CARLISLE SPRAY FOAM INSULATION
100 Enterprise Drive
Cartersville, GA 30120
Phone: (770) 607-0755
www.CarlisleSFI.com

FOAMSULATE CLOSED CELL SPRAY-APPLIED POLYURETHANE FOAM PLASTIC INSULATION

CSI Section:
07 21 00 Thermal Insulation

1.0 RECOGNITION

Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation described in this report has been evaluated for use as thermal insulation and for use in Type V construction. The physical properties, thermal resistance, surface burning characteristics, air permeability, water resistance, fire-resistance-rating, attic and crawl space installations were evaluated for compliance with the following codes and regulations:

- 2018, 2015, 2012, 2009, and 2006 International Building Code® (IBC)
- 2018, 2015, 2012, 2009, and 2006 International Residential Code® (IRC)
- 2018, 2015, 2012, 2009, and 2006 International Energy Conservation Code® (IECC)

2.0 LIMITATIONS

Use of Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation recognized in this report subject to the following limitations:

2.1 The insulation shall be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. If there are any conflicts between the manufacturer's published installation instructions and this report, the more restrictive shall govern.

2.2 In accordance with Sections 4.6.1 and 4.6.2 of this report, the insulation shall be separated from the interior of the building by a code-complying thermal barrier or ignition barrier as appropriate.

2.3 The insulation shall not exceed the nominal density and thickness for the installation conditions described in this report.

2.4 During application, the insulation shall be protected from exposure to weather.

2.5 The insulation shall be installed by professional spray polyurethane foam installers approved by Carlisle Spray Foam Insulation, Accella Polyurethane Systems, LLC, or by the Spray Polyurethane Foam Alliance (SPFA).

2.6 Use of the insulation in areas of "very heavy" termite infestation probability shall be in accordance with 2018 and 2015 IBC Section 2603.8, 2012 IBC Section 2603.9, 2009 or 2006 IBC Section 2603.8, or 2015, 2012 and 2009 IRC Section R318.4, or 2006 IRC Section R320.5, as applicable.

2.7 When required by the applicable code, a vapor retarder shall be installed.

2.8 Labeling and jobsite certification of the insulation and coatings shall comply with the following code sections as applicable:

- 2018, 2015, 2012 or 2009 IBC Section 2603.2
- 2018, 2015, 2012 or 2009 IRC Section R316.2
- 2018, 2015 IRC Section N1101.10.1.1
- 2012 IRC Section N1101.12.1.1
- 2009 IRC Section N1101.4.1
- 2018, 2015 or 2012 IECC Sections C303.1.1.1 or R303.1.1.1
- 2009 IECC Section 303.1.1.1

2.9 Foam Plastic used in plenums as interior finish or interior trim shall comply with Section 2603.7 of the IBC.

2.10 The insulation shall be produced by Carlisle Spray Foam Insulation in Cartersville, Georgia or Spring, Texas under a quality control program with inspections.

3.0 PRODUCT USE

Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation complies with IBC Section 2603, IRC Section R316, 2012 IECC Sections C303, C402, R303, and R402, 2009 IECC Sections 303 and 402, and 2006 IECC Section 402. When installed in accordance with Section 4.0 of this report, the foam plastic insulation can be used in wall cavities, floor assemblies or ceiling assemblies, interior and/or exterior side of vertical foundations, the underside of on-grade slabs, and/or in attics and crawl spaces as nonstructural thermal insulation material. Foamsulate Closed Cell insulation is used in Type V construction under the IBC and in one- and two-family dwellings under the IRC.

Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation may be used as air impermeable insulation when installed in accordance with Section 4.4 of this report.

4.0 PRODUCT DESCRIPTION

4.1 Properties: Foamsulate Closed Cell is a medium density, closed cell, spray-applied polyurethane foam plastic insulation in accordance with Section 3.1.1 and Table 1 of AC377. The insulation has a nominal in-place density of 1.9 pcf (30 kg/m^3). The two-component spray foam plastic is produced in the field by combining a polymeric isocyanate (A component) and a polymeric resin (B component). The liquid components shall be stored in 55-gallon (208 L) drums at temperatures between 70°F and 80°F (21°C and 27°C). When Component A and Component B are stored in factory-sealed containers at the recommended temperatures, the maximum shelf life is six months.

4.2 Thermal Resistance (R-Values): Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation has thermal resistance (R-Value) at a mean temperature of 75°F (24°C) as shown in Table 1 of this report.

Table 1
Thermal Resistance (R-Values)[1]

Thickness (inch)	**Foamsulate Closed Cell R-Value** (°F•ft^2•h/Btu)
1	6.9
2	14
3	21
3.5	24
4	28
5	34
5.5	38
6	41
7	48
7.5	52
8	55
9	62
10	69
11	76
11.5	79
12	83

For **SI:** 1 inch = 25.4 mm, 1°F·ft^2·h/Btu = 0.176 110 K·m^2/W.
[1]R-Values are calculated based on tested K values at 1-inch and 4-inch thicknesses.

