

UL Approvals

Underwriters Laboratories (UL) is chartered as a non-profit independent organization testing for public safety. It maintains and operates laboratories for the examination and testing of devices, systems, and materials to determine their relation to life, fire, and casualty hazards as well as crime prevention. UL's findings are recognized by insurance rating bureaus and many federal agencies, state, county, and municipal authorities, and inspectors. There are three areas of testing by UL that affect Siplast Lightweight Insulating Concrete Systems. They are: fire resistance ratings, roofing materials classifications, and wind uplift/fire classifications.

In addition to the testing function, UL maintains a Follow-Up Service. This service is designed to be a check on the means the manufacturer exercises to determine compliance of a product with requirements for approval established by UL. As part of the Follow-Up Service, UL conducts inspections and testing of products at the manufacturer's plant. Manufacturers are then authorized by UL to attach labels or markings to approved products to indicate the product's compliance with UL requirements. Siplast Lightweight Insulating Concrete Systems are maintained under such a Follow-Up Service with UL. Listed below are the Follow-Up Service report numbers for various products used in Siplast Lightweight Insulating Concrete Systems.

<u><i>File No.</i></u>	<u><i>Product</i></u>
R18128	Insulperm
R15948	ZIC Concrete Aggregate NVS Concrete Aggregate
R15949	Insulcel and Zonocel Concrete

Fire Resistance Ratings

The UL fire resistance test provides an indication of the length of time it would take an interior building fire to cause structural damage and collapse of the construction system. The test procedure is described as UL 263 and is also known as ANSI A2.1, ASTM E 119, and NFPA 251. During this test, fire temperatures on the underside of the roof assembly reach 1000° F at 5 minutes, 1400° F at 15 minutes, 1550° F at 30 minutes, 1700° F at 60 minutes, 1850° F at 120 minutes, 1925° F at 180 minutes, and 2000° F at 240 minutes. The maximum time the assembly can withstand these temperatures without an opening being created (allowing gases to pass into an adjacent area), or without sufficient heat being generated (which will ignite adjacent combustible material), or without structural collapse of the system determines the fire resistance rating for the assembly.

Several important points relate to the use of fire rated constructions:

1. Fire resistance ratings apply only to assemblies in their entirety. Individual components are not assigned a fire resistance rating and are not intended to be interchanged between assemblies. Rather, individual components are designated for use in a specific design, in order that its rating may be achieved. UL has established specific procedures for transferring rated beams from certain designs in place of the structural supports for roof assemblies.
2. Most roof insulation assemblies are tested with a Class C roofing material covering the assembly. The fire resistance rating developed also applies to a Class A or Class B roofing material.
3. Unless specifically described in a design, the addition of insulation in the concealed space between the ceiling membrane and the roof structure may reduce the hourly rating of an assembly by causing premature disruption of the ceiling membrane and/or higher temperatures on structural components under fire exposure conditions.
4. During fire resistance tests, the assembly is loaded with weight so that structural beams or bar joists and decking are stressed to 100% of their steel design value. For beams, that number is 36,000 psi for fiber stress in bending. The fiber stress in bending for I series bar joists is 22,000 and for H series bar joists it is 30,000 psi. Some fire resistance ratings show a design loading of 50% or 75%. The percentage is applied to the bending stress for the structural member, and not to the design vertical loading for the structure in pounds per square foot. An engineer must check to see if the vertical live plus dead load causes the structural member's allowable bending stress to exceed the percentage of stress shown in the design.

Restrained vs. Unrestrained Ratings

Most fire rated designs show an hourly rating for restrained and unrestrained conditions. Restrained and unrestrained conditions refer to the boundary support resistance provided to the structural members when exposed to elevated temperatures created by a fire. Consult your local building code authority for help in determining whether the building should be designed for restrained or unrestrained conditions.

Roof Covering Material Classification

When UL conducts a fire resistance rating test of a roof insulation construction, a Class C built-up roof is applied to the rooftop construction. UL also recognizes Class A or B roofing materials as being acceptable substitutes in fire resistance construction. UL Class A, B, or C roof coverings are only evaluated with respect to fire resistance from external sources. Following are the UL definitions of these classes.

- Class A** Includes roof coverings that are effective against severe fire exposures. Under such exposures, roof coverings of this class are not readily flammable and do not carry or communicate fire, afford a fairly high degree of fire protection to the roof deck, do not slip from position, possess no flying brand hazard, and do not require frequent repairs in order to maintain their fire resistant properties.
- Class B** Includes roof coverings that are effective against moderate fire exposures. Under such exposures, roof coverings of this class are not readily flammable and do not readily carry or communicate fire, afford a moderate degree of fire protection to the roof deck, do not slip from position, possess no flying brand hazard, but may require infrequent repairs in order to maintain their fire resistant properties.
- Class C** Includes roof coverings that are effective against light fire exposure. Under readily carry or communicate fire, afford some degree of fire protection to the roof deck, do not slip from position, possess no flying brand hazard, and may require occasional repairs or renewals in order to maintain their fire resistant properties.

