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**THERMOSEAL 2000/2000W SPRAY-APPLIED
 POLYURETHANE FOAM PLASTIC
 INSULATION**

CSI Section:
07 21 00 Thermal Insulation

1.0 RECOGNITION

Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation described in this report has been evaluated for use as thermal insulation and for use in Construction Types I through V. The physical properties, thermal resistance, surface burning characteristics, air permeability, fire-resistance-rating, attic and crawl space installations were evaluated for compliance with 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)

2.0 LIMITATIONS

Use of Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation recognized in this report is subject to the following limitations:

- 2.1** The insulations shall 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, the more restrictive shall govern.
- 2.2** In accordance with Sections 4.6.1 and 4.6.2 of this report, the insulations shall be separated from the interior of the building by a code-complying thermal barrier or ignition barrier as appropriate.
- 2.3** The insulations shall not exceed the nominal density and thickness for the installation conditions described in this report.
- 2.4** During application, the insulations shall be protected from exposure to weather.

2.5 The insulations shall be installed by professional spray polyurethane foam installers approved by Thermoseal, LLC, or by the Spray Polyurethane Foam Alliance (SPFA).

2.6 Use of the insulations in areas of “very heavy” termite infestation probability shall be in accordance with 2015 IBC Section 2603.8, 2012 IBC Section 2603.9, 2009 or 2006 IBC Section 2603.8, or 2015, 2012 and 2009 IRC Section R318.4, or 2006 IRC Section R320.5, as applicable.

2.7 When required by the applicable code, a vapor retarder shall be installed.

2.8 Labeling and jobsite certification of the insulations and coatings shall comply with the following code sections as applicable:

- 2015, 2012 or 2009 IBC Section 2603.2
- 2015, 2012 or 2009 IRC Section R316.2
- 2015 IRC Section N1101.10.1.1
- 2012 IRC Section N1101.12.1.1
- 2009 IRC Section N1101.4.1
- 2015 or 2012 IECC Sections C303.1.1.1 or R303.1.1.1
- 2009 IECC Section 303.1.1.1

2.9 The insulations shall be produced by Thermoseal, LLC under a quality control program with inspections.

3.0 PRODUCT USE

Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation complies with IBC Section 2603, IRC Section R316, 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 of this report, the foam plastic insulation can be used in wall cavities, floor assemblies or ceiling assemblies, and/or in attics and crawl spaces as nonstructural thermal insulation material. Thermoseal 2000/2000W insulation is used in Type V construction under the IBC and in one- and two-family dwellings under the IRC.

Thermoseal 2000/2000W insulation may also be used in Construction Types I, II, III or IV when installed in accordance with Section 4.6.3 of this report.

Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation may be used as air impermeable insulation when installed in accordance with Section 4.4 of this report.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.





4.0 PRODUCT DESCRIPTION

4.1 Properties: Thermoseal 2000/2000W is a medium density, closed cell, spray-applied polyurethane foam plastic insulation in accordance with Section 3.1.1 and Table 1 of AC377. The insulation has a nominal in-place density of 1.9 pcf (30 kg/m³). The two-component spray foam plastic is produced in the field by combining a polymeric isocyanate (A component) and a polymeric resin (B component). The liquid components shall be stored in 55-gallon (208 L) drums at temperatures between 70°F and 80°F (21°C and 27°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): Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation has a thermal resistance (R-Value) at a mean temperature of 75°F (24°C) as shown in Table 1 of this report.

Thickness (inch)	Thermoseal 2000/2000W R-Value (°f·ft ² ·h/Btu)
1	6.9
2	14
3	21
3.5	24
4	28
5	34
5.5	38
6	41
7	48
7.5	52
8	55
9	62
10	69
11	76
11.5	79
12	83

For SI: 1 inch = 25.4 mm, 1°F·ft²·h/Btu = 0.176 110 K·m²/W.
¹R-Values are calculated based on tested K values at 1-inch and 4-inch thicknesses.

4.3 Surface Burning Characteristics: At a maximum thickness of 4 inches (102 mm) and a nominal density of 1.9 pcf (30 kg/m³), the Thermoseal 2000/2000W insulations yield a flame spread index of 25 or less and smoke-developed index of 450 or less when tested in accordance with ASTM E84. Greater thicknesses, depending on the end use, are recognized when installed in accordance with this report.

