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ESR-3159

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Reissued 07/2015
This report is subject to renewal 07/2017.

DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
SECTION: 07 21 00—THERMAL INSULATION

REPORT HOLDER:

JOHNS MANVILLE

717 17TH STREET
DENVER, COLORADO 80217

EVALUATION SUBJECT:

JM CORBOND MCS™ SPRAY-APPLIED POLYURETHANE INSULATION



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

JOHNS MANVILLE
 717 17TH STREET
 DENVER, COLORADO 80217
 (800) 654-3103
www.jm.com

EVALUATION SUBJECT:
JM CORBOND MCS™ SPRAY-APPLIED POLYURETHANE INSULATION
1.0 EVALUATION SCOPE
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)
- Other Codes (see Section 8.0)

Properties evaluated:

- Physical properties
- Surface-burning characteristics
- Vapor permeance
- Air permeability
- Attic and crawl space installation
- Thermal resistance
- Exterior walls in Types I through IV construction

2.0 USES

JM Corbond MCS™ spray-applied polyurethane foam insulation is used as nonstructural thermal insulating material in Types I, II, III, IV and V construction under the IBC and in dwellings under the IRC. The insulation is for use in wall cavities, floor/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 under IRC Section R806.4, when installed in accordance with Section 3.5. The insulation may be used in exterior walls of Types I, II, III, and IV construction when used as described in Section 4.5.

3.0 DESCRIPTION
3.1 General:

JM Corbond MCS™ insulation is two-component, spray-applied, rigid, medium-density, polyurethane foam plastic having a nominal in-place density of 2.1 pcf. The insulation is produced in the field by combining a polymeric isocyanate (A component) with a polymeric resin (B component). The liquid components are supplied in 55-gallon (208 L) drums and 250-gallon (946 L) totes. The polymeric isocyanurate (A component) has a shelf life of twelve months when stored in factory-sealed containers at temperatures between 60°F (15.5°C) and 75°F (24°C). The polymeric resin (B component) has a shelf life of six months when stored in factory-sealed containers at temperatures between 60°F (15.5°C) and 75°F (24°C).

3.2 Surface-burning Characteristics:

The insulation, at a maximum thickness of 4.3 inches (109 mm) and a nominal density of 2.0 pcf, have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Thicknesses of up to 9¹/₄ inches (235 mm) for wall cavities and 11¹/₄ inches (286 mm) for ceiling cavities are recognized, based on testing in accordance with NFPA 286, when the insulation is 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 insulation has thermal resistance (*R*-values) at a mean temperature of 75°F (24°C) as shown in Table 1.

3.4 Vapor Permeance:

The insulation has a vapor permeance of less than 1 perm [5.7×10^{-12} kg/(Pa·s·m²)] when tested in accordance with the ASTM E96 desiccant method (Procedure A), when applied at a minimum thickness of 1¹/₂ inches (38 mm). The insulation qualifies as a Class II vapor retarder under the IRC.

3.5 Air Permeability:

The insulation, at a minimum thickness of 1¹/₂ inches (38 mm), is considered air-impermeable insulation in accordance with Section R806.4 of the IRC, based on testing in accordance with ASTM E283.

3.6 JM IB Intumescent Coating:

JM IB intumescent coating, manufactured by Johns Manville Corporation, is a one-component, water-based,

liquid intumescent coating supplied in 5-gallon (19 L) pails. The coating materials have a shelf life of 12 months when stored in factory-sealed containers at temperatures above 50°F (10°C).

3.7 DC 315 Intumescent Coating:

DC 315 intumescent coating, manufactured by International Fire Proof 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°C).

3.8 TPR² Fireshell[®] JMTC Intumescent Coating:

TPR² Fireshell[®] JMTC is manufactured by TPR² Corporation, and is a one-component, water-based, polymer intumescent coating. The coating is supplied in 5-gallon (19L) pails and 55-gallon (208L) drums and has a shelf life of one year when stored in factory-sealed containers at temperatures of 50°F (10°C) or above.

3.9 TPR² Fireshell[®] JMTC Intumescent Coating:

TPR² Fireshell[®] JMTC intumescent coating, manufactured by TPR² Corporation, is a one-component, water-based, polymer intumescent coating. The coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of one year when stored in factory-sealed containers at temperatures of 45°F (7°C) or above.

