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# ICC-ES Report

## ESR-1826

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Reissued 02/2016

This report is subject to renewal 02/2018.

**DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION**

**SECTION: 07 21 00—THERMAL INSULATION**

**REPORT HOLDER:**

**ICYNENE, INC.**

**6747 CAMPOBELLO ROAD  
MISSISSAUGA, ONTARIO L5N 2L7  
CANADA**

**EVALUATION SUBJECT:**

**ICYNENE CLASSIC, CLASSIC MAX, CLASSIC ECO AND CLASSIC PLUS**



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# ICC-ES Evaluation Report

**ESR-1826**

Reissued February 2016

This report is subject to renewal February 2018.

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A Subsidiary of the International Code Council®

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

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**EVALUATION SUBJECT:**
**ICYNENE CLASSIC, CLASSIC MAX, CLASSIC ECO AND  
CLASSIC PLUS**
**1.0 EVALUATION SCOPE**
**1.1 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.

- Other Codes (see Section 8.0)

**Properties evaluated:**

- Surface burning characteristics
- Physical properties
- Thermal performance (*R*-values)
- Attic and crawl space installation
- Fire resistance
- Air permeability
- Noncombustible construction

**1.2 Evaluation to the following green standard:**

- 2008 ICC 700 *National Green Building Standard*™ (ICC 700-2008)

**Attributes verified:**

- See Section 2.0

**2.0 USES**

Icynene Classic, Classic Max, Classic Eco and Classic Plus are used to provide thermal insulation in buildings and to seal areas such as plumbing and conduit penetrations against air infiltration. The insulations are for use in wall cavities and floor assemblies; and in attic and crawl space installations as described in Section 4.4.

The Classic, Classic Max and Classic Eco insulations are for use in Type V construction under the IBC and dwellings under the IRC; fire-resistance-rated construction when installed in accordance with Section 4.5; and in Types I through IV construction when installed in accordance with Section 4.6.

The Classic Plus insulation are for use in Type V-B construction under the IBC and nonfire-resistance-rated construction under the IRC.

The attributes of the insulations have been verified as conforming to the provisions of ICC 700-2008 Section 703.2.1.1.1(c) as an air impermeable insulation. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

**3.0 DESCRIPTION**
**3.1 General:**

**3.1.1 Classic and Classic Max:** Icynene Classic and Classic Max are low-density, open-cell, polyurethane foam plastic insulations and air barrier systems that are 100 percent water-blown with an installed nominal density of 0.5 pcf (8 kg/m<sup>3</sup>). The insulations are two-component, spray-applied products. The two components of the insulation are polymeric isocyanate (A-Component, also known as Base Seal®) and proprietary resin (B-Component, Classic or Classic Max Resin). When stored at temperatures between 50°F (10°C) and 100°F (38°C), the components have a shelf life of six months.

**3.1.2 Classic Eco:** The Icynene Classic Eco foam plastic insulation is two-component, low-density, open cell, spray-applied, foam plastic with a nominal density of 0.5 pcf (8 kg/m<sup>3</sup>). The polyurethane foam is produced by combining a polymeric isocyanate (A component) and proprietary resin, Classic Eco (B component). When stored at temperatures between 50°F (10°C) and 100°F (38°C), the components have a shelf life of six months.

**3.1.3 Classic Plus:** The Icynene Classic Plus foam plastic insulation is two-component, low density, open cell, spray-applied, foam plastic with a nominal density of 0.7 pcf (11 kg/m<sup>3</sup>). The polyurethane foam is produced by combining a polymeric isocyanate (A component) and proprietary resin, Classic Plus (B component). When stored at temperatures between 50°F (10°C) and 100°F (38°C), the components have a shelf life of twelve months.

### 3.2 Surface Burning Characteristics:

**3.2.1 Classic and Classic Max:** When tested in accordance with ASTM E84/UL 723, at a thickness of 6 inches (152 mm) and a nominal density of 0.5 pcf (8 kg/m<sup>3</sup>), Icynene Classic and Classic Max have a flame spread index of 25 or less and a smoke-developed index of 450 or less. Thicknesses of up to 7<sup>1</sup>/<sub>2</sub> inches (190.5 mm) for wall cavities and 11<sup>1</sup>/<sub>2</sub> inches (292 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum <sup>1</sup>/<sub>2</sub>-inch-thick (13 mm) gypsum board or an equivalent thermal barrier complying with the applicable code. Greater thicknesses of insulation are recognized as described in Section 4.4.1.2.1.

