# ICC-ES Evaluation Report

**ESR-2642**

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*This report is subject to re-examination in two years.*

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**DIVISION: 07—THERMAL AND MOISTURE PROTECTION**
**Section: 07210—Building Insulation**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:**

**BASF POLYURETHANE FOAM ENTERPRISES SPRAY-APPLIED INSULATIONS: SPRAYTITE® (158, 178, 81205 AND 81206); COMFORT FOAM® (158 AND 178) AND WALLTITE® (US AND US-N)**

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)
- 2009 *International Energy Conservation Code*® (IEEC)
- Other Codes (see Section 8)

**Properties evaluated:**

- Physical properties
- Surface burning characteristics
- Water vapor transmission
- Attic and crawl space installation
- Air permeability
- Fire-resistance-rated construction
- Exterior walls in Types I through IV construction

## 2.0 USES

SPRAYTITE® (158, 178, 81205 and 81206), COMFORT FOAM® (158 and 178) and WALLTITE® (US and US-N) spray-applied polyurethane foam insulations are used as nonstructural thermal insulating material in Type I, II, III, IV and V construction under the IBC and dwellings under the IRC. See Section 4.6 for use in Type I, II, III, IV and V construction. The insulation is for use in wall cavities, floor/ceiling assemblies, or attic and crawl spaces as described in Section 4.4. Under the IRC, the insulation may be used as air-impermeable insulation when installed in accordance with Section 3.5. The insulation may be used in fire-resistance-rated wall assemblies when construction is in accordance with Section 4.5.

## 3.0 DESCRIPTION

### 3.1 General:

SPRAYTITE® (158, 178, 81025 and 81206), COMFORT FOAM® (158 and 178) and WALLTITE® (US and US-N) are two-component, closed-cell, rigid foam plastic insulations. The insulations are produced in the field by combining an isocyanate component A with a resin component B, resulting in products having a nominal density of 2.0 pcf (32 kg/m$^3$). SPRAYTITE®, COMFORT FOAM® and WALLTITE® insulations use an A component designated as ELASTOSPRAY® 8000A. Each insulation uses a different proprietary blend for the B component. The insulation components B have a shelf life of three months and components A have a shelf life of nine months when stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (27°C) before installation.

### 3.2 Surface-burning Characteristics:

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 E 84 at a maximum thickness of 4 inches (102 mm).

Thicknesses of up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized, based on testing in accordance with NFPA 286, when covered with a minimum $^1/_2$-inch-thick (12.7 mm) gypsum board or an equivalent thermal barrier complying with, and installed in accordance with, the applicable code.

### 3.3 Thermal Resistance, *R*-values:

The insulations have thermal resistance (*R*-values) at a mean temperature of 75°F (24°C) as shown in Table 1.

### 3.4 Vapor Retarder:

The insulations have a vapor permeance of less than 1 perm [5.7 x 10$^{-11}$ kg /(m$^2$sPa)], in accordance with ASTM E 96, when applied at the following minimum thicknesses, and qualify as Class II vapor retarders:

| | | |
|---|---|---|
| SPRAYTITE® (158, 81205) | = | 3 inches (76 mm) |
| SPRAYTITE® (178, 81206) | = | 2 inches (51 mm) |
| COMFORT FOAM® (158) | = | 3 inches (76 mm) |
| COMFORT FOAM® (178) | = | 2 inches (51 mm) |
| WALLTITE® (US and US-N) | = | 2 inches (51 mm) |

### 3.5 Air Permeability:

SPRAYTITE® (178 and 81206), COMFORT FOAM® 178 and WALLTITE® (US and US-N) spray-applied polyurethane foam insulations, at a minimum thickness of 1 inch (25.4 mm), are considered air-impermeable insulation in accordance with Section R806.4 of the IRC, based on testing in accordance with ASTM E 283.

### 3.6 ELASTOCOAT™ 1500 Ignition Barrier:

ELASTOCOAT™ 1500 Ignition Barrier coating is supplied by BASF Polyurethane Foam Enterprises, LLC. The coating is water-based and available in both 5- and 55-gallon containers (18.9 and 208 L) and has a shelf life of six months when stored in a factory-sealed container at temperatures between 50°F (10°C) and 80°F (26.5°C).

### 3.7 ALDOCOAT 800 Intumescent Coating:

ALDOCOAT 800 intumescent coating is manufactured by Aldo Products Company and is a water-based latex coating supplied in 5-gallon pails and 55-gallon (18.9 and 208 L) drums. The materials have a shelf-life of six months when stored in a factory-sealed container at temperatures of 40°F (4.5°C) and 90°F (32°C).