4.0 INSTALLATION

4.1 General:

JM Corbond MCS[™] spray-applied polyurethane foam insulation must be installed in accordance with the manufacturer's published installation instructions, the applicable code and this report. A copy of the manufacturer's published installation instructions must be available at all times on the jobsite during installation.

4.2 Application:

The insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the Johns Manville application manual. The insulation must be applied when the substrate temperatures are between 45°F (7°C) and 90°F (32°C). The foam plastic must not be used in electrical outlet or junction boxes or in contact with water, rain or soil. 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 insulation must be protected from the weather during and after application. Where the insulation is used as an air-impermeable insulation, such as in unvented attic assemblies under 2012 IRC Section R806.5 or 2009 IRC Section R806.4, the insulation must be installed at a minimum thickness of 1½ inches (38 mm). The insulation must be applied in passes not exceeding 2 inches (51 mm) per pass and must be allowed to fully expand and cure for a minimum of 20 minutes prior to the application of the next additional pass. For additional details on curing times, see the Johns Manville published installation instructions.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier:

JM Corbond MCS[™] spray-applied polyurethane foam insulation must be separated from the interior of the building by an approved thermal barrier of ½-inch-thick (12.7 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, except where insulation is in an attic or crawl space as described in Section 4.4. Thicknesses of up to 9¼ inches (235 mm) for wall cavities and 11¼ inches

(286 mm) for floor/ceiling cavities are recognized, based on room corner fire testing in accordance with NFPA 286, when the insulation is covered with a minimum ½-inch-thick (12.7 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, the applicable code.

4.3.2 Application without a Prescriptive Thermal Barrier with DC-315 Intumescent Coating:

The prescriptive 15-minute thermal barrier or ignition barrier may be omitted when installation is in accordance with this section (Section 4.3.2). The insulation and intumescent coating may be spray-applied to the interior facing of walls, the underside of the roof sheathing or roof rafter, 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 roof sheathing must not exceed 9¼ inches (235 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 7¼ inches (184 mm). The foam plastic must be covered on all surfaces with DC 315 intumescent coating at a minimum wet film thickness of 22 wet mils (0.56 mm) [14 dry mils (0.36 mm)], at a rate of 1 gallon (3.38L) per 73 square feet (6.8 m²). 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.

4.3.3 Application without a Prescriptive Thermal Barrier with TPR² Fireshell[®] JMTC Intumescent Coating:

The prescribed 15-minute thermal barrier may be omitted when installation is in accordance with this section. The JM Corbond MCS[™] spray-applied insulation and TPR² Fireshell[®] JMTC system may be spray-applied to the interior facing of walls, the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier. The foam plastic insulation thickness must not exceed 6 inches (152 mm) in walls and 9½ inches (241 mm) in ceilings, and the insulation must be covered with 12 dry mils (0.3 mm) [20 wet mils (0.5 mm)] of TPR² Fireshell[®] JMTC intumescent coating applied in a single coat at a minimum rate of 1 gallon (3.78L) per 82 square feet (7.6 m²). The substrate must be dry, clean and free of dirt and loose debris or other substances that could interfere with the adhesion of the coating. TPR² Fireshell[®] JMTC may be applied by airless sprayer, conventional sprayer, medium knap roller or brush at ambient temperatures between 62°F and 95°F (16.5°C and 35°C) and relative humidity of less than 70 percent.

4.4 Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier:

When the spray-applied 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 Section R316.5.3 or 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. The insulation as described in this section may be installed in unvented attics in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4 when installed at a minimum thickness of 1½ inches (38 mm).

4.4.2 Application without a Prescriptive Ignition Barrier:

When JM Corbond MCS[™] spray-applied polyurethane foam insulation is installed without an ignition

barrier in attics and crawl spaces, as described in Sections 4.4.2.1 and 4.4.2.4, the following conditions apply:

- a. Entry to the attic or crawl space is only 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. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
- e. 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 the IRC.
- f. Combustion air is provided in accordance with IMC (*International Mechanical Code*[®]) Section 701.

