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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation

REPORT HOLDER:

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REPORT SUBJECT:

ThermoSeal OCX Spray-applied Polyurethane Foam Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

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

NOTE: This report references 2015 Code sections with [2012 and 2009] Code sections shown in brackets where they differ.

1.2 ThermoSeal OCX has been evaluated for the following properties (see Table 1):

- Surface-burning characteristics
- Thermal resistance
- Physical properties
- Air Permeability
- Alternatives to thermal barriers
- Alternatives to ignition barriers

1.3 ThermoSeal OCX has been evaluated for the following uses (see Table 1):

- Use as nonstructural thermal insulation on or in interior and exterior walls, floors, and under roof decks
- Use in Types I, II, III, IV, and V construction under the IBC and construction under the IRC

2.0 STATEMENT OF COMPLIANCE

ThermoSeal OCX 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 Materials:

3.1.1 ThermoSeal OCX: ThermoSeal OCX is a two-component, open-cell, spray-applied 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 0.5 pcf. Both insulation components have a shelf life of one year when stored in unopened containers at temperatures between 50°F and 100°F before installation.

3.1.2 Intumescent Coatings:

3.1.2.1 Blazelok™ IB4: Blazelok™ IB4, manufactured by TPR² Corporation, is a one-component, water-based liquid coating with specific gravity of 1.3. Blazelok™ IB4 is supplied in 5-gallon pails and/or 55-gallon drums and has a shelf life of one year when stored in factory-sealed containers at temperatures between 45°F and 90°F.

3.1.2.2 Andek Firegard™: Andek Firegard, manufactured by Andek Corporation, is a one-component, water-based coating with specific gravity of 1.37. Andek Firegard is supplied in 5-gallon pails and has a shelf life of one year when stored in factory-sealed containers at temperatures between 45°F and 90°F.

3.1.2.3 No-Burn® Plus XD: No-Burn® Plus XD, manufactured by No-Burn, Inc., is a translucent aqueous liquid in 1- and 5-gallon pails and 55-gallon drums. The coating has a shelf life of three years when stored in a factory-sealed container at temperatures between 40°F and 90°F.



3.1.2.4 Blazelok™ TBX: Blazelok™ TBX, manufactured by TPR² Corporation, is a one-component, water-based liquid coating with specific gravity of 1.3. Blazelok™ TBX is supplied in 5-gallon pails and/or 55-gallon drums and has a shelf life of one year when stored in factory-sealed containers at temperatures between 45°F and 90°F. Blazelok TBX complies with ICC-ES AC456 as recognized in ICC-ES ESR-3997.

3.1.2.5 DC315 Fireproof Paint: DC315, manufactured by International Fireproof Technology, Inc., is a one-component, water-based, liquid coating with a specific gravity of 1.3. DC 315 is supplied in 5-gallon pails and/or 55-gallon drums and has a shelf life of one year when stored in unopened factory-sealed containers between 50°F to 80°F. DC315 complies with ICC-ES AC456 as recognized in Intertek CCRR-1076.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface-burning Characteristics: When tested in accordance with ASTM E84 at a maximum thickness of 4 inches, the insulation has a flame-spread index of 25 or less and a smoke-development index of 450 or less. ThermoSeal OCX can be installed at greater thicknesses as described in Sections 5.3 and 5.4.2 of this report.

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 Section 1203.3 [not applicable in the 2012 and 2009 IBC], or IRC Section R806.5 [2009 – R806.4] based on testing in accordance with ASTM E283 and ASTM E2178.

4.3 Thermal Resistance (R-value): 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: ThermoSeal OCX 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 installation requirements in Sections 5.1 through 5.4 apply to all types of construction.

The insulation must be stored at temperatures between 50°F and 100°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 insulation is not intended for installation to the exterior of below-grade walls or beneath slabs-on-grade. 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 ThermoSeal, LLC.

5.2 Application: The insulation is spray-applied on the jobsite using spray equipment specified in ThermoSeal, LLC published installation instructions. ThermoSeal OCX can be installed in one pass (or lift). Where multiple passes (or lifts) 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: ThermoSeal OCX 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 insulation may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces provided the assembly conforms to one of the assemblies described in Table 3. The coatings identified in Table 3 must be applied over all surfaces and in accordance with the coating manufacturer's installation 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 ThermoSeal OCX 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 [2009 – R806.4].

