



# Code Compliance Research Report CCRR-1075

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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:

GacoGreen 052N 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 GacoGreen 052N has been evaluated for the following properties (see Table 1):

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

1.3 GacoGreen 052N has been evaluated for the following uses (see Table 1):

- Use as nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings, and roofs
- Alternative to thermal barriers
- Alternative to ignition barriers
- Use in Types I, II, III and IV construction
- Use in Type V construction
- Duct insulation

## 2.0 STATEMENT OF COMPLIANCE

GacoGreen 052N 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 GacoGreen 052N:** GacoGreen 052N insulation is an open cell, low-density, polyurethane foam plastic. The insulation is a two-component, spray-applied foam plastic with a nominal in-place density of 0.5 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 insulation components have 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 Intumescent Coatings:

**3.2.1 DC315 Intumescent Coating:** DC 315 intumescent coating, manufactured by IFTI, Paint to Protect, is a water-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of 2 years when stored in factory-sealed containers at a temperature between 41°F to 95°F.

**3.2.2 TPR<sup>2</sup> FIRESHIELD Coatings:** TPR2 FIRESHIELD F10E and IB-4 coatings, manufactured by TPR<sup>2</sup> Corporation, are water-based intumescent coatings supplied in 5-gallon pails and 55-gallon drums. The coatings have a shelf life of 1 year when stored unopened at temperatures between 45°F and 95°F.

## 4.0 PERFORMANCE CHARACTERISTICS

**4.1 Surface Burning Characteristics:** The insulation, at a maximum thickness of 6 inches and a nominal density of 0.5 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 inch 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.



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**4.3 Air Permeability:** GacoGreen 052N insulation, at a minimum thickness of 3-1/2 inches, is considered an 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], based on testing in accordance with ASTM E283.

## 5.0 INSTALLATION

### 5.1 General:

GacoGreen 052N 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:

GacoGreen 052N 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 insulation must not be used in electrical outlet or junction boxes, or in contact with water, rain or soil. The insulation 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.

### 5.3 Thermal Barrier:

**5.3.1 Application with a Prescriptive Thermal Barrier:** GacoGreen 052N insulation must be separated from the interior living space of the building by an approved thermal barrier of 1/2 inch 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. Exceptions are provided in Sections 5.3.2 and 5.4.

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

### 5.3.2 Application without a Prescriptive Thermal Barrier:

**5.3.2.1 DC315 Intumescent Coating:** GacoGreen 052N insulation may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in this section. The thickness of the insulation applied to the underside of the

roofs, ceilings, or floors must not exceed 11-1/4 inches, and applied to vertical wall surfaces must not exceed 11-1/4 inches. The insulation must be covered on all exposed surfaces with DC 315 intumescent coating at a nominal thickness of 20 wet mils (13 dry mils). The coating is applied over the insulation with low-pressure airless spray equipment in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with the adhesion of the coating.

### 5.3.2.2 TPR2 FIRESHELL F10E Intumescent Coating:

GacoGreen 052N insulation may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in this section. The thickness of the insulation applied to the underside of the roofs, ceilings, or floors must not exceed 9-1/4 inches, and applied to vertical wall surfaces must not exceed 5-1/4 inches. The insulation must be covered on all exposed surfaces with the F10E intumescent coating at a nominal thickness of 26 wet mils (14 dry mils). The coating is applied over the insulation with low-pressure airless spray equipment in accordance with the coating manufacturer's instructions and this report.

Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with the adhesion of the coating.

### 5.4 Attics and Crawl Spaces:

The insulation may be applied in attics and crawl spaces as described in either Section 5.4.1 or 5.4.2. When foam insulation is installed in an attic or crawl space in accordance with this section, a thermal barrier, as described in Section 5.3.1, is not required between the foam plastic insulation and the attic or crawl space but is required between the insulation and the interior living space.

### 5.4.1 Application with a Prescriptive Ignition Barrier:

When GacoGreen 052N insulation is installed in 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. GacoGreen 052N insulation may be installed in unvented attics in accordance with IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4] at a minimum thickness of 1 inch.

#### 5.4.2 Application without a Prescriptive Ignition Barrier:

**5.4.2.1 General:** GacoGreen 052N insulation may be installed in attics and crawl spaces, without the ignition barrier prescribed in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, subject to the following conditions:

- 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. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.4 [1203.3] or IRC Section R408.1, as applicable.
- e. 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 IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Section R806.5 [2009 - R806.4].
- f. Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701 [Sections 701 and 703].

