



UL Solutions Evaluation Report

UL ER38653-01

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UL Solutions Category Code: ULEX-Thermal Insulation

CSI MasterFormat®

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Sub-level 2: 07 20 00 - Thermal Protection

Sub-level 3: 07 21 00 - Thermal Insulation

Sub-level 4: 07 21 13 - Board Insulation

Sub-level 3: 07 22 00 - Roof and Deck Insulation

Sub-level 4: 07 22 16 - Roof Board Insulation

Company:

KINGSPAN INSULATION LLC

Suite 175

2100 RiverEdge Pky.

Atlanta, GA 30328 United States

www.kingspan.com

1. Subject:

Optim-R™ Vacuum Insulation Panel (VIP) and Kingspan Optim-R E Vacuum Insulation Panel (VIP)



2. Scope of Evaluation:

- 2021 *International Building Code*® (IBC)
- 2023 *Florida Building Code*® (FBC)
- ICC-ES Acceptance Criteria for Quality Documentation (AC10)

The products were evaluated for the following properties:

- Surface Burning Characteristics (ASTM E84)
- Roofing Systems for Exterior Fire Exposure (UL 790)
- Roof Deck Construction Material With Resistance to Internal Fire Exposure (UL 1256)
- Class 1 and Noncombustible Roof Deck Construction (FM 4470)
- Roofing Systems, Wind Uplift Resistance (FM 4474)
- Thermal Transmission (ASTM C1667)
- Thermal and Humid Aging (ASTM D2126)
- Compression Resistance (ASTM C165)

3. Reference Documents

ICC-ES:

- ICC-ES Acceptance Criteria for Quality Documentation (AC10)

UL:

- UL 790, Standard Test Methods for Fire Tests of Roof Coverings
- UL 1256, Fire Test of Roof Deck Constructions

ASTM:

- ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM D2126, Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- ASTM C1667, Standard Test Method for Using Heat Flow Meter Apparatus to Measure the Center-of-Panel Thermal Transmission Properties of Vacuum Insulation Panels
- ASTM C165, Standard Test Method for Measuring Compressive Properties of Thermal Insulations

FM:

- FM 4470, Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction
- FM 4474, Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures

4. Uses

4.1 Optim-R™ and Optim-R E:

Kingspan Optim-R™ Vacuum Insulation Panel (VIP) and Kingspan Optim-R E Vacuum Insulation Panel (VIP) are insulation panels used as roof insulation. The insulation panels covered by this report will be evaluated under the alternative materials, design and methods clause referenced in IBC and FBC Section 104.11. Installation shall be in accordance with Section 6 of this report.

4.1.1 Optim-R™ and Optim-R E for use in Roofing:

Optim-R™ and Optim-R E Vacuum Insulation Panels are provided as flat building units for use as nonstructural insulation as components of a UL Classified Class A, B, or C roof-covering assembly in accordance with UL 790. The boards may also be installed directly to steel decks as components of a UL Classified roof deck construction in accordance with UL 1256. Installation shall be in accordance with Section 6.2 of this report.

5. Product Description

5.1 General:

Optim-R™ and Optim-R E Vacuum Insulation Panels described in this report are rigid insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, having a flame spread index not exceeding 25 and a smoke developed index not exceeding 450 when tested in accordance with ASTM E84 as required by IBC and FBC, Section 2603.3. When the physical properties were tested in accordance with the following standards, the rigid insulation panels performed as described below.

Table 1 – Physical Properties and Values

Thickness mm/(inches) lb/ft² (kg/m²)	20/0.79 0.82 (4.0)	25/0.98 1.02 (5.0)	30/0.79 1.23 (6.0)	35/1.18 1.43 (7.0)	40/1.57 1.64 (8.0)
Dimensional Stability ASTM D2126	Maximum Length			Maximum Width	
	0.5 %			0.6 %	
Compressive Strength, Min. (psi) @ 10% deformation ASTM C165	23				

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Table 2 – Thermal Resistance Values - 1°F ft² h/Btu (°K m²/W)

(For SI: 1 lb/ft³ = 16.018 kg/m³, 1°F ft² h/Btu = 0.176°K m²/W, 1inch = 25.4 mm.)

