

Use of Icynene-Lapolla Foam-LOK FL-450 & Foam-LOK FL-750 Spray Polyurethane Foam (SPF) in Unvented Attics & Crawlspace

TER No. 1810-01

Icynene-Lapolla

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 19 – Foamed-in-Place Insulation
Section: 07 27 36 – Sprayed Foam Air Barrier

1. Products Evaluated:

- 1.1. Foam-LOK FL-450
- 1.2. Foam-LOK FL-750
- 1.3. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.4. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).
- 1.5. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in [IBC Section 1703](#). Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see drjcertification.org.

DrJ is a Professional Engineering Approved Source

 [Learn more about DrJ's Accreditation](#)

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with IBC Section 1703.

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- 1.6. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.7. DrJ's code compliance work:
 - 1.7.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
 - 1.7.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:¹

- 2.1. 2012, 2015 and 2018 International Building Code (IBC)
- 2.2. 2012, 2015 and 2018 International Residential Code (IRC)
- 2.3. 2012, 2015 and 2018 International Energy Conservation Code (IECC)
- 2.4. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- 2.5. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics
- 2.6. ASTM D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
- 2.7. ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- 2.8. ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics
- 2.9. ASTM D6226 – Standard Test Method for Open Cell Content of Rigid Cellular Plastics
- 2.10. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- 2.11. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials
- 2.12. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- 2.13. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials
- 2.14. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
- 2.15. UL 723 – Standard Test Method for Surface Burning Characteristics of Building Materials

3. Performance Evaluation:

- 3.1. IBC and IRC Compliance
 - 3.1.1. This TER assesses Foam-LOK FL-450 and Foam-LOK FL-750 for the following:
 - 3.1.1.1. Physical properties of the product in accordance with the standards listed in [Section 2](#).
 - 3.1.1.2. Surface burning characteristics complying with the provisions of [IBC Section 2603.3](#) and [IRC Section R316.3](#).
 - 3.1.1.3. Thermal performance (R-values) complying with the provisions of [IRC Section N1102](#) and [IECC Section 402](#).
 - 3.1.1.4. Use in unvented attic spaces and crawlspaces without a thermal barrier in accordance with [IBC Section 2603.9](#)² and [IRC Sections R316.4](#) and [R316.6](#)³.

¹ Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product also complies with the 2000-2015 versions of the IBC and IRC and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see [Section 8](#).

² [2012 IBC Section 2603.10](#)

³ [2015 IRC Section R316.4](#) includes 2³/₃₂" (18.2 mm) wood structural panel.

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3.1.1.5. Use without a thermal barrier in accordance with [IBC Section 2603.3](#) and [IRC Section R316.3](#) when No-Burn® Plus ThB intumescent coating is applied.

