

# UL Solutions Evaluation Report

**ULC ER40477-02**

**Issued: 2024-06-11**

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**UL Solutions Category Code: ULEY7 – Weather Barriers for Canada (Radon)**

**CSI MasterFormat®**

**DIVISION: 07 25 00 Weather Barrier**  
Sublevel 2: 07 26 00 Vapour Retarders  
Sublevel 3: 07 26 23 Below-Grade Gas Retarders

**COMPANY:**

**Huntsman Building Solutions**  
870 Cure-Boivin  
Boisbriand, QC. Canada  
[www.huntsmanbuildingsolutions.com](http://www.huntsmanbuildingsolutions.com)

**1. Subject:**

**Radon Protection System**

## UL Solutions Evaluation Report

### 2. Scope of evaluation

2015 National Building Code of Canada, NBCC (28 September, 2018)

2020 National Building Code of Canada, NBCC (15 July, 2019)

NBCC Division A, Part 1 - Compliance

Clause 1.2.1.1.(1)(a) Compliance with this Code

NBCC Division B, Part 5 – Environmental Separation

Clause 5.4.1.1.(1)(e) Required Resistance to Air Leakage / minimize the ingress of airborne radon from the ground

Clause 5.4.1.2.(1)(a) Air Barrier System Properties

NBCC Division B, Part 9 – Housing and Small Buildings

Sentence 9.13.4.2.(1) Protection from Soil Gas Ingress – Air Barrier System

NBCC Division , Part 1 - Compliance

Clause 1.2.1.1.(1)(b) Compliance with this Code (Alternante Solutions)

NBCC Division B, Part 9 – Housing and Small Buildings

Sentence 9.13.2.2.(b) Dampproofing Materials

Sentence 9.25.3.6.(1) Air Barrier Systems in Floors-on-ground (6-mil polyethylene)

The products underwent evaluation for the following properties:

- Air Permeance ASTM E2178 – modified
- Compression Strength ASTM D1621
- Dampproofing ASTM E96 (wet cup)
- Radon Resistance ISO 11665
- Spray Foam CAN/ULC-S705.1 and CAN/ULC-S705.2

### 3. Reference documents

ASTM D1621	Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials
ASTM E2178	Standard Test Method for Air Permeance of Building Materials
CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction
ISO 11665	Measurement of radioactivity in the environment – Air : radon 222 Part 13: Determination of the diffusion coefficient in waterproof materials: membrane two-side activity concentration test method
CAN/ULC-S705.1	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
CAN/ULC-S705.2	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application

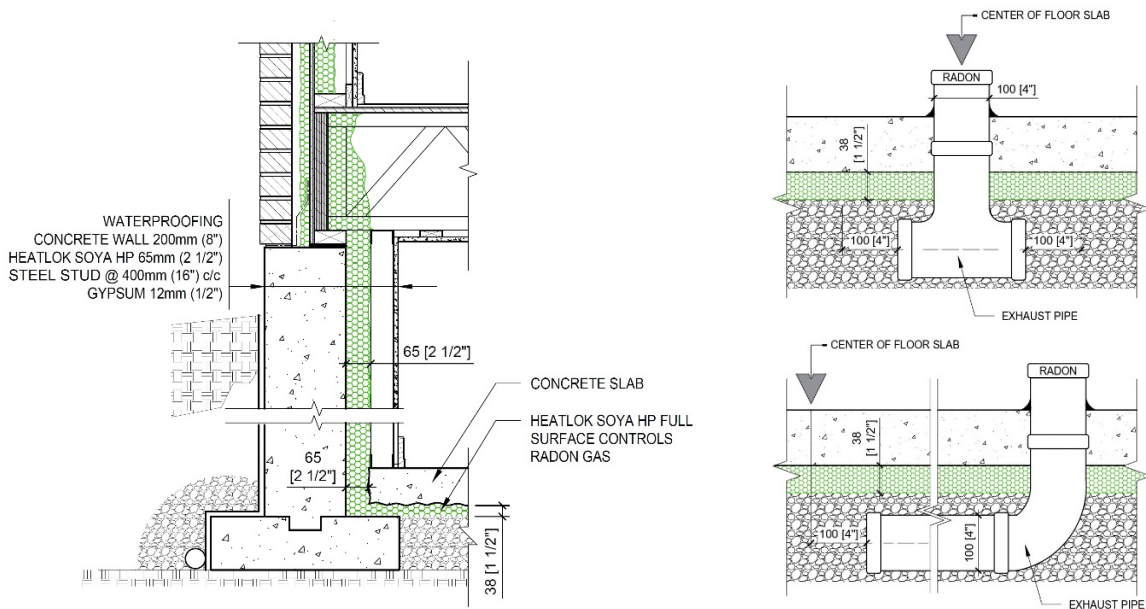
#### 4. Uses

The Huntsman Building Solutions Radon Protection System is utilized as a soil radon barrier. Spray applied polyurethane foam insulation (SPUF) is installed prior to the installation of on grade concrete slabs and applied to foundation walls to form a continuous soil gas / radon barrier, for used in the Canadian construction industry.