**3.2.2 Classic Eco:** When tested in accordance with ASTM E84/UL 723, at a thickness of 6 inches (152 mm) and a nominal density of 0.5 pcf (8 kg/m<sup>3</sup>), Icynene Classic Eco has a flame spread index of 25 or less and a smoke-developed index of 450 or less. Greater than 6-inch (152 mm) thicknesses of insulation are recognized, based on the flame spread index of 25 or less, when the insulation is covered with minimum <sup>1</sup>/<sub>2</sub>-inch-thick (13 mm) gypsum wallboard or equivalent thermal barrier complying with the applicable code.

**3.2.3 Classic Plus:** When tested in accordance with ASTM E84/UL 723, at a thickness of 4 inches (102 mm) and a nominal density of 0.7 pcf (11 kg/m<sup>3</sup>), Icynene Classic Plus has a flame spread index of 25 or less and a smoke-developed index of 450 or less. Greater than 4-inch (102 mm) thicknesses of insulation are recognized, based on the flame spread index of 25 or less, when the insulation is covered with minimum <sup>1</sup>/<sub>2</sub>-inch-thick (13 mm) gypsum wallboard or equivalent thermal barrier complying with the applicable code.

### 3.3 Thermal Resistance:

Icynene Classic, Classic Max, Classic Eco and Classic Plus have thermal resistance (*R*-values) at a mean temperature of 75°F (24°C) as shown in Table 1.

### 3.4 Air Permeability:

Icynene spray-applied foam plastic insulations are considered air-impermeable insulation in accordance with 2012 IRC Sections R202 and R806.5 and 2009 IRC Sections R202 and R806.4, at the following thicknesses:

- **Classic and Classic Max:** Minimum, 3 inches (76 mm) based on testing in accordance with ASTM E2178.
- **Classic Eco:** Minimum, 5<sup>1</sup>/<sub>2</sub> inches (140 mm) based on testing in accordance with ASTM E283.
- **Classic Plus:** Minimum, 2 inches (51 mm) based on testing in accordance with ASTM E2178.

### 3.5 Intumescent Coatings:

**3.5.1 No Burn Plus XD:** No Burn Plus XD intumescent coating is a latex-based coating supplied in 1-gallon (4L) and 5-gallon (19L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 40°F (4.4°C) and 90°F (32.2°C).

**3.5.2 DC 315:** DC 315 intumescent coating is a water-based 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-sealed containers at temperatures between 41°F (5°C) and 95°F (35°C).

## 4.0 INSTALLATION

### 4.1 General:

The manufacturer's published installation instructions and this report must be strictly adhered to and a copy of these instructions and this evaluation report must be available on the jobsite at all times during installation.

### 4.2 Application:

**4.2.1 General:** Icynene Classic, Classic Max, Classic Eco and Classic Plus foam plastic insulations must be applied on the jobsite using two-component, 1-to-1 ratio, spray equipment specified by Icynene, Inc. 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 foam plastic insulation must not be used in electrical outlet or junction boxes or in contact with rain or water, and must be protected from the weather during and after application. Where the insulation is used as air-impermeable insulation, such as in unvented attic spaces regulated by IRC Section R806, the insulation must be installed at a minimum thicknesses noted in Section 3.4. The insulation can be installed in one pass to the maximum thickness. Where multiple passes are required, the cure time between passes is negligible.

**4.2.2 Classic and Classic Max:** The insulation must be used in areas where the maximum service temperature is no greater than 180°F (82°C). The insulation must be applied when the temperature is at or above 14°F (-10°C) and be protected from the weather during and after application.

**4.2.3 Classic Eco:** The insulation may be used in areas where the maximum service temperature is no greater than 180°F (82°C). The insulation must be applied when the temperature is at or above 14°F (-10°C) and be protected from the weather during and after application.

**4.2.4 Classic Plus:** The insulation may be used in areas where the maximum service temperature is no greater than 180°F (82°C). The insulation must be applied when the temperature is at or above 14°F (-10°C) and be protected from the weather during and after application.