3.1.1.6. Air permeability in accordance with [IRC Section N1102.4](#), and [IECC Sections C402.5](#) and [R402.4](#).

3.2. Use in fire-resistance rated construction is outside the scope of this evaluation.

3.3. Any code compliance issues not specifically addressed in this section are outside the scope of this evaluation.

4. Product Description and Materials:

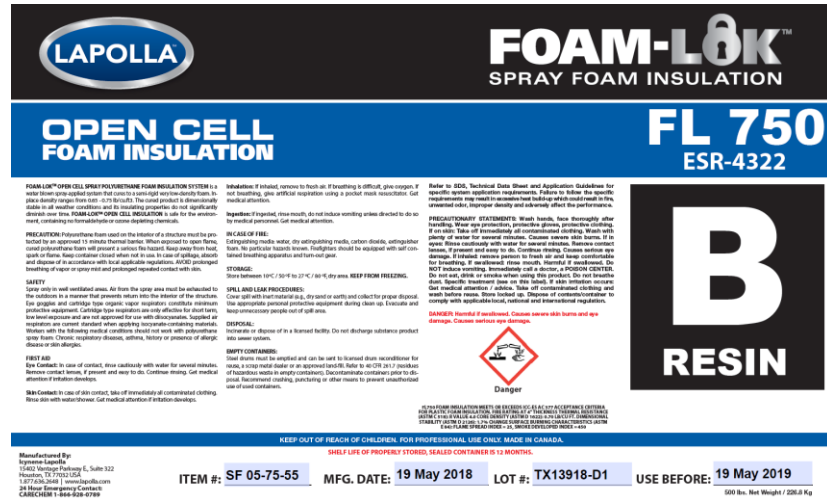


Figure 1: Foam-Lok FL-450 and Foam-Lok FL-750 SPF in Unventilated Attics

4.1. Foam-Lok FL-450 and Foam-Lok FL-750 are two-component, open-cell SPF insulation products.

4.1.1. Foam-Lok FL-450 has a density of 0.5 pounds per cubic foot (pcf) (8 kg/m³).

4.1.2. Foam-Lok FL-750 has a density of 0.7 pounds per cubic foot (pcf) (11 kg/m³).

4.2. The two components of Icynene-Lapolla low density SPF are:

- Component A: MDI/pMDI isocyanate
- Component B: proprietary resin

4.2.1. These two components are combined at the point of spray application.

5. Applications:

5.1. General

5.1.1. Foam-Lok FL-450 and Foam-Lok FL-750 insulation are used in the following applications:

5.1.1.1. Thermal insulation in buildings constructed in accordance with the *IBC* or *IRC*.

5.1.1.2. Sealant for penetrations as part of an air barrier system.

5.1.2. Where fire resistance rated construction is required, contact the manufacturer for more information.

⁴ [2012 IECC Section C402.4](#)

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5.2. Thermal Resistance

5.2.1. Icynene-Lapolla low density SPF has the thermal resistance as defined in [Table 1](#).

	Thickness	Thermal Resistance (R-values) (h·ft. ² ·°F/Btu) ^{1,2}	Thermal Resistance (U-factors) (Btu/(h·ft. ² ·°F))
Foam-LOK FL-450	1"	3.7	0.270
	2"	7.4	0.135
	3"	11	0.093
	3.5"	13	0.079
	4"	14	0.069
	5"	18	0.056
	5.5"	20	0.051
	6"	22	0.046
	7"	25	0.039
	7.5"	27	0.037
	8"	29	0.035
	9"	32	0.031
	9.5"	34	0.029
	10"	36	0.028
	11.5"	41	0.024
	13.5"	49	0.021
14"	50	0.020	
Foam-LOK FL-750	1"	4	0.250
	2"	8	0.125
	3"	12	0.083
	3.5"	14	0.071
	4"	16	0.063
	5"	20	0.050
	5.5"	22	0.045
	6"	24	0.042
	7"	28	0.036
	7.5"	30	0.033
	8"	32	0.031
	9"	36	0.028
	9.5"	38	0.026
	10"	40	0.025
	11.5"	46	0.022
	13.5"	54	0.019
14"	56	0.018	

1. Tested at a mean temperature of 75° F.
 2. R-values are calculated from testing at 1" and 3.5" thickness. Calculated R-values over 10 are rounded to the nearest integer.

Table 1: Foam-LOK FL-450 and Foam-LOK FL-750 Thermal Resistance Properties

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5.3. A Surface Burning Characteristics

5.3.1. Foam-LOK FL-450 and Foam-LOK FL-750 have the surface burning characteristics as shown in [Table 2](#).

Product	Flame Spread	Smoke Developed
Foam-LOK FL-450 ¹	< 25	< 450
Foam-LOK FL-750 ²	< 25	< 450

1. Tested in accordance with *ASTM E84/UL723* at a thickness of 6".
2. Tested in accordance with *ASTM E84/UL723* at a thickness of 4".

Table 2: Flame Spread & Smoke Developed Indexes of Icynene-Lapolla Low Density SPF

5.4. Permeability

5.4.1. Foam-LOK FL-450 and Foam-LOK FL-750 have the air permeability characteristics shown in [Table 3](#) and, therefore, are an air-impermeable insulation in accordance with [IRC Sections R202](#) and [R806.5](#).

Foam-LOK FL-450 ^{1,3}	< 0.02 (L/s.m ²) ⁴
Foam-LOK FL-750 ^{2,3}	< 0.02 (L/s.m ²) ⁴

1. Sprayed to a minimum thickness of 1.75"
2. Sprayed to a minimum thickness of 3"
3. Tested in accordance with *ASTM E2178*.
4. Liter per second per square meter when tested at a pressure differential of 75 Pa.

