VOLATILE FREE, INC.

VFI-716 SPRAY-APPLIED POLYURETHANE FOAM PLASTIC INSULATION

CSI Section:
07 21 00 Thermal Insulation

1.0 RECOGNITION

Volatile Free Inc.'s VFI-716 Spray-applied Polyurethane Foam Plastic Insulation recognized in this report has been evaluated for use as an open-cell spray-applied, polyurethane foam plastic. The fire-resistance rating, construction types I, II, III and IV, thermal resistance (R-values), air permeability, attic and crawl space installations, surface burning characteristics and physical properties of the VFI-716 Spray-applied Polyurethane Foam Plastic Insulation complies with the intent of the provisions of the following codes and 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)
- See Florida Supplement following this report for additional compliance statement

2.0 LIMITATIONS

Use of the VFI-716 Spray-applied Polyurethane Foam Plastic Insulation recognized in this report is subject to the following limitations:

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

2.2 In accordance with Section 3.4, 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 foam plastic insulation shall not exceed the nominal density and maximum or minimum thickness, as applicable, allowed by this report.

2.4 During and after installation, the insulation shall be protected from damage and exposure to weather.

2.5 Installers shall be approved by Volatile Free, Inc.

2.6 In areas of "very heavy" termite infestation probability, the foam plastic insulation shall be used in accordance with 2015 IBC Section 2603.8; 2012 IBC Section 2603.9; 2009 or 2006 IBC Section 2603.8; 2015, 2012 or 2009 IRC Section 318.4; or 2006 IRC Section 320.5; 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 IRC Sections N1101.4 and N1101.4.1; 2015, 2012 or 2009 IECC Sections C303.1.1 and C303.1.2; or 2006 IECC Sections 102.1.1 and 102.1.1.1; as applicable.

3.0 PRODUCT USE

3.1 General: VFI-716 Spray-applied Polyurethane Foam Plastic Insulation complies with IBC Section 2603; 2015, 2012 and 2009 IRC Section R316; 2006 IRC Section 314; 2015 and 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, VFI-716 Spray-applied Polyurethane Foam Plastic Insulation may be used in wall cavities, floor assemblies or ceiling assemblies, or in attic and crawl spaces as a thermal insulation material. The spray-applied foam plastic insulation is used in Type V-B construction under the IBC and in dwellings under the IRC.

VFI-716 may be installed in Types I, II, III, and IV Construction when installed in accordance with Section 4.3 of this report.

VFI-716 may be used as an air-impermeable insulation when installed in accordance with Section 3.4 of this report.

VFI-716 may be used as part of a fire-resistance-rated assembly when installed in accordance with Section 3.5 of this report.

3.2 Installation General

VFI-716 Spray-applied Polyurethane Foam Plastic Insulation shall comply with requirements in 2015 and 2012 IECC Sections C402.1 and R402, and 2009 and 2006 IECC Section 402. The manufacturer's published installation instructions for VFI-716 and this report shall be available on the jobsite during installation. Where conflicts occur, the most restrictive shall govern.

VFI-716 shall be spray-applied on the jobsite using equipment specified 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. The insulation shall be spray-applied in multiple passes having a maximum thickness of 3½ inches (89 mm) per pass, up to the maximum insulation thickness of 11½ inches (292 mm). Each pass shall be allowed to fully expand for a minimum of 10 minutes before being covered by additional passes. The maximum in-service temperature shall not exceed 180°F (82°C) as specified in the manufacturer's installation instructions. The foam plastic insulation shall not be used in electrical outlets or junction boxes or in contact with water or soil.

The Polyurethane Foam Plastic Insulation shall be separated from the interior of the building by a code-complying thermal barrier of minimum ½-inch-thick (12.7 mm) gypsum wallboard or equivalent. The thermal barrier shall comply with, and be installed in accordance with IBC Section 2603.4; 2015, 2012 or 2009 IRC Section R316.4; or 2006 IRC Section 314.4; as applicable.

