ICC EVALUATION SERVICE®

ICC-ES Evaluation Report

ESR-4242

Reissued March 2023

This report is subject to renewal March 2024.

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 21 00—Thermal Insulation

REPORT HOLDER:

HUNTSMAN BUILDING SOLUTIONS, LLC

EVALUATION SUBJECT:

FOAM-LOK FL 450

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2021, 2018, 2015, 2012 and 2009 *International Residential Code*® (IRC)
- 2021, 2018, 2015, 2012 and 2009 *International Energy Conservation Code*® (IECC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:

- Surface burning characteristics
- Physical properties
- Thermal performance (*R*-values)
- Attic and crawl space installation
- Air permeability

1.2 Evaluation to the following green standard:

2008 ICC 700 *National Green Building Standard*™ (ICC 700-2008)

Attributes verified:

See Section 2.0.

2.0 USES

Foam-Lok FL 450 is used to provide thermal insulation in buildings and to seal areas such as plumbing and conduit penetrations against air infiltration. The insulation is for use in wall cavities and floor assemblies; and in attic and crawl space installations as described in Section 4.4. Foam-Lok FL 450 insulation is for use in non-fire-resistance rated Type V construction under the IBC and dwellings under the IRC.

The attributes of the insulation have been verified as conforming to the provisions of ICC 700-2008 Section 703.2.1.1.1(c) as an air impermeable insulation. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

3.0 DESCRIPTION

3.1 General:

Foam-Lok FL 450 is a low-density, open-cell, polyurethane foam plastic insulation and air barrier system that is 100 percent water-blown with an installed nominal density of 0.5 pcf (8 kg/m^3). The insulation is a two-component, spray-applied product. The two components of the insulation are polymeric isocyanate (A-Component, also known as Base Seal®) and proprietary resin (B-Component, Foam-Lok FL 450 Resin). When stored at temperatures between 50°F (10°C) and 100°F (38°C), the components have a shelf life of six months. Foam-Lok FL 450 meets or exceeds the minimum requirements set forth in Section 2603.1.1 of the 2021 IBC.

3.2 Surface Burning Characteristics:

When tested in accordance with ASTM E84/UL 723, at a thickness of 6 inches (152 mm) and a nominal density of 0.5 pcf (8 kg/m^3), Foam-Lok FL 450 has a flame spread index of 25 or less and a smoke-developed index of 450 or less. There is no thickness limit when installed behind a code-prescribed 15-minute thermal barrier, except as noted in Section 4.3.2 and Table 2.

3.3 Thermal Resistance:

Foam-Lok FL 450 has thermal resistance (*R*-values) at a mean temperature of 75°F (24°C) as shown in Table 1.

3.4 Air Permeability:

Foam-Lok FL 450 is considered air-impermeable insulation in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) and 2021, 2018, 2015, and 2012 IRC Sections R202 and R806.5 (2009 IRC Sections R202 and R806.4), when installed at 3 inches (76 mm) minimum in accordance with ASTM E2178.

3.5 Intumescent Coatings:

3.5.1 No Burn Plus XD: No Burn Plus XD intumescent coating is a latex-based coating supplied in 1-gallon (4 L) and 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 40°F (4.4°C) and 90°F (32.2°C).

3.5.2 DC 315 Coating: DC 315 coating (ESR-3702), manufactured by International Fireproof Technology, International Inc. / Paint To Protect Inc., is a water-based

intumescent coating supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 50ºF (10ºC) and 80ºF (27ºC).

3.5.3 Fireshell® F10E Coating: Fireshell® F10E coating, manufactured by ICP Construction (ESR-3997), is a water-based intumescent coating supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 45ºF (7.2ºC) and 95ºF (35ºC).

4.0 INSTALLATION

4.1 General:

The manufacturer's published installation instructions and this report must be strictly adhered to and a copy of these instructions and this evaluation report must be available on the jobsite at all times during installation.