Table 3: Foam-LOK FL-450 and Foam-LOK FL-750 Air Barrier Material Properties

5.5. Unvented Attic and Unvented Enclosed Rafter Assemblies

5.5.1. General

5.5.1.1. Foam-LOK FL-450 and Foam-LOK FL-750 are approved for use in unvented attic and unvented, enclosed rafter assemblies in accordance with [IBC Section 1203.3](#) provided the following conditions are met:

- 5.5.1.1.1. The attic space is completely within the building thermal envelope.
- 5.5.1.1.2. No interior Class I vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly or on the ceiling side of the unvented, enclosed roof framing assembly.
- 5.5.1.1.3. Where wood shingles or shakes are used, a minimum ¼ inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.
- 5.5.1.1.4. In Climate Zones 5, 6, 7 and 8, a Class III vapor retarder coating or covering in direct contact with the underside of the insulation shall be installed.
- 5.5.1.1.5. The insulation shall be installed in direct contact with the underside of the structural sheathing.
- 5.5.1.1.6. Where other air-permeable insulation is used in conjunction with Foam-LOK FL-450 and Foam-LOK FL-750, the Foam-LOK FL-450 and Foam-LOK FL-750 shall be installed in the thickness required by [IBC Table 1203.3](#) for condensation control.

5.5.1.2. Foam-LOK FL-450 and Foam-LOK FL-750 shall be separated from the building interior by a thermal barrier consisting of a minimum ½" gypsum wallboard or equivalent in accordance with [IBC Section 2603.4](#) or [IRC Section R316.4](#),⁵ except in unventilated attics and crawlspaces as described in [Sections 5.5.1.3](#) and [5.5.1.4](#).

⁵ Includes 2³/₃₂" (18.2 mm) wood structural panel.

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5.5.2. Application in an Unvented Attic without a Prescriptive Thermal Barrier or Ignition Barrier

5.5.2.1. When Foam-LOK FL-450 and Foam-LOK FL-750 are applied in unvented attics conforming to [IRC Section R806.5](#)⁶ and as shown in [Figure 2](#), the:

- 5.5.2.1.1. SPF shall be applied to the underside of roof sheathing to a minimum thickness of 3.5" (89 mm).
- 5.5.2.1.2. Roof rafter or truss top chord member edges may be left exposed.
- 5.5.2.1.3. SPF shall be applied to vertical wall surfaces to a minimum thickness of 3.5" (89 mm).
- 5.5.2.1.4. Wall stud edges may be left exposed.
- 5.5.2.1.5. Maximum thickness of the SPF is 20" (508 mm) on the underside of roof sheathing or on the vertical wall surfaces.
- 5.5.2.1.6. SPF insulation may be left exposed to the attic without a thermal barrier, prescriptive ignition barrier, or an intumescent coating.
- 5.5.2.1.7. Attic shall have access complying with [IRC Section R807](#), horizontally placed in the floor, and shall feature one of the following:
 - 5.5.2.1.7.1. A downward-opening hatch,
 - 5.5.2.1.7.2. A pull down stair or,
 - 5.5.2.1.7.3. Access opening in accordance with [IRC Section R807](#) using Rockfon® Pacific™ 201 Square Edge Ceiling Tile to cover the opening. The Rockfon® Pacific™ 201 ceiling tile shall have a maximum density of 8 pcf, a maximum binder content of 3% and shall be listed as a Class A product in accordance with *ASTM E1264*.

5.5.2.2. Items penetrating the roof deck or walls, such as skylight wells and venting systems, shall be covered with a minimum of 3¹/₂" (89 mm) of Foam-LOK FL-450 or Foam-LOK FL-750 insulation with the following exceptions and conditions:

- 5.5.2.2.1. The perimeter of penetrating items (annular space) does not require fire caulking. However, for penetrating items not needing full coverage, the perimeter (annular space) of the items must be covered with SPF at a minimum 3.5" thickness.
- 5.5.2.2.2. Penetrations through the attic floor or soffit not conveying air, such as can lights, electrical wiring, potable water, HVAC condensation lines, etc. do not need to be covered with foam or air sealed to the perimeter of the penetration (annular space).
- 5.5.2.2.3. Skylights penetrating through the attic floor, soffit, gable or roof deck where the tubular daylighting pathway is constructed of gypsum, steel or other non-combustible material (with melting temperature greater than steel) do not need full coverage of foam.
- 5.5.2.2.4. For all attic volumes
 - 5.5.2.2.4.1. Rigid or flexible HVAC ducts penetrating only the attic floor including all plastic materials, rigid or semi-rigid/flexible aluminum, any ducts wrapped in fiberglass and steel or copper components may be left uncovered by foam.
- 5.5.2.2.5. For attics up to 46,080 cu. ft.
 - 5.5.2.2.5.1. Any schedule 40 (minimum) ABS or PVC vent pipe does not need to be covered in SPF.
 - 5.5.2.2.5.2. Rigid or flexible vent ducts/pipes that only penetrate the attic floor and/or soffit, including rigid or semi-rigid/flexible aluminum, any ducts wrapped in fiberglass, any ducts with higher melting/softening points than aluminum, and steel or copper do not need to be protected with SPF. Additionally, where exhaust fans with capacity of 60 cfm or less are

⁶ [2009 IRC Section R806.4](#)

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installed, plastic materials thinner than schedule 40 do not need to be protected with SPF.

5.5.2.2.5.3. Rigid or flexible vent ducts/pipes that only penetrate the roof deck and/or gable, including rigid or semi-rigid/flexible aluminum, any ducts wrapped in fiberglass, any ducts with higher melting/softening points than aluminum, and steel or copper do not need to be protected with SPF. Additionally, where exhaust fans with capacity of 60 cfm or less are installed AND the total area of penetrations from this section do not exceed 36 square inches, plastic materials thinner than schedule 40 do not need to be protected with SPF.

5.5.2.2.6. For attics larger than 46,080 cu. ft.

5.5.2.2.6.1. Rigid or flexible vent ducts/pipes that only penetrate the attic floor and/or soffit, including any materials with higher melting/softening points than aluminum, and steel or copper do not need to be protected with SPF. Additionally, where exhaust vent fans with a capacity of 60 cfm or less are installed, any plastic materials, rigid or semi-rigid/flexible aluminum, any ducts wrapped in fiberglass, and vinyl or other plastic with lower melting/softening points than aluminum do not need to be protected with SPF.

5.5.2.2.6.2. Rigid or flexible vent ducts/pipes that only penetrate the roof deck and/or gable, including any materials with higher melting/softening points than aluminum, and steel or copper do not need to be protected with SPF. Additionally, where exhaust vent fans with a capacity of 60 cfm or less are installed AND the total area of penetrations from this section do not exceed 36 square inches, any plastic materials, rigid or semi-rigid/flexible aluminum, any ducts wrapped in fiberglass, and vinyl or other plastic with lower melting/softening points than aluminum do not need to be protected with SPF.

5.5.2.2.7. Other items penetrating the roof deck or gable not specifically named above (other than steel or copper) need to be covered in SPF at a minimum 3.5" thickness.

5.5.3. Application in an Unvented Crawlspace without a Prescriptive Thermal Barrier or Ignition Barrier

5.5.3.1. When Foam-LOK FL-450 and Foam-LOK FL-750 are applied in unvented crawlspaces conforming to [IRC Section R408.3](#), the:

5.5.3.1.1. SPF shall be applied to the underside of upper surface to a minimum thickness of 3.5" (89 mm).

5.5.3.1.2. SPF shall be applied to vertical wall surfaces to a minimum thickness of 3.5" (89 mm).

5.5.3.1.3. Wall stud edges may be left exposed.

5.5.3.1.4. Maximum thickness of the SPF is 14" (356 mm) on the underside of the upper surface or 3.5" (89 mm) on the vertical wall surfaces.

5.5.3.1.5. SPF insulation may be left exposed to the crawlspace without a thermal barrier, prescriptive ignition barrier, or an intumescent coating.

5.5.3.1.6. Crawlspace access shall be provided in accordance with [IRC Section R408.4](#).

5.5.3.1.7. Enclosures for items penetrating the upper surface or walls, such as plumbing and venting systems, shall be covered with a minimum of 3.5" (89 mm) of Foam-LOK FL-450 and Foam-LOK FL-750 insulation.

5.5.3.2. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience and technical judgment.