3.3 Installation In Attics or Crawl Spaces

VFI-716 Spray-applied Polyurethane Foam Plastic Insulation may be installed in attics or crawl spaces when installed in accordance with this section (Section 4.2). VFI-716 insulation may be installed in unvented attics and unvented enclosed rafter spaces for use as described in Section 3.5 of this report.

When installed in attics or crawl spaces, VFI-716 insulation shall be separated from the interior of the building by a code prescribed thermal barrier or ignition barrier, as applicable, or by one of the non-prescriptive fire-retardant coatings described in Section 3.3.4 of this report. When one of these fire-retardant coatings is installed as a thermal barrier, the ignition barrier specified in IBC Section 2603.4.1.6 and 2015, 2012 and 2009 IRC Section R316.5.3 or 2006 IRC Section R314.5.3, as applicable, may be omitted.

3.3.1 Installation Using a Prescriptive Ignition Barrier: When installed within attics or crawl spaces where entry is made only for the service of utilities, VFI-716 Spray-applied Polyurethane Foam Plastic Insulation shall be covered with an 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.

3.3.2 Installation Using a Non-Prescriptive Ignition Barrier: VFI-716 Spray-applied Polyurethane Foam Plastic Insulation may be installed in attics and crawl spaces using a non-prescriptive ignition barrier provided:

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. Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with the 2015 IBC Section 1203.3, 2012 IRC Section R806.5, 2009 IRC Section R806.4; and under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
e. The foam plastic insulation is limited to the maximum thickness and density tested.
f. Combustion air is provided in accordance with IMC Section 701 [2006 IMC Sections 701 and 703].
g. The installed coverage rate or thickness of coatings shall be equal to or greater than described in Section 3.3.4 of this report.

3.3.3 Installation for the Application of Fire-retardant Coatings: VFI-716 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 VFI-716 insulation shall not exceed 11½ inches (292 mm). When applied to vertical surfaces, the maximum thickness shall not exceed 8 inches (203 mm).

The foam plastic insulation shall be covered with a fire retardant intumescent coating described in Section 3.3.4 of this report. The coatings shall be applied over the foam insulation in accordance with the coating manufacturer's published installation instructions and this report. The ambient and substrate temperatures shall be within a range of 50°F (10°C) to 90°F (32°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.

3.3.4 Fire Retardant Coatings

3.3.4.1 DC-315 Fireproof Paint: DC-315 fireproof paint is a water-based, latex intumescent coating manufactured by International Fireproof Technology, Inc. and is supplied in 5 gallon (19 L) pails and 55-gallon (208 L) drums. When stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (27°C), the coating has a shelf life of one year. The coating has a minimum 24-hour curing time. When used as a thermal barrier, the DC-315 Fireproof Paint shall be applied at a required minimum thickness of 20-mil (0.51 mm) wet film [13 mils (0.33 mm) dry film] thickness. When used as an ignition barrier, the DC-315 Fireproof Paint shall be applied at a required minimum thickness of 4-mil wet film [3 mils dry film].

3.3.4.2 Flame Seal TB Fire Retardant: Flame Seal TB is a water based intumescent coating manufactured by Flame Seal Products, Inc. and is supplied in 5-gallon (19 L) and 50-gallon (189 L) kits. When stored in factory-sealed containers at temperatures between 40°F (4°C) and 90°F (32°C), the coating has a shelf life of one year from the date of manufacture. The coating has a minimum 24-hour curing time. When used as a thermal barrier, the Flame Seal TB shall be applied at a required minimum thickness of 30-mil (0.76 mm) wet film [19 mils (0.48 mm) dry film]. When used as an ignition barrier, the Flame Seal TB shall be applied at a required minimum thickness of 4-mil wet film [3 mils dry film].

