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ESR-3199

Reissued 04/2017
This report is subject to renewal 04/2018.

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 MD-C-200™



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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

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.

Properties evaluated:

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

1.2 Evaluation to the following green standard:

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

Attribute verified:

- See Section 3.1

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 2.4 pcf (38.4 kg/m³). The polyurethane foam is produced by combining Icynene Base Seal MDI 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 one formulation for all climates.

The attributes of the insulation 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.

3.2 Surface Burning Characteristics:

The Icynene MD-C-200 insulation, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2.4 pounds per cubic foot (38.4 kg/m³), has a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 (UL 723).

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 1.4-inch (25.4 mm) thickness, is considered air-impermeable

insulation in accordance with 2012 IRC Section R806.5 (2009 IRC Section R806.4), based on testing in accordance with ASTM E2178.

3.5 Vapor Permeability:

Icynene MD-C-200 insulation has a vapor permeance of less than 1 perm (5.7×10^{-11} kg/Pa-s-m²) 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:

DC 315 intumescent coating (ESR-3702), 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 12 months when stored in factory-sealed containers at temperatures between 50°F (10°C) and 80°F (24°C).

4.0 DESIGN AND INSTALLATION

4.1 General:

Icynene MD-C-200 must be installed in accordance with the manufacturer's published installation instructions, this report and the applicable code. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the 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 1.4 inch (35.6 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 in accordance with the manufacturer's instructions. 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 1/2-inch-thick (12.7 mm) gypsum board installed using mechanical fasteners in accordance with the applicable code, 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. There is no thickness limit when installed behind a code-prescribed thermal barrier except as noted in Section 4.4.2.1, 4.4.2.2, 4.4.3.

4.3.2 Application without a Prescriptive Thermal Barrier: Icynene MD-C-200 may be installed without the 15-minute thermal barrier prescribed in IBC Section 2606.4 and IRC Section R316.4, when the 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 24 mils (16 mils dry). The coating must be applied over the Icynene MD-C-200 insulation in accordance with the coating manufacturer's instructions, ESR-3702 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 Ignition Barrier – 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 2012 IRC Section R806.5 or 2009 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*[®]) 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 806.5 or 2009 IRC Section R806.4.
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—Uncoated: The thickness of the foam plastic applied to the underside of the roof sheathing and/or rafters, or the underside of floors, must not exceed 8 inches (203 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 6 inches (152 mm). The insulation does not require a code-prescribed ignition barrier or coating.

4.4.2.2 Attics and Crawl Spaces—Coated: The thickness of the foam plastic applied to the underside of the roof sheathing and/or rafters, or the underside of floors, must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 8 inches (203 mm).

The Icynene MD-C-200 insulation must be covered on all surfaces with DC315 at a minimum dry film thickness of 3 mils (0.08 mm) [wet film thickness of 4 mils (0.10 mm)] at a rate of 0.25 gallons (0.95 L) per 100 square feet (9.3 m²).

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.

4.4.3 Use on Attic Floors: Icynene MD-C-200 insulation may be installed exposed at a maximum thickness of 11¹/₄ inches (286 mm) between and over the joists in attic floors. The insulation must be separated from the interior of the building by an approved thermal barrier. An 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 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 1¹/₄-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 1¹/₂ inches (38 mm) wide, are spaced 16 inches (406.4 mm) on center vertically on each steel stud, and secured using two 5/8-inch-long (41.3) self-drilling screws, through 4-inch (102 mm) red clay brick [3¹/₂ inches (88.9 mm) by 2¹/₄ inches (57.1 mm) by 7³/₄ 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, 5/8-inch (15.9 mm) thick and complying with ASTM C1396, is applied to the interior side with the long edge parallel to steel studs, and is secured using 1¹/₄-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 2785 Btu/ft² (31.6 MJ/m²) 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, 7/8-inch-long (22.2 mm), self-tapping, pan head framing

screws. Georgia Pacific DensGlass® Gold 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, 1¹/₄-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, 5/8 inches (15.9 mm) thick and complying with ASTM C1396, is installed, with the long dimension perpendicular to steel studs, with No. 6, Type S, 1¹/₄-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 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 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. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.
- 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 2012 IBC Section 2603.9, 2009 IBC Section 2603.8, or IRC Section R318.4, as applicable.
- 5.7 Jobsite certification and labeling of the insulation must comply with 2012 IRC Sections N1101.12.1 and N1101.12.1.1 or 2009 IRC Sections N1101.4 and N1101.4.1) and 2012 IECC Sections C303.1.1, C303.1.1.1, R303.1.1 and R303.1.1.1 (2009 IECC Sections 303.1.1 and 303.1.1.1), as applicable.
- 5.8 The A and B components of the insulation are produced 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 April 2016, including reports of tests in accordance with Appendix X of AC377.
- 6.2 Report of air permeance tests in accordance with ASTM E2178.
- 6.3 Report of vapor permeance tests in accordance with ASTM E96.
- 6.4 Engineering Analysis of fire-resistance tests in accordance with ASTM E119.
- 6.5 Report of fire propagation characteristics testing in accordance with NFPA 285.
- 6.6 An engineering analysis supporting the report of testing in accordance with NFPA 285.
- 6.7 Reports of room corner fire tests in accordance with NFPA 286.

6.8 Report of potential heat tests in accordance with NFPA 259.

6.9 Report of critical radiant flux test in accordance with ASTM E970.

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; the lot number; the flame spread and smoke developed indices; mixing instructions; density; the shelf life and the expiration date; and the evaluation report number (ESR-3199).

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

TABLE 1—THERMAL RESISTANCE (R-VALUES)

THICKNESS (inch)	R-VALUE (°F.ft².h/Btu)
1.0	6.6
3.5	23
4.0	26
5.5	36
6.0	40
7.5	50
8.5	56
9.5	63
10.0	66
11.25	74

For SI: 1 inch= 25.4 mm; 1°F.ft².h/Btu = 0.176110°K.m².h/W.

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

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