Code Compliance Research Report
CCRR-0452

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 21 00 – Thermal Insulation
Section: 07 21 19 – Foamed-In-Place Insulation

REPORT HOLDER:
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REPORT SUBJECT:
OC Pro, OC-NM Pro, CC-HFO Pro and CC Pro Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

- 2021, 2018, and 2015 *International Building Code®* (IBC)
- 2021, 2018, and 2015 *International Residential Code®* (IRC)
- 2021, 2018, and 2015 *International Energy Conservation Code®* (IECC)

NOTE: This report references the most recent edition of the codes cited. Section numbers in earlier versions of the codes may differ.

1.2 The insulations have been evaluated for the following properties (see Table 1):

- Physical properties
- Surface-burning characteristics
- Thermal resistance
- Air permeance
- Vapor permeance

1.3 The insulations have been evaluated for the following uses (see Table 1):

- Use as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings and the underside of roofs
- Alternative to Code-prescribed thermal barriers
- Alternative to Code-prescribed ignition barriers
- Use in Type I, II, III, IV, and V construction (IBC) and buildings regulated under the IRC

2.0 STATEMENT OF COMPLIANCE

SFM Foam OC Pro, OC-NM Pro, CC-HFO Pro and CC Pro insulations comply 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 OC Pro, OC-NM Pro, CC-HFO Pro and CC Pro: The insulations are two-component spray-applied polyurethane foam plastic, produced in the field by combining a polymeric isocyanate (A component) with a resin (B component). The insulation liquid components are supplied in 55-gallon drums and must be stored at temperatures between 65°F and 85°F. The A and B components have a shelf life of six months when stored in factory-sealed containers at these temperatures.

OC Pro and OC-NM Pro have a nominal density of 0.5 pcf. CC-HFO Pro and CC Pro have a nominal density of 2 pcf.

3.2 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by International Fireproof Technology, Inc., 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 a temperature between 41°F and 95°F.

DC315 complies with ICC-ES AC456 and is recognized in ICC-ES ESR-3702.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface-burning characteristics: The insulations, at a maximum thickness of 4 inches and the nominal densities stated in Section 3.1 of this report, have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Based on large scale tests in accordance with NFPA 286 and ICC-ES AC377 Appendix X, the insulations can be installed at greater thicknesses as described in Sections 5.3 and 5.4. When the insulations are separated from the interior occupied space of the building with minimum 1/2-inch-thick gypsum board, the maximum insulation thickness is not limited. Under the IRC, a thermal barrier of minimum 23/32-inch-thick wood structural panel is also permitted, and the maximum insulation thickness is not limited.

4.2 Thermal Resistance: The thermal resistance of the insulations is shown in Table 2.

4.3 Air Permeability: CC-HFO Pro at a minimum thickness of 1-1/2 inches, CC Pro at a minimum thickness of 1 inch, OC-NM Pro at a minimum thickness of 3-1/2 inches, and OC Pro at a minimum thickness of 3 inches are considered air-impermeable insulations in accordance with IBC Section 1202.3 or IRC Sections R202 and R806.5 and are considered an air barrier material complying with IECC Section C402.5.1.3, based on testing in accordance with ASTM E283 or ASTM E2178.

4.4 Vapor Permeance:

4.4.1 CC-HFO Pro has a vapor permeance of 0.40 perms when applied at a minimum thickness of 2 inches and may be used where a Class II vapor retarder is required.

4.4.2 CC Pro has a vapor permeance of 0.96 perms when applied at a minimum thickness of 2 inches and may be used where a Class II vapor retarder is required.

4.4.3 OC-NM Pro has a vapor permeance of less than 10 perms when applied at a minimum thickness of 2 inches and may be used where a Class III vapor retarder is required.

5.0 INSTALLATION

5.1 General:

The insulations 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.

