



EVALUATION SUBJECT: FOAMSULATE™ 220 SPRAY-APPLIED POLYURETHANE FOAM PLASTIC INSULATION

REPORT HOLDER:

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CSI Division: 07 THERMAL AND MOISTURE
PROTECTION

CSI Section: 072100 Thermal Insulation

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 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)

1.2 Evaluated in accordance with:

- ICC-ES AC377, approved April 2016

1.3 Properties assessed:

- Physical Properties
- Thermal Resistance (R-Values)
- Surface Burning Characteristics
- Air Permeability
- Attic and crawl space installations
- Construction Types I, II, III and IV

2.0 PRODUCT USE

Foamsulate™ 220 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, and/or in attics and crawl spaces as nonstructural thermal insulation material. Foamsulate™ 220 insulation is used in Type V-B construction under the IBC and in one- and two-family dwellings under the IRC.

Foamsulate™ 220 insulation may also be used in Construction Types I, II, III or IV when installed in accordance with Section 4.4 of this report.

Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation may be used as air impermeable insulation when installed in accordance with Section 3.4 of this report.

3.0 PRODUCT DESCRIPTION

3.1 Properties: Foamsulate™ 220 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 2.2 PCF (35 kg/m³). 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 65°F and 85°F (18°C and 29°C). When Component A and Component B are stored in factory-sealed containers at the recommended temperatures, the maximum shelf life is six months.

3.2 Thermal Resistance (R-Values): Foamsulate™ 220 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.

Thickness (inch)	Foamsulate™ 220 R-Value (°ft ² •h/Btu)
1	6.6
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
9.5	65
10	69
11.5	79

For SI: 1 inch = 25.4 mm, 1°F•ft²•h/Btu = 0.176 110 K•m²/W.

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

3.3 Surface Burning Characteristics: At a maximum thickness of 4 inches (102 mm) and a nominal density of 2.4 PCF (38 kg/m³), the Foamsulate™ 220 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.





Thicknesses are not limited for ceiling cavities and wall cavities when covered by a code complying prescriptive thermal barrier, such as minimum ½ inch (12.7 mm) thick gypsum board. Thicknesses of up to 11½ inches (292 mm) for ceiling cavities and 7½ inches (191 mm) for wall cavities are recognized based on testing in accordance with NFPA 286, when installed in accordance with Section 4.2.2 of this report.

3.4 Air Permeability: Foamsulate™ 220 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.

3.5 Fire- Protective Coatings and Coverings

3.5.1 DC 315 Fire Protective Coating: DC 315 Fire Protective Coating is a water-based fire retardant coating, manufactured expressly for the thermal protection of polyurethane foam plastic insulation. DC 315 is manufactured by International Fireproof Technology, Inc., and is supplied in 5-gallon (19 L) pails and 55-gallon drums (208 L). When DC 315 Fire Protective Coating is stored in factory-sealed containers at temperatures between 50°F and 80°F (10°C and 27°C), the maximum shelf life is one year.

3.5.2 Staycell ONE STEP® 255: Staycell ONE STEP® 255 is a two-part, closed-cell, intumescent spray-applied polyurethane foam having a nominal in-place density of 2.0 lb/ft³ (32 kg/m³). Staycell ONE STEP® 255 is manufactured by Preferred Solutions, Inc. and Parts A and B are supplied in 55-gallon (208 L) drums. When Staycell ONE STEP® 255 components are stored in factory-sealed containers at temperatures between 50°F and 75°F (10°C and 24°C), the maximum shelf life is six months.

4.0 INSTALLATION

4.1 General

Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation shall comply with one of the following requirements:

- 2015, 2012 IECC Sections C402.1 (prescriptive)
- 2015, 2012 IECC Section R407 (performance)
- 2009 IECC Sections 402, 405, 502 or 506 as appropriate.

The manufacturer's published installation instructions for Foamsulate™ 220 insulation and this report shall be available on the jobsite during installation. Where conflicts occur, the most restrictive governs.

Foamsulate™ 220 insulation shall be spray-applied on the jobsite using equipment specified in the manufacturer's published installation instructions. The insulation is

applied in multiple passes having a maximum thickness of 3 inches (76 mm) per pass up to the maximum insulation thickness specified in this report. The spray-applied foam plastic Insulation shall be allowed to fully expand and cure for a minimum of 15 minutes prior to application of additional passes. 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 soil.

4.2 Thermal Barrier

4.2.1 Application With a Prescriptive Thermal Barrier:

Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation in ceiling cavities and in wall cavities 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, 2015, 2012 and 2009 IRC Section R316.4 or 2006 IRC Section 314.4, as applicable.