3.3.4.3 Pyrodyne Fire Retardant Acrylic Coating: Pyrodyne fire retardant coating is a water-based intumescent fire-retardant coating, manufactured expressly for the thermal protection of polyurethane foam plastic insulation. Pyrodyne fire retardant coating is manufactured by Flame Control Coatings, LLC and is supplied in 5-gallon (19 L) pails and 55-gallon drums (208 L). When Pyrodyne fire retardant coating is stored in factory-sealed containers at temperatures between 45°F and 75°F (8°C and 24°C), the maximum shelf life is six months. The coating has a minimum four-hour curing time per coat. When used as a thermal barrier, Pyrodyne Fire Retardant Acrylic Coating shall be applied to a thickness of 9.12 mils (0.24 mm) or approximately 1 gallon per 100 square feet (0.41 L/m^2).

3.4 Exterior Walls of Types I, II, III and IV Construction (IBC)

3.4.1 General: When used on exterior walls of Types I, II, III or IV construction, the assembly shall comply with IBC Section 2603.5 and this section, and the VFI-716 Spray-Applied Polyurethane Foam Plastic Insulation shall be installed at a maximum thickness of 3⅝ inches (92 mm).

3.4.2 Base Wall: Studs shall be 3⅝ inch deep (92 mm), No. 25 gage, C-channel steel studs spaced at maximum 24 inches (610 mm) on center, laterally braced at 4 feet (1220 mm) on center. The studs shall be fastened in accordance with the requirements of the building code. Nominal 4 pcf (64 kg/m^3) mineral wool safing complying with ASTM C665 shall be placed at floor lines, filling the cavities the full floor depth. The stud cavity shall be filled with VFI-716 Spray-Applied Polyurethane Foam Plastic Insulation to a maximum thickness of 3⅝ inches (92 mm).

3.4.3 Interior Face: Type X gypsum board, ⅝ inch (15.9 mm) thick, complying with ASTM C1396 shall be installed with the long dimension parallel to the studs, with the sheathing joints backed by framing. The wall board shall be fastened in accordance with the requirements of the building code. The gypsum board joints shall be treated with joint compound complying with ASTM C475 using a minimum 2-inch-wide (51 mm) tape.

3.4.4 Exterior Face: Georgia Pacific DensGlass® Sheathing, 5/8 inch (15.9 mm) thick complying with ASTM C1177 shall be installed horizontally with joints staggered over the exterior side of the steel studs in accordance with the sheathing manufacturer's published installation instructions. The sheathing joints shall be backed by framing.

3.5 Installation as Part of a Non-load-bearing Fire-resistance-rated Assembly: VFI-716 Spray-applied Polyurethane Foam Plastic Insulation may be used as part of a fire-resistance-rated assembly when installed in accordance with this section.

3.5.1 Framing: The framing shall be 2 by 6 No. 1 SYP lumber spaced at maximum 16 inches (406 mm) on center, secured to single top and bottom plates using two 16D framing nails at each location.

3.5.2 Wallboard: ⅝ inch-thick (15.9 mm) Type X gypsum wallboard shall be installed perpendicular to the studs on the interior and exterior faces of the framing. The wall board shall be installed using 1⅝-inch-long coarse-thread drywall screws at 8 inches (203 mm) on center at the panel edges and 12 inches (305 mm) on center in the field. The seams and fasteners shall be brought to a GA-214 Level 2 finish.

3.5.3 Insulation: The cavities shall be filled with VFI-716 Spray-applied Polyurethane Foam Plastic Insulation installed in accordance with the manufacturer's published installation instructions.

4.0 PRODUCT DESCRIPTION

4.1 General: VFI-716 is an open-cell, spray-applied, polyurethane foam plastic meeting the requirements to qualify as low-density insulation in accordance with Section 3.1.1 of this report and Table 1 of AC377. The insulation is a two-component spray foam plastic with a nominal in-place density of 0.5 pounds per cubic foot (8 kg/m^3).

The spray-applied insulation is produced in the field by combining a polymeric isocyanate (A component) and a polymeric resin (B component). The liquid components are 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.

4.2 Thermal Resistance (R-Values): VFI-716 Spray-applied Foam Plastic Insulation has thermal resistance as shown in Table 1.