### 4.3 Thermal Barrier:

#### 4.3.1 Classic and Classic Max:

**4.3.1.1 Application with a Prescriptive Thermal Barrier:** Icynene Classic and Classic Max foam plastic insulations must be separated from the interior of the building by an approved thermal barrier, such as <sup>1</sup>/<sub>2</sub>-inch (12.7 mm) gypsum wallboard installed using mechanical fasteners in accordance with the applicable code, or an equivalent 15-minute thermal barrier complying with the applicable code. When installation is within an attic or crawl space as described in Section 4.4, a thermal barrier is not required between the foam plastic and the attic or crawl space, but is required between the foam plastic insulation and the interior of the building. Thicknesses of up to 7<sup>1</sup>/<sub>2</sub> inches (190.5 mm) for wall cavities and 11<sup>1</sup>/<sub>2</sub> inches (292 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum <sup>1</sup>/<sub>2</sub>-inch-thick (13 mm) gypsum board or equivalent thermal barrier complying with the applicable code.

**4.3.1.2 Application without a Prescriptive Thermal Barrier or Ignition Barrier:** The prescriptive 15-minute thermal barrier or ignition barrier may be omitted when installation is in accordance with this section. The insulation and coating may be spray-applied to the interior facing of walls, the underside or roof sheathing of roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier or ignition barrier. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 6 inches (152 mm). The foam plastic must be covered on all surfaces with DC 315 coating at a minimum thickness of 20 wet mils [13 dry mils (0.33 mm)], applied at a rate of 1.25 gallons (4.7 L) per 100 square feet (9.2 m<sup>2</sup>). 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 low-pressure airless spray equipment.

#### 4.3.2 Classic Eco:

**4.3.2.1 Application with a Prescriptive Thermal Barrier:** Icynene Classic Eco polyurethane foam plastic insulation must be separated from the interior of the building by an approved thermal barrier of  $\frac{1}{2}$ -inch-thick (13 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as applicable.

#### 4.3.3 Classic Plus:

**4.3.3.1 Application with a Prescriptive Thermal Barrier:** Icynene Classic Plus polyurethane foam plastic insulation must be separated from the interior of the building by an approved thermal barrier of  $\frac{1}{2}$ -inch-thick (13 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as applicable.

### 4.4 Attics and Crawl Spaces:

#### 4.4.1 Classic and Classic Max:

**4.4.1.1 Application with a Prescriptive Ignition Barrier:** When Icynene Classic and Classic Max foam plastic insulations are installed within attics where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 and 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. The Classic or Classic Max insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 3 inches (76 mm) in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.1.2 Application without a Prescriptive Ignition Barrier:** Where Icynene Classic and Classic Max foam plastic insulations are installed in an attic or crawl space without a prescriptive ignition barrier, in accordance with Sections 4.4.1.2.1, 4.4.1.2.2, 4.4.1.2.3 and 4.4.1.2.4, the following conditions apply:

1. Entry to the attic or crawl space is only for service of utilities and no storage is permitted.

2. There are no interconnected attic, crawl space or basement areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Combustion air is provided in accordance with IMC Section 701.
5. 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, as applicable.
6. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

**4.4.1.2.1 Attics – Classic and Classic Max:** In attics, Icynene Classic and Classic Max foam plastic insulations may be spray-applied to the underside of the roof sheathing and/or rafters, as described in this section. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 5.5 inches (140 mm). The insulation must be covered on all surfaces with one of the coatings described in Section 3.5. 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 low-pressure airless spray equipment. The coating must be applied to a thickness as follows:

- No Burn Plus XD at a minimum thickness of 6 wet mils (0.15 mm) [4 dry mils (0.1 mm) dry film thickness], applied at a rate of 0.4 gallon (1.5 L) per 100 square feet (9.2 m<sup>2</sup>).
- DC 315 at a minimum thickness of 4 wet mils (0.1 mm) [3 dry mils], applied at a rate of 0.3 gallon (1.1 L) per 100 square feet (9.2 m<sup>2</sup>).

The coatings must be applied when ambient and substrate temperature is at least 60°F (16°C) and no more than 95°F (35°C). All other surfaces (including glass) must be protected against damage from the coating. The insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 3.5 inches (89 mm) as described in this section in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.1.2.2 Attics—Classic Max:** When Classic Max is applied in unvented attics conforming to 2012 IRC Section R806.5 or 2009 IRC Section R806.4, the insulation may be applied to the underside of roof sheathing and/or rafters to a minimum thickness of 3 $\frac{1}{2}$  inches (90 mm) and may be applied to vertical wall surfaces to a minimum thickness of 3 $\frac{1}{2}$  inches (90 mm). Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 20 inches (508 mm). The insulation may be left exposed to the attic without a prescriptive ignition barrier or an intumescent coating.

