



# Code Compliance Research Report CCRR-1040

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## DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

### Section: 07 21 00 – Thermal Insulation

#### REPORT HOLDER:

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#### REPORT SUBJECT:

Gaco FR6500R Spray-applied Polyurethane Insulation

## 1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

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

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

1.2 Gaco FR6500R insulation has been evaluated for the following properties (see Table 1):

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

1.3 Gaco FR6500R has been evaluated for the following uses (see Table 1):

- Use as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings, and roofs.
- Attic and crawl space applications
- Duct Insulation
- Use in Types I, II, III, and IV construction

## 2.0 STATEMENT OF COMPLIANCE

Gaco FR6500R 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 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.

## 4.0 PERFORMANCE CHARACTERISTICS

### 4.1 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.

### 4.2 Thermal Resistance:

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

#### 4.3 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].

#### 4.4 Air Barrier:

Gaco FR6500R 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.

### 5.0 INSTALLATION

#### 5.1 General:

Gaco FR6500R 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:

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.

#### 5.3 Thermal Barrier:

**5.3.1 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.

#### 5.4 Attics and Crawl Spaces:

The insulation may be applied in attics and crawlspaces as described in Section 5.4.1. 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.

**5.4.1 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.

#### 5.5 Exterior Walls in Types I, II, III, and IV Construction:

Gaco FR6500R may be installed on exterior walls of buildings of Types I, II, III, and IV construction complying with IBC Section 2603.5 and as described in this section. Intertek Design Listing GWL/FI 30-03 describes the assemblies tested and certified by Intertek as complying with NFPA 285. The test wall assemblies were extended to include various wall constructions described in Table 3 through a third-party engineering analysis. The potential heat of the foam plastic in any portion of the wall must not exceed 1859 Btu/ft<sup>2</sup> of wall area.

## 5.6 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

## 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 living space of the building by a thermal barrier as described in Section 5.3.

**6.3** The insulation must not exceed the thicknesses noted in Sections 5.2, 5.3, 5.4, and 5.5 as applicable.

**6.4** Use of the insulation in Types I, II, III, and IV construction must be as described in Section 5.5.

**6.5** 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.

**6.6** 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.

**6.7** Gaco FR6500R is manufactured under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).

## 7.0 SUPPORTING EVIDENCE

**7.1** Reports of tests in accordance with ASTM C518, ASTM E84, ASTM E283, NFPA 259, NFPA 285, and ASTM C411.

**7.2** Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC 377), dated April 2016.

**7.3** Priest & Associates, Inc. Letter No. 10383 dated May 10, 2016.

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

## 8.0 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).

## 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 <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	IBC SECTION <sup>1</sup>	IRC SECTION <sup>1</sup>	IECC SECTION <sup>1</sup>
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
Exterior walls of Types I-IV construction	2603.5	Not applicable	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

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

**TABLE 2 – THERMAL RESISTANCE (R Values)<sup>1,2,3</sup>**

THICKNESS (inches)	R-VALUE (°F.ft <sup>2</sup> .h/Btu)
1.0	4.1
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.ft<sup>2</sup>.h/Btu = 0.176 110°K.m<sup>2</sup>/W

<sup>1</sup> R-values are calculated based on tested K-values at 1 inch and 3.5 inch thicknesses.

<sup>2</sup> R-values greater than 10 are rounded to the nearest whole number.

<sup>3</sup> To determine R values for thickness not listed:

- Between 1 inch and 3.5 inch can be determined through linear interpolation or
- Greater than 3.5 inches can be calculated based on R= 3.94/inch

**TABLE 3 – NFPA 285 COMPLYING WALLS WITH GACO FR6500R IN WALL CAVITY**

WALL COMPONENTS	MATERIALS
<b>Base Wall System</b> Use either 1, 2 or 3	1. Concrete wall 2. Concrete masonry wall 3. One layer of 5/8 in. thick Type X gypsum board installed on the interior side of minimum 3-5/8 in. deep, minimum No. 20 gage steel studs spaced at a maximum of 24 in. OC with lateral bracing every 4 ft. vertically. Openings must be protected with minimum No. 20 gage steel framing.
<b>Floorline Firestopping</b>	Mineral wool (4.0 lb/ft <sup>3</sup> ) friction fit in each stud cavity and at each floorline.
<b>Cavity Insulation</b>	3-5/8 inch depth or less of FR6500 applied using sheathing as substrate and covering the width of the cavity and inside of the stud flange.
<b>Exterior Sheathing</b>	5/8 in. thick DensGlass Gold exterior gypsum sheathing
<b>Exterior Wall Covering</b> Use either 1 or 2	1. Any noncombustible exterior wall covering material. 2. Any combustible exterior wall covering system that has successfully been tested in accordance with NFPA 285.