5.2 Application: The insulations are spray-applied on the jobsite using a volumetric positive displacement pump as identified in the manufacturer's application instructions. The insulations must be applied when the ambient temperature is greater than 32°F. The insulations must not be used in areas that have a maximum in-service temperature of greater than 180°F. The insulations must not be used in electrical outlet or junction boxes or in contact with water, rain, or soil. The insulations must not be sprayed onto a substrate that is wet or covered with frost or ice, loose scales, rust, oil, or grease. The insulations must be protected from the weather during and after application.

OC Pro and OC-NM Pro may be applied to the intended thickness, with each pass being a maximum of 12-inches thick. Where multiple passes are required, no cure time between passes is required.

CC-HFO Pro is applied in passes having a maximum thickness of 4 inches per pass. When multiple passes are required, subsequent passes can be sprayed once the core temperature drops below 100°F.

CC Pro is applied in passes having a maximum thickness of 2 inches per pass. When multiple passes are required, subsequent passes can be sprayed once the core temperature drops below 100°F.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: The insulations must be separated from the interior living space of the building by an approved thermal barrier of 1/2-inch-thick gypsum board or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as

applicable. Exceptions are provided in Sections 5.3.2 and 5.4.

When the insulations are 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 IRC, a thermal barrier of 23/32-inch-thick wood structural panel is also permitted, and the maximum insulation thickness is unlimited.

5.3.2 Application without a Prescriptive Thermal Barrier: The insulations 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.

CC-HFO Pro may be applied to a maximum of 7-1/4 inches on walls and 7-1/4 inches on ceilings and must be covered on all surfaces with DC315 applied at 18 wet mils (1.13 gal/100 ft^2).

OC Pro may be applied to a maximum of 8 inches on walls and 12 inches on ceilings and must be covered on all surfaces with DC315 applied at 20 wet mils (1.28 gal/100ft^2).

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:

The insulations may be applied in attics and crawl spaces as described in either 5.4.1 or 5.4.2. When the insulation is installed in an attic or crawlspace in accordance with this section, a thermal barrier is not required between the insulation and the attic or crawl space but is required between the insulation and the interior living space. Attics and crawl spaces must be ventilated in accordance with the applicable Code.

5.4.1 Application with a Prescriptive Ignition Barrier: When the insulations are installed within attics and crawl spaces where entry is made only for service of utilities, the ignition barrier must be installed in accordance with IBC Section 2603.4.1.6, or IRC Section R316.5.3 or 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 the foam plastic insulation is not exposed.

5.4.2 Application without a Prescriptive Ignition Barrier: CC-HFO Pro and CC Pro 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, subject to the following conditions:

a. Entry to the attic or crawl space 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 or crawl space is not circulated to other parts of the building.
d. Under-floor (crawl space) ventilation is provided when required by IBC Section 1202.4 or IRC Section R408.1, as applicable.
e. Attic ventilation is provided when required by IBC Section 1202.2.1 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with IBC Section 1202.3 or IRC Section R806.5.
f. Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701.

The insulation may be spray-applied to the underside of the roof sheathing and/or rafters in attics; the underside of wood floors in crawl spaces; and to vertical surfaces in both attics and crawl spaces, as described in this section.

CC-HFO Pro may be applied, with no coating or covering, to a maximum of 6 inches on walls and 10 inches on ceilings. CC Pro may be applied, with no coating or covering, to a maximum of 6 inches on walls and ceilings.

OC Pro and OC-NM Pro may be applied at maximum thickness of 8 inches on wall and 12 inches on ceilings and must be covered on all surfaces with DC315 applied at 4 wet mils (0.25 gal/100 ft^2).

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.

5.4.3 Use on Attic Floors: CC-HFO Pro may be applied between and over the joists in attic floors to a maximum thickness of 10 inches with no coating or covering. CC Pro may be applied between and over the joists in attic floors to a maximum thickness of 6 inches with no coating or covering.

The insulation must be separated from the interior occupied space by an approved thermal barrier.