### 3.8 NoBurn® Plus Intumescent Coating:

NoBurn® intumescent coating, manufactured by No-Burn, Inc., is a translucent aqueous liquid supplied in 1- and 5-gallon (3.8 and 18.8 L) pails and 55-gallon (208 L) drums. The coating has a shelf life of three years when stored in a factory-sealed container at temperatures between 40°F (4.5°C) and 90°F (32°C).

## 4.0 INSTALLATION

### 4.1 General:

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

### 4.2 Application:

The insulation is spray-applied at the jobsite using a volumetric positive displacement pump as recommended in the manufacturer's published installation instructions. The insulation is applied in passes having a minimum thickness of $^1/_2$ inch (12.7 mm) and a maximum thickness of 2 inches (51 mm) per pass, up to the total thickness specified in Sections 3.2, 4.3 and 4.4 of this report. The insulation passes must be allowed to fully expand and be cured for a minimum of 15 minutes prior to application of an additional pass. The insulation must not be used in areas that have a maximum service temperature greater than 180°F (82°C). The foam plastic insulation must not be used in electrical outlet or junction boxes or in contact with rain or water (e.g., rain, condensation, ice, snow). The substrate must be free of moisture, frost or ice, loose scales, rust, oil, and grease or other surface contaminants. The insulation must be protected from the weather during and after application.

### 4.3 Thermal Barrier:

The spray-applied insulations must be separated from the interior of the building by an approved thermal barrier of 0.5-inch (12.7 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with IBC Section 2603.4 or IRC Section R316.4, as applicable, except where installation is in an attic or crawl space as described in Section 4.4, or when the installation is in sill plates and headers at a total thickness of 3.25 inches (83 mm) or less as permitted by IRC Section R316.5.11. Thicknesses of up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized, based on testing in accordance with NFPA 286. A thermal barrier is not required when Ure-K cellulose insulation, which is recognized in evaluation report ESR-2110, is applied at a minimum dry thickness of 4 inches (102 mm); or when W.R. Grace Monokote Z-3306, which is recognized in evaluation report ESR-1044, is applied at a minimum dry thickness of $^3/_8$ inch (9.5 mm).

### 4.4 Attics and Crawl Spaces:

**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:** In lieu of the ignition barriers described in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, SPRAYTITE® (178 and 81206), COMFORT FOAM® 178, and WALLTITE® (US and US-N) insulations may be installed in attics and crawl spaces as described in this section and Table 2, subject to the following conditions:

a. Entry to the attic or crawl space is 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. 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 Section R806.4 of IRC. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

e. Combustion air is provided in accordance with IMC Sections 701 and 703.

In attics, the insulation may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces; and in crawl spaces, the insulation may be spray-applied to the underside of floors and/or vertical surfaces. The thickness of the foam plastic applied to the underside of the top of the space or vertical surfaces must not exceed values set forth in Table 2. When required, the foam plastic must be covered with an ignition barrier as described in Table 2. 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 ignition barriers are applied with a medium-size nap roller, soft brush or conventional airless spray equipment at a rate specified in Table 2. The coating must be applied when ambient and substrate temperatures are above 50°F (10°C). The coating requires a 24-hour curing time. The insulations may be installed in unvented attics as described in this section in accordance with IRC Section R806.4.

**4.4.3 Use on Attic Floors:** The SPRAYTITE® (178 and 81206), COMFORT FOAM® 178, and WALLTITE® (US and US-N) insulations may be installed in accordance with this section and Table 2 at a maximum thickness of $9^1/_4$ inches (235 mm) between and over the joists in attic floor. The insulation must be separated from the interior of the building by an approved thermal barrier. The ignition barrier required in IBC Section 2603.4.1.6 and IRC Section R316.5.3 may be omitted.

**4.5 Two-hour Fire-resistance-rated Wall Assemblies (Load-bearing):**

SPRAYTITE® 158, SPRAYTITE® 81205 or COMFORT FOAM® 158 may be installed on interior load-bearing two-hour fire-resistance-rated walls, provided the system is installed in accordance with the following:

**4.5.1 Wood Framing:** Two rows on separate plates, 3 inches (76 mm) apart, of minimum 2-by-4 wood studs (No. 2 Douglas fir) spaced a maximum of 16 inches (406 mm) on center.

**4.5.2 Wall Finish:** Base layer of $^5/_8$-thick (15.9 mm), Type X gypsum wallboard is applied horizontally and fastened to each outer side of a double row of studs with 6d by $1^7/_8$-inch-long (48 mm) coated nails, spaced 2 feet (610 mm) on center. Face layer of $^5/_8$-inch-thick (15.9 mm), Type X gypsum board is applied horizontally and fastened to each outer side of studs over the base layer with 8d by $2^3/_8$-inch-long (60 mm) coated nails, spaced 8 inches (203 mm) on centers. Gypsum wallboard joints must be staggered 24 inches (610 mm) between layers and on opposite sides of the wall.

