

Class 1 and Class A Roof Assemblies are Not the Same

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)
- QualityMark^{CM} certified LTRR-values

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.



Surround yourself with the best.

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)

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.”¹

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
Class A	1400 F/10 min.	6 feet maximum
Class B	1400 F/10 min.	8 feet maximum
Class C	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
Roof Assembly Test	Yes	Yes
Tested Properties	Under deck fire; Wind uplift; Live load resistances; Corrosion of metal parts; Fatigue of plastic parts	Under deck fire only
Decks	Steel	Metallic & Non-Metallic
Ratings	Class 1 if all tested properties meet test criteria	“Pass” or “Fail”
Component Substitution	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) 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

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

UL 1256 *Fire Test of Roof Deck Constructions*

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

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.

For more information on polyisocyanurate insulation, visit www.polyiso.org



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