

Polyiso and Unfaced Mineral Wool Board Insulation in Commercial Roof Applications

Polyiso roof insulation is one of the most thermally efficient rigid board insulations. It exceeds most functional performance criteria when compared to unfaced mineral wool board specified for commercial roofs.

	Polyiso for Commercial Roofs	Unfaced Mineral Wool Board for Commercial Roofs
Thermal Performance (R-value)	★ The R-value per inch of Polyiso roof insulation ranges from 5.6 to 5.9 (0.99 to 1.04 Rsi), and is certified by PIMA's QualityMark ^{cm} certification program.	The R-value per inch of unfaced mineral wool board used for commercial roof applications is 3.8 (0.67 Rsi).
	POLYISO BENEFIT: The R-value per inch of Polyiso roof insulation provides over 45% more R-value than unfaced mineral wool board, meaning that less insulation and fewer truck loads of material are required.	
Fire Performance	★ Polyiso roof insulation is approved for thousands of building code-compliant roof assemblies, meeting all necessary safety requirements.	★ Unfaced mineral wool board is approved in numerous building code-compliant roof assemblies, meeting all necessary safety requirements.
	POLYISO BENEFIT: Polyiso roof insulation meets life and building safety standards established by the model building codes, Underwriters Laboratories (UL) and FM Approvals (FM) without compromising thermal insulation performance for unmatched versatility.	
Compressive Strength	★ With a typical compressive strength of 20 psi (138 kPa), Polyiso roof insulation is over 80% stronger than unfaced mineral wool board.	The compressive strength of unfaced mineral wool board is only 11 psi (76 kPa), and reduced thickness, through compression, can significantly reduce its insulation effectiveness. Insulation compression, as a result of foot traffic around mechanical fasteners, can also result in membrane damage and puncture.
	POLYISO BENEFIT: Polyiso roof insulation has a high compressive strength, meaning it resists damage and deformation during installation and is more likely to meet short- and long-term design installation requirements.	
Weight Per Installed R-value	★ With an R-value of 11.4 (2.01 Rsi), 2 in. (51 mm) of 4 ft. x 8 ft. (1.2 m x 2.4 m) Polyiso roof insulation weighs 10.6 lbs. (4.8kg).	To match an equivalent R-value of 11.4 (2.01 Rsi), unfaced mineral wool board must be 3 in. (76 mm) thick, but is only 4 ft. x 4 ft. (1.2 m x 1.2 m) and weighs 50 lbs. (23 kg) - almost 5 times greater than a 4 ft. x 8 ft. Polyiso board of equivalent R-value.
	POLYISO BENEFIT: When covering the same roof area with an equivalent R-value, unfaced mineral wool board is over 4 1/2 times heavier than Polyiso roof insulation and requires twice as many boards, making it more difficult to handle and costly to install. With unfaced mineral wool board, the structure must be designed to hold this increased dead load.	

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Water Resistance	★ The closed cell structure of Polyiso rigid foam is resistant to water absorption.	Unfaced mineral wool board has an open fibrous structure that is susceptible to water absorption.
	POLYISO BENEFIT: The low water absorption of Polyiso foam results in more stable R-value and retention of mechanical strength compared to unfaced mineral wool board.	
Environmental Benefit	★ Polyiso roof insulation requires less energy to manufacture and has a low Global Warming Potential (GWP).	On an equivalent R-value basis, unfaced mineral wool board requires over 85% more energy to produce and has a GWP over 3 times higher than Polyiso roof insulation.
	POLYISO BENEFIT: Polyiso roof insulation has a lower net environmental impact than unfaced mineral wool, with less embodied energy and a lower GWP.	
Value	★ Polyiso roof insulation offers a lighter-weight, larger (4 ft.x8 ft./1.2 m x 2.4 m) insulation product that has a greater R-value per inch at nearly half the cost of unfaced mineral wool board.	Unfaced mineral wool board offers a heavier, smaller (4 ft.x4 ft./ 1.2 m x 1.2 m) insulation product that has a lower R-value per inch at nearly twice the cost of Polyiso roof Insulation.
	POLYISO BENEFIT: Polyiso is a higher-performing roof insulation that reduces material and labor costs.	

While Polyiso roof insulation and unfaced mineral wool board insulations are both used in a wide variety of commercial building roofing systems, they do not perform in the same way.

Polyiso rigid foam insulation is an engineered composite specifically designed for each type of building envelope application. The versatility of the product is demonstrated by the many building envelope applications in which it is commonly used.

Unfaced mineral wool board insulation is made from stone or slag that is spun into a fiber-like structure, with an R-value of 3.8 per inch (0.67 Rsi). Inorganic rock or slag is the main component, and the remaining organic content includes a thermosetting resin urea-extended phenol formaldehyde binder (an adhesive) and other components to increase resistance to liquid water and water vapor.

R-value

Polyiso roof insulation provides a high R-value per inch compared to other insulation products. Polyiso's R-value also increases with the thickness of the foam, so three inches of Polyiso has a higher R-value per inch than two inches. This increased efficiency can be useful when specifying insulation for high R-value roof sections. The R-value per inch of Polyiso roof insulation ranges from 5.6 to 5.9 (.99 to 1.04 Rsi).

In addition, all manufacturing members of the Polyisocyanurate Insulation Manufacturers Association are eligible to participate in the PIMA QualityMark^{cm} certification program to certify the Long-Term Thermal Resistance (LTTR) values of their Polyiso roof insulation products through an independent third party. This program was designed to be a benchmark for all roof insulations. The certification gives consumers an easy way to identify quality products that have LTTR values which are compliant with the PIMA QualityMark^{cm} certification process.