**4.5.3 Insulation:** SPRAYTITE® 158, SPRAYTITE® 81205 or COMFORT FOAM® 158 is applied in the stud cavities of both rows at a thickness of 3 inches (76 mm).

**4.6 Exterior Walls in Types I, II, III and IV Construction:**

When used on walls of Type I, II, III and IV construction, the SPRAYTITE® (178, 81206), COMFORT FOAM® 178, and WALLTITE® (US and US-N) spray-applied foam insulations must comply with Section 2603.5 of the IBC at a maximum thickness of 3 inches (76 mm), when installed per the manufacturer's published installation instructions and this report. The potential heat of the foam plastic in any portion of the wall or panels must not exceed the potential heat, expressed in Btu/ft$^2$ (MJ/m$^2$), of the foam plastic insulation contained in the wall assembly tested in accordance with NFPA 285. The potential heat of SPRAYTITE® (178, 81206), COMFORT FOAM® 178, and WALLTITE® (US and US-N) spray-applied insulations is 1961 Btu/ft$^2$ (22.3 MJ/m$^2$) per inch of thickness.

## 5.0 CONDITIONS OF USE

The BASF Polyurethane Foam Enterprises 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 spray-applied insulations and the intumescent coatings must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. The instructions within this report govern if there are any conflicts between the manufacturer's published installation instructions and this report.

**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, except where installation is in an attic or crawl space as described in Section 4.4.

**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 insulations must be protected from the weather during and after application.

**5.5** The spray-applied insulations must be applied by professional spray polyurethane foam installers certified by BASF Polyurethane Foam Enterprises or by the Spray Polyurethane Foam Alliance (SPFA) for the installation of spray polyurethane foam insulation.

**5.6** Installation in fire-resistance-rated construction must be as described in Section 4.5.

**5.7** Use of the insulation in areas where the probability of termite infestation is "very high" must be in accordance with IBC Section 2603.8 or IRC Section R318.4, as applicable.

**5.8** Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1 and IECC Sections 303.1.1 and 303.1.2.

**5.9** When use is on buildings of Type I, II, III and IV construction, documentation must be submitted to the code official verifying that the insulation has been qualified as a component of an assembly tested in accordance with Sections 2603.5.1, 2603.5.5 and 2603.5.7 of the IBC, as applicable. The maximum potential heat of the foam plastic used in the assembly must be no greater than that noted in Section 4.6.

**5.10** The polyurethane foam plastic insulation components are produced in Houston, Texas, and Minneapolis, Minnesota, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

## 6.0 EVIDENCE SUBMITTED

**6.1** Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2009, including reports of tests in accordance with Appendix A Section A1.2.2 or Appendix X of AC377.

**6.2** Data in accordance with ASTM E 119.

**6.3** Reports of water vapor transmission tests in accordance with ASTM E 96.

**6.4** Reports of air leakage testing in accordance with ASTM E 283.

**6.5** Reports of fire propagation characteristics tests in accordance with NFPA 285.

**6.6** Reports of potential heat of foam plastics tests in accordance with NFPA 259.

**6.7** Reports of room corner tests in accordance with NFPA 286.

## 7.0 IDENTIFICATION

Each container of components A and B of the polyurethane foam plastic insulation bears a label with the BASF Polyurethane Foam Enterprises, LLC, name and address, the product name, the product type (A or B component), density, the flame- spread and smoke-developed indices, the evaluation report number (ESR-2642), the shelf life and the date of manufacture. The containers also bear the name of the inspection agency (Underwriters Laboratories Inc.).

ELASTOCOAT™ 1500 Ignition Barrier coating is identified with the BASF Polyurethane Foam Enterprises, LLC, report holder's name and the product name.

ALDOCOAT 800 intumescent coating is identified with the manufacturer's name (Aldo Products Company) and address, the product trade name, and use instructions.

NoBurn® Plus intumescent coating is identified with the manufacturer's name (No-Burn, Inc.) and address, the product trade name, and use instructions.

## 8.0 OTHER CODES

### 8.1 Evaluation Scope:

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2006 *International Energy Conservation Code*® (2006 IECC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2003 *International Energy Conservation Code*® (2003 IECC
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IRC)
- 2000 *International Energy Conservation Code*® (2000 IECC)

### 8.2 Uses:

The products comply with the above-mentioned codes as described in Sections 2.0 through 7.0 of this report except as noted below:

- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, except attics and crawl spaces must be vented in accordance with the applicable code.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, except attics and crawl spaces must be vented in accordance with the applicable code.