5.4.2 Application without a Prescriptive Ignition Barrier:

ThermoSeal OCX 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 Section 5.4.2.1, 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 or 2009 IBC], or IRC Section R806.5 [2009 – R806.4].
- e. Under-floor (crawl space) ventilation is provided in accordance with IBC Section 1203.5 [1203.3] or IRC Section R408.1, as applicable.
- f. Combustion air is provided in accordance with International Mechanical Code® Section 701 [Sections 701 and 703].

In attics, the insulation may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces, provided the assembly conforms to one of the assemblies described in Table 4. In crawl spaces, the

insulation may be spray-applied to the underside of floors and/or vertical surfaces, provided the assembly conforms to one of the assemblies described in Table 4. When an intumescent coating is used, surfaces to be coated must be dry, clean, and free of dirt, loose debris, and any other substances that could interfere with adhesion of the coating. The intumescent coating must be applied to all surfaces in accordance with the respective coating manufacturer's installation instructions. The coating must be applied when ambient and substrate temperatures are above of 50°F unless otherwise permitted by the intumescent coating manufacturer's installation instructions.

When installed in accordance with this section, 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 [2009 – R806.4], when applied at a minimum thickness of 3-1/2 inches.

5.4.3 Use on Attic Floors: ThermoSeal OCX insulation may be installed between and over joists in attic floors in accordance with this section, conditions a. through f. of Section 5.4.2, and Table 4 based on testing in accordance with AC377 Appendix X. The insulation must be separated from the interior of the building by an approved thermal barrier.

5.4.4 Unvented Attics: ThermoSeal, LLC has conducted end use configuration testing (per IBC Section 2603.9 [2603.10] and IRC Section R316.6) and analysis to qualify the use of ThermoSeal OCX insulation without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with 2015 IBC Section 1203.3 or IRC Section R806.5 [2009 – R806.4]. (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 10362b, dated April 18, 2016. The conclusions of that evaluation (and associated Engineering Letters) are as follows: When ThermoSeal OCX is applied in unvented attics conforming to IBC Section 1203.3 or IRC Section R806.5 [2009 – R806.4] the insulation may be applied to the underside of roof sheathing and/or rafters, and to vertical surfaces to a minimum thickness of 3 inches. Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 13 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 and opening outward toward the living space. For items penetrating the roof deck or walls, such as skylight wells or vents, the penetrating item must be covered with a minimum of 3 inches of ThermoSeal OCX insulation.

5.5 Exterior Walls In Types I, II, III, and IV Construction:

5.5.1 When used in or on exterior walls of Types I, II, III, or IV construction, the assembly must comply with IBC Section 2603.5 and this section. Intertek Design Listing TSL/FI 30-01 describes the assembly tested and certified by Intertek as complying with NFPA 285. The potential heat of the ThermoSeal OCX insulation is 497 Btu/ft² per inch of insulation thickness with a maximum permitted thickness, in any part of the wall, of 3-5/8 inches.

5.5.2 Details of exterior wall coverings and fenestration details must be provided to the building official along with an engineering analysis demonstrating that the addition of the wall covering and fenestration details will not negatively impact conformance of the assembly with the requirements of IBC Section 2603.5.

6.0 CONDITIONS OF USE

6.1 The installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict between the manufacturer's instructions and this report, 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 3.1, 5.3, 5.4, and 5.5.

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 ThermoSeal, LLC.

6.7 When ThermoSeal OCX insulation is installed under the conditions of Section 5.4.4 of this report, the following conditions apply:

6.7.1 Since the performance of ThermoSeal OCX, 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 5.4.4 and Conditions a. through c. and Condition f. of Section 5.4.2. A copy of the Priest & Associates Engineering Evaluation (referenced in Sections 5.4.4 and 7.3) 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-1095 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 [2012 - 2603.9, 2009 - 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 [2012 - N1101.1, 2009 - N1101.4] and IECC Section C303.1 or R303.1 [2009 - 303.1], as applicable.