4.2.2 Alternative Thermal Barrier Assemblies:

Foamsulate™ 220 spray applied foam plastic insulation may be installed without a thermal barrier as defined in Section 4.2.1 of this report when installed in accordance with Table 2 of this report.

4.3 Installation in Attics or Crawl Spaces:

Foamsulate™ 220 Spray-applied Polyurethane Foam Plastic Insulation may be installed in attics or crawl spaces when installed in accordance with this section (Section 4.3). The insulation may be installed in unvented attics and unvented enclosed rafter spaces for use as air-impermeable insulation as described in Section 3.4 of this report.

When installed in attics or crawl spaces where entry is made only for the service of utilities, Foamsulate™ 220 insulation may be installed in accordance with this section. Foamsulate™ 220 insulation need not be surfaced with a thermal barrier, however, such attic and crawl space areas must be separated from the interior of the building by a thermal barrier in accordance with Section 4.2 of this report.

4.3.1 Installation Using a Prescriptive Ignition Barrier:

When installed within attics or crawl spaces where entry is made only for the service of utilities, Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation shall be covered with a prescriptive ignition barrier in accordance with IBC Section 2603.4.1.6, 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.



Exception: The prescriptive ignition barrier may be omitted when installed in accordance with Section 4.3.2 of this report.

4.3.2 Installation Using an Alternative Ignition Barrier Assembly: Foamsulate™ 220 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 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:

- 2015 IBC Section 1203.3
- 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:

- 2015 IBC Section 1203.4
- 2012, 2009 and 2006 IBC Section 1203.3
- 2015, 2012, 2009 and 2006 IRC Section R408.1

- e. The foam plastic insulation is limited to the maximum thickness and density tested.
- f. In accordance with IMC (International Mechanical Code®) Section 701, [2006 IMC Sections 701 and 703], combustion air is provided.
- g. The installed coverage rate or thickness of coatings shall be equal to or greater than described in Section 4.2.2.

4.3.2.1 Installation for the Application of Fire-Protective Coatings: Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation may be spray-applied in attics to the underside of roof sheathing or roof rafters, and vertical surfaces; and may be spray-applied in crawl spaces to the underside of floors and vertical surfaces as described in this section. When applied to the underside of the top of the space, the thickness of the Foamsulate™ 220 insulation shall not exceed 11½ inches (292 mm). When applied to vertical surfaces, the maximum thickness shall not exceed 7½ inches (191 mm). The foam plastic insulation shall be covered with DC 315 Fire Protective Coating, as described in Sections 3.5.1 of this report with a 4 mils (0.1 mm) wet film thickness (2.7 mils dry film

thickness [0.07 mm]).

The coating shall be applied over the insulation using airless spray equipment, roller, or a brush in accordance with the coating manufacturer's published installation instructions and this report. The ambient and substrate temperatures shall be minimum 50°F (10°C), and the surface shall be dry, clean, free of dirt and loose debris, and any other substance that could interfere with adhesion of the coating.

4.3.2.2 Application Without Fire Protective Coating: Foamsulate™ 220 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™ 220 insulation shall not exceed 7½ inches (191 mm), and when applied to vertical surfaces maximum thickness shall not exceed 5½ inches (140 mm). The insulation may be installed in unvented attics as described in this section in accordance with 2015 IBC Section 1203.3, 2015 or 2012 IRC Section R806.5 or 2009 or 2006 IRC Section R806.4, as applicable.

4.4 Exterior Walls of Types I, II, III or IV Construction (IBC)

4.4.1 General: When Foamsulate™ 220 insulation is used in exterior walls of Types I, II, III or IV construction of any height, the insulation shall comply with IBC Section 2603.5 and this section.

4.4.2 Complying Exterior Wall Assemblies: Wall assemblies that comply with Section 2603.5 of the IBC and this report that may be used in exterior walls of buildings of Type I, II, III or IV construction of any height are described in Tables 3 and 4 of this report.

5.0 LIMITATIONS

The Foamsulate™ 220 Spray-Applied Polyurethane Foam Plastic Insulation described in this report complies with those codes listed in Section 1.0 of this report or are considered suitable alternatives to what is specified in the code, subject to the following conditions:

5.1 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.

5.2 In accordance with Sections 4.2 and 4.3 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.



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

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

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

5.6 Use of the insulation in areas of "very heavy" termite infestation probability shall be in accordance with 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.

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

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

- 2015, 2102 or 2009 IBC Section 2603.2
- 2015, 2012 or 2009 IRC Section R316.2
- 2015 IRC Section N1101.10.1.1
- 2012 IRC Section N1101.12.1.1
- 2009 IRC Section N1101.4.1
- 2015 or 2012 IECC Sections C303.1.1.1 or R303.1.1.1
- 2009 IECC Section 303.1.1.1

5.9 The insulation shall be produced by Accella Polyurethane Systems, LLC in Cartersville, Georgia under a quality control program with inspections.

