

Installing High Performance Insulation Part 2:

A Guide to Installing Light Density Spray Foam In Canada

Interest in high performance insulation materials is increasing due to consumer demand for more energy efficiency, resilient, and comfortable homes. Spray Polyurethane Foam (SPF) products are an ideal choice for consumers looking to ensure their homes are built to last. SPF products are unique because they are the only insulation products on the market that also control unwanted air leakage without the use of additional materials. Insulating and air sealing a home with SPF will help ensure the thermal envelope is as energy efficient as possible. The benefits don't stop with energy efficiency. SPF products help to minimize condensation, mold and other related problems, all while making the home stronger and more resilient. SPF for the residential market comes in two basic types: medium and light density products.

Light Density SPF (LD SPF) insulation, sometimes called half-pound foam or open-cell foam, is appropriate for interior applications. LD SPF is air impermeable and provides high R-values (a measure of a product's thermal resistance) and functions as an air barrier at typically installed thicknesses. LD SPF can be installed in wall cavities, basements, crawlspaces, and attics. LD SPF can also be installed in interior partition walls for sound-absorption. LD SPF can fit easily into new and existing building designs including ones containing large irregular shaped, difficult to access cavities.

LD SPF in Canada is applied under the oversight of third party quality assurance programs to ensure SPF products are installed safely. The quality assurance programs include certifying SPF products and product installers to ensure the products is installed per the manufacturer's recommendations. The industry maintains a product stewardship website and SPF chemical health and safety training available at www.spraypolyurethane.org.

This guide provides a general overview of the physical properties and Canadian code requirements for for the use of LD SPF.

Light Density Spray Foam Performance Characteristics

With regard to material performance, LD SPF products should conform to CAN/ULC S712.1 “Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Material Specification.” The next version of the National Building Code (NBC) is expected to reference this standard. To conform to the standard, LD SPF must meet the key performance requirements in Table 2.1. LD SPF are optimized for different applications. Therefore, products vary slightly from one manufacturer to the next and from product to product. It is important for designers to obtain specific information on each product from the product manufacturer.

Products adhering to Standard CAN/ULC-S712.1 have met performance thresholds for R-values, air permeance, core density, dimensional stability, water vapour permeance, surface burning, compressive strength, and volatile organic emissions. In combination with the SPF quality assurance programs, CAN/ULC-S712.1 helps ensure that the building community can expect a high level of performance when using LD SPF.

LD SPF conforms easily to the shape of the substrate and can be easily trimmed to provide fully filled cavities. Since LD SPF is typically not a vapour barrier, an approved vapour barrier material is needed in most Building Envelope wall and roof cavity applications to make these assemblies Code-compliant. In addition to wall cavities, LD SPF can be applied to interior basement walls resulting in a continuous insulation

Table 2.1 Characteristics of Light Density Spray Polyurethane Foam

R-Value	Has good insulation value. A minimum thermal resistance at 50 mm thickness of RSI 1.2 (R 6.8). Typically product performance is RSI 0.6 to 0.7 (R 3.4 to 4.0) at 25 mm.
Air Permeance	Has low air permeance. Testing of air permeance of at 75 Pa. Typically products qualify as an air barrier material at a 76 mm thickness. Reduced air leakage results in minimized airborne moisture transfer and airborne noise control.
Density	Has soft, flexible, stable foam structure, with a minimum density of 6.8 kg/m ³ (0.43 lb/ft ³). Typical density 7.0 to 8.0 kg/m ³ (0.44 to 0.50 lb/ft ³). Bond with framed assembly can withstand small scale movement thereby maintaining seal.
Vapour Permeance	Is vapour permeable - does not trap moisture. Framed assemblies have a high drying potential, similar to the rate expected with fiber-based insulation products. Requires a vapour barrier on the "warm in winter" side of the assembly in most applications.
Blowing Agent	Water blowing agent has zero Ozone Depletion Potential and ultra low Global Warming Potential of 1.
Applications	Should only be used in areas protected from exposure to rain and groundwater (e.g. on the interior of an assembly). Framed cavities for exterior walls, overhanging floors and attic/cathedralized roof are typical applications.

