Code Compliance Research Report
CCRR-1112

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

REPORT HOLDER:
Xtreme Seal LLC
36 Finnell Drive, 3.5
Weymouth, MA 02188
(508) 933-1894
www.xtremesealfoam.com
info@xtremesealfoam.com

REPORT SUBJECT:
XtremeSeal 0.4 LX Shield Spray-applied Polyurethane Foam Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

- 2015, 2012, 2009, and 2006 *International Building Code®* (IBC)
- 2015, 2012, 2009, and 2006 *International Residential Code®* (IRC)
- 2015, 2012, 2009, and 2006 *International Energy Conservation Code®* (IECC)

NOTE: This report references 2015 Code sections. Sections for earlier editions may differ.

1.2 0.4 LX Shield has been evaluated for the following properties (see Table 1):

- Physical properties
- Surface burning characteristics
- Air permeability
- Thermal resistance

1.3 0.4 LX Shield has been evaluated for the following uses (see Table 1):

- Use as nonstructural thermal insulation on or in interior and exterior walls, floors, and underside of roof decks
- Alternatives to Code-prescribed ignition barriers
- Alternatives to Code-prescribed thermal barriers
- Use as air-impermeable insulation
- Use in Type V construction

2.0 STATEMENT OF COMPLIANCE

0.4 LX Shield complies with the Codes listed in Section 1.1, for the properties stated in Section 1.2 and uses stated in Section 1.3, when installed as described in this report, including the Conditions of Use stated in Section 6.

3.0 DESCRIPTION

3.1 0.4 LX Shield: 0.4 LX Shield is a two-component, open-cell, foam plastic insulation. The insulation is produced in the field by combining an isocyanate (Component A) with a proprietary resin (Component B), resulting in insulation with a nominal density of 0.4 pcf. The insulation components have a shelf life of six months when stored at temperatures between 50°F and 80°F before installation.

3.2 Intumescent Coatings:

3.2.1 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by IFTI, Paint to Protect, is a water-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of 24 months when stored in factory-sealed containers at temperatures between 41°F and 95°F. DC315 is an Intertek certified product. DC315 complies with ICC-ES AC456 as recognized in Intertek CCRR-1076.

3.2.2 FS-IB Intumescent Coating: FS-IB intumescent coating, manufactured by Flame Seal Coatings, is a single-component latex-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of six months when stored in factory-sealed containers at temperatures between 60°F and 80°F.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface Burning Characteristics: The insulation, at a maximum thickness of 4 inches, 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. 0.4 LX Shield can be installed at greater thicknesses as described in Sections 5.3 and 5.4.2. When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited. Under the 2015 IRC, a thermal barrier of minimum 23/32 inch thick wood structural panel is also permitted and the thickness is not limited.

4.2 Air Permeability: The insulation, at a minimum thickness of 3-1/2 inches, is considered air-impermeable insulation in accordance with 2015 IBC and 2015 IRC Sections 202 and R202 respectively, based on testing in accordance with ASTM E283. Air permeability was not defined in the 2012 and 2009 IBC.

4.3 Thermal Resistance: The insulation has thermal resistance (R-value), at a mean temperature of 75°F, as shown in Table 2.

5.0 INSTALLATION

5.1 General:

0.4 LX Shield must be installed in accordance with the manufacturer's published installation instructions, the applicable Code, and this Research Report. A copy of the manufacturer's instructions must be available on the jobsite during installation.

The insulation must be stored at temperatures between 50°F and 80°F and must not be used in areas that have a maximum service temperature greater than 180°F. The foam plastic insulation must not be used in electrical outlet or junction boxes, or in contact with rain or water. The substrate must be free of moisture, frost or ice, loose scales, rust, oil, and grease. The insulation must be protected from the weather during and after application, unless approved specifically by Xtreme Seal LLC.

The manufacturer's published installation instructions must be available on the jobsite at all times during installation.

5.2 Application:

The insulation is spray-applied on the jobsite using spray equipment specified in Xtreme Seal LLC's published installation instructions. 0.4 LX Shield can be installed in one pass. Where multiple passes are required, the cure time between passes is negligible.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: The insulation must be separated from the interior of the building by an approved thermal barrier of 1/2 inch thick gypsum wallboard or an equivalent 15-minute thermal barrier complying with IBC Section 2603.4 or IRC Section R316.4, as applicable, except where installation is in an attic or crawl space as described in Section 5.4. When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited. Under the 2015 IRC, a thermal barrier of minimum 23/32 inch thick wood structural panel is also permitted and the thickness is not limited.

5.3.2 Application without a Prescriptive Thermal Barrier: 0.4 LX Shield may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in this section. The thickness of the foam plastic insulation applied to the underside of the roof sheathing and floors must not exceed 14 inches, and the thickness on walls must not exceed 8.5 inches. The foam plastic must be covered on all surfaces with DC315 intumescent coating at an application rate of 0.9 gallon per 100 sq. ft. to achieve 14 wet mils (9 dry mils).