Thickness (in./mm)	(0.79/20)	(0.98/25)	(1.18/30)	(1.57/40)	(1.97/50)
R-Value ¹ ASTM C1665	26	32	37	49	60
Edge Effect R-Value ² ASTM C1665	22	28	33	46	57

¹Values based on linear interpolation of test results for 20mm and 50mm Optim-R panels.

²Edge effect R-values based on the average from six of the most commonly used panel sizes.

5.2 Optim-R™ and Optim-R E Vacuum Insulation Panels:

Kingspan Optim-R™ and Optim-R E Vacuum Insulation Panels are manufactured in nominal stock thicknesses ranging from 0.79 to 1.97 inches (20 – 50 mm). The panels are offered in standard dimensions ranging from 11.8 - 23.6 inches (300 – 600 mm) wide and 11.8 - 47.2 inches (300 – 1200 mm) long. Non-stock sizes are also offered.

6. Installation

6.1 General:

Installation of Kingspan Optim-R™ and Optim-R E Vacuum Insulation Panels must comply with this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at all times on the jobsite during installation. The insulation boards must be installed on substrates in a manner that will secure the insulation in place.

The code official may require an approved vapor retarder to be installed in accordance with 2021 IBC Section 1404.3, as applicable. The insulation boards must not be used structurally to resist transverse, vertical, or in-plane loads on the basis of this Evaluation Report.

6.2 Optim-R™ and Optim-R E Vacuum Insulation Panels for use in Roofing:

Optim-R™ and Optim-R E Vacuum Insulation Panels are used as a roofing insulation as follows:

- As part of a UL Classified Class A, B or C roof-covering assembly in accordance with UL 790, or
- As part of a UL Classified Roof Deck Construction in accordance with UL 1256

Reroofing: New roofing must not be applied over existing roof-covering systems described in this report, since the fire performance of the systems is directly affected by the materials covering the foam plastic insulation. The components of the existing roofing that are to remain on the roof deck must be inspected in accordance with 2021 IBC Section 1511. The existing roof-covering membrane and, if necessary, the cover board must be removed before new roofing materials are installed; the new roofing materials must have characteristics specifically described in this report.

7. Conditions of use

7.1 The insulation boards described in this report comply with or are suitable alternatives to what is specified in those codes listed in Section 2 of this report, subject to the following conditions.

7.2 The insulation must be produced, identified, and installed in accordance with the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions this report governs.

7.3 The boards must be separated from the building interior with a thermal barrier complying with the applicable code, such as minimum ½-inch thick (12.7 mm) gypsum wallboard installed in accordance with the applicable code, except as described in Sections 4.1, 4.1.2, 6.1.2, and 6.1.4 of this report.

7.4 For a listing of applicable UL Certifications for Atlas Molded Polystyrene and ThermalStar insulation, see Product iQ® for the following categories:

- Class A, B or C roof-covering assemblies UL Classified in accordance with UL 790 ([TGFU](#)).
- Roof Deck Construction 735 for UL Classification in accordance with UL 1256 ([TIAR](#)).

7.5 Manufacturing Locations:

The products are manufactured at the following locations under the UL Solutions Classification and Follow-Up Service Program, which includes audits in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC 10:

Location	Plant ID
Pembridge, Leominster Herefordshire	UNITED KINGDOM

8. Supporting evidence

8.1 UL Solutions Classification reports in accordance with UL 790 and UL 1256. See UL Solutions Product Certification Categories (TGFU) and (TIAR).

8.2 Documentation of quality system elements described in ICC-ES Acceptance Criteria for Quality Documentation (AC10).

8.3 Reports in accordance with ASTM C1667 Standard Test Method for Using Heat Flow Meter Apparatus to Measure the Center-of-Panel Thermal Transmission Properties of Vacuum Insulation Panels.

8.4 Reports in accordance with ASTM D2126 Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

- 8.5** Reports in accordance with ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- 8.6** Reports in accordance with FM 4470, Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction
- 8.7** Reports in accordance with FM 4474, Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures
- 8.8** Reports in accordance with ASTM C165, Standard Test Method for Measuring Compressive Properties of Thermal Insulations

9. Identification

Kingspan insulation described in this evaluation report are identified by a marking bearing the report holder's name (Kingspan Insulation LLC); the plant identification; the product name; the UL Solutions Certification Mark, and the evaluation report number UL ER38653-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Solutions Classification Mark certificate.

