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ESR-2478

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
SECTION: 07 21 00—THERMAL INSULATION

REPORT HOLDER:

GACO WESTERN LLC

**1245 CHAPMAN DRIVE
WAUKESHA, WISCONSIN 53186**

EVALUATION SUBJECT:

GACOGREEN 052 AND 052N SPRAY-APPLIED POLYURETHANE INSULATIONS



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**DIVISION: 07 00 00—THERMAL AND MOISTURE
PROTECTION**
Section: 07 21 00—Thermal Insulation
REPORT HOLDER:

GACO WESTERN, LLC
 1245 CHAPMAN DRIVE
 WAUKESHA, WISCONSIN 53186
 (262) 542-8072
www.gaco.com

EVALUATION SUBJECT:
**GACOGREEN 052 AND 052N SPRAY-APPLIED
POLYURETHANE INSULATIONS**
1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2012 and 2009 *International Building Code*® (IBC)
- 2012 and 2009 *International Residential Code*® (IRC)
- 2012 and 2009 *International Energy Conservation Code*® (IECC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)[†]

[†]The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:

- Physical properties
- Surface-burning characteristics
- Attic and crawl spaces
- Thermal resistance
- Air permeability

2.0 USES

GacoGreen 052 and 052N spray-applied polyurethane foam plastic insulations are used as nonstructural thermal insulating materials in Type V construction under the IBC and in dwellings under the IRC. The insulations are for use in wall cavities, floor/ceiling assemblies, attics and crawl spaces, sill plates, band joists and headers when installed in accordance with this report. Under the IRC, the insulations may be used as air-impermeable insulation when installed in accordance with Section 3.4. Use in attics and crawl spaces is described in Section 4.4.

3.0 DESCRIPTION
3.1 General:

GacoGreen 052 and GacoGreen 052N insulations are two-

component, open-cell, semirigid foam plastic insulation systems having a nominal density of 0.5 pcf (8 kg/m³). The insulations are produced in the field by combining a polymeric isocyanate (Part A) and a polymeric resin (Part B). The insulation components are supplied in 55-gallon (208 L) drums and have a shelf life of three months when stored at temperatures between 50°F (10°C) and 80°F (27°C).

3.2 Surface-burning Characteristics:

At a maximum thickness of 6 inches (152 mm) and a nominal density of 0.5 pcf (8 kg/m³), the insulations have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Thicknesses of up to 11¹/₄ inches (286 mm) for wall cavities and 16 inches (406 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286.

3.3 Thermal Resistance (R-values):

At a mean temperature of 75°F (24°C), the insulation has thermal resistance (R-values) as shown in Table 1.

3.4 Air Permeability:

The insulations, at a minimum thickness of 3.5 inches (89 mm), are considered air-impermeable insulations in accordance with IRC Section R202, based on testing in accordance with ASTM E283.

3.5 DC 315 Fireproof Paint:

DC 315 Fireproof Paint is manufactured by International Fireproof Technology, Inc., and is a water-based intumescent coating supplied in 5-gallon (19L) pails and 55-gallon (208L) drums. The coating material has a shelf life of 24 months when stored in factory containers at temperatures between 50°F (10°C) and 90°F (32°C).

3.6 TPR² FIRESHELL® F10E and IB-4 Coatings:

TPR² FIRESHELL® F10E and IB-4 intumescent coatings are proprietary, water-based, intumescent coatings manufactured by TPR² Corporation. The coatings are supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and have a shelf life of one year when stored in factory containers at temperatures between 45°F (7°C) and 95°F (35°C).

4.0 INSTALLATION
4.1 General:

The insulation must be installed in accordance with the manufacturer's published installation instructions, the applicable code and this report. A copy of the manufacturer's published installation instructions must be available at all times on the jobsite during installation.