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 with low-pressure airless spray equipment.

5.4 Attics and Crawl Spaces:

5.4.1 Application with a Prescriptive Ignition Barrier: Where 0.4 LX Shield is installed within attics or crawl spaces, and where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or 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, as specified in this section, may be installed in unvented attics and unvented enclosed rafter assemblies in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5.

5.4.2 Application without a Prescriptive Ignition Barrier: 0.4 LX Shield insulation may be installed in attics and crawl spaces without the ignition barrier prescribed in IBC Section 2603.4.1.6, and IRC Sections R316.5.3 and R316.5.4, as described in Sections 5.4.2.1, 5.4.2.2, 5.4.2.3, and 5.4.3, subject to the following conditions:

a. Entry to the attic or crawlspace is only to service utilities and no storage is permitted.
b. There are no interconnected attic or crawl space areas.
c. Air in the attic is not circulated to other parts of the building.
d. Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806.1, as applicable, except when insulation is permitted in unvented attics in accordance with 2015 IBC Section 1203.3 [not applicable under the 2012, 2009 or 2006 IBC], or IRC Section R806.5.
e. Under-floor (crawl space) ventilation is provided in accordance with IBC Section 1203.5 or IRC Section R408.1, as applicable.
f. Combustion air is provided in accordance with IMC (International Mechanical Code®) Section 701.

The insulation may be installed in unvented attics as described in this section in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5, when applied at a minimum thickness of 3-1/2 inches.

5.4.2.1 Application with DC315 Intumescent Coating: 0.4 LX Shield insulation maybe applied to the underside of roof sheathing, to roof rafters and to walls; and in crawl spaces; the insulation may be spray-applied to the underside of wood floors and to walls, as described in this section.

The thickness of the foam plastic applied to vertical surfaces must not exceed 8 inches, and the thickness applied to the underside of the wood floor or roof sheathing must not exceed 12 inches. The foam plastic must be covered with DC315 intumescent coating, applied in accordance with the manufacturer's instructions, at a minimum application rate to provide a minimum 4 mil wet film (3 mil dry film) coating.

The ignition barrier required by IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4 may be omitted.

5.4.2.2 Application with FS-IB Intumescent Coating: 0.4 LX Shield insulation maybe applied to the underside of roof sheathing, to roof rafters and to walls; and in crawl spaces; the insulation may be spray-applied to the underside of wood floors and to walls, as described in this section.

The thickness of the foam plastic applied to vertical surfaces must not exceed 8 inches, and the thickness applied to the underside of the wood floor or roof sheathing must not exceed 14 inches. The foam plastic must be covered with FS-IB intumescent coating, applied in accordance with the manufacturer's instructions, at a minimum application rate to provide a minimum 6 mil wet film (3 mil dry film) coating.

The ignition barrier required by IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4 may be omitted.

5.4.2.3 Use on Attic Floors: 0.4 LX Shield insulation may be installed at a maximum thickness of 8 inches between joists in attic floors, when covered on the attic side of the insulation with one of the following:

- DC315 intumescent coating, applied in accordance with the manufacturer's instructions, at a minimum application rate of 0.3 gallon per 100 sq. ft. to provide a minimum 4 mil wet film (3 mil dry film) thickness.
- FS-IB intumescent coating, applied in accordance with the manufacturer's instructions, at a minimum application rate of 0.4 gallon per 100 sq.ft. to provide a minimum 6 mil wet film (4 mil dry film) thickness.

The insulation must be separated from the interior of the building by an approved thermal barrier.

5.4.2.4 Unvented Attics: Xtreme Seal LLC has conducted end use configuration testing (per IBC Section 2603.9 and IRC Section R316.6) and analysis to qualify the use of 0.4 LX Shield insulation without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with 2015 IBC Section 1203.3 or IRC Section R806.5. (Note that unvented attics were not addressed in the 2012 and earlier versions of the IBC.) The testing and analysis is described in Priest & Associates EEV 10124b, Revision 3, dated August 24, 2015, and Engineering Evaluation dated December 9,

2015. The conclusions of that evaluation (and associated Engineering Letters) are as follows: When 00.4 LX Shield is applied in unvented attics conforming to IBC Section 1203.3 or IRC Section R806.5, the insulation may be applied to the underside of roof sheathing and/or to rafters and to vertical surfaces to a minimum thickness of 3 1/2 inches. Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 18 inches. 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 attic floor, opening outward toward the living space. For items penetrating the roof deck or walls, such as skylight wells or vents, the annular space must be sealed and penetrations extending through the attic space that are combustible shall be covered with a minimum of 3 1/2 inches of 0.4 LX Shield insulation.