Foam insulation thicknesses of up to 11½ inches (292 mm) for ceiling cavities and 7½ inches (191 mm) for wall cavities when covered by a code complying prescriptive thermal barrier, such as minimum ½ inch (12.7 mm) thick gypsum board, are recognized based on testing in

accordance with NFPA 286 and when installed in accordance with Section 4.6 of this report.

4.4 Air Permeability: Thermoseal 2000/2000W insulation is classified as air-impermeable insulations when tested in accordance with ASTM E283 at a minimum thickness of 1 inch (25.4 mm), in accordance with 2015 IBC Section 1203.3, 2015 and 2012 IRC Section R806.5 and 2009 and 2006 IRC Section R806.4.

4.5 Fire-Protective Coatings and Coverings: Fire protective coatings, for use as alternative thermal barriers, shall be in accordance with Table 2 of this report, as applicable, and installed in accordance with Section 4.6 of this report.

4.6 Installations: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation shall comply with one of the following requirements:

- 2015, 2012 IECC Sections C402.1 (prescriptive)
- 2015, 2012 IECC Section R407 (performance)
- 2009 IECC Sections 402, 405, 502 or 506 as appropriate.

The manufacturer’s published installation instructions for Thermoseal 2000/2000W insulation and this report shall be available on the jobsite during installation. Where conflicts occur, the most restrictive governs.

Thermoseal 2000/2000W insulation shall be spray-applied on the jobsite using equipment specified in the manufacturer’s published installation instructions. The insulations are applied in multiple passes having a maximum thickness of 3 inches (76 mm) per pass up to the maximum insulation thickness specified in this report. The spray-applied foam plastic insulation shall be allowed to fully expand and cure for a minimum of 10 minutes prior to application of additional passes. The maximum in-service temperature for all areas shall not exceed the maximum temperature stated 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 and shall not be used in electrical outlets or junction boxes or in contact with rain, water, or soil.

4.6.1 Thermal Barrier

4.6.1.1 Application With a Prescriptive Thermal Barrier: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation thicknesses of up to 11½ inches (292 mm) in ceiling cavities and up to 7½ inches (191 mm) for in wall cavities shall be separated from the interior by an approved thermal barrier of minimum ½ inch thick (12.7 mm) gypsum wallboard or equivalent 15-minute thermal barrier. The thermal barrier shall comply with, and be installed in accordance with IBC Section 2603.4, 2015, 2012 and 2009 IRC Section R316.4 or 2006 IRC Section 314.4, as applicable.



4.6.1.2 Alternative Thermal Barrier Assemblies:

Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation may be installed without a thermal barrier as defined in Section 4.6.1 of this report when installed in accordance with Table 2 of this report and as referenced in [IAPMO UES ER-499](#).

4.6.2 Installation in Attics or Crawl Spaces: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation may be installed in attics or crawl spaces when installed in accordance with this section (Section 4.6 of this report). The insulations may be installed in unvented attics and unvented enclosed rafter spaces for use as air-impermeable insulation as described in Section 4.4 of this report.

When installed in attics or crawl spaces where entry is made only for the service of utilities, Thermoseal 2000/2000W insulation may be installed in accordance with this section. Thermoseal 2000/2000W insulation need not be surfaced with a thermal barrier, however, such attic and crawl space areas shall be separated from the interior of the building by a thermal barrier in accordance with Section 4.2 of this report.

4.6.2.1 Installation Using a Prescriptive Ignition Barrier: When installed within attics or crawl spaces where entry is made only for the service of utilities, Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation at thicknesses up to 4 inches (102 mm) shall be covered with a prescriptive 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.

Exception: The prescriptive ignition barrier may be omitted when installed in accordance with Section 4.6.2 of this report.

4.6.2.2 Installation Using an Alternative Ignition Barrier Assembly: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulations may be installed in attics and crawl spaces using an alternative ignition barrier assembly provided:

- Entry is only to service utilities in the attic or crawl space and no storage is permitted.
- Attic or crawl space areas cannot be interconnected.
- Air from the attic or crawl space cannot be circulated to other parts of the building.
- Attic ventilation is provided as required by IBC Section 1203.2 or IRC Section R806 except where air-impermeable insulation is permitted in unvented attics and shall comply with the following code sections as applicable:

For Unvented Attics:

- 2015 IBC Section 1203.3

- 2015 and 2012 IRC Section R806.5
- 2009 IRC Section R806.4

Crawl space ventilation is provided as required by the following code sections as applicable:

- 2015 IBC Section 1203.4
 - 2012, 2009 and 2006 IBC Section 1203.3
 - 2015, 2012, 2009 and 2006 IRC Section R408.1
- The foam plastic insulation is limited to the maximum thickness and density tested as shown in Section 4.6.2.2.1 of this report.
 - In accordance with IMC (International Mechanical Code®) Section 701, [2006 IMC Sections 701 and 703], combustion air is provided.

