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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation

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REPORT SUBJECT:
FOAM-LOK FL2000-4G Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

This Research Report addresses compliance with the following Codes:

- 2015, 2012 and 2009 *International Building Code® (IBC)*
- 2015, 2012 and 2009 *International Residential Code® (IRC)*
- 2015, 2012 and 2009 *International Energy Conservation Code® (IECC)*

FOAM-LOK FL2000-4G insulation has been evaluated for the following properties:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Air permeability
- Water vapor permeability
- Alternatives to Thermal Barriers
- Alternatives to Ignition Barriers
- Fire-resistance-rated construction
- Exterior walls of Types I through IV construction
- Use in Type V construction

See Table 1 for applicable Code sections related to these properties.

NOTE: This report references 2015 Code sections with [2012] and [2009] Code sections showed in brackets where they differ.

2.0 USES

FOAM-LOK FL2000-4G spray-applied polyurethane foam insulation is used as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings and roofs. Use in fire-resistance rated construction is described in Section 4.5. The insulation may be used in all types of construction; when used in exterior walls of buildings of Types I, II, III, or IV construction, the assembly must be as described in Section 4.6. Under the IRC, the insulation may be used as air-impermeable insulation when installed in accordance with Section 3.1.3.

3.0 DESCRIPTION

3.1 Materials:

3.1.1 FOAM-LOK FL2000-4G: FOAM-LOK FL2000-4G insulation is a semi-rigid, closed cell, polyurethane foam plastic. The insulation is a two-component spray foam plastic with a nominal in-place density of 2 pcf. The insulation is produced in the field by combining a polymeric isocyanate (A component) with a resin (B component). The insulation liquid components are supplied in 55-gallon drums and/or 250-gallon totes, and must be stored at temperatures between 50°F and 100°F. The resin (B component) must be protected from freezing temperatures and has a shelf life of 3 months.

3.1.2 FIRE-LOK/DC-315 Intumescent Coating: FIRE-LOK/DC-315 intumescent coating is a water-based coating manufactured by IFTI, Paint to Protect, and is supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of 24 months when stored in factory-sealed containers at temperatures between 41°F and 95°F.

3.2 Performance Characteristics:

3.2.1 Surface-burning Characteristics: FOAM-LOK FL2000-4G insulation, at a maximum thickness of 4 inches and a nominal density of 2 pcf, 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. Based on large scale

tests in accordance with NFPA 286, the insulation can be installed at greater thicknesses as described in Sections 4.3 and 4.4. When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited.

3.2.2 Thermal Resistance, R-values: FOAM-LOK FL2000-4G insulation has thermal resistance (R-value) at a mean temperature of 75°F as shown in Table 2.

3.2.3 Air Permeability: FOAM-LOK FL2000-4G insulation, at a minimum thickness of 1 inch, has tested values of 0.008 (Infiltration) and 0.009 (Exfiltration). Therefore, it is considered air-impermeable insulation in accordance with 2015 IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Sections R202 and R806.5 [2009 - R806.4], based on testing in accordance with ASTM E283.

3.2.4 Water Vapor Permeability: FOAM-LOK FL2000-4G has a vapor permeance of 1.4 perms at a thickness of 1 inch. Therefore the insulation, with a minimum thickness of 1 inch, may be used where a Class III vapor retarder is required by the applicable Code. To achieve a vapor permeance of less than 1.0 perm, and a Class II rating, the insulation must be applied at a thickness of 1.5 inch.

4.0 INSTALLATION

4.1 General:

FOAM-LOK FL2000-4G insulation must be installed in accordance with the manufacturer's published installation instructions, the applicable Code, and this Research Report. A copy of the manufacturer's instructions must be available on the jobsite during installation.

4.2 Application:

FOAM-LOK FL2000-4G insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the manufacturer's application instructions. The insulation must be applied when the ambient temperature is greater than 20°F. The insulation must not be used in areas that have a maximum in-service temperature greater than 180°F. 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. The insulation may be applied to a maximum thickness of 3 inches per pass. A minimum of 20 minutes must be allowed between applications of material. Where the insulation is used as an air-impermeable insulation, such as in unvented attic assemblies under IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4], the insulation must be installed at a minimum thickness of 1 inch.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: FOAM-LOK FL2000-4G insulation must be separated from the interior living space of the building by an approved thermal barrier of 1/2 inch thick 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. Exceptions are provided in Sections 4.3.2 and 4.4.

When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited.

4.3.2 Application without a Prescriptive Thermal Barrier: FOAM-LOK FL2000-4G insulation may be installed without the 15 minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in this section. The thickness of the foam plastic insulation must not exceed 8 inches on walls and 12 inches on horizontal surfaces. The foam plastic must be covered on all surfaces with one coat of DC 315 coating at an application rate of 88 square feet per gallon [18 mils nominal wet film thickness, 12 mils dry film thickness]. 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 with low-pressure airless spray equipment.

4.4 Attics and Crawl Spaces:

FOAM-LOK FL2000-4G insulation may be applied in attics and crawl spaces as described in either 4.4.1 or 4.4.2. When the insulation is installed in an attic or crawlspace in accordance with this section, a thermal barrier is not required between the insulation and the attic or crawlspace, but is required between the insulation and the interior living space.

