

ICC-ES Evaluation Report

ESR-2629*

Reissued December 1, 2011

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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:

**FOAM-LOK FL2000 (ALSO KNOWN AS AIR TIGHT CC,
 GUARDFOAM 55 CC OR FOAM-LOK AB2000) SPRAY
 FOAM 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)

Properties evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Vapor retardance
- Fire-resistance-rated construction
- Exterior walls of Type I through IV construction

2.0 USES

Foam-Lok FL2000 (also known as Air Tight CC, GuardFoam 55 CC or Foam-Lok AB2000) spray foam insulation 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. See Section 4.5 for use in Types I, II, III and IV construction. The insulation is for use in wall cavities, floor assemblies or ceiling assemblies, and in attic and crawl space applications as described in Section 4.4.

3.0 DESCRIPTION
3.1 General:

Foam-Lok FL2000 spray foam insulation is medium-density, semirigid, cellular polyurethane foam plastic that is installed as a nonstructural component of floor/ceiling assemblies, wall assemblies and attic and crawl spaces. The material is a two-component, closed-cell, one-to-one-by-volume spray foam with a nominal density of 2.0 pcf (32 kg/m³). The polyurethane foam is produced in the field by combining a polymeric isocyanate (A) component and a resin (B) component. The products have a shelf life of six months when stored in factory-sealed containers at temperatures between 50°F and 80°F (10°C and 27°C). The insulation liquid components are supplied in nominally 55-gallon (208 L) drums.

Foam-Lok FL2000 spray foam insulation is considered air-impermeable in accordance with 2012 IRC Section R806.5 and 2009 IRC Section R806.4, based on testing in accordance with ASTM E 283.

3.2 Surface-burning Characteristics:

The insulation at a maximum thickness of 4 inches (102 mm) and a nominal density of 2.0 pcf (32 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. Thicknesses up to 12 inches (305 mm) in wall cavities and 12 inches (305 mm) in ceiling cavities are recognized based on room corner testing in accordance with NFPA 286. Thicknesses up to 10¹/₂ inches (267mm) for wall cavities and 11¹/₂ inches (292 mm) for ceiling cavities in attics and crawl spaces are recognized based on diversified fire tests.

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 Retarder:

Foam-Lok FL2000 spray foam insulation has a vapor permeance of less than 1 perm (5.7x10⁻¹¹ kg/Pa-s-m²) when applied at a minimum thickness of 2 inches (51 mm), and may be used where a vapor retarder is required by the applicable code.

3.5 Fire-Lok DC-315 Fireproof Paint:

Fire-Lok DC-315 fireproof paint is manufactured by International Fireproof Technology, Inc., and is a water-based latex intumescent coating supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating has a shelflife of 24 months when stored in factory-sealed containers at temperatures between 40°F (4°C) and 90°F (32°C).

*Revised August 2012

4.0 INSTALLATION

4.1 General:

Foam-Lok FL2000 spray 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 LaPolla application instructions. The insulation may be used for application to wood, metal, concrete, masonry and gypsum surfaces. The Foam-Lok FL2000 resin "B" component must be stored at temperatures between 50°F (10°C) and 80°F (27°C). The insulation must be used in areas where the maximum ambient temperature is equal to or less than 180°F (82°C). The foam plastic must not be used in electrical outlet or junction boxes or in contact with water. 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 applied at a minimum thickness of 1 inch (25.4 mm) per pass, and a maximum thickness of 2 inches (51 mm) per pass, up to the maximum thicknesses as specified in Sections 3.2 and 4.3 through 4.5.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier:

The Foam-Lok FL2000 spray foam insulation must be separated from the interior of the building by an approved thermal barrier of minimum 1/2-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 as described in Section 4.3.2 or when installation is in attics and crawl spaces as described in Section 4.4. Thicknesses of up to 12 inches (305 mm) for ceiling cavities and 12 inches (305 mm) for wall cavities are recognized, based on room corner fire testing in accordance with NFPA 286.

4.3.2 Application without a Prescriptive Thermal Barrier:

The Foam-Lok FL2000 spray foam insulation may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, subject to the following conditions:

- Fire-Lok DC-315 is applied to all exposed foam surfaces at a minimum application rate of 22 wet mils (0.56 mm) [14 dry mils (0.36 mm)] at a rate of 1 gallon (3.38 L) per 73 square feet (6.8 m²).
- The maximum installed thickness of Foam-Lok FL2000 is 6 1/4 inches (159 mm) on vertical walls and 8 1/4 inches (210 mm) on ceilings.