4.6.2.2.1 Application Without Fire Protective Coating:

Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation may be applied without a fire-retardant or fire protective coating to the underside of roof sheathing or roof rafters and vertical surfaces of attics and in crawl spaces. When applied to the underside of the top of the space, the thickness of the Thermoseal 2000/2000W insulation shall not exceed 1 1/4 inches (286 mm), and when applied to vertical surfaces maximum thickness shall not exceed 7/4 inches (184 mm). The insulations may be installed in unvented attics as described in this section in accordance with 2015 IBC Section 1203.3, 2015 or 2012 IRC Section R806.5 or 2009 or 2006 IRC Section R806.4, as applicable.

4.6.3 Exterior Walls of Types I, II, III or IV Construction (IBC)

4.6.3.1 General: When Thermoseal 2000/2000W insulation is used in exterior walls of Types I, II, III or IV construction of any height, the insulation shall comply with IBC Section 2603.5 and Section 4.6.3 of this report.

4.6.3.2 Complying Exterior Wall Assembly 1: Wall assemblies shall consist of minimum nominal 3 5/8-inch (92 mm) deep, 20 gage steel studs spaced a maximum of 24 inches (610 mm) on-center. Openings, for windows, doors, etc., shall be framed with minimum No. 20 gage steel framing. A layer of 5/8-inch (15.9 mm) thick Type X exterior gypsum sheathing complying with ASTM C1396 shall be installed over the exterior wall side, and openings, and secured to the studs with screws spaced a maximum of 8-inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. A layer of 5/8-inch (15.9 mm) thick Type X gypsum wallboard shall be installed over the interior side and secured to the studs with screws spaced a maximum of 8 (203 mm) inches on-center around the perimeter and 12 inches (305 mm) on-center in the field. Thermoseal 2000/2000W insulation is spray applied into the stud cavities to approximately one-half the stud depth but not greater than 1 13/16-inch (46 mm).



4.6.3.3 Complying Exterior Wall Assembly 2: Wall assemblies shall consist of minimum nominal 3⁵/₈-inch (92 mm) deep, 20 gage steel studs spaced a maximum of 24 (610 mm) inches on-center. Openings, for windows, doors, etc., shall be framed with minimum No. 20 gage steel framing. A layer of 5⁵/₈-inch (15.9 mm) thick Type X exterior gypsum sheathing complying with ASTM C1396 shall be installed over the exterior wall side, and openings, and secured to the studs with screws spaced a maximum of 8-inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. A layer of 5⁵/₈-inch (15.9 mm) thick Type X gypsum wallboard shall be installed over the interior side and secured to the studs with screws spaced a maximum of 8 inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. Thermoseal 2000/2000W insulation is spray applied over the exterior sheathing to a maximum nominal depth of 3¹/₄-inches (82.6 mm). The spray foam insulation shall be covered by nominal 4-inch (102 mm) thick clay brick masonry with a nominal 2-inch (50.8 mm) air gap between the brick and foam insulation.

4.6.4 Non-Loadbearing One-Hour Fire-Resistance-Rated Wall Assemblies: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation may be used in non-loadbearing one-hour fire-resistance-rated wall assemblies in accordance with this section.

4.6.4.1 Fire-resistance-rated Assembly 1: Steel studs shall be nominally 5¹/₂ inch (140 mm) deep, minimum 20 gage, spaced a maximum of 24 inches (610 mm) on-center. The interior of the wall assembly shall be covered with minimum 5⁵/₈ inch (15.9 mm) thick Type X gypsum wallboard complying with ASTM C79 fastened with No. 6, 1¹/₄ inch (32 mm) long self-drilling drywall screws spaced 8 inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. The Thermoseal 2000/2000W foam plastic insulation shall be spray-applied into the stud cavities to a maximum nominal thickness of 3-inches (76.2 mm). The exterior of the wall assembly shall be covered with minimum 5⁵/₈ inch (15.9 mm) thick Type X exterior gypsum sheathing complying with ASTM C1396 fastened with No. 6, 1¹/₄ inch (32 mm) long self-drilling drywall screws spaced 8 inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. A layer of DuPont Tyvek HomeWrap water-resistive barrier shall be attached over the Type X exterior gypsum sheathing. The water-resistive barrier shall be covered with 5⁵/₁₆-inch (7.9 mm) thick HardiPanel[®] cement board fastened with screws spaced 6 inches (152 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field.