This Evaluation Report does not cover the Radon Protection System for areas of high-water tables, exposed combustible material, thermal insulation, waterproofing performance or rodent infestation. Additional evaluations and testing are required to meet these and other applications.

#### 5. Product Description

The Huntsman Building Solutions Radon Protection System utilizes a medium density closed cell spray-in-place rigid polyurethane foam (HEATLOK SOYA HP™) to form a continuous below grade soil gas / radon control barrier. The HEATLOK SOYA HP™ is applied at a minimum density of 35.3 kg/m<sup>3</sup> (2.2 pcf). The SPUF when installed at a minimum thickness of 38 mm and extended above grade on interior surface of foundation walls, in conjunction with a minimum 100mm gravel base and roughed-in radon sub slab extraction system, combine to comply with the code requirements of controlling and minimizing soil gas and radon ingress.



Residential Cross Section

Pipe Details

The Radon Protection System utilizes HEATLOK SOYA HP™ SPUF applied by trained and certified installers following the Huntsman Building Solutions field quality assurance procedures.

The HEATLOK SOYA HP™ elements are under a UL quality audit program where UL/ULC Field Engineering staff audit material manufacturing facilities, installer certification and the system design criteria. Details of the product and system are on file at ULC.

## 6. Performance characteristics

### 6.1 Spray Foam

The Radon Protection System SPUF system was evaluated for the performance characteristics as reported below in Table 1 Performance Characteristics:

Table 1: Performance Characteristics

Properties	Requirement	Results
SPUF (HEATLOK SOYA HP™)	CAN/ULC-S705.1	Compliant
SPUF Radon Resistance	≤ 6-mil polyethylene sheet	Compliant
Compression Strength	≥ 140 kPa	182 kPa
Dampproofing	≤ 43 ng/Pa·s·m <sup>2</sup>	39 ng/Pa·s·m <sup>2</sup>

### 6.2 Radon Resistance

The HEATLOK SOYA HP™ material was evaluated as a barrier to radon along with the NBCC acceptable solution of an overlapped 6-mil polyethylene sheet (CGSB 51.34-M Vapour Barrier, Polyethylene Sheet for Use in Building Construction), as reported in Table 2 Material Radon Performance. The HEATLOK SOYA HP™ demonstrated increased resistance to radon than the 6-mil polyethylene sheet.

Table 2: Material Radon Performance (ISO 11665)

Material	Radon Resistance	Radon Diffusion Coefficient
6-mil polyethylene	21.10 <sup>6</sup> s/m	7,2.10 <sup>-12</sup> m <sup>2</sup> /s
SPUF (HEATLOK SOYA HP™) @15.6mm thickness	5332.10 <sup>6</sup> s/m	2,5 x 10 <sup>-11</sup> m <sup>2</sup> /s

### 6.3 Material Performance

The HEATLOK SOYA HP™ SPUF material was evaluated for air barrier performance to meet NBCC acceptable solution, as reported in Table 3 Air Barrier System Properties. The Radon Protection System design provides a continuous air / vapour barrier layer which is extended above grade. Additionally, the HEATLOK SOYA HP™ SPUF material demonstrated the continuity of the air barrier performance around common pipe penetration of various materials (PVC, ABS, cast iron, galvanized, concrete and copper) without the need for a primer or sealants.

Table 3: Air Barrier System Properties (ASTM E2178 – with deviations)

NBCC Requirement	≤ 0.02 L/(s·m <sup>2</sup> )
SPUF HEATLOK SOYA HP™ @ 38 mm thickness	0.005 L/(s·m <sup>2</sup> )
Continuous air leakage performance at pipe penetrations (PVC, ABS, cast iron, copper, and concrete)	0.005 L/(s·m <sup>2</sup> )

The HEATLOK SOYA HP™ SPUF compression property exceeds the NBCC acceptable solution of polystyrene or polyurethane boards, providing durability of the air barrier during installation of the concrete slab. Additionally, the SPUF met the requirement for a dampproofing material, NBCC Clause 9.13.2.2.(2)(b), based on the ASTM E96 water method results.

