



ICC-ES Evaluation Report ESR-4073

Reissued August 2021

Revised October 2021

This report is subject to renewal August 2022.

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

REPORT HOLDER:

HUNTSMAN BUILDING SOLUTIONS, LLC

EVALUATION SUBJECT:

HEATLOK® HFO HIGH LIFT SPRAY FOAM INSULATION

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)

Property evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Water vapor transmission
- Air permeability
- Exterior walls in Types I through IV construction

1.2 Evaluation to the following green standard:

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

2.0 USES

Heatlok® HFO closed cell spray foam is a spray-applied polyurethane foam plastic insulation used as a nonstructural thermal insulating material in all Types of construction under the 2018, 2015, 2012, and 2009 IBC; in Type V construction under the 2021, 2018, 2015, 2012 and 2009 IBC; and in dwellings under the IRC. The insulation is

intended for use in wall cavities, floor/ceiling assemblies, the underside of on-grade slabs, or attics and crawl spaces when installed in accordance with Section 4.4. Under the IRC and 2021, 2018 and 2015 IBC, the insulation may be used as air-impermeable insulation when installed in accordance with Section 3.5.

Under the 2018, 2015, 2012 and 2009 IBC, the insulation may be used in exterior walls of Type I, II, III or IV construction when used as described in Section 4.5.

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:

Heatlok® HFO product is a rigid, medium-density, spray-applied cellular polyurethane foam plastic insulation installed as a component of wall assemblies, ceilings, floors, crawlspaces and cavities of roofs. The foam plastic insulation is a two-component, closed-cell, one-to-one by volume spray foam system with a nominal density of 2.0 pcf (32 kg/m³). The insulation is produced in the field by combining a polymeric isocyanate (A component) with a polymeric resin blend (B component). The insulation components have a shelf life of six months when stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (26°C). The Heatlok® HFO product meets or exceeds the minimum requirements set forth in Section 2603.1.1 of the 2021 IBC.

3.2 Surface-burning Characteristics:

Heatlok® HFO product, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2.0 pcf (32 kg/m³), has a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 (UL 723). There are no thickness limitations when insulation is covered by a code-prescribed 15-minute thermal barrier.

3.3 Thermal Resistance (R-values):

Heatlok® HFO product has thermal resistance (R-value), at a mean temperature of 75°F (24°C), as shown in Table 1.

3.4 Vapor Permeance:

Heatlok® HFO has a vapor permeance of 1.0 perm or greater and less than 10 perms when applied at a minimum of 1 inch (25.4 mm) thickness and may be used where a Class III vapor retarder is required by the applicable code.

3.5 Air Permeability:

Heatlok® HFO foam plastic insulation, at a minimum 1-inch (25.4 mm) thickness, is considered air-impermeable insulation in accordance with 2021, 2018, 2015 and 2012 IRC Section R806.5 (2009 IRC Section R806.4) and 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) based on testing in accordance with ASTM E283.

3.6 Blazelok TBX or Fireshell® F10E Intumescent Coating:

Blazelok™ TBX or Fireshell® F10E intumescent coating (see [ESR-3997](#)), manufactured by ICP Construction, is a one-component water-based liquid coating. The coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of (1) year when stored in factory-sealed containers at temperatures between 45°F (7°C) and 95°F (35°C).

3.7 DC 315 Intumescent Coating:

DC 315 intumescent coating (see [ESR-3702](#)), manufactured by International Fireproof Technology, Inc., is a water-based coating supplied in 5-gallon (19L) pails and 55-gallon (208L) drums and has a shelf life of one (1) year when stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (24°C).

4.0 DESIGN AND INSTALLATION

4.1 General:

Heatlok® HFO product must be installed in accordance with the manufacturer's published installation instructions and this report. A copy of the manufacturer's published installation instructions must be available at all times on the jobsite during installation.

4.2 Application:

The insulation is spray-applied on the jobsite using equipment identified in the manufacturer's published installation instructions. The Heatlok® HFO product must be applied when the ambient and substrate temperature is between 50°F (10°C) and 100°F (38°C). The insulation must not be used in areas that have a maximum service temperature greater than 180°F (82°C). The foam plastic insulation must not be used in electrical outlet or junction boxes or in continuous contact with rain or water. The substrate must be free of moisture, frost or ice, loose scales, rust, oil and grease, or contaminants that will interfere with adhesion of the spray foam insulation. The Heatlok® HFO product may be applied in passes having a maximum thickness of 6½ inches (165 mm) per pass. When multiple passes are required, subsequent passes can be sprayed once the core temperature drops below 100°F (37.7°C).