The attic must have attic access complying with IRC Section R807, horizontally placed in the floor, and opening outward toward the living space. Items penetrating the roof deck or walls, such as skylight wells and vents, must be covered with a minimum of 3 $\frac{1}{2}$  inches (90 mm) of the Classic Max insulation.

**4.4.1.2.3 Crawl Spaces:** In crawl spaces, Icynene

Classic and Classic Max insulations may be spray-applied to vertical walls and the underside of floors, as described in this section. The thickness of the foam plastic applied to the underside of the floors must not exceed 14 inches (356 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed 3½ inches (88.9 mm). The foam plastic does not require an ignition barrier or a coating.

**4.4.1.2.4 Use on Attic Floors:** When used on attic floors, Icynene Classic and Classic Max foam plastic insulations may be installed at a maximum thickness of 11½ inches (292 mm) between joists in attic floors. The insulation must be separated from the interior of the building by an approved thermal barrier. The coatings specified in Section 4.4.1.2.1 and the ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3, may be omitted.

#### 4.4.2 Classic Eco:

**4.4.2.1 Application with a Prescriptive Ignition Barrier:** When Icynene Classic Eco is 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 and 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. Icynene Classic Eco may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 5.5 inches (140 mm) in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.2.2 Application without a Prescriptive Ignition Barrier:** Where Icynene Classic Eco insulation is installed in accordance with Sections 4.4.2.2.1, 4.4.2.2.2 and 4.4.2.2.3, the following conditions apply:

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

**4.4.2.2.1 Attics and Crawl Spaces:** In attics and crawl spaces, Icynene Classic Eco insulation may be spray-applied to the underside of the roof sheathing and/or rafters, the underside of wood floors, and 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 13½ inches (343 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed 5½ inches (140 mm). The foam plastic must be covered on all surfaces with one of the coatings described in Section 3.5. The coating must be applied over the Icynene Classic Eco 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 low-pressure airless spray equipment. The coating must be applied to a thickness as follows:

- No Burn Plus XD at a minimum thickness of 10 wet mils (0.3 mm) [6 dry mils (0.2 mm)], applied at a rate of 0.63 gallon (2.4 L) per 100 square feet (9.2 m<sup>2</sup>)
- DC 315 at a minimum thickness of 8 wet mils (0.2 mm) [6 dry mils (0.2 mm)], applied at a rate of 0.5 gallon (1.9 L) per 100 square feet (9.2 m<sup>2</sup>)

The coating must be applied when ambient and substrate temperature is at least 60°F (16°C) and no more than 95°F (35°C). All other surfaces (including glass) must be protected against damage from the coating.

Icynene Classic Eco insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 5½ inches (140 mm) as described in this section, in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.2.2.2 Crawl Spaces:** In crawl spaces, Icynene Classic Eco insulation may be spray-applied to vertical walls and the underside of floors, as described in this section. The thickness of the foam plastic applied to the underside of the floors must not exceed 14 inches (356 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed 3½ inches (88.9 mm). The foam plastic does not require an ignition barrier or a coating.

**4.4.2.2.3 Use on Attic Floors:** Icynene Classic Eco insulation may be installed at a maximum thickness of 5½ inches (152 mm) between joists in attic floors when covered with one of the coatings applied as described in Section 4.4.2.2.1. The insulation must be separated from the interior of the building by an approved thermal barrier.

#### 4.4.3 Classic Plus:

**4.4.3.1 Application with a Prescriptive Ignition Barrier:** When Icynene Classic Plus is installed up to a maximum thickness of 4 inches (102 mm) 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 and 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. Icynene Classic Plus may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 2 inches (51 mm) in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.3.2 Application without a Prescriptive Ignition Barrier:** Where Icynene Classic Plus insulation is installed in accordance with Sections 4.4.3.2.1, 4.4.3.2.2, and 4.4.3.2.3, the following conditions apply:

1. Entry to the attic or crawl space is to service utilities, and no storage is permitted.
2. There are no interconnected attic or crawl space areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Combustion air is provided in accordance with IMC Section 701.

5. 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, as applicable.
6. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

**4.4.3.2.1 Attics:** In attics, Icynene Classic Plus insulation may be spray-applied to the underside of the roof sheathing and/or rafters, the underside of wood floors, and 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 14 inches (356 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed 8 inches (203 mm). The foam plastic insulation must be covered on all exposed surfaces with DC315 intumescent coating at a minimum thickness of 4 wet mils (0.1 mm) [3 dry mils (0.08 mm)], applied at a rate of 0.25 gallon (0.95 L) per 100 square feet (9.2 m<sup>2</sup>). The coating must be applied over the Icynene Classic Plus 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 low-pressure airless spray equipment.

