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ICC-ES Evaluation Report
ESR-3824

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Revised November 2023
This report is subject to renewal June 2024.

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

REPORT HOLDER:

HUNTSMAN BUILDING SOLUTIONS

EVALUATION SUBJECT:

HEATLOK® XT-s SPRAY-APPLIED 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)
- 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.

- Other Codes (See Section 8.0)

Properties evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Water vapor transmission
- 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)

Attributes verified:

See Section 3.1

2.0 USES

Heatlok® XT-s closed cell spray foam product is used as a nonstructural thermal insulating material in Type V-B construction (IBC) and dwellings under the IRC. The insulation is for use in wall cavities, floor assemblies, 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 the 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 that do not exceed 40 feet (12 192 mm) in height above grade plane when used as described in Section 4.5.

3.0 DESCRIPTION

3.1 General:

Heatlok® XT-s 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/m^3). 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® XT-s product meets or exceeds the minimum requirements set forth in Section 2603.1.1 of the 2021 IBC.

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.

3.2 Surface-burning Characteristics:

Heatlok® XT-s product, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2.0 pcf (32 kg/m^3), 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 not any thickness limitations when insulation is covered by a code-prescribed thermal barrier.

3.3 Thermal Resistance (*R*-values):

Heatlok® XT-s 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® XT-s has a vapor permeance of less than 1.0 perms ($5.7x10^{-12}$ kg/Pa-s-m^2) when applied at a minimum of 1 inch (25.4 mm) thickness and may be used where a Class II vapor retarder is required by the applicable code.

3.5 Air Permeability:

HEATLOK® XT-s foam plastic insulation, at a minimum 1-inch (25 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 DC 315 Coating:

DC 315 Coating (ESR-3702), manufactured by International Fireproof Technology, Inc. / Paint to Protect Inc., is a one-component water-based coating. The coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (27°C).

3.7 Blazelok TBX or Fireshell‡ F10E Intumescent Coating:

Blazelok™ TBX or Fireshell‡ F10E intumescent coating (ESR-3997), manufactured by ICP Construction, is a one-component water-based liquid-applied coating. The coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 45°F (7°C) and 95°F (35°C).

4.0 INSTALLATION

4.1 General:

Heatlok® XT-s 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® XT-s product must be applied when the ambient and substrate temperature is between 50ºF (10ºC) and 120ºF (49ºC). The insulation must not be used in areas that have a maximum service temperature greater than 180ºF (82ºC). 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 contaminates that will interfere with adhesion of the spray foam insulation. The Heatlok® XT-s product is applied in passes having a maximum thickness of 2 inches (51 mm) per pass. When multiple passes are required, subsequent passes can be sprayed once the core temperature drops below 100ºF.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: Heatlok® XT-s insulation must be separated from the interior of the building by an approved thermal barrier of 1/2-inch-thick (12.7 mm) gypsum wallboard or an equivalent 15-minute 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: The prescriptive 15-minute thermal barrier may be omitted when installation is in accordance with this section. The insulation and coating may be spray-applied to the interior facing of walls and the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier or ignition barrier. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 11 1/2 inches (292 mm). The thickness of the foam plastic applied to the vertical wall surfaces must not exceed 7 1/2 inches (191mm). The foam plastic must be covered on all surfaces with DC 315 coating at a minimum wet film thickness of 18 wet mils (0.46 mm) (12 dry mils [0.31 mm]), at a rate of 1.12 gal/100 ft^2 (0.457 L/m^2); or with Blazelok™ TBX or Fireshell‡ F10E at a minimum wet film thickness of 18 wet mils (0.46 mm) (12 dry mils [0.31 mm]), at a rate of 1.12 gal/100 ft^2 (0.457 L/m^2). The coating must be applied over the Heatlok® XT-s insulation in accordance with the coating manufacturer's instructions and this report. The DC 315 coating must be applied in accordance with the manufacturer's instructions and ESR-3702. The Blazelok TBX or Fireshell‡ F10E coating must be applied in accordance with the manufacturer's instructions and ESR-3997. Surfaces to be coated must be dry, clean and free of dirt, loose debris and other substances that could interfere with the adhesion of the coating. The coating is applied in one coat by airless spray equipment at ambient temperatures above 50˚F (10˚C) and relative humidity of less than 70 percent.