4.3 Surface Burning Characteristics: At a maximum thickness of 4 inches (102 mm) and a nominal density of 1.9 pcf (30 kg/m^3), the Foamsulate Closed Cell insulation yields a flame spread index of 25 or less and smoke-developed index of 450 or less when tested in accordance with ASTM E84. Greater thicknesses, depending on the end use, are recognized when installed in accordance with this report.

Foam insulation thicknesses of up to 11$^1/_2$ inches (292 mm) for ceiling cavities and 7$^1/_2$ inches (191 mm) for wall cavities when covered by a code complying prescriptive thermal barrier, such as minimum ½ inch (12.7 mm) thick gypsum board, are recognized based on testing in accordance with NFPA 286 and when installed in accordance with Section 4.6 of this report.

4.4 Air Permeability: Foamsulate Closed Cell insulation is classified as air-impermeable insulation when tested in accordance with ASTM E283 at a minimum thickness of 1 inch (25.4 mm), in accordance with 2015 IBC Section 1203.3, 2015 and 2012 IRC Section R806.5 and 2009 and 2006 IRC Section R806.4.

4.5 Fire-Protective Coatings and Coverings: Fire protective coatings, for use as alternative thermal barriers, shall be in accordance with Table 2 of this report, as applicable, and installed in accordance with Section 4.6 of this report.

4.6 INSTALLATIONS: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation shall comply with one of the following requirements:

- 2018, 2015, 2012 IECC Sections C402.1 (prescriptive)
- 2018, 2015, 2012 IECC Section R402.1 (prescriptive)
- 2009 IECC Sections 402, 405, 502 or 506 as appropriate.

The manufacturer's published installation instructions for Foamsulate Closed Cell insulation and this report shall be available on the jobsite during installation. Where conflicts occur, the most restrictive governs.

Foamsulate Closed Cell insulation shall be spray-applied on the jobsite using equipment specified in the manufacturer's published installation instructions. The maximum in-service temperature for all areas shall not exceed the maximum temperature stated in the manufacturer's published installation instructions. The insulation shall be sprayed onto a substrate that is protected and clean from any debris or weather-related conditions during and after application and shall not be used in electrical outlets or junction boxes or in contact with rain, water, or unprepared soil.

4.6.1 Thermal Barrier

4.6.1.1 Application with a Prescriptive Thermal Barrier: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation in ceiling cavities and in wall cavities, in any thickness, shall be separated from the interior by an approved thermal barrier of minimum ½ inch thick (12.7 mm) gypsum wallboard or equivalent 15-minute thermal barrier. The thermal barrier shall comply with, and be installed in accordance with IBC Section 2603.4, 2018, 2015, 2012 and 2009 IRC Section R316.4 or 2006 IRC Section 314.4, as applicable.

4.6.1.2 Alternative Thermal Barrier Assemblies: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation may be installed without a thermal barrier as defined in Section 4.6.1 of this report when installed in

accordance with Table 2 of this report and as referenced in IAPMO UES ER-499.

4.6.2 Installation in Attics or Crawl Spaces: Foamsulate Closed Cell may be installed in attics or crawl spaces when installed in accordance with this section (Section 4.6). The insulation may be installed in unvented attics and unvented enclosed rafter spaces for use as air-impermeable insulation as described in Section 4.4 of this report.

When installed in attics or crawl spaces where entry is made only for the service of utilities, Foamsulate Closed Cell insulation may be installed in accordance with this section. Foamsulate Closed Cell insulation need not be surfaced with a thermal barrier, however, such attic and crawl space areas shall be separated from the interior of the building by a thermal barrier in accordance with Section 4.2 of this report.

4.6.2.1 Installation Using a Prescriptive Ignition Barrier: When installed within attics or crawl spaces where entry is made only for the service of utilities, Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation shall be covered with a prescriptive ignition barrier in accordance with IBC Section 2603.4.1.6, 2018, 2015, 2012 or 2009 IRC Sections R316.5.3 and R316.5.4 or 2006 IRC Sections R314.5.3 and R314.5.4, as applicable. Thicknesses are limited to those shown in Section 4.6.2.2.1 of this report.

Exception: The prescriptive ignition barrier may be omitted when installed in accordance with Section 4.6.2 of this report.

