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Code Compliance Research Report CCRR-1040

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation

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REPORT SUBJECT: Gaco FR6500R Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

This Research Report addresses compliance with the following Codes:

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

Gaco FR6500R insulation has been evaluated for the following properties:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Air permeability
- Attic and crawl space installation
- Duct Insulation

See Table 1 for applicable Code sections related to these properties.

NOTE: This report references 2015 Code sections with [2012] and [2009] Code sections shown in brackets where they differ.

2.0 USES

Gaco FR6500R spray-applied polyurethane foam insulation is used as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings and roofs. When used in exterior walls of buildings constructed under the IBC, its use is limited to Type V-B construction. Under the IRC, the

insulation may be used as air-impermeable insulation when installed in accordance with Section 3.2.3.

The insulation may be used as duct insulation material when installed as described in Section 4.5.

3.0 DESCRIPTION

3.1 Gaco FR6500R:

Gaco FR6500R insulation is a semi-rigid, open cell, low-density, polyurethane foam plastic. The insulation is a two-component spray-applied foam plastic with a nominal in-place density of 0.55 pcf. 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 100°F. The resin (B component) must be protected from freezing temperatures. Gaco FR6500R insulation has a shelf life of 1 year on the polymeric isocyanate (A component) and 6 months on the resin (B component) when stored in factory-sealed containers at these temperatures.

3.2 Performance Characteristics:

3.2.1 Surface Burning Characteristics: The insulation, at a maximum thickness of 4 inches and a nominal density of 0.55 pcf, 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 inches thick gypsum board, the maximum thickness is not limited.

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

3.2.3 Air Permeability: Gaco FR6500R insulation, at a minimum thickness of 3-1/2 inches, is considered air-impermeable insulation in accordance with 2015 IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Sections R202 and R806.5 [2009 - R806.4]. The insulation at minimum thickness of 3-1/2 inches complies with the requirements of IECC Section

C402.5.1.2.2 [C402.4.1.2.2] as an air barrier assembly based on testing in accordance with ASTM E283. The insulation is deemed to comply as an air barrier material in accordance with IECC Section C402.4.1.2.1 [C402.4.1.2.1] when installed at a minimum thickness of 4-1/2 inches.

4.0 INSTALLATION

4.1 General:

Gaco FR6500R insulation must be installed in accordance with the manufacturer's published installation instructions, the applicable Code and this Research Report. The manufacturer's published installation instructions and this Research Report must be strictly adhered to, and a copy of the instructions must be available on the jobsite during installation.

4.2 Application:

Gaco FR6500R insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the Gaco Western application instructions. The insulation must be applied when the ambient temperature is greater than 32°F. The insulation must not be used in areas that have a maximum in-service temperature greater than 200°F. The foam plastic 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 or ice, loose scales, rust, oil, or grease. The insulation must be protected from the weather during and after application. The insulation may be applied to the maximum thickness in a single pass. Where insulation is used as an air-impermeable insulation, such as in unvented attic assemblies under 2015 IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4], the insulation must be installed at a minimum thickness of 3-1/2 inches.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: Gaco FR6500R insulation must be separated from the interior living space of the building by an approved thermal barrier of 1/2 inches 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.

Where the insulation is separated from the interior living space of the building with minimum 1/2 inches thick gypsum board, the maximum thickness is not limited.

4.4 Attics and Crawl Spaces:

The insulation may be applied in attics and crawlspaces as described in Section 4.4.1. When foam insulation is installed in an attic or crawlspace in accordance with this section, a thermal barrier is not required between the foam plastic insulation and the attic or crawlspace, but is required between the insulation and the interior living space.

4.4.1 Application with a Prescriptive Ignition Barrier:

When Gaco FR6500R insulation is 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. Gaco FR6500R insulation as described in this section may be installed in unvented attics and enclosed rafter assemblies (cathedral ceilings) in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4] at a minimum thickness of 3-1/2 inches.

4.4.2 Duct Insulation: Gaco FR6500R may be applied to residential ducts in attics and crawl spaces in compliance with IRC Section M1601.3. The insulation must be protected in accordance with the ignition barrier requirements of IRC Sections R316.5.3 and R316.5.4.

5.0 CONDITIONS OF USE

The Gaco FR6500R spray-applied foam plastic insulation described in this Research Report complies with, or is a suitable alternative to, what is specified in those Codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict between the manufacturer's instructions and this report, this report governs.

5.2 The insulation must be separated from the interior living space of the building by a thermal barrier as described in Section 4.3.

5.3 The insulation must not exceed the thicknesses noted in Sections 3.2.1, 4.3, and 4.4, as applicable.

5.4 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 [2012 - 2603.9] [2009 - 2603.8], as applicable.

5.5 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10 [2012 – N1101.12] [2009 – N1101.4] and IECC Sections C303.1 or R303.1 [2009 – 303.1], as applicable.

5.6 The insulation is produced in Waukesha, Wisconsin, under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).

6.0 SUPPORTING EVIDENCE

6.1 Reports of tests in accordance with ASTM C518, ASTM E84, ASTM E283 and ASTM C411.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC 377), dated May 2015.

6.3 Intertek Listing Report "[Gaco FR6500R Spray-Applied Polyurethane Foam Insulation](#)".

7.0 IDENTIFICATION

The A and B components of the insulation are identified with the manufacturer's name (Gaco Western, LLC), address and telephone number, the product name (Gaco FR6500R); use instructions; the flame spread and smoke-development indices; the lot number; the Intertek Mark; and the Research Report number (CCRR-1040).

8.0 OTHER CODES

This section is not applicable.

9.0 CODE COMPLIANCE RESEARCH REPORT USE

9.1 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.

9.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

9.3 Reference to the [Intertek website](#) is recommended to ascertain the current version and status of this report.

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TABLE 1 – PROPERTIES EVALUATED

PROPERTY	IBC SECTION ¹	IRC SECTION ¹	IECC SECTION ¹
Physical properties	Not required	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	1203.3 [1301]	R806.5 [2009 - R806.4]	C402.4 R402.4
Thermal resistance	1301	N1101.10 N1102 [N1101.1, N1101.12]	C303.1.1 C303.1.4 R303.1.1 R30301.4 [303.1.1 and 303.1.2]
Duct Insulation	Not applicable	N1103.2.1 M1601.3	R403.2.1

¹Section numbers refer to the 2015 Codes with 2012 and 2009 Codes in parentheses where different

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

THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)
1.0	4.04
3.3	13
3.5	14
5.1	20
5.5	22
7.25	28
7.6	30
9.25	36
9.7	38
12.5	49
15.3	60

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 3.5 inch thicknesses.

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

³ To determine R values for thickness not listed:

- a. between 1 inch and 3.5 inch can be determined through linear interpolation or
- b. greater than 3.5 inches can be calculated based on R= 3.94/inch