6.11 The insulation components are produced 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, ASTM E2178, NFPA 285, NFPA 259, 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 reports of 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 10362b, dated April 18, 2016.

7.5 Intertek Listing Report "ThermoSeal OCX", on the [Intertek Directory of Building Products](https://bpdirectory.intertek.com).

8.0 IDENTIFICATION

The ThermoSeal OCX is identified with the manufacturer’s name (ThermoSeal, LLC), address and telephone number, the product name (ThermoSeal OCX), the product type (A or B component), the mixing instructions, the flame-spread and smoke-developed indices, date of manufacture, the Intertek Mark as shown below, and the Code Compliance Research Report number (CCRR-1095).



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

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TABLE 1 - PROPERTIES EVALUATED

| PROPERTY | IBC SECTION ¹ | IRC SECTION ¹ | IECC SECTION ¹ |
|----------------------------------|--------------------------|---|---|
| Physical Properties | Not required | Not required | Not required |
| Surface-burning Characteristics | 2603.3 | R316.3 | Not applicable |
| Thermal Barrier/Ignition Barrier | 2603.4 | R316.4 | Not applicable |
| Thermal Resistance | 1203.3 [1301] | N1101.10 N1102 [N1102.12, N1101.1] | C303.1.1 C303.1.4 R303.1.4 R303.1.4 [303.3.3 and 3.3.1.2] |

¹ Section numbers may be different for earlier versions of the International Codes.

TABLE 2 – THERMOSEAL OCX THERMAL RESISTANCE (R-values)^{1,2,3}

| THICKNESS (inches) | R-VALUE (°F.ft ² .h/Btu) |
|--------------------|-------------------------------------|
| 1 | 3.8 |
| 3.5 | 13 |
| 4 | 15 |
| 5 | 19 |
| 5.5 | 21 |
| 6 | 23 |
| 7 | 27 |
| 7.25 | 28 |
| 8 | 30 |
| 9 | 34 |
| 9.25 | 35 |
| 10 | 38 |
| 11 | 42 |
| 11.25 | 43 |
| 12 | 46 |
| 13 | 49 |
| 14 | 53 |
| 15 | 57 |

¹ R-values are calculated based on tested k-factors at multiple 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: between 1 inch and 4 inch can be determined through linear interpolation or greater than 4 inches can be calculated based on R = 3.8/inch.





TABLE 3 – ASSEMBLIES WITHOUT A PRESCRIPTIVE THERMAL BARRER

| Coating | Maximum Insulation Thickness (in.) Vertical Surfaces | Maximum Insulation Thickness (in.) Ceiling Surfaces | Fire Protective Coating (Applied to all Foam Surfaces) | | | Method |
|--------------|--|---|--|----------------|--------------------------------|----------|
| | | | Minimum Thickness (mils) | | Minimum Application Rate | |
| | | | Dry film (dft) | Wet film (wft) | | |
| Blazelok TBX | 7.5 | 11.5 | 11 | 17 | 1.11 gal / 100 ft ² | NFPA 286 |
| DC315 | 7.5 | 11.5 | 12 | 18 | 1.12 gal / 100 ft ² | NFPA 286 |

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

TABLE 4 – ASSEMBLIES WITHOUT A PRESCRIPTIVE IGNITION BARRER

| Coating | Maximum Insulation Thickness (in.) Wall Cavities and Attic Floors | Maximum Insulation Thickness (in.) Underside of Roof Sheathing/Rafters and Floors | Fire Protective Coating (Applied to all Foam Surfaces) | | | Method |
|-----------------|---|---|--|----------------|--------------------------------|------------|
| | | | Minimum Thickness (mils) | | Minimum Application Rate | |
| | | | Dry film (dft) | Wet film (wft) | | |
| Blazelok IB4 | 9.25 | 11.25 | 5 | 9 | 0.57 gal / 100 ft ² | Appendix X |
| Andek Firegard | 9.5 | 11.25 | 10 | 20 | 1.00 gal / 100 ft ² | Appendix X |
| No-Burn Plus XD | 9.5 | 11.25 | 6 | 10 | 0.6 gal / 100 ft ² | Appendix X |
| DC315 | 7.25 | 11.25 | 3 | 4 | 0.3 gal / 100 ft ² | Appendix X |

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