



CERTIFICATION



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Technical Evaluation Report

TER 1703-15

Use of Icynene Classic Plus Spray
Polyurethane Foam (SPF) in Unvented
Attics & Crawlspace

Icynene-Lapolla

Product:

**Icynene Classic Plus (LD-
C-70)**

Issue Date:

July 8, 2014

Revision Date:

September 30, 2020

Subject to Renewal:

October 1, 2020

COMPANY
INFORMATION:

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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 PRODUCT EVALUATED¹

1.1 Icynene Classic Plus (LD-C-70)

2 APPLICABLE CODES AND STANDARDS^{2,3}

2.1 Codes

2.1.1 *NBC—10, 15: National Building Code of Canada*

2.1.2 *NECB—17: National Energy Code of Canada for Buildings*

2.2 Standards and Referenced Documents

2.2.1 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*

2.2.2 *ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics*

2.2.3 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*

2.2.4 *ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*

2.2.5 *ASTM D2842: Standard Test Method for Water Absorption of Rigid Cellular Plastics*

2.2.6 *ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics*

2.2.7 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*

¹ Building codes require data from valid certification, evaluation, and qualification reports be obtained from accredited third-party organizations. An accredited certifying organization (a type of accredited third-party organization) is a certification body that performs "certification of a product, process, or system." An accredited third-party organization is accomplished via accreditation using ISO/IEC 17065 evaluation procedures meeting code requirements of independence, accredited testing, and professional personnel. DrJ is an ISO/IEC 17065 [ANSI-Accredited Product Certification Body – Accreditation #1131](#).

Through ANSI accreditation, DrJ certification can be used to obtain product approval in any country that is an [IAF MLA Signatory](#), such as Canada, and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) – "certified once, accepted everywhere." Manufacturers can go to jurisdictions in any IAF MLA Signatory Country and have their products readily approved by *authorities having jurisdiction* using DrJ's ANSI accreditation. For more information about DrJ's accreditation, refer to this [letter](#) from the Standards Council of Canada (SCC).

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, see drjcertification.org.

² Unless otherwise noted, all references in this TER are from the 2015 version of the *NBC*. This *alternative solution* is also approved for use with the 2010 *NBC* and the standards referenced therein (e.g., *CAN/CSA*, *CAN/ULC*). Where this TER is not approved, the AHJ shall respond in writing stating the reasons this TER was not approved. For any variations in provincial, territorial, and local codes, see Section 8.

³ All terms defined in the applicable building codes are italicized.

- 2.2.8 *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*
- 2.2.9 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*
- 2.2.10 *CAN/ULC-S102: Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies*
- 2.2.11 *CAN/ULC-S705.1: Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification*
- 2.2.12 *CAN/ULC-S705.2: Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application*
- 2.2.13 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*

3 PERFORMANCE EVALUATION

- 3.1 This TER evaluates Icynene Classic Plus for the following:
 - 3.1.1 Physical properties of the product in accordance with the standards listed in Section 2.
 - 3.1.2 Surface burning characteristics complying with the provisions of *NBC Division B, Part 3, Subsection 3.1.12.*
 - 3.1.3 Thermal performance (R-values) complying with the provisions of *NBC Division B, Part 5, Subsection 5.3.1 and Part 9, Subsections 9.25.2 and 9.36.2.*
 - 3.1.4 Use in unvented attic spaces and crawlspaces without a thermal barrier in accordance with *NBC Division B, Part 3, Articles 3.1.4.2 and 3.1.5.15 and Part 9, Article 9.10.17.10.*
 - 3.1.5 Air permeability in accordance with *NBC Division B, Part 5, Section 54.1 and Part 9, Subsection 9.25.3.*
- 3.2 Use in a ventilated attic or crawl space without a thermal barrier is outside the scope of this evaluation.
- 3.3 Use in fire-resistance rated construction is outside the scope of this evaluation.
- 3.4 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.5 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 Icynene Classic Plus, pictured in Figure 1, is a two-component, open-cell SPF insulation product.
 - 4.1.1 Classic Plus has a density of 0.7 pounds per cubic foot (pcf) (11 kg/m3).



FIGURE 1. ICYNENE CLASSIC PLUS SPF IN UNVENTILATED ATTICS

- 4.2 The two components of Icynene low density SPF are:
 - 4.2.1 Component A: MDI/pMDI isocyanate
 - 4.2.2 Component B: proprietary resin
- 4.3 These two components are combined at the point of spray application.