4.4.2.1 Application with JM IB Intumescent Coating: In attics, JM Corbond MCS™ foam insulation may be spray-applied to the underside of the roof sheathing and/or rafters; and in crawl spaces, the insulation may be spray-applied to the underside of wood floors as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 10 inches (254 mm) and the vertical surfaces must not exceed 8 inches (203 mm). The foam plastic surfaces must be covered with a minimum thickness of 5 dry mils (0.13 mm) [10 wet mils] of the JM IB intumescent coating described in Section 3.6. The intumescent coating must be spray-applied over the insulation in accordance with the Johns Manville instructions and this report at a rate of 0.6 gallon (2 L) per 100 square feet (9.3 m²) to obtain the recommended minimum dry film thickness noted in this section.

4.4.2.2 Application with TPR² Fireshell[®] JM IC Intumescent Coating: In attics, JM Corbond MCS™ foam insulation may be spray-applied to the underside of the roof sheathing and/or rafters; and in crawl spaces, the insulation may be spray-applied to the underside of wood floors as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 5.5 inches (140 mm), and the thickness when applied to vertical surfaces must not exceed 3.5 inches (89 mm). The foam plastic surfaces must be covered with a minimum thickness of 3 dry mils (0.08 mm) [4 wet mils] of the JM IC intumescent coating described in Section 3.9. The intumescent coating must be spray-applied over the insulation in accordance with the Johns Manville instructions and this report at a rate of 0.27 gallon (1 L) per 100 square feet (9.3 m²) to obtain the recommended minimum dry film thickness noted in this section.

4.4.2.3 Application without an ignition barrier or intumescent coating: In attics, JM Corbond MCS™ foam insulation may be spray-applied to the underside of the roof sheathing and/or rafters; and in crawl spaces, the insulation may be spray-applied to the underside of wood floors as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 8 inches (203 mm), and the thickness when applied to vertical surfaces must not exceed 6 inches (152 mm). The foam plastic may be installed uncovered, without either a code-prescribed ignition barrier or an intumescent coating.

4.4.2.4 Use on Attic Floors: JM Corbond MCS™ spray-applied foam insulation may be installed at a maximum

thickness of 11¹/₄ inches (286 mm) between and over the joists in attic floors. The ignition barrier, in accordance with IBC Section 2603.4.1.6 or IRC Section R316.5.3, may be omitted. A thermal barrier is required between the foam plastic and the habitable space below.

4.5 Exterior Walls of Type I, II, III and IV Construction:

4.5.1 General: When used on exterior walls of Type I, II, III and IV construction, the wall assembly must comply with Section 2603.5 of the IBC and this section (Section 4.5), and the insulation must be installed at a maximum thickness of 3 inches (76 mm). The potential heat of the JM Corbond MCS™ insulation is 1992 Btu/ft² (22.7 MJ/m²) per inch of thickness when tested in accordance with NFPA 259.

4.5.2 Specific Wall Assemblies: Wall assemblies complying with Section 4.5 must be as described in Table 2.

5.0 CONDITIONS OF USE

The JM Corbond MCS™ 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 products must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. If there are any conflicts between the manufacturer's published installation instructions and this report, 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 or IRC Section R316.4, except when installation is as described in Sections 4.3.2 and 4.4.2. A thermal barrier must be installed between the insulation and the interior space above (crawl space) or below (attic).
- 5.3 The insulation must not exceed the thicknesses noted in Sections 3.2, 4.3, 4.4 and 4.5.
- 5.4 The insulation must be protected from exposure to weather during and after application.
- 5.5 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.
- 5.6 When use is on exterior walls of buildings of Types I, II, III and IV, construction must be as described in Section 4.5 and Table 2.
- 5.7 The insulation must be applied by installers certified by Johns Manville Corporation or by the Spray Polyurethane Foam Alliance (SPFA) for the spray polyurethane foam insulation.
- 5.8 Use of insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IBC Section 2603.8 or IRC Section R318.4, as applicable.
- 5.9 The insulation components are produced in Belgrade, Montana, under a quality control program with inspections by ICC Evaluation Service.

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); including reports of tests in accordance with AC377 Appendix X.
- 6.2 Reports of air permeance testing in accordance with ASTM E283.

- 6.3 Reports of vapor permeance testing in accordance with ASTM E96.
- 6.4 Reports of room corner fire testing in accordance with NFPA 286.
- 6.5 Reports of potential heat testing in accordance with NFPA 259.
- 6.6 Reports of fire propagation characteristics testing in accordance with NFPA 285.
- 6.7 Report of critical radiant flux testing of exposed attic floor in accordance with ASTM E970.