4.4 Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier:

When Foam-Lok FL2000 spray foam 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. Foam-Lok FL2000 spray foam insulation as described in this section may be installed in unvented attics in accordance with Section R806.4 of the 2009 IRC or Section R806.5 of the 2012 IRC.

4.4.2 Application without a Prescriptive Ignition Barrier:

Where Foam-Lok FL2000 spray foam insulation is installed without a prescriptive ignition barrier in attics and crawl spaces in accordance with this section, the following conditions apply:

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

Foam-Lok FL2000 spray foam insulation may be spray-applied to the underside of roof sheathing and/or rafters, and the underside of wood floors and/or floor joists in crawl spaces as described in this section. The thickness of the foam plastic applied to the underside of the wood floor and roof sheathing must not exceed 1 1/2 inches (292 mm). The spray foam insulation applied to vertical wall surfaces in attics and crawl spaces must not exceed 10 1/2 inches (267 mm). Foam-Lok FL2000 spray foam insulation, as described in this section, may be installed in unvented attics in accordance with IRC Section R806.4.

4.4.3 Use on Attic Floors:

Foam-Lok FL2000 spray foam insulation may be installed exposed at a maximum thickness of 10 1/2 inches (267 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. The ignition barrier required IBC Section 2603.4.1.6 and IRC Section R316.5.3 may be omitted.

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

Foam-Lok FL2000 spray foam insulation may be installed on exterior walls of buildings of Types I, II, III and IV construction complying with IBC Section 2603.5 and as described in this section. The maximum thickness of the foam plastic is 3 inches (76 mm) when installed on the exterior of the sheathing. The wall assembly must be as described in Table 2. The potential heat of Foam-Lok FL2000 spray foam insulation is 1,885 Btu/ft² (21.4 MJ/m²) per inch of thickness.

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

4.6.1 Steel Framing: 3 5/8-inch (92 mm), No. 20 GA galvanized steel studs spaced 24 inches (610 mm) on center, floated between No. 20 GA galvanized steel tracks.

4.6.2 Interior and Exterior Finish: Two layers of 4-foot-by-10-foot-by-5/8-inch (1219 mm by 3048 mm by 16 mm) USG SheetRock[®] Firecode Core Type X[™] gypsum board, installed with the long edge parallel to the studs installed as follows: Base layer installed using No. 6 by 1 1/4-inch (32 mm) self-drilling screws spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. Face layer installed with butt joints staggered 24 inches (610 mm) from the base layer, secured using No. 6 by 1 7/8-inch (48 mm) self-drilling screws spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. Exposed seams and fasteners receive a Level 2 finish in accordance with ASTM C840 and GA-216.

4.6.3 Insulation: Foam-Lok™ FL 2000 Spray Insulation filling the stud cavity. See Figure 1.

4.7 One-hour Fire-resistance-rated Limited Load-bearing wall assembly:

4.7.1 Wood Framing: Minimum nominally 2-by-4-by-10-foot (3048 mm), No. 2 Grade, Southern yellow pine, spaced 16 inches (406 mm) on center.

4.7.2 Insulation: Foam-Lok™ FL2000 Spray Foam Wall Insulation spray-applied to fill the stud cavity.

4.7.3 Interior and Exterior Finish: Two layers of 5/8-inch (15.9 mm) Type X gypsum on each side, installed parallel to the studs, with the joints staggered from base layer to face layer and from interior to exterior of the assembly. The base layer is to be secured with 1 7/8-inch (41.3 mm), coarse thread drywall screws. The face layer is to be secured with 2-inch (50.8 mm), coarse thread drywall screws. The screws in both layers are to be spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. The screws in the face layer drywall are offset 4 inches (102 mm) from the base layer drywall screws. All exposed seams and fasteners receive a Level 2 finish in accordance with ASTM C840 and GA-216.

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

- 1,682 pounds (7482 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.