4.2 Application:

Foam-Lok FL 450 foam plastic insulation must be applied on the jobsite using two-component, 1-to-1 ratio, spray equipment specified by Huntsman Building Solutions, LLC. The foam plastic must not be sprayed onto a substrate that is wet, or covered with frost or ice, loose scales, rust, oil or grease. The foam plastic insulation must not be used in electrical outlet or junction boxes or in contact with rain or water, and must be protected from the weather during and after application. Where the insulation is used as air-impermeable insulation, such as in unvented attic spaces regulated by 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) or 2021, 2018, 2015, and 2012 IRC Section R806.5 (2009 IRC Section R806.4), the insulation must be installed at the minimum thickness noted in Section 3.4. The insulation can be installed in one pass to the maximum thickness. Where multiple passes are required, the cure time between passes is negligible.

The insulation must be used in areas where the maximum service temperature is no greater than 180°F (82°C). The insulation must be applied when the temperature is at or above 14°F (-10°C) and be protected from the weather during and after application.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: Foam-Lok FL 450 foam plastic insulation must be separated from the interior of the building by an approved thermal barrier, such as $^1/_2$-inch (12.7 mm) gypsum wallboard installed using mechanical fasteners in accordance with the applicable code, or an equivalent 15-minute thermal barrier complying with the applicable code. When installation is within an attic or crawl space as described in Section 4.4, a thermal barrier is not required between the foam plastic and the attic or crawl space, but is required between the foam plastic insulation and the interior of the building. There is no thickness limit when installed behind a code-prescribed 15-minute thermal barrier, except as noted in Section 4.3.2 and Table 2.

4.3.2 Application without a Prescriptive Thermal Barrier or Ignition Barrier: The prescriptive 15-minute thermal barrier or ignition barrier may be omitted when installation is in accordance with the following requirements:

- The insulation must be covered on all surfaces with a fire protective coating at the minimum thickness set forth in Table 2.
- The maximum installed thickness of the insulation must not exceed the thicknesses set forth in Table 2.
- The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report.

4.4 Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier: When Foam-Lok FL 450 foam plastic insulation is installed within attics where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code and must be installed in a manner so that the foam plastic insulation is not exposed. The insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 3 inches (76 mm) in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) or 2021, 2018, 2015, and 2012 IRC Section R806.5 (2009 IRC Section R806.4), as applicable.

4.4.2 Application without a Prescriptive Ignition Barrier: Where Foam-Lok FL 450 foam plastic insulation is installed in an attic or crawl space without a prescriptive ignition barrier, in accordance with Sections 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.2.4, the following conditions apply:

1. Entry to the attic or crawl space is only for service of utilities and no storage is permitted.
2. There are no interconnected attic, crawl space or basement areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Combustion air is provided in accordance with IMC Section 701.
5. Attic ventilation is provided when required by 2021 and 2018 IBC Section 1202.2 (2015, 2012, and 2009 IBC Section 1203.2) or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) or 2021, 2018, 2015, and 2012 IRC Section R806.5 (2009 IRC Section R806.4), as applicable.
6. Under-floor (crawl space) ventilation is provided when required by 2021 and 2018 IBC Section 1202.4 (2015 IBC Section 1203.4 or 2012 and 2009 IBC Section 1203.3) or IRC Section R408.1, as applicable.

4.4.2.1. Attics—Application with an Intumescent Coating: In attics, Foam-Lok FL 450 foam plastic insulation may be spray-applied to the underside of the roof sheathing and/or rafters, as described in this section. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 5.5 inches (140 mm). The insulation must be covered on all surfaces with one of the coatings described in Section 3.5. The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and other substances that could interfere with adhesion of the coating. The coating is applied in one coat with low-pressure airless spray equipment. The coating must be applied to a thickness as follows:

- No Burn Plus XD at a minimum thickness of 6 wet mils (0.15 mm) [4 dry mils (0.1 mm) dry film thickness], applied at a rate of 0.4 gallon (1.5 L) per 100 square feet (9.2 m^2).

- DC 315 at a minimum thickness of 4 wet mils (0.1 mm) [3 dry mils], applied at a rate of 0.3 gallon (1.1 L) per 100 square feet (9.2 m^2).