4.4.1 Application with a Prescriptive Ignition Barrier: When FOAM-LOK FL2000-4G insulation is installed within attics and crawl spaces where entry is made only for service of utilities, the 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 2015 IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4] at a minimum thickness of 1 inch.

4.4.2 Application without a Prescriptive Ignition Barrier:

4.4.2.1 General: FOAM-LOK FL2000-4G insulation may be installed in attics and crawl spaces, without the ignition barrier prescribed in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, subject to the following conditions:

- 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 1203.4 [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 2015 IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Section R806.5 [2009 - R806.4].

- f. Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701 [Sections 701 and 703].

The insulation may be installed in unvented attics as described in this section in accordance with IBC Section 1203.3 or IRC Section R806.5 [R806.4], when applied at a minimum thickness of 1 inch.

4.4.2.2 Application of Insulation without an Intumescent Coating: In attics and crawlspaces, FOAM-LOK FL2000-4G insulation may be applied to the underside of roof sheathing and rafters in attics and to the underside of wood floors and floor joists in crawl spaces, and to walls in both attics and crawl spaces. The thickness of the foam plastic must not exceed 8 inches on walls and 12 inches on the underside of roofs and wood floors. The insulation may be installed without the prescriptive ignition barrier required by IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and R316.5.4, or a protective coating.

4.4.2.3 Use on Attic Floors: FOAM-LOK FL2000-4G insulation may be installed exposed (no coating) at a maximum thickness of 8 inches between and over the joists in attic floors. The insulation must be separated from the interior of the building by 1/2 inch gypsum or an approved thermal barrier. The insulation may be installed without the prescriptive ignition barrier required by IBC Section 2603.4.1.6 or IRC Section R316.5.3 and R316.5.4 or a protective coating.

4.5 Fire Resistance Ratings:

Assemblies containing FOAM-LOK FL2000-4G have been tested for fire resistance. Refer to details in [Design Listings LII/FIP 60-01, LII/FIP 60-02, and LII/FIP 120-01](#).

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

The insulation may be used in exterior walls of Types I, II, III, or IV construction complying with IBC Section 2603.5 when the assembly is as described in [Design Listings LII/FIP 30-01 and LII/FIP 30-02](#). The potential heat of FOAM-LOK FL2000-4G insulation is 1885 Btu/ft² (21.4 MJ/m²) per inch of thickness.

5.0 CONDITIONS OF USE

The FOAM-LOK FL2000-4G spray-applied foam plastic insulation described in this Research 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 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict between the manufacturer's instructions and this report, this report governs.

5.2 The insulation must be separated from the interior living space of the building by a thermal barrier as described in Section 4.3.

5.3 The insulation must not exceed the thicknesses noted in Sections 4.3, and 4.4 as applicable.

5.4 The insulation must be applied by contractors approved by Lapolla Industries, Inc.

5.5 The insulation must be installed with a vapor retarder when required by the applicable Code.

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 [2012 - 2603.9] [2009 - 2603.8], as applicable.

5.7 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10 [2012 – N1101.12] [2009 – N1101.4] and IECC Section C303.1 or R303.1 [2009 – 303.1] as applicable.

5.8 The insulation is produced in Houston, Texas, under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).

6.0 SUPPORTING EVIDENCE

6.1 Reports of tests in accordance with ASTM C518, ASTM E84, ASTM E96, ASTM E119, ASTM E283, NFPA 259, NFPA 285 and NFPA 286.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC 377), dated May 2015, including reports of tests in accordance with Appendix X.

6.3 Intertek Listing Report "[Lapolla FOAM-LOK FL2000-4G Spray Foam Wall Insulation](#)".

7.0 IDENTIFICATION

The A and B components of the insulation described in this Research Report are identified with the manufacturer's name (Lapolla Industries, Inc.), address and telephone number; the product name (FOAM-LOK FL2000-4G); use instructions; the flame spread and smoke-development indices; the lot number; the Intertek Mark, and the Code Compliance Research Report number (CCRR-1025).

8.0 OTHER CODES

This section does not apply.

9.0 CODE COMPLIANCE RESEARCH REPORT USE

9.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

9.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek Testing.

9.3 Reference to the [Intertek website](#) is recommended to ascertain the current version and status of this report.

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TABLE 1 – PROPERTIES EVALUATED

PROPERTY	IBC SECTION ¹	IRC SECTION ¹	IECC SECTION ¹
Physical properties	Not required	Not required	Not required
Surface-burning characteristics	2603.3	R316.3	Not applicable
Thermal barrier/ignition barrier	2603.4	R316.4	Not applicable
Air permeability	1203.3 [1301]	R806.5 [2009 - R806.4]	C402.4 R402.4
Thermal resistance	1301	N1101.10 N1102 [N1101.1, N1101.12]	C303.1.1 C303.1.4 R303.1.1 R30301.4 [303.1.1 and 303.1.2]

¹ Section numbers in parentheses refer to the 2012 and 2009 Codes, if different.

TABLE 2 – THERMAL RESISTANCE (R Values)^{1,2,3}

THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)
1	6.2
2	13
3	20
3.5	24
4	27
5	34
5.5	38
6	41
7	48
8	55
9	62
10	68
11	75
11.5	79
12	82

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

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

³ To determine R values for thickness not listed:

- a. between 1 inch and 4 inch can be determined through linear interpolation or
- b. greater than 4 inches can be calculated based on R= 6.84/inch