5.6. Application for Use as an Interior Finish without the Use of a Thermal Barrier or Ignition Barrier When Used with the Addition of No-Burn® Plus ThB Intumescent Coating

5.6.1. Icynene-Lapolla SPF with a covering of No-Burn® Plus, applied in accordance with [Table 4](#), was tested to *NFPA 286* and met the acceptance criteria of [IBC Section 803.1.2.1](#)

5.6.2. When No-Burn® Plus is applied to Icynene-Lapolla SPF in accordance with [Table 4](#), the assembly may be installed without a thermal barrier or ignition barrier in accordance with [IBC Section 2603.9](#).

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Products	No-Burn® Product Name	Maximum Thickness on Walls and Vertical Surfaces	Maximum Thickness on Ceilings, Underside of Roof Sheathing/Rafters & Floors	Application of No-Burn® Coating
Foam-LOK FL-450	Plus ThB	6"	7"	18 mils wet (12 mils dry) 89 sq. ft. per gallon

Table 4: Application of No-Burn® to Icynene-Lapolla SPF

6. Installation:

6.1. General

- 6.1.1. Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.1.2. SPF insulation shall be applied by licensed dealers and installers certified by Icynene-Lapolla.
- 6.1.3. A copy of the manufacturer's published installation instructions shall be available at all times on the jobsite during installation.
- 6.1.4. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.1.5. Foam-LOK FL-450 and Foam-LOK FL-750 shall be applied to the framing using two-component spray equipment and shall be applied using a 1:1 ratio of [Component A and Component B](#).
- 6.1.6. The substrate shall be dry and free of frost, ice, rust, oil, grease, dirt or any other substances that may prevent adhesion of the SPF to the substrate.
- 6.1.7. Foam-LOK FL-450 and Foam-LOK FL-750 are intended for interior use only and are not to be used where they could come in contact with water. Provide protection from weather during and after installation.
- 6.1.8. Where used as an air barrier in unventilated attics, the insulation shall be installed to the minimum thickness required and shall be installed in accordance with the provisions of [IRC Section R806](#).
- 6.1.9. Foam-LOK FL-450 and Foam-LOK FL-750 may be installed to the required thickness with one pass of the spray equipment. If installation using multiple passes is desired, no cure time is required between passes.
- 6.1.10. Do not use Foam-LOK FL-450 and Foam-LOK FL-750 inside of electrical or junction boxes.
- 6.1.11. Foam-LOK FL-450 and Foam-LOK FL-750 shall be installed only when the temperature is at or above 14°F (-10°C).
- 6.1.12. Insulation shall not be installed in areas where the service temperature is greater than 180°F (82°C).

6.2. Foam-LOK FL-450 and Foam-LOK FL-750 Installation

- 6.2.1. For general SPF installation guidelines, see the American Chemistry Council's [Guidance on Best Practices for the Installation of Spray Polyurethane Foam](#).
- 6.2.2. Foam-LOK FL-450 and Foam-LOK FL-750 shall be installed in accordance with Icynene-Lapolla's installation instructions and this TER.