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: Heatlok® HFO insulation must be separated from the interior of the building by an approved thermal barrier of ½-inch-thick (12.7 mm) gypsum wallboard or an equivalent thermal barrier complying with and installed in accordance with the applicable code except where the installation complies with

the requirements set forth in Section 4.3.2. 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 insulation and the interior of the building.

There is no thickness limit when installed behind a code-prescribed thermal barrier except as noted in Section 4.4.2.1.

4.3.2 Application without a Prescriptive Thermal Barrier: Heatlok® HFO spray foam insulation may be installed without the prescriptive 15-minute thermal barrier or ignition barrier described in Section 4.3.1 or Section 4.4.1, respectively when installation is in accordance with the following:

4.3.2.1 The insulation must be covered on all surfaces with a fire protective coating at the minimum thickness set forth in Table 2.

4.3.2.2 The maximum installed thickness of the insulation must not exceed the thickness set forth in Table 2.

4.3.3 The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and respective ICC-ES evaluation report for the coating and this report.

4.4 Ignition Barrier – Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier: When Heatlok® HFO insulation is installed within attics or crawl spaces 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, except when the installation is in accordance with Section 4.4.2. 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 attic or crawl space area must be separated from the interior of the building by an approved 15-minute thermal barrier as described in Section 4.3.1.

Heatlok® HFO insulation, as described in this section, may be installed in unvented attics in accordance with 2021, 2018, 2015 and 2012 IRC Section R806.5 (2009 IRC Section R806.4) or 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3).

4.4.2 Application without a Prescriptive Ignition Barrier: Where the spray-applied insulation is installed in accordance with Section 4.4.2.1, the following conditions apply:

- a) Entry to the attic or crawl space is to only service utilities, and no storage is permitted.
- b) There are no interconnected attic or crawl space areas.
- c) Air in the attic or crawl space is not circulated to other parts of the building.
- d) 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 the 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.
- e) Under-floor (crawl space) ventilation is provided when required by 2021 and 2018 IBC Section 1202.4 [2015 IBC Section 1203.4 (2012 and 2009 IBC Section 1203.3)] or IRC Section R408.1, as applicable.

- f) Combustion air is provided in accordance with *International Mechanical Code*® Section 701.

4.4.2.1 Application without a Prescriptive Ignition Barrier: In attics and crawl spaces, Heatlok® HFO insulation may be spray-applied to the underside of roof sheathing and/or rafters, and to vertical surfaces and the underside of floors as described in this section. The thickness of the foam plastic applied to the underside of the overhead surfaces (roof sheathing, rafters and the underside of floors) must not exceed 1 1/4 inches (286 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 7/8 inches (184 mm). The attic or crawl space must be separated from the interior of the building by an approved thermal barrier as described in Section 4.3.1.

4.4.3 Use on Attic Floors: Heatlok® HFO insulation may be installed at a maximum thickness of 1 1/4 inches (286 mm) between and over joists in attic floors. The Heatlok® HFO insulation must be separated from the interior of the building by an approved thermal barrier.

4.5 Exterior Walls of Type I, II, III and IV Construction Under the 2018, 2015, 2012 and 2009 IBC:

4.5.1 General: When used on exterior walls of Type I, II, III, and IV construction, the assembly must comply with Section 2603.5 of the 2018, 2015, 2012 and 2009 IBC and this section, and the Heatlok® HFO insulation must be installed at a maximum thickness described in Table 3. The potential heat of Heatlok® HFO insulation is 2300 Btu/ft² (26 Mj/m²) per inch of thickness when tested in accordance with NFPA 259.

4.5.2 Specific Wall Assemblies: Wall assemblies complying with Section 4.5 must be as described in Table 3.

5.0 CONDITIONS OF USE

The Heatlok® HFO spray foam insulation described in this report complies 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 The products must be installed in accordance with the manufacturer's published installations instructions, this evaluation report and the applicable code. If there are any conflicts between the manufacturer's published installation instructions and this report, this report governs.
- 5.2 The insulation must be separated from the interior of the building by an approved thermal barrier, except when installation is as described in Sections 4.3.2 and 4.4.2. A thermal barrier must be installed between the insulation and the interior space above (crawl space) or below (attic).
- 5.3 The insulation must not exceed the thicknesses noted in this report based upon the intended end use.
- 5.4 The insulation must be protected from exposure to weather during and after application.
- 5.5 The insulation must be applied by contractors authorized by Huntsman Building Solutions, LLC.
- 5.6 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with 2021, 2018, 2015, and 2009 IBC Section 2603.8 (2012 IBC Section 2603.9) or IRC Section R318.4, as applicable.
- 5.7 When use is on exterior walls of buildings of Types I, II, III, and IV under the 2018, 2015, 2012 and 2009 IBC, construction must be as described in Section 4.5.