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.

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

7.0 IDENTIFICATION

The spray foam insulation is identified with the following:

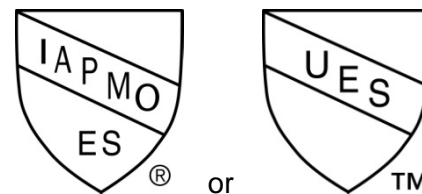
- a. Manufacturer's name (Accella Polyurethane Systems, LLC)
- b. address and telephone number,
- c. the product trade name (Foamsulate™ 220)
- d. use instructions

- 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-352)
- i. the name or logo of the inspection agency

Either mark of conformity may be used as shown below:

Each container of DC 315 Fire Protective Coating is labeled with the manufacturer's name (International Fireproof Technology, Inc.), the product name, and use instructions.

Each container of Staycell ONE STEP® 255 is labeled with the manufacturer's name (Preferred Solutions, Inc.), the product name, and use instructions.



IAPMO ER #352

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



TABLE 2 - ALTERNATIVE THERMAL BARRIER ASSEMBLIES

FIRE-PROTECTIVE COATING/COVERING ¹ (APPLIED TO ALL SPF SURFACES)			MAXIMUM SPF THICKNESS		
TYPE	MINIMUM THICKNESS	THEORETICAL APPLICATION RATE (COATINGS ONLY)	WALLS AND VERTICAL SURFACES	CEILING AND OVERHEAD SURFACES	
DC315	18 mils WFT	1.13 gal/100 ft ²	7.5 in.	11.5 in.	This assembly is permitted on all construction planes.
Staycell ONE STEP™ 255	1 in.	N/A	3.0 in.	N/A	This assembly is not permitted in combination with foam plastic in the ceiling or overhead areas.
Staycell ONE STEP™ 255	0.5 in.	N/A	N/A	8.0 in.	This assembly is not permitted in combination with foam plastic in the wall or vertical areas.

¹ Fire-protective coatings and coverings must be installed over the SPF surfaces in accordance with the coating/covering manufacturer's instructions and this report.



**TABLE 3 - NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES (Part 1)
FOAMSULATE 220 APPLIED IN WALL STUD CAVITY**

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System (BWS) Use either 1, 2 or 3	1 – concrete wall 2 – concrete masonry wall 3 – 1 layer of 5/8-inch thick Type X gypsum wallboard installed on the interior side of minimum 3 5/8-inch deep minimum No. 25 gauge steel studs spaced a maximum of 24 inches on center. Lateral bracing installed minimum every 4 feet vertically or as required. Wall stud cavities shall be filled at each floor line with minimum 4 pcf density mineral wool (e.g. Thermafiber) friction fit between steel wall studs.
Perimeter Fire Barrier System	Perimeter fire barrier system complying with Section 715.4 of the 2015 or 2012 IBC shall be installed, as applicable, to fill the void created at the intersection of the exterior curtain wall assembly and the concrete floor slab.
Interior Insulation Use either 1, 2, 3, 4 or 5; or combination of 3 and 4; or combination of 3 and 5	1 – None 2 – Maximum 3 5/8-inch thickness of Foamsulate 220 insulation applied to the interior surface of BWS 1 or 2 above. ^{1,3} 3 – Foamsulate 220 insulation applied to the full depth of the wall stud cavity, or less, with exterior gypsum sheathing (see BWS 3 above) as the substrate covering the width of the cavity and the inside of the steel wall stud framing flange. ³ 4 – Fiberglass batt insulation (faced or unfaced) 5 – Mineral wool insulation (faced or unfaced)
Exterior Sheathing Use either 1 or 2	1 – None (for BWS 1 or 2 above) 2 – 5/8-inch thick exterior gypsum sheathing (for BWS 3 above)
Exterior Wall Covering² 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 successfully been tested in accordance with NFPA 285. 3 – Any combustible exterior wall covering system with or without a combustible WRB that has successfully been tested in accordance with NFPA 285.
Flashing of window, door and other exterior wall penetrations	As an option, flash around windows, doors and other exterior penetrations with limited amounts of maximum 12-inch wide flashing tape (acrylic, asphalt or butyl-based) or liquid-applied membrane material with or without fiber mesh reinforcements.

SI: 1 inch = 25.4 mm; 1 pcf = 16.0 kg/m³; 1 Btu/ft² = 0.01128 MJ/m²

¹ Fireblocking per Section 718 of the 2012 IBC and thermal barrier material requirements per Section 2603.4 of the 2012 IBC shall be met for Base Wall Systems 1 and 2, as required by specific wall construction details when a combustible concealed space is created on interior side of exterior wall assembly.