4.2 Application:

The GacoGreen 052 and GacoGreen 052N insulations are spray-applied on the jobsite using a proportioning pump to combine Part A and Part B components at a one-to-one ratio, as specified in the manufacturer's published installation instructions. The insulation must not be applied in areas that will be exposed to a maximum ambient temperature greater than 200°F (93°C). The substrates to which the insulation is applied must be clean, dry and free of frost, ice, loose debris or contaminants that will interfere with adhesion of the spray foam insulation. The spray foam insulation must not be applied in electrical outlet or junction boxes or in direct contact with water or soil. The spray-applied foam insulation must be protected from the weather during and after application.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier:

The spray-applied insulations must be separated from the interior of the building by an approved thermal barrier of 0.5-inch-thick (12.7 mm) gypsum board or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, the applicable code, except where installation is in accordance with Section 4.3.2 or 4.3.3 or in attics or crawl spaces as described in Section 4.4.

4.3.2 Application without a Prescriptive Thermal Barrier with DC 315 Fireproof Paint:

The prescriptive 15-minute thermal barrier may be omitted when installation is in accordance with this section (Section 4.3.2). The insulation and coating may be spray-applied to the interior facing of wall sheathing and the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier. The thickness of the foam plastic applied to the underside of the roof sheathing or walls must not exceed 11¹/₄ inches (286 mm). The foam plastic must be covered on all exposed surfaces with DC 315 Fireproof Paint at a minimum film thickness of 20 wet mils (0.5 mm) [13 dry mils (0.33 mm) at a rate of 1 gallon (3.38 L) per 80 ft² (7.4 m²)]. The coating must be applied over the insulation 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 adhesion of the coating. The coating is applied in one coat with brush, roller or low-pressure airless equipment.

4.3.3 Application without a Prescriptive Thermal Barrier with TPR² FIRESHIELD[®] F10E Coating:

The prescriptive 15-minute thermal barrier may be omitted when installation is in accordance with this section (Section 4.3.3). The insulation and coating may be spray-applied to the interior facing of wall sheathing and the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 9¹/₄ inches (235 mm). The thickness of foam plastic applied to the walls and/or vertical surfaces must not exceed 5¹/₄ inches (133 mm). The foam plastic must be covered on all exposed surfaces with TPR² FIRESHIELD[®] F10E intumescent coating at a minimum film thickness of 26 wet mils (0.66 mm) [14 dry mils (0.36 mm) at a rate of 1.6 gallon (6 L) per 100 ft² (9.3 m²)]. The coating must be applied over the insulation 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 adhesion of the coating. The coating is applied in one coat with brush, roller or low-pressure airless equipment.

4.4 Attics and Crawl Spaces (Note: The insulation may be applied as described in either Section 4.4.1 or Section 4.4.2):

4.4.1 Application with a Prescriptive Ignition Barrier:

When the spray-applied insulations are installed within attics or crawl spaces where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and 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 that the foam plastic insulation is not exposed.

4.4.2 Application without a Prescriptive Ignition Barrier:

Where the spray-applied insulation is installed in accordance with Section 4.4.2.1 or 4.4.2.2, the following conditions apply:

- Entry to the attic or crawl space is to service utilities, and no storage is permitted.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- 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 2012 IRC Section R806.5 or 2009 IRC Section R806.4. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
- Combustion air is provided in accordance with IMC (*International Mechanical Code*[®]) Section 701.

4.4.2.1 Application with DC 315 Intumescent Coating:

In attics, the insulation may be spray-applied to the underside of roof sheathing or rafters and/or vertical surfaces; and in crawl spaces, the insulation may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space or vertical surfaces must not exceed 11¹/₄ inches (286 mm). The foam plastic exposed surfaces must be covered with a minimum nominally 3 dry mils (0.08 mm) [4 wet mils (0.1 mm), at a rate of 0.25 gallon (0.85 L) per 100 square feet (9.3 m²)] of DC 315 Fireproof Paint intumescent coating. The intumescent coating must be applied over the insulation 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 any other substances that could interfere with adhesion of the coating. The coating is applied in one coat with low-pressure spray equipment.