Classified Roof Deck Construction

UL also identifies roof deck constructions meeting requirements regarding the spread of fire on the underside of an assembly and resistance to wind uplift. These constructions are listed by construction number in the UL [Building Materials and Systems Directory](#).

UL investigates spread of fire on the underside of an assembly using a tunnel furnace following procedures described under UL's "Outline of Investigation for Roof Deck Construction, Subject 1256." A fire classified construction primarily determines whether the contribution to an igniting fire by any or all of the materials in the assembly is sufficient to cause propagation of flame on the underside of the assembly in excess of the limits established in Subject 1256.

UL also investigates roof deck constructions' uplift resistance to both external and internal pressure on the deck associated with high velocity winds. The uplift classifications are derived in accordance with UL Standard 580 entitled "Tests for Wind Uplift Resistance of Roof Assemblies." The test method simulates the effect of wind gusts by the use of oscillating internal and external pressure.

Roof deck assemblies are classified as Class 30, Class 60 or Class 90. The normal uplift pressures commonly related in technical studies and literature are:

<u>Rating</u>	<u>Nominal Uplift Pressure</u>
Class 30	30 psf
Class 60	60 psf
Class 90	90 psf

Siplast Lightweight Insulating Concrete Systems

Siplast Lightweight Insulating Concrete Systems are fire classified according to Subject 1256 and have a Class 90 wind uplift rating as shown in Construction Number 110. A copy of Construction 110 is included in this section.

Siplast Lightweight Insulating Concrete Systems are also listed under numerous fire resistance rated assemblies. Table 1 summarizes existing fire rated assemblies. Following the table are copies of commonly used Siplast UL Design Numbers.

Table 1
Fire Resistance Ratings

Assembly Rating
(see Table A)

