

CUFCA RCS[®]

ULC Evaluated

ULC ER-R40284



RADON CONTROL SYSTEM

IN ONE SEAMLESS APPLICATION

A ULC Evaluated solution for a safe, dry, durable and comfortable basement.



In association with our valued CUFCA SPF Industry Partners:



GRIZZLY
GOLD

The Gold Standard in Spray Polyurethane Foam





What is Radon?

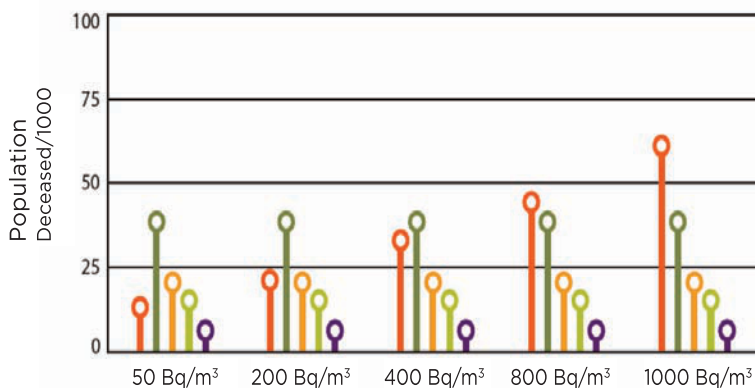
Radon is a noxious radioactive gas. It is colourless, odourless and tasteless. It is the second leading cause of lung cancer. It is heavier than air and accumulates in basements. This guide illustrates how your CUFCA® Certified Contractor can create a gas-proof basement using our tested and ULC evaluated foam system Grizzly Gold - HFO by CUSE.

Radon can infiltrate in several places:

- cracks in the floor slab or foundation wall.
- the joint between the floor slab and the foundation wall.
- penetrations in the floor slab or sump pits and floor drains.

The Canadian Lung Association (CLA) and National Building Code of Canada (NBC) and Health Canada ***recommend testing for radon if you spend more than four hours a day in a basement.***

Risk from Exposure to Radon⁵



- Lifelong exposure to Radon - Non smoker
- All accidental related deaths
- Bush pilot
- Ascending Mount Everest
- Poisoning

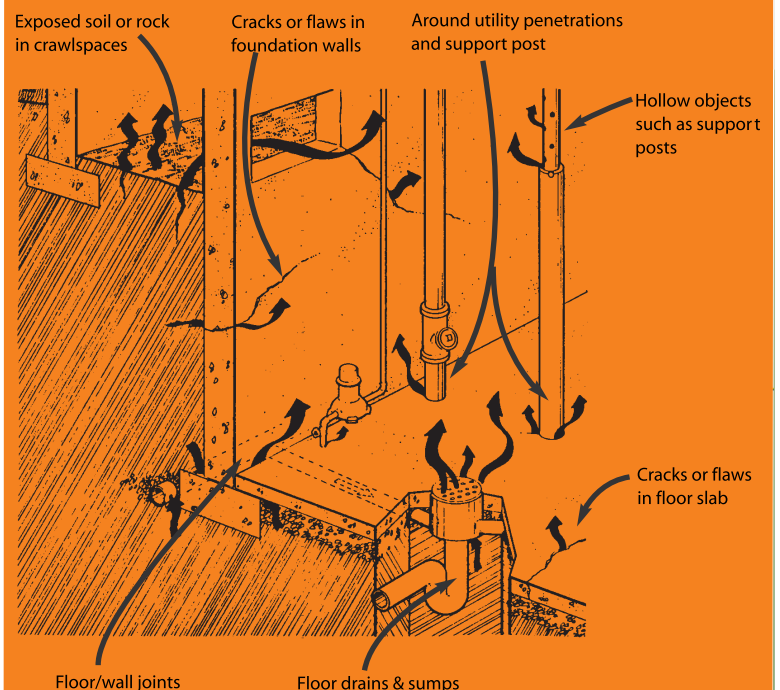
Bq= Becquerel, unit of measurement for Radon gas

Source: Radon - Reduction Guide for Canadians, Health Canada.