4.4 Ignition Barrier – Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier: When Heatlok® XT-s 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. 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® XT-s 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.

g) If hot work is to be performed, all necessary procedures, precautions and limitations must be observed in accordance with OSHA 1926 Subpart J Standard 1926.352 requirements for hot work (welding / cutting) performed in the vicinity of combustible materials.

h) An installation certificate with the following information must be posted at each entrance:

- Product name and installation thickness.
- Manufacturer name, address and contact information.
- Installation contractor name, address and contact information.
- Attestation that the product(s) have been installed in accordance with the manufacturer's installation instructions and the requirements of the evaluation report.
- A notice that the certificate is not to be removed or altered.
- A list of limitations for the space including the following:
  - Entry to the space is only to service utilities, and no storage is permitted.
  - FIRE SAFETY WARNING: If hot work is to be performed, all necessary procedures, precautions and limitations must be observed in accordance with OSHA 1926 Subpart J Standard 1926.352 requirements for hot work (welding /cutting) performed in the vicinity of combustible materials.

4.4.2.1 Application without a Prescriptive Ignition Barrier: In attics and crawl spaces, Heatlok® XT-s 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 $11^1/_2$ inches (292 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed $7^1/_2$ inches (191 mm). The insulation may be left exposed without a prescriptive ignition barrier or fire-protective coating. The attic or crawl space must be separated from the interior of the building by an approved 15-minute thermal barrier as described in Section 4.3.1.

4.4.2.2 Use on Attic Floors: Heatlok® XT-s insulation may be installed at a maximum thickness of $11^1/_2$ inches (292 mm) between and over joists in attic floors. The Heatlok® XT-s insulation must be separated from the interior of the building by an approved thermal barrier. The coating specified in Section 4.3.2 and the ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3 may be omitted.

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 that are 40 feet (12 192 mm) or less above grade plane, the Heatlok® XT-s insulation must comply with Section 2603.5 of the 2018, 2015, 2012 and 2009 IBC and this section (Section 4.5). The insulation must not exceed a maximum thickness of 3.2 inches (81 mm). The potential heat of Heatlok® XT-s insulation is 1953 Btu/ft^2 (22.0 Mj/m^2) per inch of thickness when tested in accordance with NFPA 259.

4.5.2 Specific Wall Assemblies: One layer of $^5/_8$-inch-thick (15.9 mm), Type X gypsum wallboard complying with ASTM C36 or ASTM C1396 is installed with the long dimension perpendicular to $3^5/_8$-inch-deep (92 mm), No. 20 gage steel studs spaced a maximum of 24 inches (610 mm) on center. The wallboard is 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 in the field of the wallboard. Wallboard joints must be taped and treated with joint compound in accordance with ASTM C840 or GA-216. Fastener heads must also be treated with joint compound in accordance with ASTM C840 or GA-216.

4.5.3 Exterior Face: One layer of $^5/_8$-inch-thick (15.9 mm) sheathing complying with ASTM C1177 is attached to steel studs using $1^1/_4$-inch-long (32 mm), self-tapping screws spaced 8 inches (203 mm) on center along the perimeter and in the field of the sheathing. Heatlok® XT-s spray-applied polyurethane foam insulation, at a maximum thickness of 3.2 inches (81 mm), is spray-applied onto the exterior of sheathing. Brick ties, $3^1/_2$ inches long (89 mm), must be installed at a nominal 24 inches on center to each vertical steel stud, using two No. 14 by 5-inch-long (127 mm) hex head screws. Exterior veneer must be 4-inch-thick (102 mm) standard clay brick with Type S mortar and a nominally 2-inch air gap between brick and the foam plastic insulation.

5.0 CONDITIONS OF USE

The Heatlok® XT-s insulation described in this report comply with, or are suitable alternatives 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 Heatlok® XT-s insulation and applicable coating must be installed in accordance with the manufacturer's published installation instructions, this report and the applicable code. The instructions within this report govern if there are any conflicts between the manufacturer's published installation instructions and this report.