7.0 IDENTIFICATION

Components for JM Corbond MCS™ spray-applied foam plastic insulation are identified with the manufacturer’s name (Johns Manville) and address, the product name, the name of the inspection agency (QAI Laboratories, Inc.), mixing instructions, the flame-spread and smoke-developed indices, the expiration date, and the evaluation report number (ESR-3159).

Intumescent coatings are identified with the company name and address, the product name and use instructions.

8.0 OTHER CODES

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)

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 Thermal Barrier:** See Section 4.3.1, except the installation must be in accordance with Section R314.4 of the 2006 IRC.
- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, except installation must be in accordance with Sections R314.4.3 and R314.5.4 of the 2006 IRC.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC or Section R806 of the 2006 IRC; and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 IBC or Section R408 of the 2006 IRC, as applicable.
- **Jobsite Certification and Labeling:** See Section 5.5, except jobsite certification and labeling must comply with Sections 303.1.1. and 303.1.2, as applicable, of the 2006 IECC.
- **Protection Against Termites:** See Section 5.8, except use of the insulation in areas where the probability of termite infestation is “very heavy” must be in accordance with Section R320.5 of the 2006 IRC.

TABLE 1—THERMAL RESISTANCE (R-VALUES)^{1,2}

THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)
1.0	6.8
1.5	10
2.0	14
3.5	24
4.0	27
5.5	37
7.0	48
9.0	61
9.5	65
10.0	68
12.0	82

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

¹R-values are calculated based on test values at a 1-inch and 4-inch thicknesses.

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

TABLE 2—NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES IN TYPES I, II, III AND IV CONSTRUCTION

WALL COMPONENT	MATERIALS
Base Wall System – Use either 1, 2 or 3	1 – Concrete wall 2 – Concrete masonry wall 3 – 1 layer $\frac{5}{8}$ -inch-thick Type X gypsum wallboard complying with ASTM C36 or C1396 on interior, installed over steel studs, minimum $3\frac{5}{8}$ -inch-deep, No. 20 gage, C-shaped, spaced a maximum of 24 inches on center. Gypsum wallboard must be attached with No.6, $1\frac{1}{4}$ -inch-long self-tapping screws located 8 inches on center along the perimeter and in the field of wallboard. Gypsum wallboard joints must be taped and treated with joint compound in accordance with ASTM C840 or GA-216. Lateral bracing is required in accordance with the applicable code.
Floorline Firestopping	4 pcf mineral wool (e.g., Thermafiber) in each stud cavity at each floorline, attached with Z-clips
Cavity Insulation	None
Exterior Sheathing – Use either 1 or 2	1 – $\frac{1}{2}$ -inch-thick, Type X exterior type gypsum sheathing 2 – $\frac{5}{8}$ -inch-thick Type X exterior type gypsum sheathing
Exterior insulation – Use either 1 or 2	1 – JM Corbond MCS™ SPF a maximum of 3 inches thick 2 – JM cc SPF™, a maximum of 3 inches thick
Exterior Wall covering– Use either 1 or 2, 3, 4 or 5	1 – Brick - standard nominally 4-inch-thick clay brick, running bond pattern, Type S mortar - The brick veneer is attached with Hohmann & Barnard X-Seal™ anchors, with Ve Bayna ties, using 5-inch-long zinc-coated, hex head self-drilling screws spaced 16 inches (505 mm) on center and secured to steel studs. - Maximum 1-inch air gap between exterior insulation and brick 2 – Stucco - minimum $\frac{3}{4}$ -inch-thick, exterior cement plaster and lath. A secondary water-resistive barrier may be installed between the exterior insulation and the lath. The secondary water-resistive barrier must not be full-coverage asphalt or butyl-based self-adhered membranes. 3 – Minimum 2-inch-thick natural stone (granite, limestone, marble, sandstone). Any standard non-open-jointed installation technique can be used. 4 – Minimum $1\frac{1}{2}$ -inch-thick artificial precast stone veneer recognized in an ICC-ES evaluation report complying with AC51, when installed in accordance with the ICC-ES evaluation report for the precast stone veneer. 5 – Minimum $1\frac{1}{4}$ -inch-thick Terra cotta cladding system. Any non-open-jointed technique such as ship lap may be used,

For SI: 1 inch = 25.5 mm; 1 pcf = 16.018 kg/m³.