Health Canada's recommendations for reduced radon infiltration in basements:

- Install a membrane or sealing product under the floor slab
CUFCA RCS® ✓
- Seal the joint between the foundation wall and the floor slab
CUFCA RCS® ✓
- Seal all openings in the foundation wall and floor slab
CUFCA RCS® ✓
- Seal all posts and load-bearing walls to the floor slab and membrane
CUFCA RCS® ✓
- Install floor drains that prevent gas infiltration
- Install sealed lid on sumps

Potential Radon Infiltration



Source: Radon - Reduction Guide for Canadians, Health Canada.

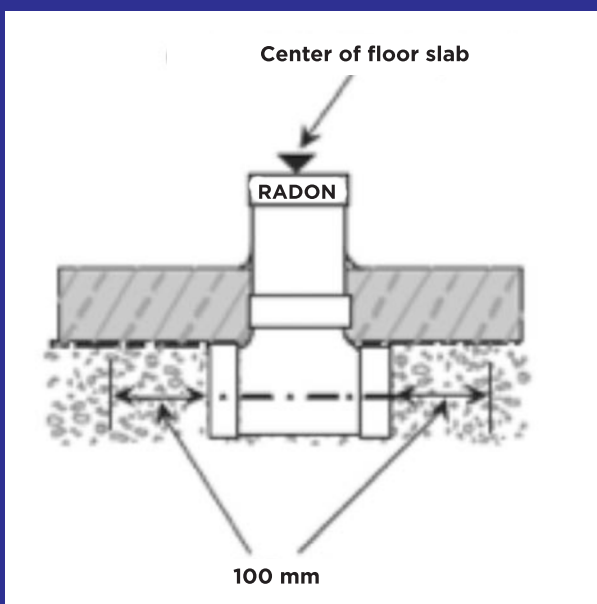
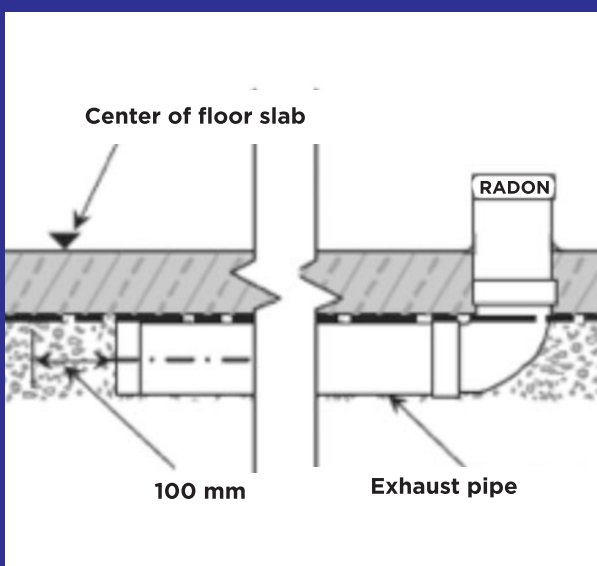


How to build a proven RADON CONTROL SYSTEM

There are six steps to build a CUFCA RCS[®] Basement in a new building:

1. Install a depressurization pipe in the gravel under the slab

Installation of this pipe is mandatory as outlined in the 2010 National Building Code of Canada. A perforated pipe 4" in diameter must be installed in a 3/4" gravel base of 4" for adequate air communication. This pipe will be stubbed up through the poured slab and capped. Should testing show a radon level in excess of the 200 Bq/m³, then this pipe can be connected to an exhaust fan for active sub slab depressurization.



Source : CNBC 2010



2. Install an air barrier and radon barrier product on the gravel under the basement slab

CUFCA has tested the Grizzly Gold HFO SPF to the Global Radon Diffusion Test protocol: ISO/TS 11665-13 and the product demonstrated performance levels significantly better than using the prescriptive 6 mil polyethylene membrane. The testing utilized 50mm of 2 lb. CC MD SPF to meet the thermal, air, vapour, and radon barrier performance levels. [Review our ULC Evaluation Report ER-R40284 for details.](#)

3. Seal the joint between the foundation wall and the floor slab

One of the key performance levels achieved by using the Grizzly Gold HFO tested SPF products is from the monolithic membrane created by the site manufactured status of spray applied 2lb CC MD SPF installed on the clear stone aggregate. The continuity of the SPF both on the ground and wrapping up over the footers and wall are complete. No additional sealant, tape or materials are needed. Any shrinkage of the poured slab will not impact the continuity of the SPF at these joint areas.

