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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:

Foamsulate™ 50 Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

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

NOTE: This report references 2018 Code sections. Sections numbers for earlier Code editions may differ.

1.2 Foamsulate™ 50 insulation has been evaluated for the following properties (see Table 1):

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

1.3 Foamsulate™ 50 insulation has been evaluated for the following uses (see Table 1):

- Nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings, and the underside of roof decks
- Alternatives to Thermal and Ignition Barriers
- Use in fire-resistance rated construction
- Use as air-impermeable insulation

2.0 STATEMENT OF COMPLIANCE

Foamsulate™ 50 insulation 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 Foamsulate™ 50: Foamsulate™ 50 insulation is a spray-applied, low-density, open-cell, polyurethane foam plastic. The insulation is a two-component spray foam plastic with a nominal in-place density of 0.5 pounds per cubic foot. The insulation is 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 250-gallon totes, and must be stored at temperatures between 50°F and 80°F. The resin (B component) must be protected from freezing temperatures and has a shelf life of 6 months.

3.2 Intumescent Coatings:

3.2.1 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by International Fireproof Technology Inc., is a single-component, water-based, liquid-applied intumescent coating. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of twenty-four months when stored in factory-sealed containers at temperatures between 41°F and 95°F. With reference to assemblies recognized in Section 5.3.2, DC315 complies with ICC-ES AC456 and is recognized in IAPMO Uniform Evaluation Service Report ER-0499.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface-burning Characteristics: The insulation, at a maximum thickness of 4 inches and a nominal density of 0.5 pounds per cubic foot, 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. When the insulation is separated from the interior living space of the building with minimum 1/2-inch-thick gypsum board, the maximum



insulation thickness is not limited. Under the 2018 and 2015 IRC, a thermal barrier of 23/32 inch thick wood structural panel is also permitted, and the maximum insulation thickness is not limited.

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

4.3 Air Permeability: The insulation, at a minimum thickness of 3/4 inch, is considered air-impermeable insulation in accordance with the IBC Section 202 and IRC Section R202, based on testing in accordance with ASTM E283. Air permeability was not defined in 2012 IBC or earlier.

5.0 INSTALLATION

5.1 General: The insulation 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 insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the manufacturer's application instructions. The insulation must be applied when the ambient temperature is between 45°F and 110°F. The resin component should be warmed to between 85°F and 95°F before use. Refer to the manufacturer's Application Guidelines for further information.

The insulation must not be used in areas that have a maximum in-service temperature greater than 180°F. The insulation must not be used in electrical outlet or junction boxes, or in contact with water, rain, or soil. The foam plastic must not be sprayed onto a substrate that is wet or covered with frost, ice, loose scale, rust, oil, or grease. The insulation must be protected from the weather during and after application. The insulation may be applied in multiple passes, with each pass not to exceed the maximum individual pass thickness stated in the manufacturer's installation instructions. Allow for full expansion of the previous pass before applying an additional pass. Where the insulation is used as an air-impermeable insulation, such as in unvented attic assemblies under IBC Section 1202.3 and IRC Section R806.5, the insulation must be installed at a

minimum thickness of 3/4 inch to achieve air-impermeability.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: The insulation 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, except where installation is in an attic or crawl space as described in Section 5.4. Under the 2018 and 2015 IRC, a thermal barrier of 23/32-inch-thick wood structural panel is also permitted.

When the insulation is separated from the interior occupied space of the building with minimum 1/2-inch-thick gypsum board, the maximum thickness is not limited. Under the 2018 and 2015 IRC, when a thermal barrier of 23/32 inch thick wood structural panel is used, the maximum insulation thickness is not limited.

5.3.2 Application without a Prescriptive Thermal Barrier: The insulation 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: The insulation may be applied in attics and crawl spaces as described in Sections 5.4.1 through 5.4.4. When the insulation is installed 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 occupied space.



**5.4.1 Application with a Prescriptive Ignition Barrier:**

When the insulation is installed within attics and 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, 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 such that the foam plastic insulation is not exposed. The insulation, as described in this section, may be installed in unvented attics in accordance with IBC Section 1202.3 and IRC Section R806.5 at a minimum thickness of 3/4 inch in order to achieve air-impermeability.

5.4.2 Application without a Prescriptive Ignition Barrier:

Foamsulate™ 50 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, 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 or IRC Section R806.1, except when air-impermeable insulation is permitted in unvented attics in accordance with IBC Section 1202.3 and IRC Section R806.5.
- f. Combustion air is provided in accordance with IMC (*International Mechanical Code*®) Section 701.

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 IBC Section 1202.3 or IRC Section R806.5, when applied at a minimum thickness of 3/4 inch to achieve air-impermeability.