5 APPLICATIONS

5.1 General

5.1.1 Icynene Classic Plus insulation is used in the following applications:

5.1.1.1 Thermal insulation in buildings constructed in accordance with the *NBC*.

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.

5.2 Surface Burning Characteristics

5.2.1 Icynene Classic Plus has the surface burning characteristics as shown in Table 1.

TABLE 1. FLAME SPREAD & SMOKE DEVELOPED INDEXES OF ICYNENE LOW DENSITY SPF

Product	Flame Spread	Smoke Developed
Icynene Classic Plus ¹	375	110
1. Tested in accordance with CAN/ULC S102 at a thickness of 75 mm (3").		

5.3 Thermal Resistance

5.3.1 Icynene low density SPF has the thermal resistance as defined in Table 2.

TABLE 2. CLASSIC PLUS THERMAL RESISTANCE PROPERTIES

	Thickness (in)	Thermal Resistance (R- values) (h ² *ft ² *°F/Btu) ^{1,2}	Thermal Resistance (U- factors) (Btu/h*°F*ft ²)	Thermal Resistance (R- values) (W/(m ² *K)) ^{1,2}	Thermal Resistance (U- factors) ((m ² *K)/W))
Classic Plus	1	4	0.250	0.7	1.420
	2	8	0.125	1.4	0.710
	3	12	0.083	2.1	0.471
	3.5	14	0.071	2.5	0.403
	4	16	0.063	2.8	0.358
	5	20	0.050	3.5	0.284
	5.5	22	0.045	3.9	0.256
	6	24	0.042	4.2	0.238
	7	28	0.036	4.9	0.204
	7.5	30	0.033	5.3	0.187
	8	32	0.031	5.6	0.176
	9	36	0.028	6.3	0.159
	9.5	38	0.026	6.7	0.148
	10	40	0.025	7.0	0.142
	11.5	46	0.022	8.1	0.125
	13.5	54	0.019	9.5	0.108
	14	56	0.018	9.9	0.102
SI: 1 in = 25.4 mm 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.					

5.4 Air Permeability

- 5.4.1 Icynene Classic Plus has the air permeability characteristics shown in Table 3 and, therefore, are an air impermeable insulation in accordance with *NBC Division B, Part 9, Subsection 9.25.4*.

TABLE 3. CLASSIC PLUS AIR BARRIER MATERIAL PROPERTIES

Product	Air Barrier Property
Icynene Classic Plus ^{1,2}	< 0.02 (L/s*m ²)
1. Sprayed to a minimum thickness of 3"	
2. Tested in accordance with <i>ASTM E2178</i> .	

5.5 Thermal Barrier

5.5.1 General

- 5.5.1.1 Icynene Classic Plus installed in combustible construction is not required to be covered with a thermal barrier in attic or roof spaces, and crawl spaces in accordance with *NBC Division B, Part 3, Article 3.1.4.2* and *Part 9, Article 9.10.17.10*.
- 5.5.1.2 In accordance with *NBC Division B, Part 3, Article 3.1.5.15*, in noncombustible construction, Icynene Classic Plus shall be separated from the adjacent building spaces by a thermal barrier consisting of:
- 5.5.1.2.1 A minimum 12.7 mm thick gypsum wallboard mechanically fastened to a supporting assembly independent of the insulation.
- 5.5.1.3 Lath and plaster fastened to a supporting assembly independent of the insulation.
- 5.5.1.4 Masonry.
- 5.5.1.5 Concrete.
- 5.5.1.6 Any thermal barrier meeting the requirements of Classification B when tested to *CAN/ULC S124*.
- 5.5.2 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

6 INSTALLATION

- 6.1 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.

6.2 Installation Procedure

6.2.1 General:

- 6.2.1.1 Installation shall comply with the manufacturer's installation instructions and this TER.
- 6.2.1.2 SPF insulation shall be applied by licensed dealers and installers certified by Icynene, Inc.
- 6.2.1.3 A copy of the manufacturer's published installation instructions shall be available at all times on the jobsite during installation.
- 6.2.1.4 In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.2.1.5 Icynene Classic Plus 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.
- 6.2.1.6 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.
- 6.2.1.7 Icynene Classic Plus is intended for interior use only and are not to be used where it could come in contact with water. Provide protection from weather during and after installation.
- 6.2.1.8 Where used as an air barrier in unventilated attics, the insulation shall be installed to the minimum thickness required as specified in Table 3.