The coating must be applied when ambient and substrate temperature is at least 60°F (16°C) and no more than 95°F (35°C). All other surfaces (including glass) must be protected against damage from the coating.

Icynene Classic Plus insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 2 inches (51 mm) as described in this section, in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4, as applicable.

**4.4.3.2.2 Crawl Spaces:** In crawl spaces, Icynene Classic Plus insulation may be spray-applied to vertical walls and the underside of floors, as described in this section. The thickness of the foam plastic applied to the underside of the floors must not exceed 14 inches (356 mm). The thickness of the spray foam plastic insulation applied to vertical wall surfaces must not exceed 8 inches (203 mm). The insulation must be covered with DC-315 coating is described in Section 4.4.3.2.1.

**4.4.3.2.3 Use on Attic Floors:** Icynene Classic Plus insulation may be installed at a maximum thickness of 13 inches (330 mm) between joists in attic floors. The insulation must be separated from the interior of the building by an approved thermal barrier. The insulation does not require an ignition barrier or a coating.

## 4.5 One-hour Fire-resistance-rated Assemblies:

### 4.5.1 Classic and Classic Max:

**4.5.1.1 Assembly 1 (Limited Load-bearing Wood Stud Wall):** Minimum nominally 2-by-4 [ $1\frac{1}{2}$  by  $3\frac{1}{2}$  inches (38 mm by 89 mm)] southern pine ( $G = 0.55$ ), No. 2 grade studs spaced 16 inches (406 mm) on center with a base layer of  $\frac{1}{2}$ -inch-thick (12.7 mm) wood fiber sound board installed horizontally on each face with vertical joints located over the studs, attached with 6d box nails, 2 inches (51 mm) long and spaced 24 inches (610 mm) on center along the studs, and a second layer of  $\frac{5}{8}$ -inch-thick (15.9 mm) Type X gypsum wallboard installed vertically on each face, attached with 8d box nails,  $2\frac{1}{2}$  inches (64 mm) long and spaced 7 inches (178 mm) on center along the studs. The stud cavity contains Icynene Classic or Classic

Max insulation nominally 2 inches (51 mm) thick.

Axial loads applied to the wall assembly must be limited to the least of the following:

- 1,805 pounds (8029 N) per stud.
- Design stress of  $0.78 F_c$ .
- Design stress of  $0.78 F_c$  at a maximum  $l_e/d$  of 33.

**4.5.1.2 Assembly 2 (Limited Load-bearing Wood Stud Wall):** Minimum nominally 2-by-4 [ $1\frac{1}{2}$  by  $3\frac{1}{2}$  inches (38 mm by 89 mm)] southern pine ( $G = 0.55$ ), No. 2 grade studs spaced 16 inches (406 mm) on center with two layers of  $\frac{1}{2}$ -inch-thick (12.7 mm) Type X gypsum wallboard installed vertically with joints staggered on each face, attached with 8d box nails,  $2\frac{1}{2}$  inches (64 mm) long and spaced 7 inches (178 mm) on center along the studs for the face layer and 6d cement coated box nails, 2 inches (51 mm) long and spaced 24 inches (610 mm) on center along the studs. The stud cavity contains Icynene Classic or Classic Max insulation nominally 2 inches (51 mm) thick.

Axial loads applied to the wall assembly must be limited to the least of the following:

- 1,805 pounds (8029 N) per stud.
- Design stress of  $0.78 F_c$ .
- Design stress of  $0.78 F_c$  at a maximum  $l_e/d$  of 33.

