

# Class 1 and Class A Roof Assemblies are Not the Same

## About Polyiso Insulation

Polyiso is a rigid foam insulation used in over 70% of commercial roof construction, in commercial sidewall construction and in residential construction.

The Benefits of using Polyiso include:

- Quality Mark™ certified LTTR-values
- Highest R-value per inch of thickness
- Excellent fire test performance
- Moisture resistant
- Dimensional stability
- Superior compressive strength
- Extensive building code approvals
- Cost effective
- Recycled content
- Zero ozone depletion potential
- Virtually no global warming potential
- Preferred insurance ratings
- Nationwide availability
- Thinner walls and roofs with shorter fasteners
- Compatible with most roofing systems

PIMA and polyiso products have received many environmental awards. These include an honorable mention in the Sustainable Buildings Industry Council's (SBIC) 2003 "Best Practice" Sustainability Awards Program and the U.S. EPA's Climate Protection Award for the association's leadership in promoting energy efficiency and climate protection. The EPA also awarded PIMA and its members the Stratospheric Ozone Protection Award for "leadership in CFC phase-out in polyiso insulation and in recognition of exceptional contributions to global environmental protection."



Building owners, specifiers, roof contractors and designers have many factors to consider when selecting a roof system: climate, building location and size, single ply or built-up or modified bitumen, mechanically attached or fully adhered, cap sheets or not, expected roof lifetime, and desired warranties. While the list can go on and on, there is one important factor that cannot be ignored – **the fire performance of the roof system.**

An often confusing issue is whether a "Class 1 roof" is the same as a "Class A roof". The distinction between these types of roof classifications becomes even more critical when the roof system contains foam plastic insulation, such as polyiso. One of the most important aspects to remember is this: not all Class A roof systems meet Class 1. For example, while roof assemblies containing polystyrene insulation can meet Class A, there are no roof assemblies with polystyrene insulation applied direct to a steel deck that qualify as a Class 1.

## Understand the differences between a Class 1 and a Class A roof assembly containing foam plastic:

- **A Class A rating is only for external fire performance** and is governed by compliance to either the UL 790 standard or ASTM E 108 standard. A Class A rating does not ensure building code compliance.
- **FM Class 1 requires that a roof deck assembly is subjected to a series of tests** – internal fire, external fire, wind uplift resistance, foot traffic, corrosion resistance, impact resistance, and susceptibility to heat damage – as described in FM 4470 Approval Standard for Class 1 Roof Covers. A roof assembly must pass all these tests in order to gain a Class 1 designation. For insulated steel roof deck assemblies, FM Class 1 includes FM 4470 and FM 4450 Approval Standard for Class 1 Insulated Steel Decks Roofs.
- **While a Class 1 assembly can be substituted for a Class A, B or C roof assembly, a Class A, B or C assembly cannot be substituted for a Class 1 roof assembly.**
- **Remember that in all cases, the roof assembly must be installed as tested.** Substitution of any component, such as insulation type and thickness, in tested roof assemblies can only be granted by FM or UL and may require additional testing. Failure to gain approval for the component substitution from FM or UL may impact insurance coverage and could result in violation of local building codes.

1 Sloan, D. E. (2005, May). The UL story: part 1. Professional Roofing. Retrieved on July 25, 2005, from the World Wide Web: ([http://www.professionalroofing.net/article.aspx?A\\_ID=641](http://www.professionalroofing.net/article.aspx?A_ID=641))

## Fire Testing of Roof Assemblies

There are two important fire assessments regarding steel deck roof assemblies: external spread of flame on the roof covering surface and below roof deck spread of flame.

### External Spread of Flame

The exterior spread of flame fire test on a complete roof assembly is determined using either ASTM E 108 or UL 790. The result of this fire test is expressed as Class A, B, or C, with Class A described as “effective against severe fire exposure.<sup>1</sup>”

ASTM E 108 and UL 790 include three test procedures: Spread of Flame, Intermittent Flame, and the Burning Brand. During all fire tests, there can be no flaming or glowing wood particles falling off the underside of the test deck; the roof deck cannot become exposed; and portions of the deck must not fall or break away in the form of glowing particles.

