ULC Evaluation Report

ULC ER-R40584

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COMPANY:

Elastochem Specialty Chemicals Inc.
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1. SUBJECT

R-SHIELD, SPRAY POLYURETHANE FOAM RADON BARRIER SYSTEM

2. SCOPE OF EVALUATION

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

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 A, Part 1 - Compliance
Clause 1.2.1.1.(1)(b) Compliance with this Code (Alternate Solutions)

Sentence 9.25.3.6.(1) Air Barrier Systems in Floors-on-ground (6-mil polyethylene)
Sentence 9.13.2.2.(b) Dampproofing Materials

The system was evaluated for the following properties:

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

3.0 REFERENCED DOCUMENTS

ASTM International

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

Canadian General Standards Board

CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction

International Organization for Standardization

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

Underwriters Laboratories of Canada

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

4.0. USES

The **Elastochem Specialty Chemicals Inc.** (Elastochem) **R-SHIELD** is utilized as a soil radon barrier. Spray applied polyurethane foam insulation (SPUF) is installed prior to the installation of concrete slabs on the ground and applied to foundation walls to form a continues barrier, for used in the Canadian construction industry.

This Evaluation Report does not cover the Elastochem R-SHIELD 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.

5.0 PRODUCT DESCRIPTION

The Elastochem R-SHIELD utilizes a medium density closed cell spray-in-place rigid polyurethane foam (SPUF) to form a continuous below grade soil gas / radon control barrier. The R-SHIELD is applied at a minimum density of 28 kg/m^3 (1.7 pcf). The SPUF when installed at a minimum thickness of 50 mm and extended above grade on interior surface of foundation walls, in conjunction with a minimum 100 mm 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.

The Elastochem R-SHIELD utilizes **Insulthane® Extreme** SPUF installed by trained and certified installers following the Elastochem field quality assurance procedures.

The Elastochem R-SHIELD 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.

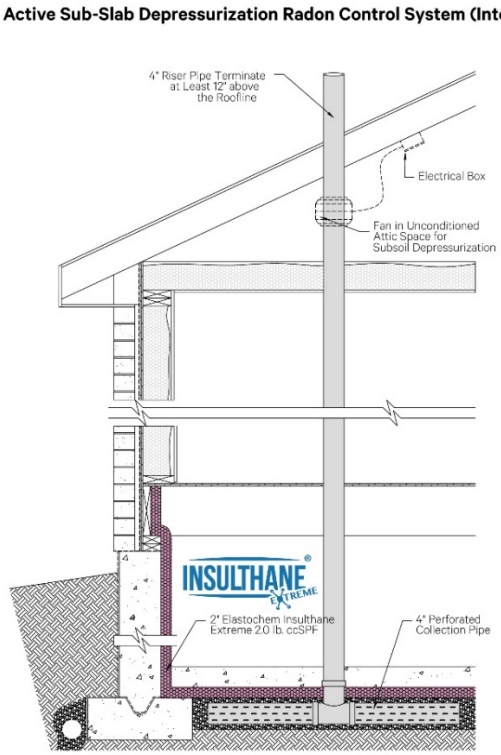

Figure 1:
Installation of Elastochem R-SHIELD for radon control below grade with 100mm grade bed and roughed-in sub slab radon depressurization system.

6.0 PERFORMANCE CHARACTERISTICS

6.1 Spray Foam

The Elastochem R-SHIELD SPUF material was evaluated for the performance characteristics as reported below in Table 1 Performance Characteristics:

Table 1: Performance Characteristics

Properties	Requirement	Results
SPUF (Insulthane® Extreme)	CAN/ULC-S705.1	PASS
SPUF Radon Resistance	≤ 6-mil polyethylene sheet	PASS
Compression Strength	≥ 140 kPa	182 kPa
Dampproofing	≤ 43 ng/Pa·s·m^2	39 ng/Pa·s·m^2

6.2 Radon Resistance

The Elastochem R-SHIELD Insulthane® Extreme SPUF 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 Insulthane® Extreme demonstrated increased resistance to radon than the 6-mil polyethylene sheet.