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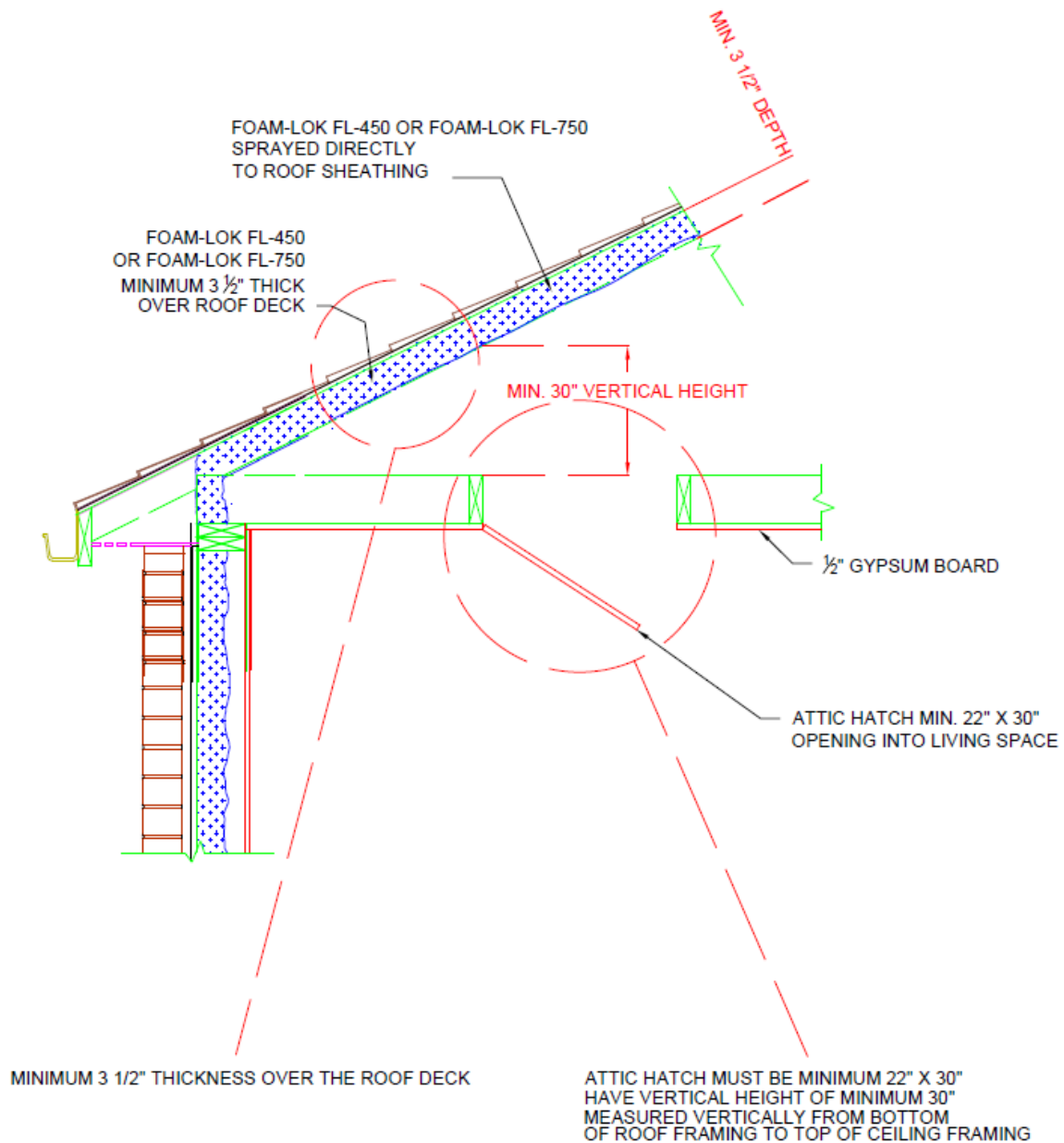


Figure 2: Foam-LOK FL-450 and Foam-LOK FL-750 Used in an Unvented Attic Space

7. Test and Engineering Substantiating Data:

- 7.1. Structural testing of trusses, joists, and rafters for comparison before and after *NFPA 286* modified fire testing. The fire testing was performed by QAI Labs in 2014, and the structural testing was performed by SBCRI under contract with Qualtim, Inc.
- 7.2. Testing and data in accordance with *NFPA 286*, modified for unventilated attics and performed by Intertek.
- 7.3. Testing and data in accordance with *NFPA 286*, modified for unventilated attics and performed by QAI Labs.
- 7.4. Testing and data in accordance with *NFPA 286*, modified for unvented attic with penetrations and performed by Priest and Associates.
 - 7.4.1. Testing and data in accordance with *NFPA 286*, modified to assess the surface burning performance of Icynene Foam-LOK FL-450 with a No-Burn® intumescent coating application and performed by QAI Labs.

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- 7.5. Fire testing of the described attic assembly to a modified version of *NFPA 286* to evaluate its performance as an unvented attic with penetrations performed by Priest and Associates.
- 7.6. Fire testing of Icynene Foam-LOK FL-450 with No-Burn® intumescent coating to *NFPA 286* performed by QAI Labs.
- 7.7. Engineering analysis comparing Foam-LOK FL-450 and Foam-LOK FL-750 fire performance by Priest and Associates.
- 7.8. Engineering analysis of Rockfon® Pacific™ 201 ceiling panels by Priest & Associates.
- 7.9. Engineering analysis justifying omission of requirement to cover entire length of items penetrating roof deck with 3½ inches of Foam-LOK FL-450 and Foam-LOK FL-750 by Priest & Associates.
- 7.10. Testing and data determining the material properties of Foam-LOK FL-450 and Foam-LOK FL-750 by Bodycote.
- 7.11. Testing showing surface burning characteristics in accordance with *ASTM E84* by Bodycote.
- 7.12. Testing as an air barrier material in accordance with *ASTM E2178* by Exova.
- 7.13. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.
- 7.14. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.
- 7.15. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.
- 7.16. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.
- 7.17. DrJ's responsibility for data provided by approved sources conforms with [IBC Section 1703](#) and any relevant professional engineering law.
- 7.18. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC, WFCM, IBC, SDPWS, NDS, ACI, AISI, PS-20, PS-2*, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