10. Use of UL Solutions Evaluation Report

- 10.1** The approval of building products, materials or systems is under the responsibility of the applicable code authorities.
- 10.2** UL Solutions Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL Solutions.
- 10.3** The current status of this report, as well as a complete directory of UL Solutions Evaluation Reports may be found at UL.com/Solutions via Product iQ®.

TABLE 3: STRUCTURAL CONCRETE DECKS - NEW CONSTRUCTION or REROOF (Tear-Off) or RECOVER
SYSTEM TYPE: ADHERED INSULATION with ADHERED ROOF COVER

SYSTEM NO.	ALLOWABLE UPLIFT CAPACITY (lbs/ft²)	INSULATION			COVERBOARD			MEMBRANE TYPE	ADHESIVE [†]	FIRE RATING UL790	
		Type	Attachment	Rate	Type	Adhesive	Rate			Class	Maximum Incline
1	-30*	Minimum 0.8 inch (20 mm) thick Optim-R	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 12 inches on center	SecurShield HD	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 12 inches on center	Sure-Seal FR EPDM, Sure-White EPDM, or Sure-Tough	Sure-Seal 90-8-30A, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives	A	½:12
2								VersiGard FR EPDM, VersiGard White EPDM, or VersiGard Reinforced EPDM	G200SA Yellow Substrate Adhesive, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		
3								Sure-Flex PVC or Sure-Flex PVC FRS or Sure-Flex KEE HP	PVC, Low VOC PVC, Aqua Base 120, or HydroBond PVC Bonding Adhesives		2:12
4								VersiFlex PVC, VersiFlex FRS PVC, or VersiFlex KEE HP			
5								VersiWeld TPO or VersiWeld Plus TPO	VersiWeld, Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		¼:12

*Concrete deck primed with CCW-702 at 0.3-0.4 gal./100-ft.² and covered with self-adhering VapAir Seal 725TR vapor barrier required.

[†]Refer to UL Product iQ™ database for adhesive coverage rates.

TABLE 3: STRUCTURAL CONCRETE DECKS - NEW CONSTRUCTION or REROOF (Tear-Off) or RECOVER
SYSTEM TYPE: ADHERED INSULATION with ADHERED ROOF COVER (continued)

SYSTEM NO.	ALLOWABLE UPLIFT CAPACITY (lbs/ft ²)	INSULATION			COVERBOARD			MEMBRANE TYPE	ADHESIVE [†]	FIRE RATING UL790	
		Type	Attachment	Rate	Type	Adhesive	Rate			Class	Maximum Incline
6	-30*	Minimum 0.8 inch (20 mm) thick Optim-R	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 12 inches on center	SecurShield HD	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 12 inches on center	Sure-Seal EPDM, Sure-White EPDM, or Sure-Weld TPO FleeceBACK Membranes	FAST Dual Tank, FAST 100 LV, Flexible FAST, Flexible FAST Dual Tank, or HydroBond Water-Based Adhesives	A	½:12
7								VersiFleece TPO	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives		
8								VersiFleece PVC, VersiFleece FRS PVC, VersiFleece KEE HP Membranes	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives	A	1½:12
9	-62.5*			Minimum ¾ inch wide ribbons 6 inches on center			Minimum ¾ inch wide ribbons 6 inches on center	Sure-Seal FR EPDM, Sure-White EPDM, or Sure-Tough	Sure-Seal 90-8-30A, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives	A	½:12
10								VersiGard FR EPDM, VersiGard White EPDM, or VersiGard Reinforced EPDM	G200SA Yellow Substrate Adhesive, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		

*Concrete deck must be primed with CCW-702 at 0.3-0.4 gal./100-ft.² and covered with self-adhering VapAir Seal 725TR vapor barrier.

[†]Refer to UL Product iQ™ database for Certification Listings under TGFU.R38653 for adhesive coverage rates.

