PIMA Technical Bulletin #203

Comparing R-values of Polyiso and Other Board Insulation Products

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:

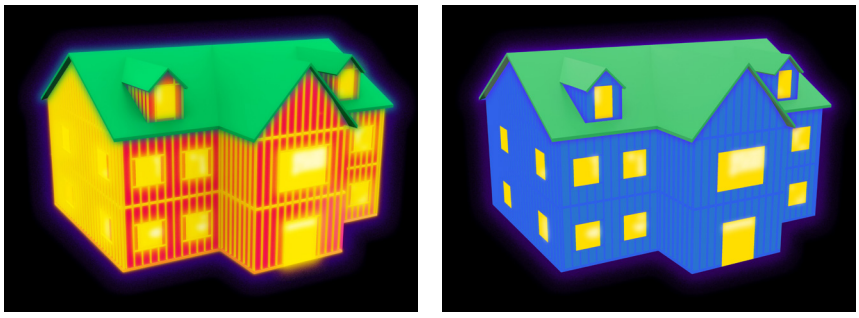
- High R-value per inch of thickness
- Excellent fire test performance
- Extensive building code approvals
- Cost-effective continuous insulation (ci) solution
- Compatible with most roof and wall systems
- Dimensional stability
- Compressive strength
- Moisture resistance
- Thinner walls and roofs with 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)

POLYISO

Surround yourself with the best.

Measuring Thermal Performance

An insulation material's resistance to heat flow is rated in terms of R-value – a higher R-value means greater insulating effectiveness (i.e., higher resistance to heat flow).



Heat loss can occur through a poorly insulated building envelope as well as thermal bridges created by structural framing (left image). Continuous insulation used across the building exterior provides additional thermal protection and reduces heat loss caused by thermal bridges (right image).

The requirements for measuring and reporting thermal resistance as well as minimum R-values for insulation products are contained in the applicable product standards. To comply with the requirements of the applicable product standards, insulation manufacturers use two primary metrics for determining thermal resistance:

1. Long-term thermal resistance (or LTTR); and
2. Thermal resistance (a conditioning period is used for certain product types).

Long-Term Thermal Resistance (LTTR): LTTR is a scientifically-supported, consensus-based method used to estimate the thermal resistance for insulation products with captive blowing agents at an age of 5 years, which corresponds closely to the average thermal resistance over a 15-year service life.

Thermal Resistance: Full thickness samples are subjected to thermal resistance testing under steady-state conditions in accordance with one of several test methods. For products containing a captive blowing agent, R-values are measured on full thickness samples following a 180-day conditioning period (that can be reduced to 90-days under an accelerated conditioning environment).

Additional information on R-value metrics and methods is available at: www.polyiso.org/page/R-VALUEMETRICS.

Note: The metrics and methods used to evaluate an insulation product's R-value can vary based on product type and jurisdiction. Always consult the manufacturer's product data sheets for information on R-value.

Comparing Thermal Performance

A number of board insulation products can be used as continuous insulation solutions for roofs and exterior wall systems. However, the R-values of various product categories are not equal. This technical bulletin compares the published R-values for the following product types:

- Polyiso insulation
- XPS insulation
- Mineral wool board insulation
- EPS insulation

ROOF INSULATION		
Type	**R-values** (1.0-inch/25mm thickness; @ 75° F)	**Notes**
Polyiso	**R-5.7** (LTTR-value)	• Manufacturers of polyiso roof insulation publish LTTR-values. • R-value increases exponentially with thickness due to the reduced contribution of more thermally conductive elements such as the facer and the denser cell structure in the foam near the surface.
Extruded Polystyrene (XPS)	**R-5.0**	
Expanded Polystyrene (EPS)	**R-4.2 to R-4.4**	• R-values typical of 20 to 25 psi EPS insulation boards. • Published R-values can vary based on product type and density.
Mineral Wool Board	**R-3.8**	• Published R-values can vary based on product type and density.

WALL INSULATION		
Type	**R-values** (1.0-inch/25mm thickness; @ 75° F)	**Notes**
Polyiso	**R-6.0 to R-6.5**	• Published R-values can vary based on facer type. • Manufacturers of polyiso wall insulation publish design thermal resistance values for the Canadian markets. • R-value increases exponentially with thickness due to the reduced contribution of more thermally conductive elements such as the facer and the denser cell structure in the foam near the surface.
Extruded Polystyrene (XPS)	**R-5.0**	
Expanded Polystyrene (EPS)	**R-4.2 to R-4.4**	• R-values typical of 20 to 25 psi EPS insulation boards. • Published R-values can vary based on product type and density.
Mineral Wool Board	**R-4.3**	• Published R-values can vary based on product type and density.

The information contained in this bulletin is based on data available through various manufacturer-published data sheets.

FTC R-value Rule

What you should know about R-values: R means resistance to heat flow. The higher the R-value, the greater the insulating power. Compare insulation R-values before you buy.

There are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house, your fuel use patterns and family size, proper installation of your insulation, and how tightly your house is sealed against air leaks. If you buy too much insulation, it will cost you more than what you'll save on fuel.

To get the marked R-value, it is essential that this insulation be installed properly.

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

PIMA
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