- 6.2.1.9 Icynene Classic Plus 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.
- 6.2.1.10 Do not use Icynene Classic Plus inside of electrical or junction boxes.
- 6.2.1.11 Icynene Classic Plus shall be installed only when the temperature is at or above 14°F (-10°C).
- 6.2.1.12 Insulation shall not be installed in areas where the service temperature is greater than 180°F (82°C).
- 6.2.2 *Icynene Classic Plus Installation:*
 - 6.2.2.1 For general SPF installation guidelines, see the American Chemistry Council's [Guidance on Best Practices for the Installation of Spray Polyurethane Foam](#).
 - 6.2.2.2 Icynene Classic Plus shall be installed in accordance with Icynene, Inc.'s installation instructions and this TER. For compliance with the NBC, installation in accordance with CAN/ULC-S705.2 is required.

LEGACY

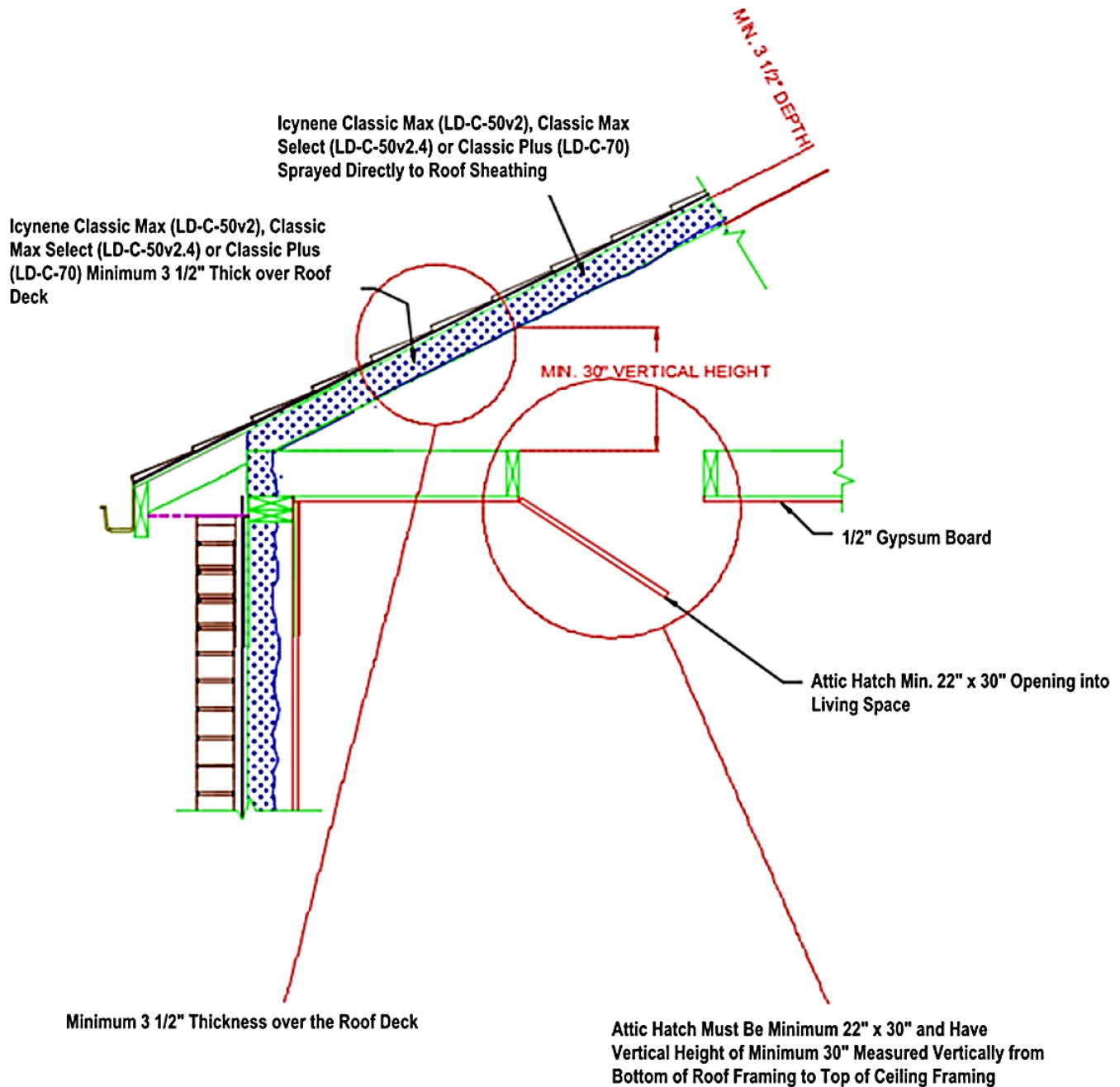


FIGURE 2. ICYNENE CLASSIC PLUS USED IN AN UNVENTED ATTIC SPACE

7 TEST 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 an ISO/IEC 17025 accredited testing laboratory under contract with Qualtim, Inc.
- 7.2 Testing and data in accordance with *NFPA 286*. Testing modified for unventilated attics and performed by Intertek.
- 7.3 Testing and data in accordance with *NFPA 286*. Testing modified for unventilated attics and performed by QAI Labs.