Table 2: Material Radon Performance (ISO 11665)

Material	Radon Resistance	Radon Transmittance
6-mil polyethylene	13.4 x 10^6 s/m	7.7 x 10^{-8} m/s
SPUF (Insulthane® Extreme @50mm thickness)	17410 x 10^6 s/m	5.7 x 10^{-11} m/s

6.3 Material Performance

The Elastochem R-SHIELD Insulthane® Extreme SPUF material was evaluated for air barrier performance to meet NBCC acceptable solution, as reported in Table 3 Air Barrier System Properties. The Elastochem R-SHIELD design provides a continuous air/vapour barrier layer which is extended above grade. Additionally, the Insulthane® Extreme 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^2)
SPUF (Insulthane® Extreme @50mm thickness)	0.002 L/(s·m^2)
Continuous air leakage performance at pipe penetrations (PVC, ABS, cast iron, copper, galvanized and concrete)	≤ 0.02 L/(s·m^2)

The 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

Elastochem R-SHIELD installers are specifically trained in accordance with the Elastochem R-SHIELD Training and Installation Manual (version June 2021) and are subject to audits following the Urethane Foam Consultant (UFC) Field Quality Assurance Program (FQAP). The Elastochem R-SHIELD 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 Elastochem R-SHIELD identification cards indicating the level of certification, insulation application (CAN/ULC S705.2) and air/radon barrier (Elastochem R-SHIELD). UFC is IAS accredited as a Personnel Certification Body (PCB-103) and an Inspection Agency (AA-755 Type A).

7.0 Installation

Installation of the Elastochem R-SHIELD Insulthane® Extreme SPUF 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.

A. The SPUF (Insulthane® Extreme) to be applied on-site by qualified installers trained and certified by UFC.
B. The minimum design thickness of 50mm SPUF must be maintained continuously over gravel beds. As per the 2015 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.
C. Roughed-in radon subfloor depressurization system to be in-place prior to SPUF installation, Article 9.13.4.3.
D. A minimum of 25-hrs shall pass prior to the pouring of the concrete floor slab.
E. Penetrations of the SPUF, other than PVC, ABS, cast iron, copper, galvanized and concrete, to be made airtight with compatible sealant application system.
F. Care shall be taken as to not damage the SPUF during concrete slab installation.

8.0 CONDITIONS OF USE

The Elastochem R-SHIELD material described in this Report has been evaluated in accordance with code sections listed in Section 2.0, subject to the following conditions:

A. 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.
B. SPUF used must be Insulthane® Extreme meeting CAN/ULC S705.1-15 Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
C. The Elastochem R-SHIELD must be site installed by UFC trained and certified installers who are issued a unique Elastochem R-SHIELD identification card, the card shall be available on-site to authorities having jurisdiction (AHJ).
D. The Elastochem R-SHIELD Training and Installation Manual shall be available on-site to authorities having jurisdiction (AHJ).
E. This system must be used in conjunction with the requirements specified in Subsection 9.13.4, Soil Gas Control of the 2015 NBCC.
F. The SPUF is a combustible material requiring fire protection in accordance with the NBCC.
G. An engineer to be consulted for system application under structurally loaded floors.

9.0 SUPPORTING EVIDENCE

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

A. Test data in accordance with CAN/ULC-S705.1-15 with compliance statement for the Insulthane® Extreme polyurethane foam insulation, compliant test reports from an ISO/IEC 17025 accredited test laboratory.
B. Sample Selection of the Insulthane® Extreme product for radon and pipe penetration testing by an ISO/IEC 17020 accredited inspection body.

C. Radon resistance test data in accordance ISO 11665 for the Insulthane® Extreme and code reference 6-mil polyethylene sheet, test reports from an ISO/IEC 17025 accredited test laboratory.
D. Test data in accordance with ASTM E2178 (modified) with compliance statement for the Insulthane® Extreme pipe penetrations, compliant test reports from an ISO/IEC 17025 accredited test laboratory.
E. Elastochem R-SHIELD Training / Installation Manual including Daily Work Record and Jobsite Label.

10.0 IDENTIFICATION

Elastochem **R-SHIELD** described in this evaluation report is identified by a marking bearing the report holder's name (**ELASTOCHEM**) and the evaluation report number **ULC ER-R40584**. The validity of the evaluation report is contingent upon this identification appearing on the product drums and literature. UFC trained and approved installers of the Elastochem R-SHIELD to be provided with individually unique identification cards and made available by the installer upon an AHJ's request.

11.0 CLIENT LOACATION / CONTACT

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12.2 ULC Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by ULC.

12.3 The current status of this report, as well as a complete directory of UL Evaluation Reports may be found at UL.com via our Product iQ® database.

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