4. Seal all penetrations in the floor slab, foundation walls, and load bearing posts or stair walls

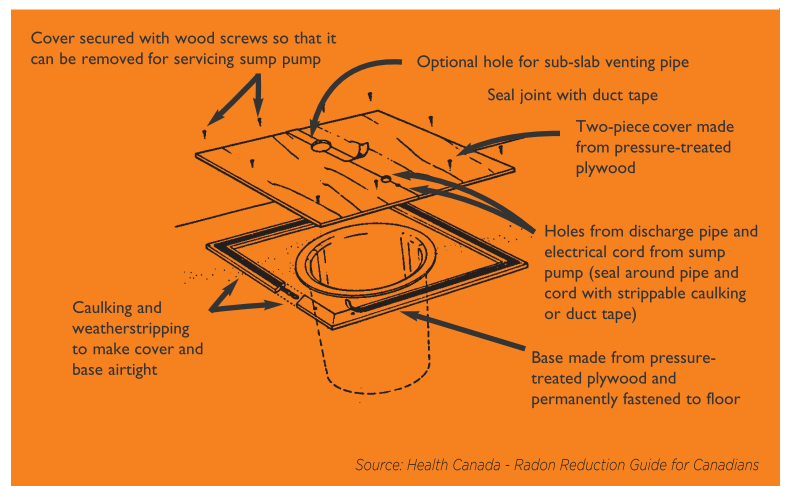
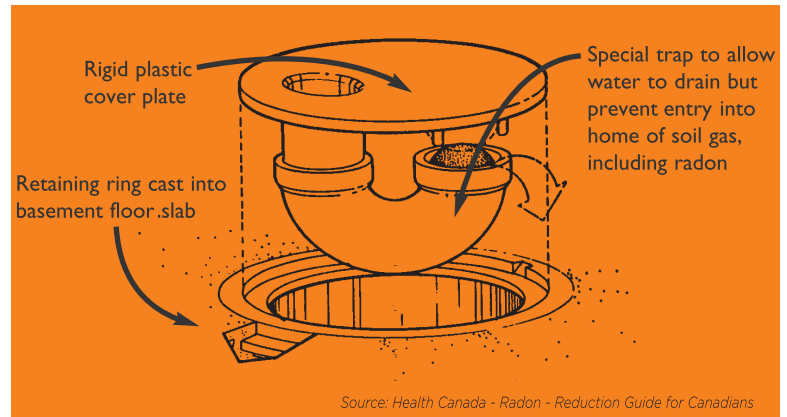
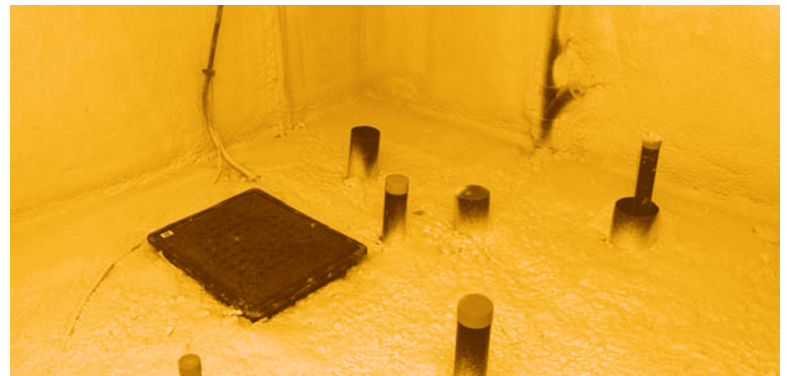
Our manufacturer member SPF product has been tested for adhesion to key substrates and pipe materials found in typical basement construction. This bonded adhesion has proven its performance to seal to ABS, PVC, Concrete, Steel, galvanized pipe, Cast Iron, and Copper.

5. Install floor drains that prevent gas infiltration

Radon can be transported into the home in water. As such it is important to install floor drains that are specifically designed to prevent gas infiltration.