- 5.8 Under the 2021 IBC, use of Heatlok® XT-s closed cell spray foam insulation on exterior walls of buildings of Types I, II, III, and IV Construction is outside the scope of this evaluation report.

- 5.9 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.

- 5.10 Jobsite certification and labeling of the insulation must comply with 2021, 2018 or 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 The insulation components A and B are produced in Arlington, Texas and Boisbriand, Quebec, Canada, 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), including reports of tests in accordance with AC377 Appendix X.
- 6.2 Reports of air leakage testing in accordance with ASTM E283.
- 6.3 Reports of water vapor transmission test in accordance with ASTM E96.
- 6.4 Reports of room corner tests in accordance with NFPA 286.
- 6.5 Reports of fire propagation characteristics tests in accordance with NFPA 285.
- 6.6 Reports of potential heat of foam plastic tests in accordance with NFPA 259.
- 6.7 Supplementary fire engineering analysis.

7.0 IDENTIFICATION

- 7.1 Components of the insulation are identified with the manufacturer's name [Huntsman Building Solutions, LLC], address and telephone number; the product name (Heatlok® HFO B-side or A-PDMI); use instructions; the density; the flame-spread and smoke-developed indices; the date of manufacture; thermal resistance values; and the evaluation report number (ESR-4073).

The ICP Construction, Blazelok™ TBX or Fireshell® F10E intumescent coating and primer is identified with the manufacturer's name, the product name, use instructions and ICC-ES evaluation report number [ESR-3997](#).

The International Fireproof Technology, Inc. / Paint To Protect, Inc. DC 315 intumescent coating is identified with the manufacturer's name, the product trade name, use instructions and ICC-ES evaluation report number [ESR-3702](#).

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

HUNTSMAN BUILDING SOLUTIONS, LLC
3315 EAST DIVISION STREET
ARLINGTON, TEXAS 76011
(817) 640-4900
info@huntsmanbuilds.com

TABLE 1—THERMAL RESISTANCE (R-VALUES)

THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)	THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)
1.0	6.3	7.0	52
1.5	10	7.5	56
2.0	14	8.0	60
2.5	18	8.5	64
3.0	22	9.0	67
3.5	26	9.5	71
4.0	30	10.0	75
4.5	34	10.5	79
5.0	37	11.0	82
5.5	41	11.5	86
6.0	45	12.0	90

For SI: 1 inch = 25.4 mm; 1°F.ft².h/Btu = 0.176 110°K.m²/W.
¹R-values are calculated based on tested K-values at 1- and 4-inch thicknesses.

TABLE 2—USE OF INSULATION WITHOUT A PRESCRIPTIVE THERMAL BARRIER (TESTED IN ACCORDANCE WITH NFPA 286)

INSULATION TYPE	MAXIMUM THICKNESS (in.) (Vertical Surfaces)	MAXIMUM THICKNESS (in.) (Overhead Surfaces)	COATING TYPE & MINIMUM THICKNESS ^{2,3} (Applied to all Foam Surfaces)	MINIMUM APPLICATION RATE OF COATING ²
Heatlok HFO	7 ¹ / ₂	11 ¹ / ₂	Blazelok TBX or Fireshell® F10E 18 mils WFT 12 mils DFT	1.2 gal / 100 ft ²
Heatlok HFO	7 ¹ / ₂	11 ¹ / ₂	DC 315 18 mils WFT 12 mils DFT	1.125 gal / 100 ft ²

For SI: 1 inch = 25.4 mm; 1 mil = 0.0254 mm; 1 gallon = 3.38 L; 1 ft² = 0.93 m².

Notes: ¹See Section 4.3.2.
²DFT = Dry Film Thickness; WFT = Wet Film Thickness
³See Sections 3.6 and 3.7.