**Table 1: ASTM E108 and UL 790**

	Fire Exposure* Flame Spread	Allowable
<b>Class A</b>	1400 F/10 min.	6 feet maximum
<b>Class B</b>	1400 F/10 min.	8 feet maximum
<b>Class C</b>	1300 F/4 min.	13 feet maximum

\*All tests conducted at 12 mph wind

The spread of flame portion is the only test conducted on roof assemblies with non-combustible (concrete, steel, or gypsum) decks. Test conditions and pass criteria are shown in Table 1.

For roof assemblies with combustible decks (wood, plank, T&G), ASTM E 108 and UL 790 require two additional fire tests: 1) an intermittent flame test, in which the flame is turned on and off during the duration of the test, and 2) the “burning brand test,” which measures the ability of the roof assembly to resist fire from flaming embers.

**Table 2: Comparison of FM 4450 and UL 1256**

	FM 4450 Approval Standard for Class 1 Insulated Steel Decks	UL 1256 Fire Test of Roof Deck Constructions
<b>Roof Assembly Test</b>	Yes	Yes
<b>Tested Properties</b>	Under deck fire; Wind uplift; Live load resistances; Corrosion of metal parts; Fatigue of plastic parts	Under deck fire only
<b>Decks</b>	Steel	Metallic & Non-Metallic
<b>Ratings</b>	Class 1 if all tested properties meet test criteria	“Pass” or “Fail”
<b>Component Substitution</b>	Only if approved by FM	Only if classified as such by UL

### Below Roof Deck Spread of Flame

FM 4450 and UL 1256 are used to judge the contribution of the roof assembly components to the spread of fire within a building. An examination of the scope of each test method shows that FM 4450 is a much more stringent and extensive test than UL 1256. See Table 2.

### Elimination of Thermal Barrier

According to building codes, roof assemblies incorporating foam plastic insulation installed on a steel deck must include a thermal barrier, typically 1/2 inch gypsum board or equivalent, between the deck and the foam plastic insulation. The thermal barrier may be eliminated if the *complete roof assembly* passes either FM 4450 or UL 1256. Note that although both FM 4450 and UL 1256 are conducted

on a specific roof assembly, passing either test without a thermal barrier in one tested roof assembly does not mean the thermal barrier may be eliminated in all roof assemblies. Specific roof assemblies that have passed FM 4450 may be found in the FM Approval Guide or the web-based FM RoofNav roof assembly search tool. Those that have passed UL 1256 may be found in the UL Roofing Materials & Systems Directory.

## For More Information

Class 1 and Class A roof assemblies are not the same. For additional details, please see the PIMA website ([www.pima.org](http://www.pima.org)) or contact a polyiso insulation manufacturer.

## Glossary

ASTM E108 *Standard Test Methods for Fire Tests of Roof Coverings*

FM – Factory Mutual Global; [www.fmglobal.com](http://www.fmglobal.com)

FM 4450 *Approval Standard for Class 1 Insulated Steel Decks Roofs*

FM 4470 *Approval Standard for Class 1 Roof Covers*

UL – Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com)

UL 1256 *Fire Test of Roof Deck Constructions*

UL 790 *Standard for Standard Test Methods for Fire Tests of Roof Covering*

## PIMA

For over 20 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 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.

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.

## SAFETY

Polyiso insulation, like wood and other organic building materials is combustible. Therefore, it should not be exposed to an ignition source of sufficient heat and intensity (e.g., flames, fire, sparks, etc.) during transit, storage or product application. Consult the product label and/or the PIMA members' Material Safety Data Sheets (MSDS) for specific safety instructions. In the United States, follow all regulations from OSHA, NFPA and local fire authorities; in Canada, follow all regulations from Health Canada Occupational Health and Safety Act (WHMIS) and local fire authorities.

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



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