**TABLE 1—THERMAL RESISTANCE (*R*-VALUES)**

| **SPRAYTITE® (158, 81205); COMFORT FOAM® 158** | |
|---|---|
| **THICKNESS (INCHES)** | ***R*-VALUE (˚F.ft².h/Btu)** |
| **ASTM C 518 TESTED VALUES** | |
| 1 | 6.6 |
| 4 | 27.2 |
| **CALCULATED *R*-VALUES[1]** | |
| 2 | 13.2 |
| 3 | 19.8 |
| 3.5 | 23.8 |
| 5 | 34 |
| 6 | 40.8 |
| 7 | 47.6 |
| 8 | 54.4 |
| 10 | 68 |
| 11 | 74.8 |
| 12 | 81.6 |
| **SPRAYTITE® (178, 81206); COMFORT FOAM® 178 and WALLTITE® (US and US-N)** | |
| **ASTM C 518 TESTED VALUES** | |
| 1 | 6.7 |
| 4 | 27.6 |
| **CALCULATED *R*-VALUES[1]** | |
| 2 | 13.4 |
| 3 | 20.1 |
| 3.5 | 24.2 |
| 5 | 34.5 |
| 6 | 41.4 |
| 7 | 48.3 |
| 8 | 55.2 |
| 10 | 69.1 |
| 11 | 76 |
| 12 | 82.9 |

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

[1]Calculated *R*-values are based on tested *K* values at a 4-inch thickness.

**TABLE 2—USE OF INSULATION IN ATTICS AND CRAWL SPACES WITHOUT A PRESCRIPTIVE IGNITION BARRIER**

| INSULATION TYPE | MAXIMUM THICKNESS (in) (Wall Cavities & Attic Floors) | MAXIMUM THICKNESS (in) (Underside of Roof Sheathing/Rafterss & Floors) | INTUMESCENT COATING MINIMUM THICKNESS & TYPE (Applied to all Foam Surfaces) | MINIMUM APPLICATION RATEOF THE INTUMESCENT COATING | TESTS SUBMITTED (AC377) |
|---|---|---|---|---|---|
| **WALLTITE® US-N** | $9^1/_4$ | $11^1/_4$ | 18 wet mils of ALDOCOAT 800 | 1.12 gallon per 100 $ft^2$ | Appendix X |
| **WALLTITE® US** | $9^1/_4$ | $11^1/_4$ | No coating required | NA | Appendix X |
| **COMFORT FOAM® 178** | $9^1/_4$ | $11^1/_4$ | No coating required | NA | Appendix X |
| **SPRAYTITE® 178** | $9^1/_4$ | $11^1/_4$ | 18 wet mils of ALDOCOAT 800 | 1.12 gallon per 100 $ft^2$ | Appendix X |
| **WALLTITE® US-N** | $9^1/_4$ | $11^1/_4$ | No coating required | NA | Appendix X |
| **WALLTITE® US** | $9^1/_4$ | $11^1/_4$ | 18 wet mils ALDOCOAT 800 | 1.12 gallon per 100 $ft^2$ | Appendix X |
| **COMFORT FOAM® 178** | $9^1/_4$ | $11^1/_4$ | 18 wet mils ALDOCOAT 800 | 1.12 gallon per 100 $ft^2$ | Appendix X |
| **WALLTITE® US** | $9^1/_4$ | $11^1/_4$ | 12 wet mils of NoBurn Plus | 0.75 gallon per 100 $ft^2$ | Appendix X |
| **WALLTITE® US-N** | $9^1/_4$ | $11^1/_4$ | 12 wet mils of NoBurn Plus | 0.75 gallon per 100 $ft^2$ | Appendix X |
| **SPRAYTITE® 178** | $9^1/_4$ | $11^1/_4$ | 12 wet mils of NoBurn Plus | 0.75 gallon per 100 $ft^2$ | Appendix X |
| **SPRAYTITE® 178** | $9^1/_4$ | $11^1/_4$ | No coating required | NA | Appendix X |
| **COMFORT FOAM® 178** | $9^1/_4$ | $11^1/_4$ | 12 wet mils of NoBurn Plus | 0.75 gallon per 100 $ft^2$ | Appendix X |
| **SPRAYTITE® (178 & 81206); COMFORT FOAM® 178; WALLTITE® US & US-N** | 3 | 7 | 16 wet mils of ELASTOCOAT 1500 | 1 gallon per 100 $ft^2$ | Appendix A1.2.2 |

For **SI:** 1 inch = 25.4 mm; 1 mil = 0.0254 mm; 1 gallon = 3.38 L; 1 $ft^2$ = 0.93 $m^2$; NA = not applicable.