**4.5.1.3 Assembly 3 (Floor/Ceiling):** Minimum nominally 2-by-10 [ $1\frac{1}{2}$  by  $9\frac{1}{4}$  inches (38 mm by 235 mm)] Douglas fir, No. 2 grade wood joists spaced 24 inches (610 mm) on center, with minimum 1-by-3 [ $\frac{3}{4}$  by  $2\frac{1}{2}$  inches (19.1 by 64 mm)] spruce bridging at mid-span. Floor decking must be minimum  $\frac{1}{2}$ -inch-thick (12.7 mm) exterior grade plywood installed perpendicular to joists and fastened with 2-inch-long (51 mm) ring shank nails 6 inches (152 mm) on center at the joints and 12 inches (305 mm) on center at the intermediate joists. Plywood joints must occur over joists. Icynene Classic or Classic Max insulation must be applied to the underside of the plywood deck between the joists to a depth of 5 inches (127 mm). Two layers of minimum  $\frac{5}{8}$ -inch-thick (15.9 mm), Type X gypsum wallboard must be attached perpendicular to the joists on the ceiling side of the assembly. The first layer must be attached with  $1\frac{1}{4}$ -inch-long (32 mm), Type W drywall screws, spaced 24 inches (610 mm) on center. The second layer must be applied perpendicular to the joists, offset 24 inches (610 mm) from the base layer. The second layer must be attached with 2-inch-long (51 mm), Type S drywall screws spaced 12 inches (305 mm) on center. Additional fasteners must be installed along the butt joints of the second layer, securing the two layers together. These fasteners must be  $1\frac{1}{2}$ -inch-long (38 mm), Type G drywall screws placed 2 inches (51 mm) back from each end of the butt joint and spaced 12 inches (305 mm) on center. The wallboard joints on the exposed side must be treated with paper tape embedded in joint compound and topped with an added coat of compound, and the fastener heads must be coated with joint compound in accordance with ASTM C840 or GA-216.

**4.5.1.4 Assembly 4 (Non-loadbearing Steel Stud Wall):** Nominally 6-inch-deep (152.4 mm), No. 18 gage, galvanized steel studs spaced 16 inches (406.4 mm) on center, are friction-fit into No. 18 gage galvanized steel floor and ceiling track with a layer of  $\frac{5}{8}$ -inch-thick (15.9 mm), Type X gypsum board applied to the interior side with the long edge parallel to steel studs and secured using No. 6,  $1\frac{1}{4}$ -inch-long (31.7 mm), 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 gypsum board joints must be treated with vinyl or casein, dry or premixed joint compound applied in two coats to cover all exposed screw heads and gypsum board butt joints, and a minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape embedded in the first layer of compound over butt joints of the gypsum board. The stud cavity is filled with Icynene Classic or Classic Max insulation up to 6 inches (152 mm) thick. DensGlass® Exterior Sheathing, 1/2 inch (12.7 mm) thick, is installed parallel to steel studs with vertical joints offset a minimum of 16 inches (406 mm) from the vertical joints of the gypsum board and the horizontal joints offset a minimum of 24 inches (610 mm) from the horizontal joints of the gypsum board. The sheathing is attached using No. 6, 1 1/4-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203 mm) on center around the perimeter and in the field. Hohmann & Barnard DW-10 brick ties, 6 inches (152 mm) long by 1 1/2-inches (38 mm) wide, are spaced 16 inches (406.4 mm) on center vertically on each steel stud, and secured, using two 1 5/8-inch-long (41.3 mm) self-drilling screws, through 4-inch (102 mm) red clay brick [3 1/2 inches (88.9 mm) by 2 1/4 inches (57.1 mm) by 7 3/4 inches (197 mm)] laid in a running bond pattern with Type S mortar, leaving a nominally 1-inch (25.4 mm) air gap between the brick and the exterior sheathing.

Optional: It is permitted to add code-complying, expanded polystyrene (EPS), extruded polystyrene (XPS), foil-faced, rigid polyurethane board stock or polyurethane spray foam on the exterior of the wall (between the DensGlass® sheathed wall and the brick), while maintaining the 1-inch (25.4 mm) air space. The length of the brick ties must be increased to account for the thickness of the insulation.

**4.5.2 Classic Eco (Non-loadbearing Steel Stud Wall):** Nominally 6-inch-deep (152 mm) deep, No. 18 gage, galvanized steel studs spaced 16 inches (406 mm) on center, are friction-fit into No. 18 gage galvanized steel floor and ceiling track with a layer of 5/8-inch-thick (15.9 mm), Type X gypsum board installed to the interior side with the long edge parallel to steel studs and secured using No. 6, 1 1/4-inch-long (31.7 mm), 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 gypsum board joints must be treated with vinyl or casein, dry or premixed joint compound applied in two coats to cover all exposed screw heads and gypsum board butt joints, with a minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape embedded in the first layer of compound over butt joints of the gypsum board. The stud cavity is filled with Icynene Classic Eco insulation up to 6 inches (152 mm) thick. DensGlass® Exterior Sheathing, 1/2 inch (12.7 mm) thick, is installed parallel to steel studs with vertical joints offset a minimum of 16 inches (406 mm) from the vertical joints of the gypsum board and the horizontal joints offset a minimum of 24 inches (610 mm) from the horizontal joints of the gypsum board. The sheathing is attached using No. 6, 1 1/4-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203 mm) on center around the perimeter and in the field. Hohmann & Barnard DW-10 brick ties, 6 inches (152 mm) long by 1 1/2 inches (38 mm) wide and spaced 16 inches (406 mm) on center vertically on each steel stud, are secured, using two 1 5/8-inch-long (41.3 mm) self-drilling screws, through 4-inch (102 mm) red clay brick [3 1/2 inches (88.9 mm) by 2 1/4 inches (57.1 mm) by 7 3/4 inches (197 mm)] laid in a running bond pattern with Type S mortar. A nominally 1-inch (25.4 mm) air gap is left between the brick and the exterior sheathing.