Reoccupancy Time: the time when all building occupants can permanently return to the building without need for personal protection equipment. A toxicological assessment is necessary for compliance.

Reentry Time: the time when unprotected healthy workers can return to the building unprotected for an 8-hour work shift. This is typically regulated under provincial labour laws (e.g. WHMIS).

Learn more at: spraypolyurethane.org

layer with no joints or seams to seal and minimal thermal bridging. Because of its ability to adhere and air seal, it is particularly useful in overhead applications—cantilevered floors, floors of rooms over garages, etc.

LD SPF can be applied in very cold conditions, as cold as -40°C. Most common construction materials are suitable as substrate for an LD SPF application. LD SPF can be applied to wood framing, sheathing, concrete, concrete block, metal, and gypsum board products. SPF manufacturers have conducted field evaluations and product compatibility testing to demonstrate LD SPF products are chemically compatible and adhesively compatible with adjacent materials including electrical wiring and various piping materials.

Code Compliance: Installing Light Density Spray Polyurethane Foam

Material specification standard CAN/ULC-S712.1 was developed in 2010 to outline the performance and physical property testing to qualify LD SPF. The 2020 revision of the NBC is expected to reference CAN/ULC-S712.1 in Article 9.25.2.2 Insulation Materials, and note that LD SPF must conform to the requirements of this standard. Currently, the 2015 NBC notes LD SPF and CAN/ULC-S712.1 in Table A-9.36.2.4.(1)-D, Materials, Thermal Resistance Values of Common Building Materials. The standard providing guidance on this product's installation is CAN/ULC S712.2, which is also expected to be referenced in 2020 NBC Article 9.25.2.5, Installation of Spray-Applied Polyurethane.

All LD SPF products are required to undergo testing to assess Volatile Organic Compound (VOC) emissions, according to CAN/ULC-S774, to determine the reoccupancy time. Time to re-occupancy may not be less than 24 hours. Reentry time is determined in accordance with provincial labour and Workplace Hazardous Materials Information System (WHMIS) regulations. Consult the manufacturer's safety data sheet for guidance.

Code Compliance: Fire Safety and LD SPF

LD SPF is a thermoset plastic. Generally, LD SPF is more thermally stable at increased temperatures than other foam plastics. Regardless, all foam insulation products are combustible and are not permitted to be left exposed. All foam plastics installed in Canada are required to have a protective thermal barrier to separate the foam plastic from the occupied space.

Part 9 – Housing and Small Buildings

As required by NBC Article 9.10.17.10. – Protection of Foamed Plastics, foamed plastics are to be protected from adjacent space in the building by an interior finish, such as plaster, gypsum board, plywood, or oriented strand board (OSB) or an approved thermal barrier. Foam insulation adjacent to a concealed space, such as within attic or roof spaces, is not subject to this requirement.

Foamed plastic is subject to flame spread limits in NBC Subsection 9.10.17. CAN/ULC S712.2 includes the same requirements. The ceiling gypsum below the floor

of the attic provides the needed separation between combustible materials and occupied space.

It is generally accepted that LD SPF can be applied on most types of plumbing and wiring. Good practice in cold climates indicates that plumbing should be oriented towards the interior of insulated assemblies to protect pipes from freezing. LD SPF can also be applied to metal ductwork in accordance with NBC Sentence 9.33.6.4.6, provided it is not less than 3 meters away from the furnace bonnet.

NBC Subsection 9.10.16 specifies requirements for fire blocks within concealed spaces and wall assemblies. In some cases, fire blocks are omitted when the concealed wall space is filled with insulation. The use of foamed plastic to fill the annular space around penetrations in fire block materials is subject to the approval by the authority having jurisdiction. NBC Article 9.10.16.4 states that the effectiveness around penetrations of fire blocks shall be maintained, but there is no defined rating for combustible materials in unrated assemblies.

