

# ICC-ES Evaluation Report

**ESR-3199\***

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*This report is subject to renewal in one year.*
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**DIVISION: 07 00 00—THERMAL AND MOISTURE  
PROTECTION**
**Section: 07 21 00—Thermal Insulation**
**REPORT HOLDER:**

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**EVALUATION SUBJECT:**
**ICYNENE MD-C-200™**

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)
- 2009 *International Energy Conservation Code*® (IECC)
- Other Codes (see Section 8.0)

**Properties evaluated:**

- Surface-burning characteristics
- Physical properties
- Thermal resistance (*R*-values)
- Attic and crawl space installation
- Air permeability
- Vapor permeability
- Fire resistance
- Exterior walls of Types I–IV construction

## 2.0 USES

Icynene MD-C-200 spray foam is used as a nonstructural thermal insulating material in Types I, II, III, IV and V construction under the IBC and dwellings under the IRC. The insulation is for use in wall cavities, floor assemblies, ceiling assemblies, or attics and crawl spaces when installed in accordance with Section 4.4. Under the IRC, the insulation may be used as air-impermeable insulation when installed in accordance with Section 3.4, and as a vapor retarder when installed in accordance with Section 3.5. Icynene MD-C-200 spray foam may be used in 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.

## 3.0 DESCRIPTION

### 3.1 MD-C-200 Insulation:

Icynene MD-C-200 foam plastic insulation is a two-component, closed-cell, spray-applied foam plastic with a nominal density of 2.0 pcf (32 kg/m<sup>3</sup>). The polyurethane foam is produced by combining Icynene Platinum Seal isocyanate (the A component) and Icynene MD-C-200 resin (the B component). The products have a shelf life of six months when stored in factory-sealed containers at temperatures between 60°F and 85°F (16°C and 29°C). The MD-C-200 is supplied in four grades designated as S, W, AS and AW.

### 3.2 Surface Burning Characteristics:

The Icynene MD-C-200 insulation, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2.0 pounds per cubic foot (32.0 kg/m<sup>3</sup>), has 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. Thicknesses of up to 11<sup>1</sup>/<sub>4</sub> inches (286 mm) for wall and ceiling cavities are recognized based on room corner fire 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 the applicable code.

### 3.3 Thermal Resistance:

Icynene MD-C-200 insulation has a thermal resistance, *R*-value, at a mean temperature of 75°F (24°C) as shown in Table 1.

### 3.4 Air Permeability:

Icynene MD-C-200 insulation, at a minimum 1-inch (25.4 mm) thickness, is considered air-impermeable insulation in accordance with IRC Section R806.4, based on testing in accordance with ASTM E 283.

### 3.5 Vapor Permeability:

Icynene MD-C-200 insulation has a vapor permeance of less than 1 perm (5.7x10<sup>-11</sup> kg/Pa-s-m<sup>2</sup>) at a minimum thickness of 1.5 inches (38.1 mm) and may be used where a Class II vapor retarder is required by the applicable code.

### 3.6 Intumescent Coatings:

**3.6.1 DC 315:** DC 315 intumescent coating, manufactured by International Fireproof Technology, Inc., 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°).

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**3.6.2 No Burn Plus:** No Burn Plus, manufactured by No Burn, Inc., is an intumescent coating supplied in 1-gallon (4 L) and 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 36 months when stored in factory-sealed containers at temperatures between 40°F (4.4°C) and 90°F (32.2°C).

#### 4.0 DESIGN AND 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:

Icynene MD-C-200 must be applied using spray equipment specified by Icynene, Inc. The insulation must not be used in areas having a maximum service temperature greater than 180°F (82°C), 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 Icynene MD-C-200 is used as an air-impermeable barrier, such as in unventilated attic spaces regulated by IRC Section R806, the insulation must be installed at a minimum thickness of 1 inch (25.4 mm). The insulation is applied to the intended thickness, with each pass being a maximum of 2 inches (51 mm). Where multiple passes are required, the cure time between passes is negligible. Icynene MD-C-200 must be installed only by factory-certified applicators.