² Exterior wall coverings shall be installed in accordance with the manufacturer's installation instructions and shall comply with the provisions of Chapter 14 of the IBC and Chapter 7 of the IRC, as applicable.

³ The potential heat of Foamsulate 220 insulation is 1,883 Btu/ft² per inch of thickness when tested in accordance with NFPA 259.



**TABLE 4 - NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES (Part 2)
FOAMSULATE 220 APPLIED TO EXTERIOR OF WALL ASSEMBLY WITH FOAMSULATE 220 OR
FOAMSULATE 50 IN WALL STUD CAVITY**

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System (BWS) Use either 1, 2 or 3	1 – concrete wall 2 – concrete masonry wall 3 – 1 layer of 5/8-inch thick Type X gypsum wallboard installed on the interior side of minimum 3 5/8-inch deep minimum No. 25 gauge steel studs spaced a maximum of 24 inches on center. Lateral bracing installed minimum every 4 feet vertically or as required. Wall stud cavities shall be filled at each floor line with minimum 4 pcf density mineral wool (e.g. Thermafiber) friction fit between steel wall studs.
Perimeter Fire Barrier System	Perimeter fire barrier system complying with Section 715.4 of the 2015 or 2012 IBC shall be installed, as applicable, to fill the void created at the intersection of the exterior curtain wall assembly and the concrete floor slab.
Interior Insulation Use either 1, 2, 3, 4 or 5; or combination of 3 and 4; or combination of 3 and 5	1 – None 2 – Maximum 3 5/8-inch thickness of Foamsulate 220 or Foamsulate 50 open-cell SPF (UES ER-351) insulation applied to the interior surface of BWS 1 or 2 above. ^{1,3,4} 3 – Foamsulate 220 or Foamsulate 50 insulation applied to the full depth of the wall stud cavity, or less, with exterior gypsum sheathing (see BWS 3 above) as the substrate covering the width of the cavity and the inside of the steel wall stud framing flange. ^{3,4} 4 – Fiberglass batt insulation (faced or unfaced) 5 – Mineral wool insulation (faced or unfaced)
Exterior Sheathing Use either 1 or 2	1 – None (for BWS 1 or 2 above) 2 – 5/8-inch thick exterior gypsum sheathing (for BWS 3 above)
Exterior Insulation	Maximum 4-inch thickness of Foamsulate 220 insulation
Exterior Wall Covering² Use either 1, 2, 3, 4 or 5	1 – Brick: Standard type brick veneer anchors, installed at a minimum 24-inches on center, vertically on each stud with maximum 1-inch air gap between exterior insulation and brick. Brick to be standard nominal 4-inch thick clay brick installed in a running bond pattern using Type S mortar. 2 – Stucco: Minimum 3/4-inch thick, exterior cement plaster and lath. A secondary water-resistive barrier (WRB) may be installed between the exterior insulation and the lath. The secondary WRB shall not be full-coverage asphalt or butyl-based self-adhered membranes. 3 – Natural Stone: Minimum 2-inch thick natural stone (granite, limestone, marble, sandstone). Any standard non-open jointed installation technique may be used. 4 – CMU and others: Minimum 1 1/2-inch thick concrete masonry unit (CMU), pre-cast concrete or artificial cast stone. Any standard non-open jointed installation method may be used. 5 – Terra Cotta: Minimum 1 1/4-inch thick Terra Cotta non-open jointed. Any standard non-open jointed installation method may be used.
Flashing of window, door and other exterior wall penetrations	As an option, flash around windows, doors and other exterior penetrations with limited amounts of maximum 12-inch wide flashing tape (acrylic, asphalt or butyl-based) or liquid-applied membrane material with or without fiber mesh reinforcements.

SI: 1 inch = 25.4 mm; 1 pcf = 16.0 kg/m³; 1 Btu/ft² = 0.01128 mJ/m²

¹ Fireblocking per Section 718 of the 2012 IBC and thermal barrier material requirements per Section 2603.4 of the 2012 IBC shall be met for Base Wall Systems 1 and 2, as required by specific wall construction details when a combustible concealed space is created on interior side of exterior wall assembly.

² Exterior wall coverings shall be installed in accordance with the manufacturer's installation instructions and shall comply with the provisions of Chapter 14 of the IBC and Chapter 7 of the IRC, as applicable.

³ The potential heat of Foamsulate 220 insulation is 1,883 Btu/ft² per inch of thickness when tested in accordance with NFPA 259.

⁴ The potential heat of Foamsulate 50 insulation is 508 Btu/ft² per inch of thickness when tested in accordance with NFPA 259.