TABLE 3—NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES – WALL CAVITY INSULATION ^{1,2}

WALL COMPONENT	MATERIALS
Base Wall System – Use either 1, 2 or 3	1 – Concrete wall. 2 – Concrete masonry wall. 3 – Minimum 3 ⁵ / ₈ -inch-deep (92 mm), No. 25 gage, C-shaped steel studs, spaced a maximum of 24 inches on center with lateral bracing every 4 feet (1219 mm) as required by code. Interior sheathing must be 1 layer 5 ⁸ / ₈ -inch-thick (19.1 mm) Type X gypsum wallboard complying with ASTM C1396. Exterior Sheathing shall be as described in Exterior Sheathing below.
Floorline Firestopping	Minimum 4 pcf mineral wool in each stud cavity at each floorline, attached with Z-clips. Thickness must match stud cavity depth.
Perimeter Fire Barrier System	Perimeter fire barrier system complying with 2018, 2015 and 2012 IBC Section 715.4 (2009 IBC Section 714.4) must be installed to fill the void between the edge of the concrete floor slab and the interior surface of the exterior wall assembly.
Cavity / Interior Insulation – Use either 1, 2, 3, 4 or 5; (Note: Cavity Insulation No. 3 may be combined with No. 4 or Cavity Insulation No. 3 may be combined with No. 5 to achieve depth of insulation required)	1 – None. 2 – 3 ⁵ / ₈ inches (92 mm) of Heatlok® HFO applied to the interior surface of Base Wall System 1 or 2 ^a . 3 – Full cavity depth not exceeding 3 ⁵ / ₈ inches (92 mm) of Heatlok® HFO. 3 – Any insulation qualified as noncombustible in accordance with ASTM E136. 4 – Glass fiber batt insulation ^b . 5 – Mineral fiber insulation ^b . ^a Fireblocking in accordance with 2018, 2015 and 2012 IBC Section 718 (2009 IBC Section 717) and thermal barrier material requirements in accordance with IBC Section 2603.4 shall be met for Base Wall Systems 1 and 2, when a combustible concealed space is present on interior side of the exterior wall assembly. ^b Insulation must comply with the applicable requirements of 2018, 2015 or 2012 IBC Section 720.2 (2009 IBC Section 719.2).
Exterior Sheathing – Only for Base Wall System No.3	Minimum 5 ⁸ / ₈ -inch-thick (19.1 mm) glass mat gypsum sheathing complying with ASTM C1177. Sheathing shall be attached with No. 6, 1 ¹ / ₄ -inch-long (32 mm) self-tapping screws located 8 inches (203 mm) on center along the perimeter and 12 inches (302 mm) on center in the field of wallboard. Joints must be taped and treated with joint compound in accordance with ASTM C840 or GA-216.

<p>Exterior Wall Covering – Use either 1 or 2</p>	<p>1 – Any noncombustible exterior wall covering material using any standard installation technique (Base Wall 1 or 2) 2 – Any noncombustible exterior wall covering system with a combustible WRB that has successfully been tested in accordance with NFPA 285. (Base Wall 3) Details of the exterior wall covering must be provided to the code official by the report holder, designer or specifier, with an engineering analysis demonstrating that (1) the exterior wall covering conforms to ASTM E136 and (2) the addition of the wall covering and/or water-resistive barrier to the assembly described in this section does not negatively affect conformance of the assembly with the requirements of IBC Section 2603.5.</p>
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¹ When used on exterior walls of Types I, II, III or IV construction, the specific wall assembly must comply with 2018, 2015, 2012 and 2009 IBC Section 2603.5.

² The exterior wall assemblies described in Table 3 comply with 2018, 2015, 2012 and 2009 IBC Section 2603.5.5.

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EVALUATION SUBJECT:

HEATLOK® HFO HIGH LIFT SPRAY FOAM INSULATION

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Heatlok® HFO High Lift Spray Foam Insulation, described in ICC-ES evaluation report [ESR-4073](#), has also been evaluated for the codes noted below.

Applicable code edition:

- 2019 California Building Code (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) and Division of the State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 California Residential Code (CRC)
- 2019 California Energy Code (CEC)

2.0 CONCLUSIONS

2.1 CBC and CRC:

The Heatlok® HFO High Lift Spray Foam Insulation, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4073](#), complies with the 2019 CBC and CRC, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) and 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report.

2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CEC:

The Heatlok® HFO High Lift Spray Foam Insulation, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4073](#), complies with the 2019 CEC, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report.

2.2.1 Conditions of Use:

In accordance with Section 110.8 of the 2019 California Energy Code, verification of certification by the Department of Consumer Affairs, Bureau of Household Goods and Services, must be provided to the code official, demonstrating that the insulation conductive thermal performance is approved pursuant to the California Code of Regulations, Title 24, Part 12, Chapters 12-13, Article 3, "Standards for Insulating Material." Certification can be verified with the DCA Bureau of Household Goods and Services using the following link to the bureau's Directory of Certified Insulation Materials: https://bhgs.dca.ca.gov/consumers/ti_directory.pdf

This supplement expires concurrently with the evaluation report, reissued August 2021 and revised October 2021.