### 6.4 Training and Qualified Installers

Radon Protection System installers are specifically trained in accordance with the HEATLOK SOYA HP™ Training and Installation Manual (version June 2021) and are subject to audits following the Caliber Quality Solutions Field Quality Assurance Program (FQAP). The HEATLOK SOYA HP™ training and certification is in addition to the NBCC requirement of CAN/ULC-S705.2 for certification of SPUF installers. Qualified installers are provided with HEATLOK SOYA HP™ identification cards indicating the level of certification, insulation application (CAN/ULC S705.2) and air / radon barrier (Radon Protection System). Caliber Quality Solutions is IAS accredited as a Personnel Certification Body (PCB-112).

### 7. Installation

Installation of the Radon Protection System must comply with this report and the association published installation instructions. The published installation instructions are to be available at the jobsite at all times during installation.

- The SPUF (HEATLOK SOYA HP™) to be applied on-site by qualified installers trained and certified by Caliber Quality Solutions.
- The minimum design thickness of 38mm SPUF must be maintained continuously over gravel beds. As per the 2020 NBCC Sentence 9.16.2.1.(1), the specified gravel shall consist of course, clean granular material containing not more than 10% of material that will pass through a 4mm sieve.
- Roughed-in radon subfloor depressurization system to be in-place prior to SPUF installation, Article 9.13.4.3.
- A minimum of 25-hrs shall pass prior to the pouring of the concrete floor slab.
- Penetrations of the SPUF, other than PVC, ABS, cast iron, copper, galvanized and concrete, to be made airtight with compatible sealant application system.
- Care shall be taken as to not damage the SPUF during concrete slab installation.

### 8. Condition of use

The Huntsman Building Solutions Radon Protection System material described in this Report has been evaluated in accordance with code sections listed in Section 2.0, subject to the following conditions:

- Materials and methods of installation must comply with this report and the manufacturer's published installation instructions. In the event of a conflict between the manufacturer's published installation instructions and this report, the manufacturer shall be consulted.
- SPUF used must be HEATLOK SOYA HP™ meeting CAN/ULC S705.1-15 Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
- The HEATLOK SOYA HP™ must be site installed by Caliber Quality Solutions trained and certified installers who are issued a unique HEATLOK SOYA HP™ identification card, the card shall be available on-site to authorities having jurisdiction (AHJ).
- The HEATLOK SOYA HP™ Training and Installation Manual shall be available on-site to authorities having jurisdiction (AHJ).
- This system must be used in conjunction with the requirements specified in Subsection 9.13.4, Soil Gas Control of the 2015 and 2020 NBCC.
- The SPUF is a combustible material requiring fire protection in accordance with the NBCC.
- An engineer to be consulted for system application under structurally loaded floors.
- The Huntsman HEATLOK SOYA HP™ material utilized in this report are produced under the UL Solutions Follow-Up Service Program, which includes audits in accordance with quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC10.

### 9. Supporting evidence

Huntsman Building Solutions has submitted technical documentation for ULC's review. The test and evaluation data submitted for this product is summarized below.

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- Test data in accordance with CAN/ULC-S705.1-15 with compliance statement for the HEATLOK SOYA HP™ polyurethane foam insulation, compliant test reports from an ISO/IEC 17025 accredited test laboratory.
- Sample Selection of the HEATLOK SOYA HP™ product for radon and pipe penetration testing by an ISO/IEC 17020 accredited inspection body.
- Radon resistance test data in accordance ISO 11665 for the HEATLOK SOYA HP™ and code reference polyethylene sheet, test reports from an ISO/IEC 17025 accredited test laboratory.
- Test data in accordance with ASTM E2178 (modified) with compliance statement for the HEATLOK SOYA HP™ pipe penetrations, compliant test reports from an ISO/IEC 17025 accredited test laboratory.
- HEATLOK SOYA HP™ Training / Installation Manual including Daily Work Record and Jobsite Label.

### 10. Identification

The Huntsman Building Solutions Radon Protection System described in this evaluation report is identified by a marking bearing the report holder's name (Huntsman Building Solutions) and the evaluation report number ULC ER40477-02. The validity of the evaluation report is contingent upon this identification appearing on the product drums and literature. Caliber Quality Solutions trained and approved installers of the Radon Protection System to be provided with individually unique identification cards and made available by the installer upon an AHJ's request.

### 11. Client location / contacts

Huntsman Building Solutions  
870 Cure-Boivin  
Boisbriand, QC  
Canada J7G 2A7  
866-437-0223  
[www.huntsmanbuildingsolutions.com](http://www.huntsmanbuildingsolutions.com)

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*Underwriters Laboratories of Canada Inc.  
7 Underwriters Road  
Toronto, ON M1R 3A9 Canada  
T: 800.463.6852  
W: [UL.com/Solutions](http://UL.com/Solutions)*