5.4.2.1 Use on Attic Floors: The 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. The insulation must be separated from the interior occupied space of the building by an approved thermal barrier.

5.4.2.2 Unvented Attics: Carlisle Spray Foam Insulation has conducted end-use configuration testing (per IBC Section 2603.9 and IRC Section R316.6) and analysis to qualify the use of the insulation without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with 2018 and 2015 IBC Section 1202.3 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 are described in Priest & Associates Consulting, LLC EEV 10737A, dated March 11, 2019. The conclusions of that evaluation are as follows: When the insulation is applied in 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 3-1/2 inches. Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 16 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 1-1/2 inches of Foamsulate™ 50 insulation.



5.5 Fire-resistance Rated Construction:

5.5.1 One-hour Non-loadbearing Wall Assembly:

The insulation may be installed in a one-hour, non-loadbearing wall assembly as described in this section based on testing in accordance with ASTM E119. The as-tested assembly was configured as described in Sections 5.5.1.1 through 5.5.1.3.

5.5.1.1 Facing: One-layer of 5/8 inch thick Type X gypsum board installed on each face of the wall assembly with the long dimension parallel to the lumber framing in Section 5.5.1.2 and secured using 1-5/8-inch-long coarse-thread drywall screws spaced 8 inches on center (o.c.) around the perimeter and 12 inches on center (o.c.) in the field. Exposed seams and fasteners treated to a minimum ASTM C840, Level 2 Finish.

5.5.1.2 Framing: Nominal 2x6 wood framing, minimum Southern Yellow Pine (No. 1 Grade), spaced 16 inches on center (o.c.), secured to single top and bottom plates with two 16d framing nails at each location.

5.5.1.3 Insulation: Foamsulate™ 50 installed to nominal full cavity depth.

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 occupied space of the building by a thermal barrier as described in Section 5.3.1, except as described in Section 5.3.2.

6.3 The insulation must not exceed the thicknesses noted in Sections 4.1, 5.3, 5.4, and 5.5, as applicable.

6.4 The insulation must be protected from the weather during and after application as specified in the manufacturer's installation 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 Carlisle Spray Foam Insulation.

6.7 When Foamsulate™ 50 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 the insulation, when installed in unvented attics without a Code-prescribed ignition barrier or an intumescent coating, is based on full-scale end-use testing 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 f. of Section 5.4.2. A copy of the Priest & Associates Engineering Evaluation (referenced in Sections 5.4.2.2, 7.4, and 7.5) 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-0292 on the [Intertek website](#).*"

6.8 Use of the insulation 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.

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

6.10 Foamsulate™ 50 insulation is 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 C518, ASTM E84, ASTM E119, ASTM E283, and NFPA 286.

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated April 2016, including reports of testing 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 Consulting, LLC, Engineering Evaluation, Project 10737A, dated March 11, 2019.

7.5 Intertek Listing Report "Foamsulate™ 50", on the [Intertek Directory of Building Products](https://bpdirectory.intertek.com).

8.0 IDENTIFICATION

The A and B components are identified with the manufacturer’s name (Carlisle Spray Foam Insulation), address and telephone number, the product name (Foamsulate™ 50), 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-0292).



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	2018 IBC SECTION ¹	2018 IRC SECTION ¹	2018 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
Air permeability	1202.3	R806.5	C402.5 R402.4
Vapor permeance	202 1404.3	R202 R702.7.1	Not applicable
Fire-resistance rated construction	703	R302	Not applicable
Exterior walls of Type I-IV construction	2603.5	Not applicable	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 editions of the International Codes.

TABLE 2 – THERMAL RESISTANCE (R Values)^{1,2,3}

THICKNESS (inches)	R-VALUE (°F·ft ² ·h/Btu)
1	3.8
2	7.5
3	11
3.5	13
4	15
5	19
5.5	20
6	22
7	26
7.25	27
8	30
9	33
9.25	34
10	37
11	41
11.25	42
12	44
13	48
14	52
15	56
16	59

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

² R-values greater than 10 are rounded to the nearest whole number.

³ To determine R values for thickness not listed:

- Between 1 inch and 4 inches can be determined through linear interpolation, or
- Greater than 4 inches can be calculated based on R= 3.7/inch





TABLE 3 – ASSEMBLIES WITHOUT A PRESCRIPTIVE THERMAL BARRIER (See Section 5.3.2)

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	
			Wet film (wft)	Dry film (dft)		
DC 315	8	12	20	13	1.3 gal/100-ft ²	NFPA 286

TABLE 4 – ASSEMBLIES WITHOUT A PRESCRIPTIVE IGNITION BARRIER (See Sections 5.4.2 and 5.4.3)

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	
			Wet film (wft)	Dry film (dft)		
DC 315	12	12	4	3	0.3 gal/100-ft ²	Appendix X