The R-value of unfaced mineral wool insulation is a constant R-3.8 (0.67 Rsi) per inch, does not increase with thickness and is not certified by a third-party independent program.

POLYISO BENEFIT: The R-value per inch of Polyiso roof insulation is over 45 percent higher than unfaced mineral wool board. With Polyiso, less material is needed for a higher-performing thinner roof section. This also aids when specifying tapered insulation to improve roof drainage, reducing problems with parapet height limits.

Fire Performance

Polyiso roof insulation meets the requirements of the stringent FM and UL fire tests required to demonstrate compliance with building codes for commercial buildings. It is unmatched in versatility. As a result, there are over 500,000 listed assemblies where it is used, providing many roof design options for architects and specifiers.

Unfaced mineral wool board insulation also meets the requirements of fire tests, however, is in less than 20 percent of approved assemblies when compared with Polyiso.

POLYISO BENEFIT: Roof assemblies with Polyiso insulation have successfully passed many stringent FM and UL fire tests, as required by the International Building Code. It can be used in the widest variety of code-approved building assembly options by architects and specifiers.

Compressive Strength

The compressive strength of Polyiso roof insulation—typically 20 psi (138 kPa)—far exceeds that of unfaced mineral wool board, which is only 11 psi (76 kPa). The high compressive strength of Polyiso roof insulation reduces the risk of job-site damage and makes mechanical attachment more reliable and consistent.

A combination of mechanical loading and exposure to moisture can reduce the compressive strength of unfaced mineral wool board by over 80 percent, creating leaks due to exposed fasteners and unavoidable roof traffic.

POLYISO BENEFIT: Polyiso roof insulation has a high compressive strength, meaning it resists damage during installation. Soft, deformed insulation can happen with unfaced mineral wool board, thus, creating thermal shorts and reduced insulation effectiveness along with the risk of leaks due to exposed fasteners.

Weight Per Installed R-Value

Polyiso roof insulation is strong but very light. For example, an R-value of 11.4 (2.01 Rsi) Polyiso board that is 2 in. (51 mm) thick and measures 4 ft. x 8 ft. (1.2 x 2.4 m) weighs 10.6 lb. (4.8 kg). By contrast, for an equivalent R-value, an unfaced mineral wool board is 3 in. (76 mm) thick **but** measures only 4 ft. x 4 ft. (1.2 m x 1.2 m) and weighs 50 lbs. (23 kg). [Note, unfaced mineral wool board is not available in 4 ft. x 8 ft. (1.2 m x 2.4 m) sheets.] The added weight may also require additional structure to support the extra dead load from the unfaced mineral wool board insulation. For example:

- 100 squares (10,000 square feet) of R-20 Polyiso roof insulation weighs 5,800 pounds.
- 100 squares (10,000 square feet) of R-20 unfaced mineral wool board weighs 54,800 pounds, adding almost 25 tons of additional deadweight to a building

POLYISO BENEFIT: For the same R-value, Polyiso roof insulation is 40 percent thinner and over 75 percent lighter than unfaced mineral wool board roof insulation. Compared with Polyiso, it takes 100 percent more unfaced mineral wool boards to cover the same roof area. With Polyiso, the result is easier handling, less expensive fasteners and faster installation, thus reducing the installed cost.

Water Resistance

Fibrous insulations, such as unfaced mineral wool, are—by design—porous materials. This allows the movement of water through the product.

POLYISO BENEFIT: Given its resistance to liquid water, the thermal insulation value of a Polyiso roof insulation is more stable than that of unfaced mineral wool board. Architects, specifiers and builders can depend on the thermal value of Polyiso insulation.

Environmental Advantage

The Polyisocyanurate Insulation Manufacturers Association has completed third-party-verified ISO compliant Environmental Product Declarations (EPD) for Polyiso roof and wall insulations as manufactured by PIMA members across North America. An EPD is an internationally recognized standardized tool that reports the environmental impacts of products. A similar EPD has been published for mineral fiber board insulation. A simple comparison shows the clear environmental benefits of Polyiso roof insulation over mineral fiber board products: Polyiso production requires less energy and has a lower GWP.

POLYISO BENEFIT: Polyiso saves energy in the long run because of its high efficiency, and its advantage is further enhanced because it has lower embodied energy and lower Global Warming Potential.

Remember, when it comes to selecting the best overall insulation for roofs, Polyiso is the product of choice and outperforms unfaced mineral wool in environmental performance.

Value

Polyiso roof insulation offers unmatched performance and value:

- Highest R-value per inch of any commonly used rigid foam insulation.
- High compressive strength and resists damage during and after installation.
- Lighter and easier to handle on the job site.
- Certified PIMA QualityMark^{cm} program

PIMA

For more than 30 years, PIMA (Polyisocyanurate Insulation Manufacturers Association) has served as the unified voice of the rigid polyiso industry proactively advocating for safe, cost-effective, sustainable and energy-efficient construction. PIMA's membership includes manufacturers of polyiso insulation and suppliers to the industry. The products of PIMA's members comprise the majority of the polyiso produced in North America.

PIMA produces technical bulletins to address frequently asked questions about polyiso insulation. These publications update and inform architects, specifiers, and contractors about and build consensus on the performance characteristics of polyiso insulation. Individual companies can provide specific information about their respective polyiso products.



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