4.8 Two-hour Fire-resistance-rated Wall Assembly (Nonload-bearing):

4.8.1 Wood Framing: 2-by-4-by-10-foot (3048 mm), No. 2 grade, Southern yellow pine, spaced 16 inches (406 mm) on center.

4.8.2 Insulation: Foam-Lok™ FL2000 Spray Foam Wall Insulation spray-applied to fill the stud cavities.

4.8.3 Interior and Exterior Finish: Two layers of 5/8-inch (15.9 mm) Type X gypsum on each side, installed parallel to the studs, with the joints staggered from base layer to face layer and from interior to exterior of the assembly. The base layer is to be secured with 1 7/8-inch (41.3 mm), coarse thread drywall screws. The face layer is to be secured with 2-inch (50.8 mm), coarse thread drywall screws. Screws in both layers are to be spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. The screws in the face layer drywall are to be offset 4 inches (102 mm) from the base layer drywall screws. All exposed seams and fasteners are to receive a Level 2 finish in accordance with ASTM C840 and GA-216.

5.0 CONDITIONS OF USE

The Foam-Lok FL2000 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 Foam-Lok FL2000 spray foam insulation 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 manufacturers' 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, except as described in Sections 4.3.2 and 4.4.

5.3 The insulation must not exceed the density and thicknesses noted in Sections 3.2 and 4.3 through 4.8 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 contractors certified by LaPolla Industries, 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 and 2009 IBC Section 2603.8 or IRC Section R318.4, as applicable.

Jobsite certification and labeling of the insulation must comply with IRC Section N1101.4 and IECC Section 102.1.1, and IECC Sections 303.1.1 and 303.1.2, as applicable.

5.7 The insulation is produced in Houston, Texas, 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 ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2012, including reports of tests in accordance with Appendix X of AC377.

6.2 Reports of air leakage tests in accordance with ASTM E283.

6.3 Reports of room corner fire testing in accordance with NFPA 286.

6.4 Reports of tests in accordance with NFPA 259 and NFPA 285.

7.0 IDENTIFICATION

Components for the Foam-Lok FL 2000 spray foam insulation are identified with the manufacturer's name (LaPolla Industries, Inc.), address and telephone number; the product trade name (Foam-Lok FL2000); use instructions; the density; the flame-spread and smoke-development indices; the evaluation report number (ESR-2629); and the name of the inspection agency (Intertek Testing Services NA Ltd.)

8.0 OTHER CODES

8.1 Evaluation Scope:

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

See Section 2.0.

8.3 Description:

See Section 3.0.

8.4 Installation:

8.4.1 General: See Section 4.1.

8.4.2 Application: See Section 4.2.

8.4.3 Thermal Barrier: See Section 4.3.

8.4.4 Attics and Crawl Spaces: See Section 4.4.

8.5 Conditions of Use:

The Foam-Lok FL2000 insulation described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 8.1 of this report, subject to the following conditions:

8.5.1 See Sections 5.1 through 5.5 and 5.9 of this report.

8.5.2 Use of the insulation in areas where the probability of termite infestation is “very heavy” must be in accordance with 2006 IBC Section 2603.8 or 2006 IRC Section R318.4, as applicable.

TABLE 1—THERMAL RESISTANCE (R-VALUES)¹

THICKNESS (INCH)	R-VALUE (°F.ft ² .h/Btu)
1	5.7
2	12
3	19
3.5	22
4	25
5.5	35
6	38
7	44
7.5	48
8	51
9	57
10	63
10.5	67
11	70
11.5	73
12	76
16	101

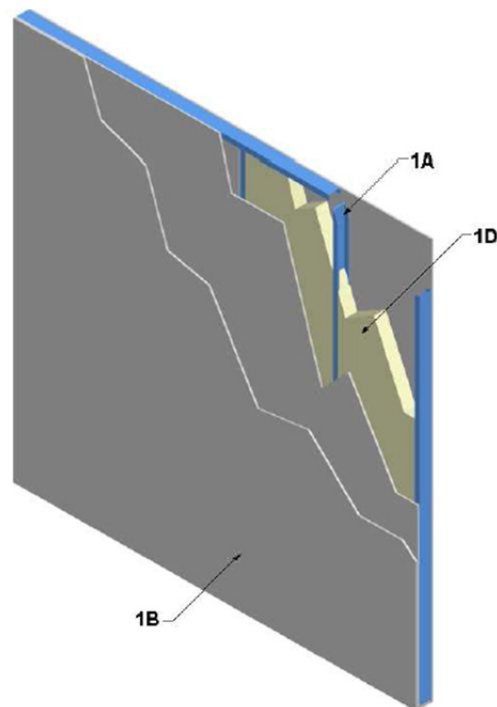
For **SI**: 1 inch = 25.4 mm; 1°F.ft².h/Btu = 0.176 110 °K.m²/W.