5.3 Heatlok® XT-s insulation must be separated from the interior of the building by an approved thermal barrier, as described in Section 4.3.1, except when installation is as described in Section 4.3.2 and 4.4.

5.4 Heatlok® XT-s insulation must be protected from the weather during application.

5.5 Heatlok® XT-s insulation must be applied by installers approved by Huntsman Building Solutions.

5.6 Use of Heatlok® XT-s insulations 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 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.

5.8 When installed in accordance with Section 4.4.2 of this report, the associated installation certificate(s) containing the required information referenced in Section 4.4.2 must be installed at each entrance to the crawlspace or attic, as applicable. The certificate(s) must be red in color and constructed of durable materials, such as metal, plastic, or laminated paper.

5.9 When used in unvented attics in accordance with Section 4.4.2 of this report, installation with a vapor diffusion port in accordance with 2021 IBC Section 1202.3, Item 5.2 or 2021 and 2018 IRC Section R806.5, Item 5.2 is outside the scope of this report.

5.10 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 and must not exceed 40 feet (12 192 mm) above grade plane.

5.11 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.

5.12 Heatlok® XT-s insulation is produced in 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 June 2023, including reports of tests in accordance with Appendix X of AC377.

6.2 Reports on room corner tests in accordance with NFPA 286.

6.3 Report on air leakage testing in accordance with ASTM E283.

6.4 Reports on water vapor transmission tests in accordance with ASTM E96 (desiccant method).

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 for Heatlok® XT-s insulation shall be identified with the name of the report holder (Huntsman Building Solutions, LLC), address and telephone number; the product trade name (Heatlok® XT-s); product type (A or B component); use instructions; the density; the flame-spread and smoke-developed indices; the ICC-ES mark of conformity; and the evaluation report number (ESR-3824). The evaluation report number (ICC-ES ESR-3824) may be used in lieu of the mark of conformity.

The ICP Construction, Blazelok™ TBX or Fireshell‡ F10E coating is labeled with the manufacturer's name, the product trade name, date of manufacture, shelf life or expiration date, manufacturer's instructions for application and ESR-3997.

The International Fireproof Technology / Paint To Protect, Inc., DC 315 coating is identified with the manufacturer's name, the product trade name, date of manufacture, shelf life or expiration date, manufacturer's instructions for application 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
www.huntsmanbuilds.com

8.0 OTHER CODES

8.1 Scope:

In addition to the codes referenced in Section 1.0, the products recognized in this report have also been evaluated for compliance with the following codes:

- 2006 IBC
- 2006 IRC
- 2006 IECC

8.2 Uses:

The products comply with the above-mentioned codes as described in Sections 2.0 through 7.0 of this report, except as noted below:

- **Application with a Prescriptive Thermal Barrier:** See Section 4.3.1, except the approved thermal barrier must be installed in accordance with Section R314.4 of the 2006 IRC.
- **Application without a Prescriptive Thermal Barrier:** See Section 4.3.2.
- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC or Section R806 of the 2006 IRC, and crawl space ventilation must be in accordance with 2006 IBC Section 1203.3 or 2006 IRC Section R408, as applicable.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC or Section R806 of the 2006 IRC, crawl space ventilation must be in accordance with 2006 IBC Section 1203.3 or 2006 IRC Section R408, as applicable, and combustion air is provided in accordance with 2006 *International Mechanical Code*® Sections 701 and 703.
- **Protection Against Termites:** See Section 5.6, except use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with Section R320.5 of the 2006 IRC.
- **Jobsite Certification and Labeling:** See Section 5.7, except jobsite certification and labeling must comply with Sections 102.1.1 and 102.1.1.1, as applicable, of the 2006 IECC.

TABLE 1—THERMAL RESISTANCE (*R*-VALUES)[1]

THICKNESS (inches)	*HEATLOK*® *XT-s* *R*-VALUE (°F.ft^2.h/Btu)
1	6.7
2	13
3	19
3.5	23
4	26
5	32
5.5	35
6	39
7	45
7.75	50
8	51
9	58
10	64
11	71
12	77
13	84
14	90
15	97
16	103

For **SI:** 1 inch = 25.4 mm; 1°F.ft^2.hr/Btu = 0.176 110 k.m^2/W.

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