4.6.2.2 Installation Using an Alternative Ignition Barrier Assembly: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation may be installed in attics and crawl spaces using an alternative ignition barrier assembly provided:

a. Entry is only to service utilities in the attic or crawl space and no storage is permitted.
b. Attic or crawl space areas cannot be interconnected.
c. Air from the attic or crawl space cannot be circulated to other parts of the building.
d. Attic ventilation is provided as required by 2018 IBC Section 1202.2, 2015, 2012, 2009 and 2006 IBC Section 1203.2 or IRC Section R806 except where air-impermeable insulation is permitted in unvented attics and shall comply with the following code sections as applicable:

   For Unvented Attics:
   - 2018 IBC Section 1202.3
   - 2015 IBC Section 1203.3
   - 2018, 2015 and 2012 IRC Section R806.5
   - 2009 IRC Section R806.4

   Crawl space ventilation is provided as required by the following code sections as applicable:
   - 2018 IBC Section 1202.4
   - 2015 IBC Section 1203.4
   - 2012, 2009 and 2006 IBC Section 1203.3
   - 2018, 2015, 2012, 2009 and 2006 IRC Section R408.1

e. The foam plastic insulation is limited to the maximum thickness and density tested as shown in Section 4.6.2.2.1 of this report.
f. In accordance with IMC (International Mechanical Code®) Section 701, [2006 IMC Sections 701 and 703], combustion air is provided.

4.6.2.2.1 Application Without Fire Protective Coating: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation may be applied without a fire-retardant or fire protective coating to the underside of roof sheathing or roof rafters and vertical surfaces of attics and in crawl spaces. When applied to the underside of the top of the space, the thickness of the Foamsulate Closed Cell insulation shall not exceed 11¼ inches (286 mm), and when applied to vertical surfaces maximum thickness shall not exceed 7¼ inches (184 mm). The insulation may be installed in unvented attics as described in this section in accordance with 2018 IBC Section 1202.3, 2015 IBC Section 1203.3, 2015 or 2012 IRC Section R806.5 or 2009 or 2006 IRC Section R806.4, as applicable.

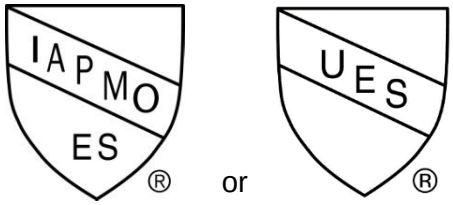
4.7 Water-resistive Barrier: Foamsulate Closed Cell spray-applied polyurethane foam plastic insulation when applied to form a minimum 1½ inches (38.1 mm) thick continuous layer may be used as an alternative water-resistive barrier specified in Section 1403.2 of the 2018 IBC and Section 1404.2 of the 2015, 2012, 2009 and 2006 IBC and Section R703.2 of the IRC, as applicable.

5.0 IDENTIFICATION

The spray foam insulation is identified with the following:

a. Manufacturer's name (Carlisle Spray Foam Insulation)
b. address and telephone number,
c. the product trade name (Foamsulate Closed Cell)
d. use instructions
e. density, flame-spread and smoke-development indices
f. date of manufacture or batch/run number
g. thermal resistance values
h. the evaluation report number (ER-626)
i. the name or logo of the inspection agency

Either mark of conformity may be used as shown below:



IAPMO ER-626

Each container of DC315 Fire Protective Coating is labeled as required in ER-499 with the manufacturer's name (International Fireproof Technology, Inc.), the product name, and use instructions.

6.0 SUBSTANTIATING DATA

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

6.2 Reports of room corner fire testing in accordance with NFPA 286 and room fire testing in accordance with UL 1715.

6.3 Reports of fire tests in accordance with ASTM E119.

6.4 Reports of water penetration tests in accordance with ASTM E331, modified (6.24 psf, 2 hours).

6.5 Reports of water resistance tests in accordance with AATCC Test Method 127.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Foamsulate Closed Cell to assess conformance to the codes and standards shown in Section 1.0 of this report and documents the product's certification. This spray foam is produced at locations noted in section 2.10 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 2 - ALTERNATIVE THERMAL BARRIER ASSEMBLIES

FIRE-PROTECTIVE COATING/COVERING[1]			MAXIMUM SPF THICKNESS (inch)	
TYPE	**MINIMUM THICKNESS**	**THEORETICAL APPLICATION RATE (COATINGS ONLY)**	**WALLS AND VERTICAL SURFACES**	**CEILING AND OVERHEAD SURFACES**
DC315 [2]	14 mils WFT (9 mils DFT)	0.87 gal/100 ft^2	5.5	9.5

For **SI:** 1 inch = 25.4 mm, 1 gallon = 3.785 L, 1 ft^2 = 0.0929 m^2

[1] Fire-protective coatings and coverings shall be applied over all exposed SPF surfaces in accordance with the coating/covering manufacturer's instructions and this report.

[2] International Fireproof Technology, Inc, recognized in IAPMO UES ER-499.