##### 4.3 Thermal Barrier:

**4.3.1 Application with a Prescriptive Thermal Barrier:** Icynene MD-C-200 spray foam insulation must be separated from the interior of the building by an approved thermal barrier of  $\frac{1}{2}$ -inch-thick (12.7 mm) gypsum board or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as applicable. 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 insulation and the interior of the building. Thicknesses of up to  $11\frac{1}{4}$  inches (286 mm) for wall and ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum  $\frac{1}{2}$ -inch-thick (12.7 mm) gypsum board or an equivalent thermal barrier complying with the applicable code.

**4.3.2 Application without a Prescriptive Thermal 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 or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a 15-minute thermal barrier or ignition barrier. The thickness of the insulation applied to the underside of the roof sheathing must not exceed 10 inches (254 mm). The thickness of the insulation applied to vertical wall surfaces must not exceed 6 inches (152 mm). The insulation must be covered on all surfaces with DC 315 coating at a minimum wet film thickness of 22 mils. The coating must be applied over the Icynene MD-C-200 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.

##### 4.4 Attics and Crawl Spaces:

**4.4.1 Application with a Prescriptive Ignition Barrier:** When Icynene MD-C-200 insulation 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 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 the foam plastic insulation is not exposed. Icynene MD-C-200 insulation may be installed in unvented attics in accordance with IRC Section R806.4.

**4.4.2 Application without a Prescriptive Ignition Barrier:** Where Icynene MD-C-200 spray foam is installed in an attic or crawl space without a prescriptive ignition barrier, in accordance with Sections 4.4.2.1 and 4.4.2.2, the following conditions apply:

1. Entry to the attic or crawl space is only for the 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 the IMC (*International Mechanical Code*)<sup>®</sup> 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 Section R806.4 of IRC.
6. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

**4.4.2.1 Attics and Crawl Spaces:** In attics and crawl spaces, Icynene MD-C-200 insulation may be spray-applied to the underside of the roof sheathing and/or rafters, and to the vertical walls and the underside of floors as described in this section. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed  $11\frac{1}{4}$  inches (285.7 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed  $11\frac{1}{4}$  inches (285.7 mm). The insulation does not require an ignition barrier or a coating.

**Optional:** It is permitted to cover all surfaces of the foam plastic with the coating, as described below and in Section 3.6. The coating must be applied over the Icynene MD-C-200 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, and must be applied to a minimum wet film thickness of 16 mils.

Icynene MD-C-200 insulation may be installed in unvented attics or crawl spaces as described in this section in accordance with IRC Section R806.4.

**4.4.2.2 Use on Attic Floors:** Icynene MD-C-200 insulation may be installed exposed at a maximum thickness of  $11\frac{1}{4}$  inches (286 mm) between and over the joist in attic floors. The insulation must be separated

from the interior of the building by an approved thermal barrier. The ignition barrier in accordance with the IBC Section 2603.4 and IRC Section R316.5.3 may be omitted.

#### 4.5 One-hour Non-load-bearing Fire-resistance-rated Wall Assembly:

**4.5.1 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 tracks. One layer of  $\frac{1}{2}$ -inch-thick (12.7 mm) Georgia Pacific DensGlass® Gold Exterior Sheathing is installed parallel to steel studs with vertical joints offset a minimum of 16 inches (406 mm) from the vertical joints of the interior Type X 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  $\frac{1}{4}$ -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  $\frac{1}{2}$  inch (38 mm) wide, are spaced 16 inches (406.4 mm) on center vertically on each steel stud, and secured using two  $\frac{5}{8}$ -inch-long (41.3) self-drilling screws, through 4-inch (102 mm) red clay brick [ $3\frac{1}{2}$  inches (88.9 mm) by  $2\frac{1}{4}$  inches (57.1 mm) by  $7\frac{3}{4}$  inch (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. The stud cavity is filled with Icynene MD-C-200 insulation to a maximum nominal thickness of 6 inches (152 mm).

**4.5.2 Interior Face:** Type X gypsum board,  $\frac{5}{8}$  inch (15.9 mm) thick and complying with ASTM C 1396 is applied to the interior side with the long edge parallel to steel studs, and is secured using  $\frac{1}{4}$ -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. A minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape is embedded in the first layer of compound over butt joints of the gypsum board.

#### 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 Icynene MD-C-200 insulation must be installed at a maximum thickness of 6 inches (152 mm). The potential heat of Icynene MD-C-200 insulation is 1918 B/ft<sup>2</sup> per inch of thickness, when tested in accordance with NFPA 259.