¹Calculated R-values greater than 4 inches are based on tested K-values at a 4-inch thickness.

TABLE 2—NFPA 285 COMPLYING WALL

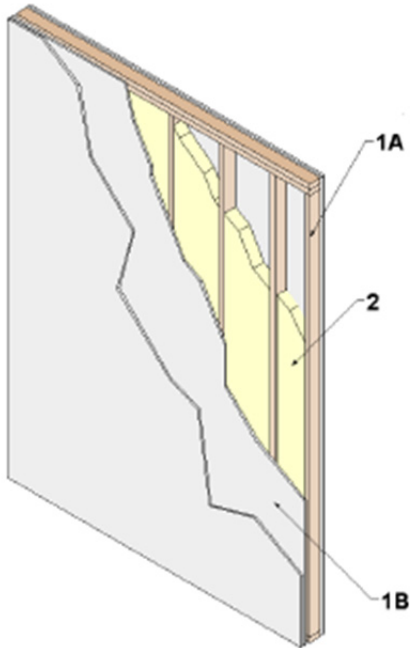
Steel Studs	3 ⁵ / ₈ inch deep, No. 20 GA galvanized steel studs, 24 inches on center, secured with #8-by-1/2 inch-long, pan head framing screws to No. 20 GA top and bottom track; No. 16 GA CRC lateral bracing installed 4 feet o.c.
Interior Cladding	4-foot-by-10-foot-by-5/8 inch USG SheetRock® Firecode Core Type X™ gypsum board installed with the long dimension perpendicular to the studs, fastened to the framing with #6-by-1 1/4-inch self-drilling, zinc-plated bugle head screws spaced 8 inches on center around the perimeter and 12 inches on center in the field; joints and fasteners receive a Level 2 finish in accordance with GA-216 and ASTM C840.
Exterior Sheathing	4-foot-by-8-foot-by-1/2 inch DensGlass® Gold Exterior Sheathing installed over exterior side, with the long edge perpendicular to the studs; secured with #6-by-1 1/4 inch self-drilling, zinc plated screws, spaced 8 inches at the joints and around the perimeter and 12 inches in the field. A water resistive barrier must be installed over the exterior sheathing in accordance with the manufacturer’s installation instructions and Section 1404.2 of the IBC or Section 703.2 of the IRC, as applicable.
Insulation	Nominal 3-inch Foam-LOK FL2000 spray foam insulation, spray-applied over DensGlass® Sheathing.
Anchors	Hohmann & Barnard 3 1/2-inch X-Seal Anchors and 3/16-inch-by-3-inch-by-3-inch VeeBee ties installed 24 inches on center vertically to each stud using #14-by-5-inch screws with washers, creating a nominal 2 inch air gap between the insulation and the exterior facing.
Exterior Wall Covering	4-inch standard clay brick (nominal 3 1/2-inch-by-7 3/4-inch-by-2 1/4-inch) in a running bond pattern using Type N mortar, a nominal 2-inch from the spray foam insulation.
Openings	4-inch-by-4-inch-by-1/4-inch steel lintel installed above the opening, extending past the opening by 8 inches on both sides; two pieces of 2-inch-by-7-inch by No. 20 GA thick aluminum must be installed to protect the opening and must be applied on both interior and exterior faces. Aluminum attached nominally 24 inches on center with 3/16-inch-by-1 1/4 inch-long self-drilling screws to the interior of the assembly. The sides and top of the assembly are to be covered with steel flashing.

For **SI**: 1 inch = 25.4 mm.