4.3 Surface Burning Characteristics: VFI-716 Spray-applied Foam Plastic Insulation has a flame spread index

of 25 or less and smoke-developed index of 450 or less when tested in accordance with ASTM E84. The ASTM E84 testing was performed at a maximum thickness of 4 inches (102 mm) and density of 0.6 pcf (9.6 kg/m^3). Greater thicknesses are recognized, depending on end use, when installed in accordance with this report.

4.4 Air Permeability: VFI-716 Spray-applied Polyurethane Foam Plastic Insulation is classified as air-impermeable insulation as a result of testing in accordance with ASTM E283 at a minimum thickness of 3½ inches (89 mm), for use as described in 2015 and 2012 IRC Section R806.5 and 2009 IRC Section R806.4.

5.0 IDENTIFICATION

The spray foam insulation is identified with the following:

a. Report holder's name (Volatile Free, Inc.)
b. address and telephone number,
c. the product trade name (VFI-716)
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-414)
i. the name or logo of the inspection agency (Quality Control Consultants, LLC).

IAPMO ES ® or UES ™

IAPMO UES ER-414

6.0 SUBSTANTIATING DATA

6.1 Data required by the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation, AC377, dated May 2015. The data includes that required by Appendix X of AC377 for use in attics and crawl spaces.

6.2 Reports of potential heat of building materials, flammability characteristics, and room corner fire testing in accordance with NFPA 259, 285, and 286, respectively.

6.3 Reports of fire-resistance-rated assembly testing in accordance with ASTM E119.

6.4 Reports of air permeance testing in accordance with ASTM E283.

7.0 CONTACT INFORMATION

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8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Volatile Free Inc.'s VFI-716 Spray-applied Polyurethane Foam Plastic Insulation to assess conformance to the codes shown in Section 1.0 of this report, and serves as documentation of the product certification.

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

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

Thickness (inch)	VFI-716 R-Value (°f•ft²•h/Btu)
1	3.7
2	7.5
3.5	13
4	15
5	19
5.5	20
6	22
7	26
7.5	28
8	30
9	33
9.5	35
10	37
11.5	43

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

[1]R-Values are calculated based on tested K values at 1-inch and 4-inch thicknesses for VFI-716.

[2]R-Values determined at a mean temperature of 75°F (24°C).

FLORIDA SUPPLEMENT

VOLATILE FREE, INC.
VFI-716 SPRAY-APPLIED POLYURETHANE FOAM PLASTIC INSULATION

CSI: 07 21 00 THERMAL AND MOISTURE PROTECTION - Thermal Insulation

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1.0 SCOPE OF EVALUATION

- 2014 Florida Building Code, Building (FBC, Building)
- 2014 Florida Building Code, Residential (FBC, Residential)

2.0 FINDINGS

VFI-716 Spray-applied Polyurethane Foam Plastic Insulation reported in IAPMO UES Evaluation Report ER-414 is a satisfactory building product alternative to those prescribed in the 2014 FBC, Building, and the 2014 FBC, Residential. Installation of the foam plastic insulation shall be in accordance with the 2012 International Building Code and the 2012 International Residential Code as noted in ER-414.

VFI-716 Insulation complies with the high-velocity hurricane zone provisions of the FBC, Building, and FBC, Residential.

3.0 LIMITATIONS

3.1 In order to provide for inspection for termite infestation, clearance between exterior wall coverings and final earth grade on the exterior of a building shall not be less than 6 inches (152 mm) in accordance with Section 1403.7 of the FBC, Building or Section R704 of the FBC, Residential.

4.0 STATE PRODUCT APPROVAL

For products falling under Florida Rule 61G20-3.001, verification shall be provided that a quality assurance agency audits the manufacturers quality assurance program and audits the production quality of products, in accordance with Section (5)(d) of Florida Rule 61G20-3.008. The quality assurance agency shall be approved by the Commission (or the building official when the report holder does not possess an approval by the Commission).