Optional: It is permitted to add code-complying EPS, XPS, foil-faced, rigid polyurethane board stock or polyurethane spray foam on the exterior of the wall (between the DensGlass sheathed wall and the brick), while maintaining the 1-inch (25.4 mm) air space. The length of the brick ties must be increased to account for the thickness of the insulation.

#### 4.6 Exterior Walls in Type I, II, III and IV Construction:

**4.6.1 General:** When used on exterior walls of Types I, II, III or IV construction, the assembly must comply with IBC Section 2603.5 and this section, and the Classic, Classic Max and Classic Eco insulations must be installed at a maximum thickness of 6 inches (152 mm). The potential heat of Icynene insulations tested in accordance with NFPA 259 is as follows:

- **Classic and Classic Max:** 494 Btu/ft<sup>2</sup> (5.6 MJ/m<sup>2</sup>) per inch of thickness
- **Classic Eco:** 168 Btu/ft<sup>2</sup> (1.9 MJ/m<sup>2</sup>) per inch of thickness.

**4.6.2 Exterior Face:** Nominally 6-inch-deep (152 mm), No. 18 gage, galvanized steel studs spaced 16 inches (406 mm) on center, are fastened to No. 18 gage, galvanized steel floor and ceiling track using No. 8, 7/8-inch-long (22.2 mm), self-tapping pan head framing screws. GP DensGlass® Exterior Sheathing, 1/2 inch (12.7 mm) thick, is installed over the exterior side of steel studs with the long end perpendicular to the steel studs, using No. 6, Type S, 1 1/4-inch (31.7 mm) long, self-tapping bugle head screws spaced 8 inches (203 mm) on center around the perimeter and in the field. The stud cavity is filled with Icynene Classic, Classic Max or Classic Eco insulation to a nominal thickness of 6 inches (152 mm).

**4.6.3 Interior Face:** Type X gypsum board, 5/8 inches (15.9 mm) thick, is installed with the long dimension perpendicular to steel studs with No. 6, Type S, 1 1/4 inch-long (31.7 mm), self-tapping, bugle head screws spaced 8 inches (203 mm) on center around the perimeter and in the field. The gypsum board joints must be treated with vinyl or casein, dry or premixed joint compound applied in two coats to cover all exposed screw heads and gypsum board butt joints, and a minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape embedded in the first layer of compound over butt joints of the gypsum board.

**4.6.4 Exterior Wall Covering:** Details of the exterior wall covering must be provided to the code official by the report holder, designer or specifier, with an engineering analysis demonstrating that (1) the exterior wall covering conforms to ASTM E136 and (2) the addition of the wall covering to the assembly described in this section does not negatively affect conformance of the assembly with the requirements of IBC Section 2603.5.

#### 5.0 CONDITIONS OF USE

The Icynene Classic, Classic Max, Classic Eco and Classic Plus spray-applied polyurethane foam plastic 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** This evaluation report and the manufacturer's published installation instructions, when required by the code official, must be submitted at the time of permit application.
- 5.2** The insulation must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. If there

is a conflict between the installation instructions and this report, this report governs.