- 8.1. The testing protocol for this project included:
 - 8.1.1. Structural testing of joists and trusses before application of Foam-LOK FL-450 SPF. Testing performed by SBCRI under contract with Qualtim, Inc.
 - 8.1.2. Shipping, and installation of trusses and joists into an attic assembly with subsequent application of Foam-LOK FL-450 for the purpose of fire testing the assembly and comparing the structural stiffness of the joists and trusses before and after the fire test. Control specimens were also included in the shipping and assembly to benchmark performance.
 - 8.1.3. Fire testing of the described attic assembly to a modified version of *NFPA 286*. Testing performed by QAI Labs.
 - 8.1.4. Disassembly of the attic by QAI Labs and shipping of trusses and joists back to SBCRI.
 - 8.1.5. Repeat structural testing by SBCRI to determine the stiffness loss and strength effects of:

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- 8.1.5.1. Shipping and handling, installation and disassembly of the control and the fire tested structural elements.
 - 8.1.5.2. Application of spray foam to these elements.
 - 8.1.5.3. Attic fire testing, including realistic fire temperatures and duration.
 - 8.1.5.4. Comparison of the performance of the control specimens to the attic fire tested specimens.
 - 8.2. There was no measured difference in performance between rafter framing and truss framing in the context of performance post-*NFPA 286* fire testing. The comparisons included:
 - 8.2.1. Truss and rafter framing that had been transported and installed in a building.
 - 8.2.2. Truss and rafter framing onto which Foam-LOK FL-450 foam had been applied in accordance with standard Icynene-Lapolla application procedures for attics.
 - 8.2.3. Truss and rafter framing subjected to modified *NFPA 286* testing of an unvented attic.
 - 8.2.4. Truss and rafter framing compared to control specimens.
 - 8.3. Additional test data and evaluations comparing the fire performance of Foam-LOK FL-450 and Foam-LOK FL-750 in unvented attics and crawlspaces using modified *NFPA 286* testing was also provided to prove the similarity of the performance of Foam-LOK FL-450 and Foam-LOK FL-750 and that these products can be used interchangeably.
 - 8.4. The application of Foam-LOK FL-450 and Foam-LOK FL-750 does not compromise the structural performance of standard rafter or truss framing in code compliant unvented attic and crawlspace applications as defined in [IRC Section R806.5](#).⁷
 - 8.5. [IBC Section 104.11](#) ([IRC Section R104.11](#) and [IFC Section 104.9](#) are similar) states:

Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code [...]. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.
 - 8.6. This product has been evaluated with the codes listed in [Section 2](#), and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:
 - 8.6.1. Florida – See [supplement](#)
 - 8.7. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. Dr.J's professional engineering work falls under the jurisdiction of each state board of professional engineers, when signed and sealed.
- ### 9. Conditions of Use:
- 9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
 - 9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

⁷2009 *IRC* Section 806.4.