The use of foamed plastic materials within fire-resistance rated assemblies in NBC Part 9 buildings is subject to its inclusion within an approved listing, such as that found in the NBC Fire and Sound Resistance Tables or an approved agency.

Part 3 – Commercial Buildings

Use of LD SPF in NBC Part 3 construction tends to be more limited than MD SPF, confined mainly to use in cavity applications where fire resistance is primarily provided by interior finish materials, structural materials such as block or brick, non-combustible claddings and sheathing.

NBC Article 3.1.5.15. (2) – Foamed Plastic Insulation, clarifies that 12.7 mm thick gypsum board qualifies as a thermal barrier. The thermal barrier protection should be continuous and cover the foamed plastic, such that the foamed plastic is not exposed to the interior of the building. The local Authority Having Jurisdiction (AHJ) should be contacted as to their thermal barrier approvals.



Other thermal barrier options include gypsum based or cementitious coatings that have been tested and found to meet the thermal barrier requirements of the NBC as shown in an evaluation report or appropriately tested in conformance with CAN/ULC-S124. Because LD SPF does not melt, other thermal barrier options such as intumescent paints may also be available in some applications and in some markets. Again, designers should consult the manufacturer for product evaluations or listings and ensure approval is obtained from the local AHJ allowing its use.

LD SPF is permitted within fire rated assemblies as long as the AHJ accept results of fire tests performed according to applicable standards. Article 9.10.3.1., Fire-Resistance and Fire-Protection Ratings, Appendix D refers to CAN/ULC-S101 standard test results. As a general rule, always consult with a fire safety consultant for guidance when combustible materials, such as LD SPF, are used in fire resistance rated assemblies, or in applications where the integrity of fire separations may be affected.

Spray Foam Compliance Documentation

To show conformance to CAN/ULC-S712.1, manufacturers obtain a Canadian Construction Materials Centre (CCMC) or ULC evaluation document (listing or report) for their LD SPF product. These documents also provide key information on use of the product in the field originating in CAN/ULC S712.2. This document also notes the physical properties of the product and identifies the Certification Organization selected by the manufacturer to provide a site quality assurance program (SQAP). Manufacturers must specify one SQAP provider as part of the listing process—either Caliber Quality Solutions, the Canadian

Urethane Foam Contractors Association (CUFCA), Building Professionals Canada (BPC) or Urethane Foam Consultants (UFC) – to license qualified installers and guide the process of third-party field auditing. The listing process requires manufacturers to use one consistent provider for this work.

Since standard CAN/ULC-S712.1 is not currently referenced in NBC Article 9.25.2.2, CCMC currently issues an Evaluation Report for a LD SPF product instead of an Evaluation Listing. In the Report, they render an opinion if the product complies with the NBC and if it could be considered as an Alternative Solution meeting Article 9.25.2.2.(1)(g) Insulation Materials. This approach provides designers and code officials confirmation of suitable code compliance and product performance. It is anticipated that as the new version of the NBC containing a specific reference to the CAN/ULC-S712.1 standard is adopted across the country, manufacturers will begin to transition to an Evaluation Listing to that standard.

Quality Assurance and Specifications

The Canadian National Master Construction Specification (NMS) - Sprayed Insulation – Polyurethane Foam (Section 07 21 29) was updated in January 2019. The previous version of the NMS referenced only one of the four SQAP providers recognized by CCMC, creating quality assurance compliance confusion in the building industry. In response, newer specification references for spray foam were developed with all four organizations in Canada recognized by CCMC as third-party quality assurance bodies for LD SPF products now noted.

For additional information on LD SPF, see:

<https://www.spraypolyurethane.org/>

<https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-construction-materials-centre>

<https://canada.ul.com/ulcstandards/>

<https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-national-master-construction-specification>

<https://www.caliberqa.com/>

<https://www.cufca.ca/>

<https://www.buildingprofessionals.ca/>

<http://foamexperts.ca/>

American Chemistry Council

700 2nd Street, NE
Washington, DC 20002
(202) 249-7000

americanchemistry.com

blog.americanchemistry.com

twitter.com/AmChemistry

facebook.com/ImpactChemistry