TABLE 3: STRUCTURAL CONCRETE DECKS - NEW CONSTRUCTION or REROOF (Tear-Off) or RECOVER
SYSTEM TYPE: ADHERED INSULATION with ADHERED ROOF COVER (continued)

SYSTEM NO.	ALLOWABLE UPLIFT CAPACITY (lbs/ft ²)	INSULATION			COVERBOARD			MEMBRANE TYPE	ADHESIVE [†]	FIRE RATING UL790	
		Type	Attachment	Rate	Type	Adhesive	Rate			Class	Maximum Incline
11	-62.5*	Minimum 0.8 inch (20 mm) thick Optim-R	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 6 inches on center	SecurShield HD	Flexible Fast Adhesive	Minimum ¾ inch wide ribbons 6 inches on center	Sure-Flex PVC or Sure-Flex PVC FRS or Sure-Flex KEE HP	PVC, Low VOC PVC, Aqua Base 120, or HydroBond PVC Bonding Adhesives	A	2:12
12								VersiFlex PVC, VersiFlex FRS PVC, or VersiFlex KEE HP			
13								VersiWeld TPO or VersiWeld Plus TPO	VersiWeld, Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		¼:12
14								Sure-Seal EPDM, Sure-White EPDM, or Sure-Weld TPO FleeceBACK Membranes	FAST Dual Tank, FAST 100 LV, Flexible FAST, Flexible FAST Dual Tank, or HydroBond Water-Based Adhesives		½:12
15								VersiFleece TPO	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives		
16								VersiFleece PVC, VersiFleece FRS PVC, VersiFleece KEE HP Membranes	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives		1½:12

*Concrete deck must be primed with CCW-702 at 0.3-0.4 gal./100-ft.² and covered with self-adhering VapAir Seal 725TR vapor barrier.

[†]Refer to UL Product iQ™ database for Certification Listings under TGFU.R38653 for adhesive coverage rates.

TABLE 3: STRUCTURAL CONCRETE DECKS - NEW CONSTRUCTION or REROOF (Tear-Off) or RECOVER
SYSTEM TYPE: ADHERED INSULATION with ADHERED ROOF COVER (continued)

SYSTEM NO.	ALLOWABLE UPLIFT CAPACITY (lbs/ft²)	INSULATION			COVERBOARD			MEMBRANE TYPE	ADHESIVE†	FIRE RATING UL790	
		Type	Attachment	Rate	Type	Adhesive	Rate			Class	Maximum Incline
17	-60	Minimum 0.8 inch (20 mm) thick Optim-R	FAST 100 LV Adhesive	Minimum ¾ inch wide ribbons 6 inches on center	SecurShield HD	FAST 100 LV Adhesive	Minimum ¾ inch wide ribbons 6 inches on center	Sure-Seal FR EPDM, Sure-White EPDM, or Sure-Tough	Sure-Seal 90-8-30A, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives	A	½:12
18								VersiGard FR EPDM, VersiGard White EPDM, or VersiGard Reinforced EPDM	G200SA Yellow Substrate Adhesive, EPDM X-23 Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		
19								Sure-Flex PVC or Sure-Flex PVC FRS or Sure-Flex KEE HP	PVC, Low VOC PVC, Aqua Base 120, or HydroBond PVC Bonding Adhesives		2:12
20								VersiFlex PVC, VersiFlex FRS PVC, or VersiFlex KEE HP			
21								VersiWeld TPO or VersiWeld Plus TPO	VersiWeld, Low VOC, Low VOC 1168, or Aqua Base 120 Bonding Adhesives		¼:12
22								Sure-Seal EPDM, Sure-White EPDM, or Sure-Weld TPO FleeceBACK Membranes	FAST Dual Tank, FAST 100 LV, Flexible FAST, Flexible FAST Dual Tank, or HydroBond Water-Based Adhesives		1½:12
23								VersiFleece TPO	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives		½:12
24								VersiFleece PVC, VersiFleece FRS PVC, VersiFleece KEE HP Membranes	DASH Dual Tank, DASH, Flexible DASH, or Flexible DASH Dual Tank, or HydroBond Water-Based Adhesives		

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UL Solutions Headquarters
333 Pfingsten Road
Northbrook, IL 60062-2096 USA
T: 847.272.8800
[UL.com/Solutions](https://www.ul.com/solutions)