5.4.4 Unvented Attics: End use configuration testing (per IBC Section 2603.9 and IRC Section R316.6) and analysis have been conducted to qualify the use of OC Pro and OC-NM Pro insulations without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with IBC Section 1202.3 or IRC Section R806.5. The testing and analysis are described in Priest & Associates EEV 10934C dated February 10, 2021. The conclusions of that evaluation are as follows: When OC Pro and OC-NM Pro are applied to unvented attics conforming to IBC Section 1202.3 or IRC Section R806.5, 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 and maximum 18 inches. The insulations may be left exposed to the attic without a prescription 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 annular space must be covered with a minimum of 3 inches of insulation.

5.4.5 Exterior Walls in Types I, II, III, and IV Construction: CC-HFO Pro may be installed in or on exterior walls of building Types I, II, III and IV construction complying with IBC Section 2603.5 and as described in Table 3. Maximum permitted thickness of foam plastic is specified in Table 3.

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 insulations must be separated from the interior occupied space of the building by a thermal barrier as described in Section 5.3, except as described in Section 5.3.2 and 5.4.

6.3 The insulations must not exceed the thicknesses noted in Sections 4.1, 5.3, and 5.4, as applicable.

6.4 When OC Pro and OC-NM Pro insulations are installed under the conditions of Section 5.4.4 of this report, the following conditions apply:

6.4.1 Since the performance of the insulation, 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 Section 5.4.4 must be provided to the Code official upon request.

6.4.2 Signage shall be permanently affixed in the attic and shall be visible form all points within 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- 0452 on the Intertek Website."*

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

6.6 Except as noted in Section 4.4, walls in which the insulation is applied must include a vapor barrier complying with the code.

6.7 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10, N1101.14 and IECC Sections C303.1 or R303.1 and R401.3, as applicable.

6.8 The insulations are manufactured under a quality control program with inspections by Intertek Testing Services NA, Inc.

7.0 SUPPORTING EVIDENCE

7.1 Reports of tests in accordance with ASTM E84, ASTM E96, ASTM E970, ASTM E283, ASTM E2178, NFPA 285, NFPA 286, and US-FTC CFR Title 16 Part 460.

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated February 2020, including reports of tests in accordance with Appendix X.

7.3 Data in accordance with ICC 1100 (2019).

7.4 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.

7.5 Priest & Associates Engineering Evaluation 10934C dated February 10, 2021.

7.6 Intertek Listing Report "OC Pro, OC-NM Pro, CC-HFO Pro and CC Pro Spray-applied Polyurethane Insulation", on the Intertek Directory of Building Products.

8.0 IDENTIFICATION

The A and B components of the insulations described in this Research Report are identified with the report holder's name (SFM Foam), address and telephone number; the product name; use instructions; the flame-spread and smoke-developed indices; the lot number; the Intertek Mark as shown below; and the Code Compliance Research Report number (CCRR-0452).

CODE COMPLIANCE

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.

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TABLE 1 - PROPERTIES EVALUATED

PROPERTY	2021 IBC SECTION[1]	2021 IRC SECTION[1]	2021 IECC SECTION[1]
Physical properties	2603.1.1	Not required	Not required
Surface-burning characteristics	2603.3	R316.3	Not applicable
Thermal barrier/ignition barrier	2603.4	R316.4	Not applicable
Air permeability	1202.3	R806.5	C402.5
Thermal resistance	1301	N1101.10 N1102	C303.1 R303.1
Exterior Walls in Types I-IV Construction	2603.5	Not Applicable	Not applicable

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

TABLE 2 – THERMAL RESISTANCE

THICKNESS (in.)	R-VALUE (°F.ft^2.h/Btu)[1, 2, 3, 4]			
	OC Pro	OC-NM Pro	CC-HFO Pro	CC Pro
1.0	3.6	3.7	6.9	6.9
2.0	6.9	7.4	14	13
3.0	10	11	20	20
3.5	12	13	24	23
4.0	14	15	27	27
5.0	17	19	34	34