6. Install a sealed lid on sump pits in basements

Sumps can communicate directly with the gravel and perimeter drainage. It is very important to use proper gas proof sealed lids for these to ensure best radon containment.



Requirements for Insulation and Protection against Radon and Soil Gases

The basement can often present challenges to homeowners and builders alike. With often high humidity, risk of floods, mold, and radon exposure, how best to address these concerns can be an issue.

With new energy code requirements in the National Building Code of Canada (NBC), it is recommended to insulate under the basement concrete slab. The insulation must have a minimum value of R-5 fully or an R-7.5 in a 4 feet (1.2 metre) around the perimeter. In addition to the thermal insulation, the NBC requires the installation of protection against soil gases (sub-section 9.13.4 of the NBC).

A CUFCA® Professional SPF Contractor with their certified SPF Installers can provide a cost effective all in one solution to the above considerations. With the tested and ULC approved foam system, CUFCA® can now provide assurances of an effective Radon Control Solution (RCS®), and Air Barrier, Vapour Barrier and highest R-value thermal insulation.

Think of the benefits of a single product application that can ensure the long term enjoyment of this often under utilized space. With an LTTR R value of R-6 per inch, our tested ULC approved system applied at 2" (50mm) thick provides an R-12 LTTR (Long Term Thermal Resistance) exceeding code requirements. The product is sprayed directly to the aggregate forming a one piece control layer with no mechanical joints or seams to worry about.

Reference article for radon NBCC-2010
5.4.1.1.1)e)-A 5.4.1.1 - 9.13.4 - 9.25.3 - 9.36.2.9

Minimum Insulation values required for basement

| Ontario SB-12 | | | | |
|---------------------------|-------------------------------|--------------------------|------------------------------------|--|
| | Full Surface Below Grade Slab | Edge of Below Grade Slab | Heated Slab or ≥ 600mm Below Grade | Basement Wall |
| Zone 1 (< 5000 HDD) | — | R-10 | R-10 | R-12 R-20 ² |
| Zone 1 (> 5000 HDD) | R-5 ¹ | R-10 | R-10 | R-12 R-20 ² R-22 ² |
| Addition | — | R-10 | R-10 | R-20 |
| Québec Part 11 | | | | |
| (< 6000 HDD) | R-5 | R-4 | R-10 | R-17 ³ |
| British Columbia Part 10 | | | | |
| Residential (< 5 stories) | — | R-10 | R-12 | R-12 |

1. Zone 2 Table 2.1.1.3.A AFUE ≥90% compliance package B,C,E,F,G,I,J,K,L,M=R-0
2. Depends on the applicable compliance package
3. Total R-17 with a minimum R-4 insulation thermal break structure. 1RSI = 5.678 R
For more information see Typical SPF Details in CUFCA Drawings for Residential Construction

The Grizzly Gold HFO tested and approved SPF system installed by a CUFCA® Certified Installer can be a single application process that provides an ALL-IN-ONE solution of Air Barrier, Moisture Barrier, Soil Gas Barrier, and high R-value Thermal Barrier. Once installed the SPF forms a single monolithic sheet upon which construction crews can walk and use wheelbarrows without any damage to the underlying radon and vapour barrier spray foam. Far exceeding the performance of mechanically sealed sheet or tile alternatives.

The Canadian government has changed the safe threshold for Radon Gas in buildings. The new requirements of the National Building Code of Canada - 2010 (sub-section 9.13.4) stipulate the installation of an air barrier system in basements to block the infiltration of radon gas. In addition to its high insulating factor our tested SPF systems provide for full air, vapour, and gas barrier performance levels that are unmatched by 6mm poly sheeting.

CUFCA was the first organization to test a Radon Control System with 2 lb. Closed Cell Medium Density Spray Foam in Canada in 2016.

Only the Grizzly Gold HFO foam system listed in our published ULC ER-R40284 can be used as a RCS® product as outlined in our CUFCA Radon RCS® Site Quality Assurance Technical Guide.

Key Benefits to the use of the CUFCA RCS[®] ULC Approved System

The use of a CUFCA tested and CCMC Listed 2 lb. CC MD Spray Foam under the slab, on the foundation walls, and on the rim joists, provides a continuous, seamless, air and soil gas barrier right up to the ground floor.