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- 9.3.** Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the Building Designer (e.g., Owner, Registered Design Professional, etc.).
- 9.4.** Foam-LOK FL-450 and Foam-LOK FL-750 insulation described in this TER comply with, or are suitable alternatives to, what is specified in the codes listed in [Section 2](#), subject to the following conditions:
- 9.4.1.** The manufacturer's installation instructions and this TER shall be available on the jobsite for inspection.
 - 9.4.2.** The SPF insulation shall be installed in accordance with the manufacturer's published installation instructions, this TER and the applicable code. If there is a conflict between the installation instructions and this TER, the more restrictive governs.
 - 9.4.3.** The SPF insulation shall be separated from the interior of the building by an approved 15-minute thermal barrier, except as noted in this TER.
 - 9.4.4.** When installed in unvented attics without a code-prescribed ignition barrier or thermal barrier, the installation shall meet the conditions outlined in [Section 5.5](#).
 - 9.4.5.** The SPF insulation shall meet the minimum thicknesses and densities noted in this TER.
 - 9.4.6.** The SPF insulation shall be protected from the weather during and after application.
 - 9.4.7.** The SPF insulation shall be applied by licensed dealers and installers certified by Icynene-Lapolla.
 - 9.4.8.** Use of the SPF insulation in areas where the probability of termite infestation is "very heavy" shall be in accordance with [IBC Section 2603.8](#) and [IRC Section R318.4](#) as applicable.
 - 9.4.9.** Jobsite certification and labeling of the SPF insulation shall comply with [IRC Section N1101.10.1](#) and [N1101.10.1.1](#) and [IECC Section 303.1.1](#) and [3030.1.1.1](#).
 - 9.4.10.** A vapor retarder shall be installed in accordance with the applicable code.
 - 9.4.11.** The components used to produce Foam-LOK FL-450 and Foam-LOK FL-750 are manufactured in Mississauga, Ontario, Canada, under a quality control program with inspections in accordance with [IBC Section 2603.2](#) and [IRC Section R316.2](#).
- 9.5. Design**
- 9.5.1. Building Designer Responsibility**
 - 9.5.1.1.** Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
 - 9.5.1.2.** The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).
 - 9.5.2. Construction Documents**
 - 9.5.2.1.** Construction documents shall be submitted to the building official for approval and shall contain the plans, specifications and details needed for the building official to approve such documents.
- 9.6. Responsibilities**
- 9.6.1.** The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.
 - 9.6.2.** DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
 - 9.6.3.** The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
 - 9.6.4.** This product is manufactured under a third-party quality control program in accordance with [IRC Section R104.4](#) and [R109.2](#) and [IBC Section 104.4](#) and [110.4](#).

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- 9.6.5.** The actual design, suitability and use of this TER, for any particular building, is the responsibility of the Owner or the Owner's authorized agent, and the TER shall be reviewed for code compliance by the Building Official.
- 9.6.6.** The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10. Identification:

- 10.1.** Foam-LOK FL-450 and Foam-LOK FL-750 described in this TER are identified by a label on the containers bearing the manufacturer's name, product name, label of the third-party inspection agency, and other information to confirm code compliance.
- 10.2.** Additional technical information can be found at lcynene.com.

11. Review Schedule:

- 11.1.** This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.
- 11.2.** For information on the current status of this TER, contact DrJ Engineering



- [Mission and Professional Responsibilities](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)

FBC Supplement to TER No. 1810-01

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 19 – Foamed-in-Place Insulation

Section: 07 27 36 – Sprayed Foam Air Barrier

REPORT HOLDER:

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EVALUATION SUBJECT:

Icynene Classic Ultra, Classic Ultra Select & Classic Plus Spray Polyurethane Foam

1. Report Purpose and Scope

- 1.1. Purpose
- 1.2. The purpose of this Technical Evaluation Report (TER) supplement is to indicate that Icynene-Lapolla Foam-LOK FL-450 and Foam-LOK FL-750 recognized in TER No. 1810-01, have also been evaluated for compliance with the codes noted below.
- 1.3. Applicable code editions
 - 1.3.1. *2014 and 2017 Florida Building Code – Building*
 - 1.3.2. *2014 and 2017 Florida Building Code – Residential*
- 1.4. This supplement is subject to renewal concurrently with TER No. 1810-01.

2. Conclusions

- 2.1. Icynene-Lapolla Foam-LOK FL-450 and Foam-LOK FL-750, described in TER No. 1810-01, comply with the provisions of the *Florida Building Code – Building* and the *Florida Building Code – Residential*, provided the design and installation are in accordance with the *International Building Code (IBC)* provisions noted in the TER.
- 2.2. Use of Icynene-Lapolla Foam-LOK FL-450 and Foam-LOK FL-750 SPF for compliance with the High-Velocity Hurricane Zone (HVHZ) provisions of the *Florida Building Code – Building* and the *Florida Building Code – Residential* has been evaluated.
- 2.3. In accordance with Florida Rule No. 61G20-3, Icynene-Lapolla Foam-LOK FL-450 and Foam-LOK FL-750 are outside the scope of the Florida Product Approval system.