



## PIMA | TECHNICAL BULLETIN 104

### FIRE PERFORMANCE IN ROOF SYSTEMS

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Polyiso roof insulation represents over 50% of all insulation used in new roof construction and at least 40% of all insulation used in re-roofing applications.

Polyiso insulation, introduced over 20 years ago, gained acceptance by the construction industry primarily because of its excellent R-value and superior performance in fire tests. It offered a cost-effective product since it was approved for installation directly to the steel roof deck, i.e., without the need for a thermal barrier.

Polyiso insulation presents many superior features that designers need when specifying insulation for use in roof systems:

- Excellent fire test performance
- Dimensionally stable
- Preferred compressive strength
- Moisture resistance
- Extensive building code approvals
- Cost effective insurance ratings
- Superior R-value and thermal performance
- Unaffected by commonly used construction adhesive and solvents

Because of continuous improvement in the product and years of rigorous testing, POLYISO OFFERS THE MOST EXTENSIVE RANGE OF CODE APPROVALS FOR INSULATION USE IN ROOF SYSTEMS. It remains the only foam plastic insulation product for direct application to steel deck to earn FM Approval for Class 1 Roof Systems. Polyiso is also classified by UL for use in roof systems with direct-to-steel-deck applications of foam plastic insulation under both single-ply and asphalt-based roof coverings.

#### **Polyiso Insulation is the Best Choice for Roof Systems**

##### *Polyiso is Used in All Types of Roof Systems*

For new construction or re-roof projects, polyiso is the only foam plastic insulation that is used in all types of roof systems:

- **Built-up Roofs:** Polyiso has high-temperature stability and will not melt like thermoplastic insulation when hot mopped with asphalt.
- **Modified Bitumen Roofs:** Polyiso performs successfully in modified bitumen systems, which are attached with high temperature methods or with hot asphalt.
- **Bitumen Roofs:** Polyiso performs successfully in modified bitumen systems, which are attached with high temperature methods or with hot asphalt.
- **Singly-ply Roofs:** Polyiso can be used in all three types of single-ply systems: loose-laid ballasted, fully adhered, and mechanically attached. Polyiso is unaffected by properly applied construction adhesives and can be used without the need for a cover board.
- **Metal Roofs:** Polyiso has excellent dimensional stability, which is important for these systems.

It is best to consult the specific polyiso manufacturer for its list of approvals for use in the desired system.

##### *Polyiso is Easy to Specify*

Polyiso insulation meets the requirements of ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board. By specifying insulation products for the roofing system with ASTM C1289, you can be assured that you have the best insulation product for the project.

## The Importance of Building Codes in Construction

Building codes are in place to provide a means to safeguard life and to protect the public welfare through regulating the design, construction practices, construction material quality (including fire performance), location, occupancy, and maintenance of buildings and structures. When regulating materials, many of the model building codes refer to quality standards developed by standard-setting organizations such as the American Society for Testing and Materials (ASTM). Some building codes and insurance rating organizations also rely on test information from Factory Mutual Research (FM) and Underwriters Laboratories Inc. (UL).

### Foam Plastic Insulation and Building Codes

The three model building codes--ICBO, BOCA, and SBCCI--include a specific section pertaining to the safe use of foam plastics in construction.

Generally, the codes require that the foam core have a flame spread rating of 75 or less and a smoke development rating of 450 or less, when tested in accordance with ASTM E84. Further, all foam plastics must be separated from the interior of a building by an approved thermal barrier such as 1/2 inch gypsum board. For roofing applications, the smoke development rating does not apply. The elimination of the thermal barrier is allowed only under very specific conditions.

#### *Direct Application of Foam Plastic Insulation to Steel Decks*

Polyiso is still the **only** foam plastic insulation product to have direct-to-steel-deck approvals from **both** FM and UL. FM approval for Class 1 roof systems was granted by passing FM 4450 and UL approval was earned by passing UL 1256. Both of these tests are specifically referenced in many building codes.

For example, in the BOCA National Building Code (Section 2603.4.1.5), the requirements for a thermal barrier: "are not applicable to foam plastic roof insulation used in roof deck construction that complies as an assembly with FM 4450 or UL 1256. For all roof applications, the smoke developed rating shall not be applicable."

Both SBCCI and ICBO have similar requirements. Polyiso insulation first successfully passed UL 1256 over 15 years ago and today satisfies the major share of the market's demand for "direct-to-steel-deck" applications.

#### *Importance of FM 4450 Calorimeter Test and UL 1256 Resistance to Interior Fire Spread Test*

The spread of fire on the underside of a roof deck is a concern when buildings have large, open interior space, such as a warehouse or manufacturing facility. The two fire tests used by code bodies to evaluate the spread of fire in this manner are FM 4450 (also called the FM Calorimeter Test) and UL 1256 (also known as the Resistance to Interior Fire Spread Test). While both tests evaluate the entire roof assembly from deck to roof covering, the test conditions and test pass criteria are very different:

--	FM 4450	UL 1256
Exposed Sample Size	4 feet x 4 feet	1.48 feet x 24 feet
Test Duration	30 minutes	30 minutes
Fuel Source/Rate (Btu/min.)	Heptane/Propane / 26,400	Natural Gas / 5,000
Temperature @ 10 minutes	1500 degrees F	580 degrees F
Temperature @ 30 minutes	1600 degrees F	NA
Pass Criteria	No external flaming; no dropping of flaming particles into the furnace	Flame spread @ 10min. less than 10 feet; 30 mins. flame spread less than 14 feet; subjective on thermal degradation and "combustive" damage
Pass Criteria, Maximum Fuel Contribution (Btu/ft <sup>2</sup> /min.)	3 minutes 410 5 minutes 390 10 minutes 360 30 minutes 285 (avg.)	NA

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*The Polyisocyanurate Insulation Manufacturers Association (PIMA) produces technical bulletins in an effort to address frequently asked questions about polyiso insulation. PIMA's technical bulletins are published to help expand the knowledge of specifiers and contractors and to build consensus on the performance characteristics of polyiso. Individual companies should be consulted for*

*specifics about their respective products.*

*The Polyisocyanurate Insulation Manufacturers Association (PIMA) is the North American trade association that advances the use of polyisocyanurate (polyiso) insulation. Polyiso is one of the nation's most widely used and cost-effective insulation products available.*

*PIMA's membership consists of manufacturers of polyiso insulation and suppliers to the industry. Our members account for a majority of all of the polyiso produced in North America.*

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