1. WALL ASSEMBLY: Construct 1 - hour rated gypsum wall assembly using the following elements:
 - A. STEEL STUDS: Install 3-5/8 in. deep, 20 GA galvanized steel studs spaced maximum 24 in. oc. Cut steel studs 3/4 in. shorter than needed and float steel studs between top and bottom 20 GA steel tracks to allow for expansion and contraction.
 - B. GYPSUM BOARD: Install two layers of 5/8 in. thick Type X gypsum board oriented vertically to both sides of the steel studs (Item 1A). Secure base layer of gypsum board to the steel studs (Item 1A) using #6 X 1-1/4 in. self drilling screws spaced 8 in. oc around the perimeter and 12 in. oc in the field. Install the face layer of the gypsum board over the base layer with vertical joints offset minimum 24 in. Secure face layer using #6 X 1-7/8 in. thread drywall screws spaced 8 in. oc around the perimeter and 12 in. oc in the field.
 - C. JOINT TAPE AND COMPOUND: (Not Shown) After gypsum board (Item 1B) is attached, apply a level 2 finish consisting of the following elements: Vinyl or casein, dry or premixed joint compound to face layers of gypsum board in two coats to all exposed screw heads and gypsum board butt joints. Embed a minimum 2 in. wide paper, plastic, or fiberglass tape in first layer of compound over butt joints of the gypsum board.
 - D. Interior Wall Insulation: Install a nominal 3-5/8 in. layer of nominal 2 pcf density Foam-LOK™ FL 2000 polyurethane foam insulation applied over the gypsum board (Item 1B) to completely fill the stud cavity.

FIGURE 1—ONE-HOUR FIRE-RESISTANCE-RATED ASSEMBLY (NON-LOAD-BEARING)



- 1A. WOOD STUDS: Install nominal 2-inch-by-4-inch Number 2 Southern Yellow Pine wood studs spaced maximum 16 inches on center.

Attach each wood stud to top and bottom wood plates using two (2) 3-inch-by-0.120-inch smooth shank nails. Construct top plate of 2 wood studs installed horizontally at the top of the gypsum wall assembly and the bottom plate of a single wood stud.

- 1B. GYPSUM BOARD: Install two layers of $\frac{5}{8}$ -inch Type X gypsum board oriented vertically to both sides of the wood studs (Item A). Install face layer of the gypsum board over base layer of the gypsum board with minimum 24-inch overlaps at vertical joints. Secure base layer of gypsum board to the wood studs (Item 1A) using $1\frac{5}{8}$ -inch coarse thread drywall screws spaced 8 inches on center around the perimeter and 12 inches on center in the field. Install the face layer of the gypsum board over the base layer with vertical joints offset minimum 24 inches. Secure face layer using 2-inch coarse thread drywall screws spaced 8 inches on center around the perimeter and 12 inches on center in the field.

2. INTERIOR WALL INSULATION: Install a nominal 3.5-inch thick, 2 ($\pm .15$) pcf density layer of Foam-LOK™ FL 2000 polyurethane foam applied over the gypsum board (Item 1B).

FIGURE 2—
ONE-HOUR LIMITED LOAD-BEARING AND TWO-HOUR NON-LOAD-BEARING FIRE-RESISTANCE-RATED ASSEMBLY

ICC-ES Evaluation Report**ESR-2629 FBC Supplement**

Issued August 2012

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Section: 07 21 00—Thermal Insulation**REPORT HOLDER:****LaPOLLA INDUSTRIES, INC.**
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www.lapolla.com**EVALUATION SUBJECT:****FOAM-LOK FL2000 (ALSO KNOWN AS AIR TIGHT CC, GUARDFOAM 55 CC OR FOAM-LOK AB2000) SPRAY FOAM INSULATION****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Foam-Lok FL2000 (also known as Air Tight CC, GuardFoam 55 CC or Foam-Lok AB2000) spray foam insulation, recognized in ICC-ES master report ESR-2629, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2010 *Florida Building Code—Building*
- 2010 *Florida Building Cod—Residential*

2.0 CONCLUSIONS

The Foam-Lok FL2000 (also known as Air Tight CC, GuardFoam 55 CC or Foam-Lok AB2000) spray foam insulation, described in Sections 2.0 through 7.0 of the master evaluation report ESR-2629, complies with the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential*, provided the design and installation are in accordance with the *International Building Code*® (IBC) provisions noted in the master report.

Use of the Foam-Lok FL2000 (also known as Air Tight CC, GuardFoam 55 CC or Foam-Lok AB2000) for compliance with the High-Velocity Hurricane Zone provisions of the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this evaluation report.

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report reissued on December 1, 2011.