4.6.4.2 Fire-resistance-rated Assembly 2: Steel studs shall be nominally 3⁵/₈ inch (92 mm) deep, minimum 25 gage, spaced a maximum of 24 inches (610 mm) on-center. The interior of the wall assembly shall be covered with minimum 5⁵/₈ inch (15.9 mm) thick Type X gypsum wallboard complying with ASTM C79 fastened with No.

6, 1¹/₄ inch (32 mm) long self-drilling drywall screws spaced 8 inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. The exterior of the wall assembly shall be covered with minimum 5⁵/₈ inch (15.9 mm) thick Type X exterior gypsum sheathing complying with ASTM C1396 fastened with No. 6, 1¹/₄ inch (32 mm) long self-drilling drywall screws spaced 8 inches (203 mm) on-center around the perimeter and 12 inches (305 mm) on-center in the field. Thermoseal 2000/2000W foam plastic insulation shall be spray-applied onto the exterior sheathing to a maximum nominal thickness of 3-inches (76.2 mm).

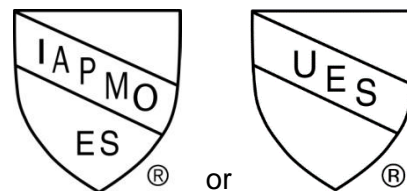
4.7 Water-resistive Barrier: Thermoseal 2000/2000W spray-applied polyurethane foam plastic insulation when applied to form a minimum 1¹/₂ inches (38.1 mm) thick continuous layer may be used as an alternative water-resistive barrier specified in Section 1404.2 of the IBC and Section R703.2 of the IRC, as applicable.

5.0 IDENTIFICATION

The spray foam insulation is identified with the following:

- a. Report holder's name (Thermoseal, LLC)
- b. address and telephone number,
- c. the product trade name (Thermoseal 2000/2000W)
- 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-581)
- i. the name or logo of the inspection agency

Either mark of conformity may be used as shown below:



IAPMO UES ER-581

Each container of DC315 Fire Protective Coating is labeled with the manufacturer's name (International Fireproof Technology, Inc.), the product name, and use instructions.

Each container of Fireshell[®] BMS TC is labeled with the manufacturer's name (TPR²), the product name, and use instructions.



6.0 SUBSTANTIATING DATA

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation, AC377, dated April 2016, including Appendix X.

6.2 Reports of room corner fire testing in accordance with NFPA 286 and room fire testing in accordance with UL 1715.

6.3 Reports of fire tests in accordance with ASTM E119.

6.4 Reports of water penetration tests in accordance with ASTM E331, modified (6.24 psf, 2 hours).

6.5 Reports of water resistance tests in accordance with AATCC Test Method 127.

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7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Thermoseal 2000/2000W to assess conformance to the codes and standards shown in Section 1.0 of this report and documents the product's certification.

TABLE 2 - ALTERNATIVE THERMAL BARRIER ASSEMBLIES

FIRE-PROTECTIVE COATING/COVERING ¹			MAXIMUM SPF THICKNESS (inch)	
TYPE	MINIMUM THICKNESS	THEORETICAL APPLICATION RATE (COATINGS ONLY)	WALLS AND VERTICAL SURFACES	CEILING AND OVERHEAD SURFACES
DC315 ²	18 mils WFT (12 mils DFT)	1.13 gal/100 ft ²	7.25	7.25
Fireshell [®] BMS TC ³	26 mils WFT (14 mils DFT)	1.5 gal/100 ft ²	7.25	9.25

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L, 1 ft² = 0.0929 m²

¹ Fire-protective coatings and coverings shall be applied over all exposed SPF surfaces in accordance with the coating/covering manufacturer's instructions and this report.

² International Fireproof Technology, Inc, recognized in [IAPMO UES ER-499](#).

³ TPR² Corporation