6.0 CONDITIONS OF USE

6.1 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict, this report governs.

6.2 The insulation must be separated from the interior of the building by an approved 15-minute thermal barrier, as described in Section 5.3, or by an approved ignition barrier, as described in Section 5.4.

6.3 The insulation thickness must not exceed that noted in Sections 4.1, 5.3, and 5.4.

6.4 The insulation must be protected from the weather during and after application as specified in the manufacturer's instructions.

6.5 A vapor barrier must be installed when required by the applicable Code.

6.6 The insulation must be applied by contractors approved by Xtreme Seal LLC.

6.7 When 0.4 LX Shield insulation is installed under the conditions of Section 5.4.2 of this report, the following conditions apply:

6.7.1 Since the performance of 0.4 LX Shield, 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. The installation must conform with the provisions of Section 5.4.2.4 and Conditions a. through c. and Condition f. of Section 5.4.2. A copy of the Priest & Associates Engineering Evaluation (referenced in Sections 7.4 through 7.7) must be provided to the Code official upon request.

6.7.2 Signage shall be permanently affixed in the attic and shall be visible from all entry points into the attic. The sign shall state *"Caution, this is an unvented attic by design. No modification may be made to this unvented condition. The attic shall not be vented. Holes into the unvented attic shall be immediately repaired and sealed. Penetrations of the ceiling or wall membrane between the unvented attic and living space, other than the horizontal access hatch, must be protected in an approved manner. This unvented attic shall not be used for storage. See Intertek Code Compliance Research Report CCRR-1112 on the* Intertek website."

6.8 Use of the insulation in fire-resistance-rated construction is outside the scope of this report.

6.9 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IBC Section 2603.8 or IRC Section R318.4, as applicable.

6.10 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10 and IECC Section C303.1 or R303.1, as applicable.

6.11 The 0.4 LX Shield is manufactured under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).

7.0 SUPPORTING EVIDENCE

7.1 Reports of tests in accordance with ASTM C518, ASTM E283, and ASTM E84.

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated April 2016, including tests in accordance with Appendix X.

7.3 Research Reports for evaluation of data in accordance with ICC-ES Acceptance Criteria for Fire-protective Coatings Applied to Spray-applied Foam Plastic Insulation Installed without a Code-prescribed Thermal Barrier (AC456), dated October 2015.

7.4 Priest & Associates Engineering Evaluation, Project 1028, dated January 22, 2014.

7.5 Priest & Associates Engineering Evaluation, Project 10200, dated January 6, 2014.

7.6 Priest & Associates Engineering Evaluation 10124b, Revision 3, dated August 24, 2015.

7.7 Priest & Associates letters dated January 3, 2014, and December 9, 2015.

7.8 Intertek Listing Report "0.4 LX Shield", on the Intertek Directory of Building Products.

8.0 IDENTIFICATION

The A and B components are identified with the manufacturer's name (Xtreme Seal LLC), address and telephone number, the product name (0.4 LX Shield), the product type (A of B component), the mixing instructions, the density, the flame-spread and smoke-developed indexes, the shelf life and date of manufacture, the Intertek Mark as shown below, and the Code Compliance Research Report number (CCRR-1112).

9.0 OTHER CODES

This section is not applicable.

10.0 CODE COMPLIANCE RESEARCH REPORT USE

10.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

10.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

10.3 Reference to the https://bpdirectory.intertek.com is recommended to ascertain the current version and status of this report.

TABLE 1 - PROPERTIES EVALUATED

PROPERTY	2015 IBC SECTION[1]	2015 IRC SECTION[1]	2015 IECC SECTION[1]
Physical properties	Not required	Not required	Not required
Surface-burning characteristics	2603.3	R316.3	Not applicable
Alternatives to thermal barrier / ignition barrier	2603.4	R316.4	Not applicable
Thermal resistance	1301	N1101.10, N1102	C303.1.1 C303.1.4 R303.1.1 R303.1.4

[1] Section numbers may be different for earlier versions of the International codes.

TABLE 2 - 0.4 LX Shield THERMAL RESISTANCE (R-Values)[1,2,3]

THICKNESSES (inches)	R-VALUE (°F.ft².h/Btu)
1	3.7
1.5	5.5
2	7.3
2.5	9.0
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	40
11.5	41
12	43
13	47
14	50

[1] R-values are calculated based on tested K-values at 1 inch and 4 inch thicknesses.

[2] R-values less than 10 are rounded to the nearest 1/10th; greater than 10 are rounded to the nearest whole number.

[3] To determine R-values for thicknesses not listed:

a. Between 1 inch and 4 inch can be determined through linear interpolation

b. Greater than 4 inches can be calculated based on R = 3.6/in.