[1]R-values are calculated based on tested K values at 1- and 3-1/2-inch thicknesses

[2]R-values may be interpolated between 1 and 3-1/2 inches

[3]Above 3-1/2 inches, R-values may be calculated as follows:

- OC Pro: R-values are calculated using R=3.43/ inch
- OC-NM Pro: R-values are calculated using R=3.67/inch
- CC-HFO Pro: R-values are calculated using R=6.86/inch
- CC Pro: R-values are calculated using R=6.70/inch

[4]R-values greater than 10 are rounded to the nearest whole number

TABLE 3A – NFPA 285 COMPLYING WALLS - CC-HFO Pro in Wall Cavity

Wall Component	Materials
Base Wall System – Use either 1, 2, or 3	1. Concrete Wall 2. Concrete Masonry Wall 3. One layer of min. 5/8-in. thick Type X gypsum wallboard installed on the interior side of 3-5/8-in. deep, minimum 25-GA thick steel studs spaced a maximum 24-in. on center. Lateral bracing installed minimum every 4-ft vertically or as required. Wall stud cavities shall be filled at each floor line with minimum 4 pcf mineral wool friction fit between steel studs.
Perimeter Fire Barrier System	Perimeter fire barrier system complying with IBC Section 715.4 shall be installed, as applicable, to fill the void between the edge of the concrete floor slab and the interior surface of the exterior wall assembly.
Wall Cavity Insulation	Full wall stud cavity depth or less of CC-HFO Pro applied using exterior sheathing as the substrate and covering the width of the cavity and the inside of the steel wall stud framing flange. Maximum thickness 3-5/8 inches.
Exterior Sheathing	Min. 5/8-in thick Type X exterior type gypsum sheathing complying with ASTM C1177
Exterior Wall Covering – Use either 1, 2, or 3	1. Any non-combustible exterior wall covering material using any standard installation technique. 2. Any non-combustible exterior wall covering system with a combustible WRB that has been successfully tested in accordance with NFPA 285. 3. Any combustible exterior wall covering system with or without WRB that has been successfully tested in accordance with NFPA 285.

TABLE 3B – NFPA 285 COMPLYING WALLS - CC-HFO Pro on Exterior Sheathing

Wall Component	Materials
Base Wall System – Use either 1, 2, or 3	1. Concrete Wall 2. Concrete Masonry Wall 3. One layer of min. 5/8-in. thick Type X gypsum wallboard installed on the interior side of 3-5/8-in. deep, minimum 20-GA thick steel studs spaced a maximum 24-in. on center. Lateral bracing installed minimum every 4-ft vertically or as required. Wall stud cavities shall be filled at each floor line with minimum 4 pcf mineral wool friction fit between steel studs.
Perimeter Fire Barrier System	Perimeter fire barrier system complying with IBC Section 715.4 shall be installed, as applicable, to fill the void between the edge of the concrete floor slab and the interior surface of the exterior wall assembly.
Exterior Sheathing	Min. 5/8-in thick Type X exterior type gypsum sheathing complying with ASTM C1177
Exterior Insulation	Maximum 3-in. (nominal) thick of CC-HFO Pro applied to the exterior side of the exterior sheathing.
Exterior Wall Covering – Use either 1, 2, 3, or 4	1. Any non-combustible exterior wall covering material using any standard installation technique. 2. Install nominal 4-in. thick clay brick or veneer with max. 2-in. air gap, with brick ties/anchors spaced max. 16-in. on center vertically and max. 24-in. on center horizontally, aligned with framing. 3. Any non-combustible exterior wall covering system with a combustible WRB that has been successfully tested in accordance with NFPA 285. 4. Any combustible exterior wall covering system with or without WRB that has been successfully tested in accordance with NFPA 285.