4.4.2.2 Application with TPR² FIRESHIELD[®] IB-4 Coating:

In attics, the insulation may be spray-applied to the underside of roof sheathing or rafters and/or vertical surfaces; and in crawl spaces, the insulation may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 11¹/₂ inches (292 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 7¹/₂ inches (191 mm). The foam plastic exposed surfaces must be covered with a minimum nominally 7 dry mils (0.18 mm) [14 wet mils (0.36 mm), at a rate of 0.88 gallon (3.3 L) per 100 square feet (9.3 m²)] of TPR² FIRESHIELD[®] IB-4 intumescent coating. The intumescent coating must be applied over the insulation 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 any other substances that could interfere with adhesion of the coating. The coating is applied in one coat with low-pressure spray equipment.

4.4.2.3 Use on Attic Floors: The insulations may be installed without the code-prescribed ignition barrier, subject to the following conditions:

- a) All exposed surfaces of the insulation must be covered with DC 315 Fireproof Paint intumescent coating or TPR² FIRESHHELL[®] IB-4 intumescent coating as follows:
 - DC 315 Fireproof Paint intumescent coating: minimum application rate of 3 dry mils (0.08 mm) [4 wet mils (0.1 mm) at a rate of 0.25 gallon (0.85 L) per 100 square feet (9.29 m²)]
 - TPR² FIRESHHELL[®] IB-4 intumescent coating: minimum application rate of 7 dry mils (0.18 mm) [14 wet mils (0.36 mm)]
- b) When covered with the intumescent coatings described in this section, the insulation must have a maximum installed thickness as follows:
 - With DC 315 Fireproof Paint intumescent coating: 11¹/₄ inches (286 mm)
 - With TPR² FIRESHHELL[®] IB-4 intumescent coating: 7¹/₂ inches (191 mm)

5.0 CONDITIONS OF USE

The GacoGreen 052 and GacoGreen 052N spray-applied insulations described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The insulations must 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, this report governs.
- 5.2 The spray-applied insulations must be separated from the interior of the building by an approved 15-minute thermal barrier as described in Section 4.3.1, except when installed as described in Sections 4.3.2 and 4.3.3. Installation in an attic or crawl space is as

described in Section 4.4.2.

- 5.3 The spray-applied insulations must not exceed the thicknesses noted in Sections 3.2, 4.3 and 4.4.
- 5.4 The spray-applied insulation must be applied by contractors certified by Gaco Western, LLC.
- 5.5 Use of the insulations in areas where the probability of termite infestation is "very heavy" must be in accordance with 2012 IBC Section 2603.9, 2009 IBC Section 2603.8 or IRC Section R318.4, as applicable.
- 5.6 Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1 and IECC Sections 102.1.1 and 102.1.11, as applicable.
- 5.7 GacoGreen 052 and GacoGreen 052N insulations are produced in Waukesha, Wisconsin, under a quality control program, with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2012, including reports of tests in accordance with Appendix X of AC377.
- 6.2 Reports of room corner fire tests in accordance with NFPA 286.
- 6.3 Reports of air leakage tests in accordance with ASTM E283.

7.0 IDENTIFICATION

Components of the GacoGreen 052 and 052N insulations are identified with the manufacturer's name (Gaco Western, LLC) and address; the date of manufacture or the lot number; the product trade name (GacoGreen 052 or 052N); the product type (Part A or Part B); the installation instructions; the density; the flame-spread and smoke-developed indices; and the evaluation report number (ESR-2478).

Intumescent coatings are identified with the manufacturer's name and address, the product name and use instructions.

TABLE 1—GACOGREEN 052 AND 052N THERMAL RESISTANCE (R-VALUES)

THICKNESS (inches)	R-VALUE ^{1,2} (°F.ft ² .h/Btu)
1	4.2
3	12
3 ¹ / ₂	14
4	16
5	20
5 ¹ / ₂	22
6	23
7 ¹ / ₂	29
8	31
9 ¹ / ₄	36
10	39
11 ¹ / ₄	44
11 ¹ / ₂	45

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

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

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