The coatings must be applied when ambient and substrate temperature is at least 60°F (16°C) and no more than 95°F (35°C). All other surfaces (including glass) must be protected against damage from the coating. The insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 3.5 inches (89 mm) as described in this section in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) and 2021, 2018, 2015, and 2012 IRC Section R806.5 (2009 IRC Section R806.4), as applicable.

4.4.2.2. Attics—Application without an Intumescent Coating: When Foam-Lok FL 450 is applied in unvented attics conforming to 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) and 2021, 2018, 2015, and 2012 IRC Section R806.5 (2009 IRC Section R806.4), the insulation may be applied to the underside of roof sheathing and/or rafters to a minimum thickness of $3^1/_2$ inches (90 mm) and may be applied to vertical wall surfaces to a minimum thickness of $3^1/_2$ inches (90 mm). Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 20 inches (508 mm). The insulation may be left exposed to the attic without a prescriptive ignition barrier or an intumescent coating.

The attic must have attic access complying with IRC Section R807, horizontally placed in the floor, and opening outward toward the living space. Items penetrating the roof deck or walls, such as skylight wells and vents, must be covered with a minimum of $3^1/_2$ inches (90 mm) of the Foam-Lok FL 450 insulation.

4.4.2.3. Crawl Spaces: In crawl spaces, Foam-Lok FL 450 insulation may be spray-applied to vertical walls and the underside of floors, as described in this section. The thickness of the foam plastic applied to the underside of the floors must not exceed 14 inches (356 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed $3^1/_2$ inches (88.9 mm). The foam plastic does not require an ignition barrier or a coating.

4.4.2.4. Use on Attic Floors: When used on attic floors, Foam-Lok FL 450 foam plastic insulation may be installed at a maximum thickness of $11^1/_2$ inches (292 mm) between joists in attic floors. The insulation must be separated from the interior of the building by an approved thermal barrier. The coatings specified in Section 4.4.2.1 and the ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3, may be omitted.

5.0 CONDITIONS OF USE

The Foam-Lok FL 450 spray-applied polyurethane foam plastic insulation described in this report comply with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 This evaluation report and the manufacturer's published installation instructions, when required by the code official, must be submitted at the time of permit application.

5.2 The insulation must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. If there is a conflict between the installation instructions and this report, this report governs.

5.3 The insulation must be separated from the interior of the building by an approved 15-minute thermal barrier, except as noted in this report.

5.4 Since the performance of Foam-Lok FL 450 when installed in unvented attics without a code-prescribed ignition barrier or an intumescent coating, is based on fire performance of an unvented attic, the installation must be approved by the code official as conforming with the provisions of Section 4.4.2.2 and Conditions 1 to 5 of Section 4.4.2.

5.5 When Foam-Lok FL 450 insulation is installed under Section 4.4.2.2 of this report, a certificate must be placed in the attic stating that the foam plastic insulation has been installed in accordance with Conditions 1 to 5 of Section 4.4.2 and the terms of Section 4.4.2.2 of this report; any alterations to the attic or insulation must be consistent with those requirements.

5.6 The insulation must not exceed the thicknesses and densities noted in this report.

5.7 The insulation must be protected from the weather during and after application.

5.8 The insulation must be applied by licensed dealers and installers certified by Huntsman Building Solutions, LLC.

5.9 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or 2021, 2018, 2015 and 2009 IBC Section 2603.8 (2012 IBC Section 2603.9), as applicable.

5.10 Jobsite certification and labeling of the insulation must comply with 2021, 2018, and 2015 IRC Sections N1101.10.1 and N1101.10.1.1 (2012 IRC Sections N1101.12.1 and N1101.12.1.1 or 2009 IRC Sections N1101.4 and N1101.4.1) and 2021, 2018, 2015, and 2012 IECC Sections C303.1.1, C303.1.1.1, R303.1.1 and R303.1.1.1 (2009 IECC Sections 303.1.1 and 303.1.1.1), as applicable.