GacoGreen 052N is an air-impermeable insulation and may be installed in unvented attics, as described in this section, in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5 [R806.4], when applied at a minimum thickness of 3-1/2 inches.

**5.4.2.2 DC315 Intumescent Coating:** The insulation may be spray-applied to the underside of the roof sheathing and/or rafters in attics; the underside of wood floors in crawl spaces; and to vertical surfaces in both attics and crawl spaces, as described in this section. The thickness of the insulation applied to the underside of the top of the space must not exceed 11-1/4 inches, and to vertical surfaces must not exceed 11-1/4 inches. The insulation must be covered on all exposed surfaces with the DC315 intumescent coating at a nominal thickness of 4 wet mils (3 dry mils). The coating is applied with low-pressure airless spray equipment in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with the adhesion of the coating.

#### 5.4.2.3 TPR<sup>2</sup> FIRESHELL IB-4 Intumescent Coating:

The insulation may be spray-applied to the underside of the roof sheathing and/or rafters in attics; the underside of wood floors in crawl spaces; and to vertical surfaces in both attics and crawl spaces, as described in this section. The thickness of the insulation applied to the underside of the top of the space must not exceed 11-1/2 inches, and to vertical surfaces must not exceed 7-1/2 inches. The insulation must be covered on all exposed surfaces with the DC315 intumescent coating at a nominal thickness of 14 wet mils (7 dry mils). The coating is applied with low-pressure airless spray equipment in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with the adhesion of the coating.

**5.4.2.4 Use on Attic Floors:** GacoGreen 052N insulation may be applied between and over the joists in attic floors as follows:

- To a maximum thickness of 11-1/4 inches and covered with DC315 intumescent coating as described in Section 5.4.2.2
- To a maximum thickness of 7-1/2 inches and covered with TPR2 FIRESHELL IB-4 intumescent coating as described in Section 5.4.2.3

The insulation must be separated from the interior living space by an approved thermal barrier.

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

GacoGreen 052N insulation 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 the 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 1746.3 Btu/ft<sup>2</sup> of wall area.

#### 5.6 Duct Insulation:

GacoGreen 052N insulation 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 either Section 5.4.1 or 5.4.2.

## 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, except as described in Sections 5.3.2 and 5.4.

**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** The insulation is produced in Waukesha, Wisconsin, 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 E2178, ASTM E2357, ASTM E96, ASTM C411, NFPA 285 and NFPA 259.

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

**7.3** Intertek Listing Report "[GacoGreen 052N Spray-applied Polyurethane Insulations](#)".

**7.4** Priest & Associates Letter Report No. 10383, dated May 10, 2016.

## 8.0 IDENTIFICATION

The GacoGreen 052N insulation is identified with the manufacturer's name (Gaco Western, LLC), address and telephone number, the product name (GacoGreen 052N), use instructions, the flame spread and smoke-development indices, the lot number, the Intertek Mark, and the Code Compliance Research Report number (CCRR-1075).

## 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
Air permeability	1203.3 [1301]	R806.5 [2009 - R806.4]	C402.4 R402.4
Air Barrier	Not applicable	Not applicable	C402.4.1.2.1 [C402.4.1.2.1] C402.5.1.2.2 [C402.4.1.2.2]
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
Exterior walls of Types I, II, III and IV construction	2603.5	Not applicable	Not applicable

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

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

THICKNESSES (inches)	R-VALUE (°F.ft <sup>2</sup> .h/Btu)
1	4.2
3	12
3-1/2	14
4	16
5-1/2	22
6	23
7-1/4	29
8	31
9-1/4	36
10	39
11-1/4	44
11-1/2	45

<sup>1</sup> R-values are calculated based on tested K-values at 1 inch and 4 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 4 inch can be determined through linear interpolation; or,
- Greater than 4 inches can be calculated based on R = 3.91/inch

TABLE 3 – NFPA 285 COMPLYING WALLS WITH GACOGREEN 052N 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 $\frac{5}{8}$ in. thick Type X gypsum board installed on the interior side of minimum $3\frac{5}{8}$ in. deep, minimum No. 20 gage steel studs spaced at a maximum of 24 in. 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> density) friction fit in each stud cavity and at each floorline.
<b>Cavity Insulation</b>	3-5/8 inch depth or less of GacoGreen 052N 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 Type X 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.