- 5.3 The insulation must be separated from the interior of the building by an approved 15-minute thermal barrier, except as noted in this report.
- 5.4 Since the performance of Classic Max, when installed in unvented attics without a code-prescribed ignition barrier or an intumescent coating, is based on fire performance of an unvented attic, the installation must be approved by the code official as conforming with the provisions of Section 4.4.1.2.2 and Conditions 1 to 5 of Section 4.4.1.2.
- 5.5 When Classic Max insulation is installed under Section 4.4.1.2.2 of this report, a certificate must be placed in the attic stating that the foam plastic insulation has been installed in accordance with Conditions 1 to 5 of Section 4.4.1.2 and the terms of Section 4.4.1.2.2 of ESR-1826; any alterations to the attic or insulation must be consistent with those requirements.
- 5.6 The insulation must not exceed the thicknesses and densities noted in this report.
- 5.7 The insulation must be protected from the weather during and after application.
- 5.8 The insulation must be applied by licensed dealers and installers certified by Icynene, Inc.
- 5.9 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, as applicable.
- 5.10 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, as applicable.
- 5.11 A vapor retarder must be installed in accordance with the applicable code.
- 5.12 Icynene Classic, Classic Max, Classic Eco and Classic Plus foam plastic insulations are manufactured in Mississauga, Ontario, Canada, 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 November 2012 (editorially corrected April 2013).
- 6.2 Reports of tests in accordance with AC377 Appendix X [Classic and Classic Max (Section 4.4.1.2.1); Classic Eco (Section 4.4.2.2.1) and Classic Plus (Sections 4.4.3.2.1 and 4.4.3.2.3)] and Appendix C [Classic and Classic Max (Section 4.4.1.2.3); and Classic Eco (Section 4.4.2.2.2)].
- 6.3 Test reports on air leakage rate in accordance with ASTM E283 (Classic Eco).
- 6.4 Test report on air leakage rate in accordance with ASTM E2178 (Classic, Classic Max and Classic Plus).
- 6.5 Reports of room corner fire testing in accordance with NFPA 286 (Classic, Classic Max, Classic Eco, and Classic Plus).
- 6.6 Test reports in accordance with ASTM E119 (Classic, Classic Max and Classic Eco).
- 6.7 Test report in accordance with NFPA 285, and related engineering analysis (Classic, Classic Max and Classic Eco).
- 6.8 Reports of tests in accordance with NFPA 259 (Classic, Classic Max and Classic Eco).
- 6.9 Reports of fire tests in accordance with ASTM E970 (Classic, Classic Max and Classic Plus).
- 6.10 For Classic Max, an engineering evaluation, including full-scale fire testing, small-scale testing and fire modeling (Section 4.4.1.2.2).

## 7.0 IDENTIFICATION

All packages and containers of Classic, Classic Max, Classic Eco and Classic Plus insulations must be labeled with the Icynene, Inc., name and address; the product name; component designation (A or B); the flame spread index and the smoke-developed index; the shelf life expiration date; the name of the inspection body (ICC-ES); and the evaluation report number (ESR-1826).

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

## 8.0 OTHER CODES

### 8.1 Scope:

In addition to the codes referenced in Section 1.0, the products recognized 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)

### 8.2 Uses:

The products comply with the above-mentioned codes as described in Sections 2.0 to 7.0 of this report, with the revisions noted below.

- **Application with a Prescriptive Ignition Barrier:** See Sections 4.4.1.1 (Classic and Classic Max) 4.4.2.1 (Classic Eco) and 4.4.3.1 (Classic Plus), except attics must be vented in accordance with 2006 IBC Section 1203.2, and crawl space ventilation must be in accordance with 2006 IBC Section 1203.3, as applicable. Additionally, an ignition barrier must be installed in accordance with 2006 IRC Section R314.5.3 or R314.5.4, as applicable.
- **Application without a Prescriptive Ignition Barrier:** See Sections 4.4.1.2 (Classic and Classic Max), 4.4.2.2 (Classic Eco) and 4.4.3.2 (Classic Plus), except attics must be vented in accordance with 2006 IBC Section 1203.2 or 2006 IRC Section R806, and crawl space ventilation must be in accordance with 2006 IBC Section 1203.3 or 2006 IRC Section R408, as applicable.
- **Jobsite Certification and Labeling:** See Section 5.10, except jobsite certification and labeling must comply with 2006 IECC Sections 102.1.1 and 102.1.11, as applicable.
- **Protection Against Termites:** See Section 5.9, except use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with 2006 IRC Section R320.5.



TABLE 1—THERMAL RESISTANCE (R-VALUES)

THICKNESS (inches)	R-VALUE (°F·ft <sup>2</sup> ·h/Btu)		
	Classic and Classic Max	Classic Eco	Classic Plus
1	3.7	3.7	4.0
2	7.4	7.4	8.0
3	11	11	12
3.5	13	13	14
4	14	14	16
5	18	18	20
5.5	20	20	22
6	22	22	24
7	25	25	28
7.5	27	27	30
8	29	29	32
9	32	32	36
9.5	34	34	38
10	36	36	40
11.5	41	41	42
13.5	—	49	54
14	50	50	56

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- and 3.5-inch thicknesses.

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