Thermal Break

The NBC now requires a thermal break between the foundation wall and the slab (min. R-4). The continuity of the polyurethane foam at the wall and footer area provides this thermal break and exceeds the R-value required.

Capillary Break

At the same time, the use of these tested SPF systems also provide an effective capillary break against moisture migration from wall and footer concrete to the interior floor slab once poured. This ensures a dry basement with a easily managed humidity for comfort and enjoyment of the living space.

Thermal Barrier

With an installed 2" (50mm) below the slab, 3" (75mm) on the walls (R-12 and R-18 respectively), these performance levels are also free of typical thermal bridges that are common with other mechanically fastened insulation products

Cost Performance

A Key benefit of the use of our CUFCA RCS[®] is the overall performance/cost benefit. As a single monolithic material that provides the performance of multiple control layers that would often require the use of many products, we can offer an unmatched price/performance level. Our system has been rigorously tested by ULC and element[™] to ensure that we can provide a **best in class** RADON Control solution to the Canadian Construction Market.

Radon Gas Barrier Performance

CUFCA worked with CCMC to develop an Industry first technical guide specifically outlining the requirements of testing to prove the performance of these superior products as an effective Radon Control System. This Master Format (07 26 23.01) guide was initially funded by CUFCA. Our recently issued ULC Evaluation Report (ULC ER-R40284) can be requested for complete details on the systems use.

CUFCA has specific installation requirements and site testing and evaluation reporting requirements that our Contractors must meet in order to complete the installations and meet our applicable standards and more importantly our CUFCA Field Quality Assurance Program (FQAP).