UL Design No.	Structural Substrate	Ceiling Condition	Insulating ZIC	Concrete NVS	Insulcel	Zonocel	Restrained Hourly Ratings	Unrestricted Hourly Ratings	Maximum Insulperm Thickness (inches)	Minimum Steel Deck Size	Minimum Bar Joist/ Beam Size	Maximum Bar Joist/ Beam Spacing
Fire Rated Designs Allowing the Use of Insulperm												
D708	Steel/Concrete	Exposed	Y	Y	Y	NO	3	1-1/2,3	8	1-1/2"-22ga	W10X17	
D916	Steel/Concrete	Exposed	Y	Y	Y	Y	3/4,1,1-1/2,2,3	0	8	1-1/2"-22ga	W8X28	
D923	Steel/Concrete	Exposed	Y	Y	Y	Y	3/4,1,1-1/2,2,3	0	8	1-1/2"-22ga	W8X28	
D925	Steel/Concrete	Exposed	Y	Y	Y	Y	3/4,1,1-1/2,2,3	0	8	1-1/2"-22ga	W8X28 OR 10K1	
D927	Steel/Concrete	Exposed	Y	Y	Y	Y	3/4,1,1-1/2,2,3	0	8	1-1/2"-22ga	W8X28	
P708	Precast Concrete	Exposed	Y	Y	Y	Y	1,1-1/2,2	1,1-1/2,2	See Table B	N/A	N/A	N/A
P810	Precast Concrete	Exposed	Y	Y	Y	Y	1,1-1/2,2	1,1-1/2,2	See Table B	N/A	N/A	N/A
P905	Precast Concrete	Exposed	Y	Y	Y	Y	2	1/2	See Table B	N/A	N/A	N/A
P910	Precast Concrete	Exposed	Y	Y	Y	Y	1,1-1/2,2	1	See Table B	N/A	N/A	N/A
P913	Precast Concrete	Exposed	Y	Y	Y	Y	1,1-1/2,2	1,1-1/2	See Table B	N/A	N/A	N/A
P916	Precast Concrete	Exposed	Y	Y	Y	Y	1,1-1/2,2	1,1-1/2	See Table B	N/A	N/A	N/A
D750	Steel/Concrete	Exposed	Y	Y	Y	NO	2	1-1/2, 2	Unlimited	1-1/2 22ga	W8X21	12" o.c.
D902	Steel/Concrete	Exposed	Y	NO	NO	NO	1,1-1/2,2,3	0,1,1-1/2,2,3	8	1-1/2"-22ga	W8X28	
D922	Steel/Concrete	Exposed	NO	NO	Y	Y	3/4,1,1-1/2,2,3	0	8	1-1/2"-22ga	W8X28	
P231	Steel Deck	Suspended	Y	NO	Y	Y	1	1	8	15/16"-26ga	10J4 or 12K1	72"
P246	Steel Deck	Suspended	Y	NO	Y	Y	1	1	8	9/16"-28ga	8H3 or 10K1	72"
P251	Steel Deck	Suspended	Y	NO	Y	Y	2	2	8	9/16"-28ga	10H3 or W6X12	72"
P255	Steel Deck	Suspended	Y	NO	Y	Y	1	1	3	9/16"-28ga	8H3 or W8X15	72"
P261	Steel Deck	Suspended	Y	NO	Y	Y	1	1	8	9/16"-28ga	10H3 or W6X12	72"
P264	Steel Deck	Suspended	Y	NO	Y	Y	1	1	8	15/16"-26ga	W8X15	
P410	Steel Deck	Plaster	Y	NO	Y	Y	2	2	8	15/16" Note 3	10J4	Note 3
P509	Steel Deck	Gypsum Wallboard	Y	NO	Y	Y	1	1	8	15/16" Note 4	10J4	Note 4
P511	Steel Deck	Gypsum Wallboard	Y	NO	Y	Y	N/A	1	8	9/16"-28ga	8H3 or 7-1/4 [24"
P513	Steel Deck	Gypsum Wallboard	Y	NO	Y	Y	1-1/2	1-1/2	8	9/16"-28ga	10J4	48"
P902	Steel Deck	Exposed	NO	NO	Y	Y	1,1-1/2,2	0, Note 5	8	Note 6, 28ga	Note 7	96"
P919	Steel Deck	Exposed	Y	NO	Y	Y	1,1-1/2	0, Note 15	See Table B	15/16"- 26ga	12J4 or W6X16	Note 16,17
P920	Steel Deck	Exposed	NO	NO	Y	Y	1,1-1/2,2	0, Note 18	8	9/16", Note 19	Note 10	Note 13,17
P921	Steel Deck	Exposed	Y	NO	Y	Y	1,1-1/2,2	0, Note 15	8	Note 20, 28ga	Note 7	Note 13,17
P922	Steel Deck	Exposed	NO	NO	Y	Y	1,1-1/2,2	0, Note 15	8	Note 20, 28ga	Note 21	Note 22
P923	Steel Deck	Exposed	NO	NO	Y	Y	1,1-1/2,2	0, Note 23	8	Note 20, 28ga	Note 7	Note 22,17
P924	Steel Deck	Exposed	Y	NO	Y	Y	1,1-1/2,2	0, Note 23	8	Note 20, 28ga	W8X28	Note 24
P925	Steel Deck	Exposed	Y	NO	Y	Y	1,1-1/2,2	0	8	Note 18, 28ga	10K5 or W6X16	Note 22
P214	Steel Deck	Suspended	Y	NO	Y	Y	1	1	0	Note 1	10J4 or 12K3	Note 1
P215	Steel Deck	Suspended	Y	NO	Y	Y	2	2	0	9/16" - 28ga	10J3	48"

Table 1 continued
Fire Resistance Ratings

Assembly Rating
(see Table A)

UL Design No.	Structural Substrate	Ceiling Condition	Insulating ZIC	Concrete NVS	Insulcel	Zonocel	Restrained Hourly Ratings	Unrestrained Hourly Ratings	Maximum Insulperm Thickness (inches)	Minimum Steel Deck Size	Minimum Bar Joist/ Beam Size	Maximum Bar Joist/ Beam Spacing
Fire Rated Designs Not Allowing the Use of Insulperm												
P216	Steel Deck	Suspended	Y	NO	Y	Y	1	3/4	0	9/16" - 28ga	10J3	48"
P231	Steel Deck	Suspended	Y	NO	Y	Y	1,1-1/2	1,1-1/2	0	15/16" -26ga	10J4 or 12K1	72"
P241	Steel Deck	Suspended	Y	NO	Y	Y	2	2	0	9/16" - 28ga	10J3	48"
P269	Steel Deck	Suspended	Y	NO	Y	Y	1, 1-1/2	1, 1-1/2	8	15/16" – 26ga	10J4 or 12K1	4' o.c.
P405	Steel Deck	Plaster	NO	NO	Y	Y	3	3	0	9/16" - 28ga	10J3 or 10K1	48"
P406	Steel Deck	Plaster	NO	NO	Y	Y	3	2	0	N/A	8J2	24"
P407	Steel Deck	Plaster	NO	NO	Y	Y	2	2	0	9/16" - 28ga	10J2	48"
P812	Normal Weight	Exposed	Y	NO	Y	Y	2	1	0	N/A	N/A	N/A
P903	Steel Deck	Exposed	NO	NO	Y	Y	1	0, Note 8	0	1-1/4" -24ga	W12X27	
P936	Steel Deck	Exposed	Y	NO	Y	Y	1, 1-1/2, 2	0	8	28ga	10K1 or W6x16	Note 22
P907	Concrete	Exposed	NO	NO	Y	Y	1,1-1/2,2	0, Note 9	0	28ga, Note 6,11	Note 10	Note 11
J701	Concrete	Exposed	Y	NO	NO	Y	2	1	0	N/A	N/A	N/A
P908	Steel Deck	Exposed	Y	NO	Y	Y	1,1-1/2,2	0, Note 12	0	Note 6, 28ga	Note 14	Note 13

