for commercial and residential building walls using continuous insulation.

Figure Notes:

1. IECC = International Energy Conservation Code published by the International Code Council, Inc. Refer to ASHRAE 90.1 for alternate code-compliant wall R-values.
2. Wall R-values are shown as cavity insulation alone or as XX + X where the first number is the cavity insulation R-value and the second is for continuous insulation. Continuous insulation "ci" R-values are shown in bold.
3. The commercial Wall R-values are based on all commercial building use groups, except R (residential) which may require additional continuous insulation R-value depending on climate zone.
4. Refer to climate zone map on the next page for geographic extent of climate zones listed above.
5. If using batt insulation instead of continuous insulation, the building will require 2x6 construction.

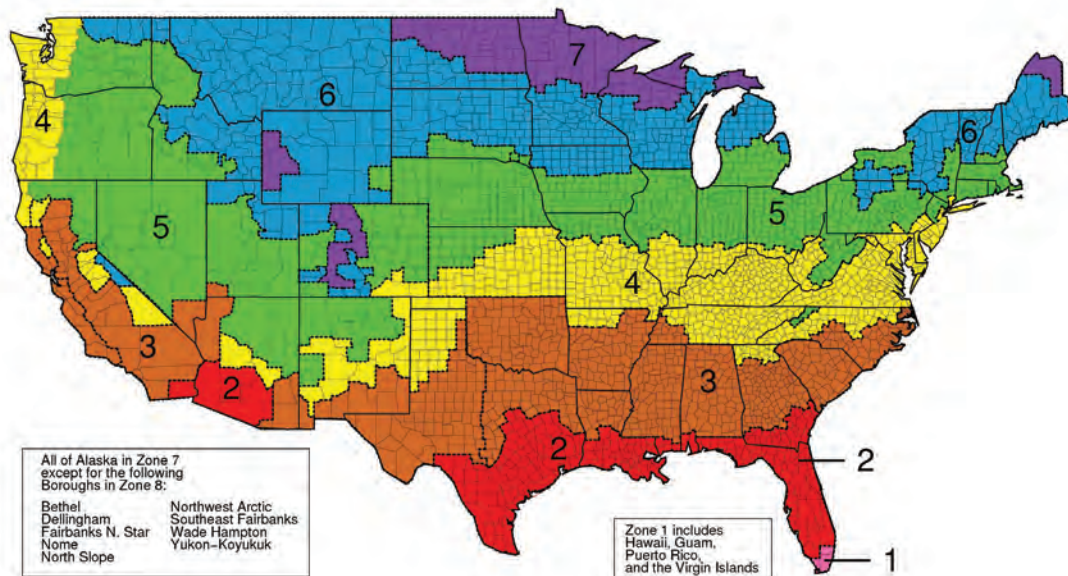


Figure 4. U.S. Climate Zone Map  
Source: <http://resourcecenter.pnl.gov/>, 4/17/2011

## Why choose polyiso?

Not all continuous insulation materials are equal. For example, the following two points demonstrate the superior value of polyisocyanurate insulation for continuous insulation on exterior wall assemblies:

- **The highest R-value in class**  
Polyiso delivers a high R-value per inch compared to other types of continuous insulation. This means more energy savings and/or more manageable wall thicknesses. Thinner, energy efficient walls using polyiso continuous insulation create more usable floor area within the footprint of the building. Also, cladding materials are more easily installed over continuous insulation products with thinner profiles like polyiso. Simply put, there's more **bang for the buck** with polyisocyanurate continuous insulation wall sheathing.
- **Code-compliant wind pressure resistance**  
Foam sheathing industry testing<sup>2</sup> for code compliance at an independent laboratory has demonstrated that polyisocyanurate continuous insulation provides code-compliant wind pressure resistance for exterior wall sheathing.
- **Wall moisture-resistant design flexibility**  
Polyiso is available with a variety of facer types to provide water resistive barrier performance or to provide water vapor permeability as required by climate or code-compliant wall design preferences.
- **Fire Test Compliant**  
Polyiso, a thermoset material, stays intact during fire exposure in the ASTM E84 or "Tunnel Test." It forms a protective char layer and remains in place during this test, thereby meeting all building code requirements and contributing to a fire-safe building. For more information on polyiso's performance in fire tests, consult the Technical Bulletins section of [polyiso.org](http://polyiso.org).

2. <http://www.foamshathing.org/> (4/17/2011)

While not all continuous insulation materials are equal, continuous insulation as a product class offers many advantages over other types of wall sheathing. Some of these advantages were discussed earlier. For more information on the advantages of continuous insulation over other non-continuous insulation wall sheathing choices, refer to “Overview of Wall Sheathing Options: The Value of Foam Sheathing as a Wall Covering.”<sup>3</sup>

3. [http://www.foamsheathing.org/tech\\_info/OverviewofWallSheathingOptions.pdf?PHPSESSID=5a3ak3njtrrggtiuef6t77h0k0](http://www.foamsheathing.org/tech_info/OverviewofWallSheathingOptions.pdf?PHPSESSID=5a3ak3njtrrggtiuef6t77h0k0) (6/15/2011)

## ABOUT PIMA

Since 1987, PIMA has served as the voice of the North American rigid polyiso insulation industry. PIMA is a leading advocate for safe, cost-effective, sustainable, and energy-efficient construction. The Association is comprised of polyiso manufacturers and industry suppliers, and represents the public policy interests of its membership at the local, national, and international levels to advance high-performance building practices.

PIMA produces technical bulletins to address key topics related to polyiso insulation. These publications inform architects, specifiers, and contractors about the performance characteristics of polyiso insulation. Always consult individual manufacturers for product specific information, including product data sheets and installation instructions.

For more information on polyisocyanurate insulation, visit [www.polyiso.org](http://www.polyiso.org)