- 7.4 Engineering analysis of Classic Plus fire performance. Analysis done by Priest and Associates.
- 7.5 Testing and data determining the material properties of Icynene Classic Plus. Testing performed by Bodycote.
- 7.6 Testing showing surface burning characteristics in accordance with ASTM E84. Testing performed by Bodycote.
- 7.7 Testing as an air barrier material in accordance with *ASTM E2178*. Testing performed by Exova.
- 7.8 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *NBC* Volume I commentary on Conformity Assessment and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.
- 7.9 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *NBC*, *NECB*, *CAN/CSA*). 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, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers 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 Icynene Classic Plus SPF. Testing performed by an ISO/IEC 17025 accredited testing laboratory under contract with Qualtim, Inc.
 - 8.1.2 Shipping, and installation of trusses and joists into an attic assembly with subsequent application of Icynene Classic Plus 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 the lab for structural testing.
 - 8.1.5 Repeat structural testing to determine the stiffness loss and strength effects of:
 - 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 Icynene Classic Plus foam had been applied in accordance with standard Icynene 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 Icynene Classic Plus in unvented attics and crawlspaces using modified *NFPA 286* testing was also provided to prove the similarity of the performance of Icynene Classic Plus and that these products can be used interchangeably.
- 8.4 The application of Icynene Classic Plus does not compromise the structural performance of standard rafter or truss framing in code compliant unvented attic and crawlspace applications

8.5 NBC Article 1.2.1.1. states:

1.2.1.1. Compliance with this Code

1) Compliance with this Code shall be achieved by

- a) complying with the applicable acceptable solutions in Division B (see Note A-1.2.1.1.(1)(a)), or
- b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions (see Note A-1.2.1.1.(1)(b)).

2) For the purposes of compliance with this Code as required in Clause 1.2.1.1.(1)(b), the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements referred to in Subsection 1.1.2. of Division B.

8.6 NBC Division C Section 2.3 includes additional guidance for *alternative solutions*.

8.7 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known provincial, territorial, and local building codes. Where there are known variations in provincial, territorial, or local codes applicable to this evaluation, they are listed here.

8.7.1 No known variations

9 CONDITIONS OF USE

9.1 Icynene Classic Plus insulation described in this TER comply with, or is a suitable alternative to, what is specified in the codes listed in Section 2, subject to the following conditions:

- 9.1.1 The manufacturer's installation instructions and this TER shall be available on the jobsite for inspection.
- 9.1.2 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.
- 9.1.3 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.
- 9.1.4 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.
- 9.1.5 The SPF insulation shall meet the minimum thicknesses and densities noted in this TER.
- 9.1.6 The SPF insulation shall be protected from the weather during and after application.
- 9.1.7 The SPF insulation shall be applied by licensed dealers and installers certified by Icynene, Inc.
- 9.1.8 Use of the SPF insulation in localities where termites are known to occur shall be in accordance with NBC Division B, Part 9, Article 9.3.2.9 as applicable.
- 9.1.9 Jobsite certification and labeling of the SPF insulation shall comply with governing Canadian regulations, as applicable.
- 9.1.10 A vapor retarder shall be installed in accordance with the applicable code.
- 9.1.11 The components used to produce Icynene Classic Plus are manufactured in Mississauga, Ontario, Canada, under a quality control program with inspections in accordance with governing Canadian regulations, as applicable.
- 9.2 Where required by the *authority having jurisdiction* in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.3 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.4 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 *designer* (e.g., *owner*).
- 9.5 At a minimum, this product shall be installed per Section 6 of this TER.

- 9.6 This product is manufactured under a third-party quality control program with quality control inspections established by the governing legislation of the adopting province or territory, as described in *NBC* Volume 1 commentary on Conformity Assessment.
- 9.7 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. Therefore, the TER shall be reviewed for code compliance by the AHJ for acceptance.
- 9.8 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 AHJ's inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

- 10.1 The product(s) listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, 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 drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.