Notes:

- Max. 72" o.c. support spacing for 1 1/2-inch, 22-gauge steel deck.
Max. 48" o.c. support spacing for 9/16-inch, 28-gauge steel deck.
- Paper backed wire fabric.
- Max. 96" o.c. support spacing for 24-gauge steel deck.
Max. 66" o.c. support spacing for 26-gauge steel deck.
- Max. 60" o.c. support spacing for 24-gauge steel deck.
Max. 48" o.c. support spacing for 26-gauge steel deck.
- The Unrestrained Assembly Rating is equal to the Restrained Assembly Rating for 1 5/16-inch steel deck with clear spans £ 90-inch.
- When steel deck £ 1-inch is used, the Restrained Assembly Rating £ 1 1/2 hr.
- 12J4/W8 x 10 or W6 x 16.
- The Unrestrained Assembly Rating is equal to the Restrained Assembly Rating for 24-gauge steel deck with clear spans £ 78-inch.
- An Unrestrained Assembly Rating of 1 hr. is achieved for 1 5/16-inch, 24-gauge steel deck with clear spans £ 90-inch.
- W6 x 16, W8 x 10, W8 x 18, 12J4, 12K5, 14K3.
- For 2 hour Restrained Assembly Rating:
96" o.c. support spacing for 22-gauge 1 1/2-inch or 3-inch fluted steel deck.
96" o.c. support spacing for 24-gauge steel deck.
72" o.c. support spacing for 26-gauge steel deck.
For 1 hour Restrained Assembly Rating:
108" o.c. support spacing for 22-gauge 1 1/2-inch or 3-inch fluted steel deck.
108" o.c. support spacing for 24-gauge steel deck.
72" o.c. support spacing for 26-gauge steel deck.
- For 2 hour Unrestrained Assembly Rating: 1 5/16-inch steel deck w/clear span £ 91-inch supported by W6 x 18 or W8 x 18.
- For 1 1/2 hour Unrestrained Assembly Rating: 1/5/16-inch steel deck w/clear span £ 91-inch supported by 12J4.
- Max. 96" o.c. support spacing for 24-gauge steel deck.
Max. 72" o.c. support spacing for 26-gauge steel deck.
Max. 48" o.c. support spacing for 28-gauge steel deck.
- W6 x 16, W8 x 10, W8 x 18, 12J4, 14K4, 16K3.
- The Unrestrained Assembly Rating is equal to the Restrained Assembly Rating for clear spans £ 92-inch.
- Max. 96" o.c. support spacing for 24-gauge steel deck.
Max. 72" o.c. support spacing for 26-gauge steel deck.
- See U.L. Fire Resistance Directory for classified steel floor and form units that permit greater spans.
- The Unrestrained Assembly Rating is equal to the Restrained Assembly Rating or the Unrestrained Beam Rating, whichever is less for clear spans £ 92-inch.
- When 28-gauge steel deck is used, the Restrained Assembly Rating £ 1 1/2 hr.
- When 9/16-inch steel deck is used, the Restrained Assembly Rating £ 1 1/2 hr.
- 8H3/W6 x 16, W8 x 10 or W8 x 18.
- Max. 96" o.c. support spacing for 1 1/2-inch, 22- gauge steel deck.
Max. 96" o.c. support spacing for 1 5/16-inch, 24- gauge steel deck.
Max. 72" o.c. support spacing for 15/16-inch, 26-gauge steel deck.
Max. 48" o.c. support spacing for 9/16-inch, 28-gauge steel deck.
- The Unrestrained Assembly Rating is equal to the Restrained Assembly Rating for 1 5/16-inch, 24 gauge steel deck with clear spans £ 90-inch.
- Max. 96" o.c. support spacing for 1 1/2-inch, 22-gauge steel deck.
Max. 72" o.c. support spacing for 1 5/16-inch, 24-gauge steel deck.
Max. 48" o.c. support spacing for 9/16-inch, 28-gauge steel deck.