5.11 Installation in unvented attics, when equipped with vapor diffusion ports in accordance with Section 1202.3, Item 5.2 of the 2021 IBC and Section R806.5, Item 5.2 of the 2021 and 2018 IRC, is outside the scope of this report.

5.12 A vapor retarder must be installed in accordance with the applicable code.

5.13 Foam-Lok FL 450 foam plastic insulation is manufactured in Mississauga, Ontario, Canada and Arlington, Texas, under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated April 2020 (editorially revised July 2020).

6.2 Reports of tests in accordance with AC377 Appendix X.

6.3 Test report on air leakage rate in accordance with ASTM E2178.

6.4 Reports of room corner fire testing in accordance with NFPA 286.

6.5 Reports of fire tests in accordance with ASTM E970.

6.6 Engineering evaluation, including full-scale fire testing, small-scale testing and fire modeling (Section 4.4.2.2).

7.0 IDENTIFICATION

7.1 All packages and containers of Foam-Lok FL 450 insulation must be labeled with the Huntsman Building Solutions, LLC name and address; the product name; component designation (A or B); the flame spread index and the smoke-developed index; the expiration date; ICC-ES mark of conformity; and the evaluation report number (ESR-4242). The evaluation report number, ICC-ES ESR-4242, may be used in lieu of the mark of conformity.

No Burn Plus XP Intumescent coating described in Section 3.5.1 is identified with the manufacturer's name and address, the product trade name and use instructions.

The International Fireproof Technology, Inc., / Paint To Protect Inc. DC 315 coating described in Section 3.5.2 is identified with the manufacturer's name and address, the product trade name, date of manufacture, shelf life or expiration date, the manufacturer's application instructions and the evaluation report number (ESR-3702).

Fireshell F10E coating described in Section 3.5.3 is identified with the manufacturer's name and address; the product name; the date of manufacture, the shelf life or expiration date; the manufacturer's instructions for application, and the evaluation report number (ESR-3997).

7.2 The report holder's contact information is the following:

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3315 EAST DIVISION STREET
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TABLE 1—THERMAL RESISTANCE (*R*-VALUES)

THICKNESS (inches)	*R*-VALUE (°F·ft²·h/Btu)
	Foam-Lok FL 450
1	3.7
2	7.4
3	11
3.5	13
4	14
5	18
5.5	20
6	22
7	25
7.5	27
8	29
9	32
9.5	34
10	36
11.5	41
13.5	—
14	50

For **SI:** 1 inch = 25.4 mm, 1°F·ft²·h/Btu = 0.176 110°K·m²/W.

[1]*R*-values are calculated based on tested *K* values at 1- and 3.5-inch thicknesses.
[2]*R*-values greater than 10 are rounded to the nearest whole number.

TABLE 2—USE OF INSULATION WITHOUT A PRESCRIPTIVE THERMAL BARRIER[1]

INSULATION	MAXIMUM THICKNESS (in.) (Walls & Vertical Surfaces)	MAXIMUM THICKNESS (in.) (Ceilings, Underside of Roof Sheathing/Rafters & Floors)	FIRE-PROTECTIVE COATING MINIMUM THICKNESS & TYPE (Applied to all Foam Surfaces)[2]	MINIMUM THEORETICAL APPLICATION RATE OF FIRE-PROTECTIVE COATING[3]	TESTS SUBMITTED
Foam-Lok FL 450	6	14	DC315 20 mils WFT / 13 mils DFT	1.25 gal / 100 ft²	NFPA 286
	7 1/2	11 1/2	Fireshell F10E 21 mils WFT / 14 mils DFT	1.31 gal / 100 ft²	NFPA 286

For **SI:** 1 inch = 25.4 mm; 1 mil = 0.0254 mm; 1 gallon = 3.38 L; 1 ft² = 0.093 m²; NA = not applicable.

[1]See Section 4.3.2.
[2]See Sections 3.5.2 and 3.5.3.
[3]As reported in the manufacturer's application instructions. Actual application rate, based on specific project conditions, must be in accordance with the manufacturer's application instructions.