**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,  $\frac{7}{8}$ -inch-long (22.2 mm), self-tapping, pan head framing screws. Georgia Pacific DensGlass® Gold Exterior Sheathing,  $\frac{1}{2}$  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,  $\frac{1}{4}$ -inch (31.7 mm), self-tapping bugle head screws spaced 8 inches (203.2 mm) on center around the perimeter and in the field. The stud cavity is filled with Icynene MD-C-200 insulation to a maximum nominal thickness of 6 inches (152 mm).

**4.6.3 Interior Face:** Type X gypsum board,  $\frac{5}{8}$  inches (15.9 mm) thick and complying with ASTM C 1396, is installed, with the long dimension perpendicular to steel studs, with No. 6, Type S,  $\frac{1}{4}$ -inch-long (31.7 mm), self-tapping bugle head screws spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) 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. A minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape is 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 E 136 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 MD-C-200 spray foam insulation described in this report complies with, or is a suitable alternative to what is specified in those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The product 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 insulation must be separated from the interior of the building by an approved 15-minute thermal barrier in accordance with IBC Section 2603.4, except when installation is as described in Section 4.3.2 or in attics and crawl spaces as described in Section 4.4.2.
- 5.3 The insulation must not exceed the thickness and density noted in Sections 3.2, 4.3, 4.4, 4.5 and 4.6 of this report.
- 5.4 The insulation must be protected from the weather during and after application.
- 5.5 The insulation must be applied by installers certified by Icynene, Inc.
- 5.6 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.
- 5.7 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.
- 5.8 The A and B components of the insulation are produced under a quality control program with inspections by Intertek Testing Services NA, Ltd. (AA-690).

#### 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation, (AC377), dated October 2010, including reports of tests in accordance with Appendix X of AC377.
- 6.2 Report of air permeance tests in accordance with ASTM E 283.

- 6.3 Report of vapor permeance tests in accordance with ASTM E 96.
- 6.4 Report of fire-resistance tests in accordance with ASTM E 119.
- 6.5 Report of fire tests in accordance with NFPA 285, and related engineering analysis.
- 6.6 Reports of room corner fire tests in accordance with NFPA 286.
- 6.7 Report of potential heat tests in accordance with NFPA 259.

**7.0 IDENTIFICATION**

Containers of Icynene MD-C-200 components are identified with a label bearing the Icynene Inc. name and address; the product trade name (Icynene MD-C-200, Grade S, W, AS or AW); the lot number; the flame spread and smoke developed indices; mixing instructions; density; the shelf life and the expiration date; the evaluation report number (ESR-3199); and the name of the inspection agency (Intertek Testing Services NA Ltd.)

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

**8.0 OTHER CODES**

In addition to the codes referenced in Section 1.0, the products recognized in this report have also been evaluated for compliance with the following codes:

- 2006 *International Building Code*<sup>®</sup> (2006 IBC)
- 2006 *International Residential Code*<sup>®</sup> (2006 IRC)
- 2006 *International Energy Conservation Code*<sup>®</sup> (2006 IECC)

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 Thermal Barrier:** See Section 4.3.2, except the approved thermal barrier must be installed in accordance with 2006 IRC Section R314.4.
- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, 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 or 2006 IRC Section R408, as applicable. Additionally, an ignition barrier must be installed in accordance with 2006 IRC Section R314.5.3 or R314.5.4.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, 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 or 2006 IRC Section R408, as applicable. Combustion air must be provided in accordance with Sections 701 and 703 of the 2006 *International Mechanical Code*<sup>®</sup>.
- **Protection against Termites:** Replace Section 5.7 with the following: 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 or 2006 IBC Section 2603.8.
- **Jobsite Certification and Labeling:** See Section 5.8, except jobsite certification and labeling must comply with 2006 IECC Sections 102.1.1 and 102.11, as applicable.

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

THICKNESS (inch)	R-VALUE (°F.ft <sup>2</sup> .h/Btu)
1.0	6.5
3.5	21
4.0	24
5.5	33
6.0	36
7.5	45
8.5	51
9.5	57
10.0	60
11.25	68

For **SI**: 1 inch= 25.4 mm; 1°F.ft<sup>2</sup>.h/Btu = 0.176110°K.m<sup>2</sup>.h/W.

<sup>1</sup>R-values are calculated based on tested K-values at 1- and 4-inch thicknesses.