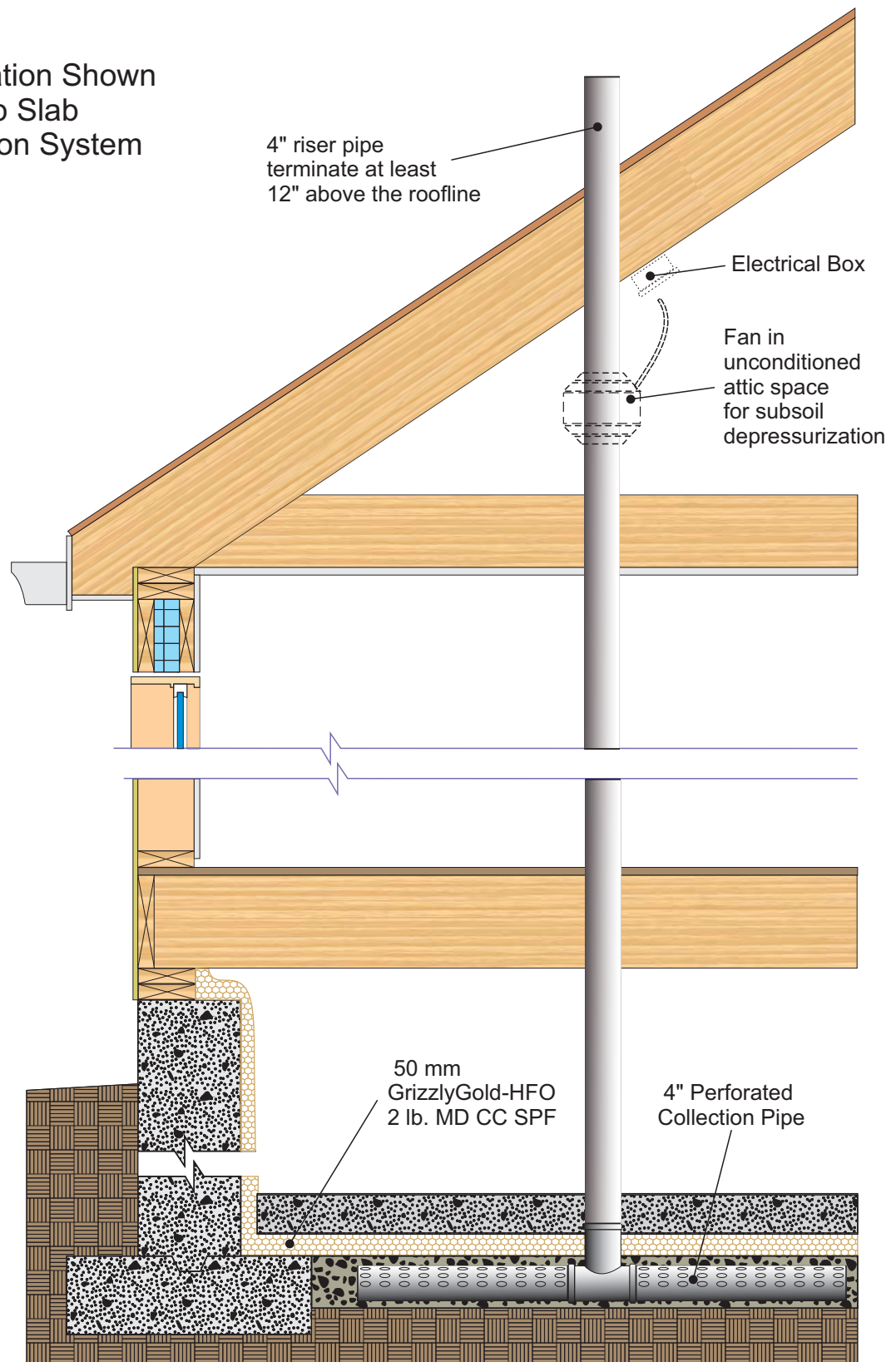
For more information visit www.cufca.ca



New Construction

Effective Thermal, Vapour, Air, and Radon Gas Barrier in a single monolithic application process

Typical Detail:
Interior Application Shown
with Active Sub Slab
Depressurization System



CUFCA RCS[®] ULC Approved System is the solution for a Comfortable, Safe, Dry and Durable Basement living space.

A conventionally constructed basement is a high-humidity environment, prone to issues of mold and mildew development. The CCMC Listed SPF systems offered by our manufacturer members and installed by our CUFCA Licensed Installers are proven moisture resistive materials and have been tested by EXOVA to ISO 15148:2002 for water performance. These SPF products will not grow mold and are not a food source for bacteria. Numerous studies have shown that 2 lb. CC MD SPF is the ideal insulation for flood zones. The SPF will remain in place even after flood. The foam does not degrade and once dry will recover all of their physical properties.

The use of the CUFCA RCS[®] under the slab and on foundation walls saves time and provides a cost effective, high performance, multiple control layer, durable membrane.

CUFCA, established in 1984, is the Industry leading Not-for-Profit trade association and Certification Organization to the Canadian Spray Foam Marketplace. CUFCA has over 400 Contractors in Canada with over 750 Licensed Installers. CUFCA members continue to support and invest in meaningful Research and Development in Spray Foam materials that will result in extending our application range in the Construction Industry.

References

1. CMHC (July 2004) - Performance of spray polyurethane foam on indoor foundation walls. Research highlights. Technical Series 04-118
2. CCMC Listing Report 14133-L for our tested product Grizzly Gold-HFO covered by this CUFCA RCS[®] ULC Report ER-R40284
3. Honeywell. Closed-Cell Spray Foam: A better building technology. Severe Weather FEMA. (August 2008). Flood damage- Resistant Materials Requirements. Technical Bulletin #2. FEMA. (December 2010). Home Builder's Guide to Coastal Construction. Technical factsheet series. FEMA P-499 SCHL. (1999). Basement walls that dry quickly. Research Highlights. Technical series 99-109
4. NRC/CNRC Technical Guide Master Format 07 26 23.01, Medium Density Spray Polyurethane Foam Insulation for Soil Gas (Radon) Control beneath Concrete Slabs-on-Ground.
5. ELEMENT Test Report 20-006-221666 Rev01, 5 pages, 4 Appendices in support of CUFCA ULC-ER-R40284
6. CUFCA RCS[®] Training and Installation Guide (008-261 rev.3 09/01/2021).
7. CUFCA FQAP Field Quality Assurance Program (008-155 rev.4 09/01/2021)
8. CMHC. ISBN: 0-662-25909-2 Radon: A guide for Canadian Homeowners
9. Swinton, M.C.; Bomberg, M.T.; Maref, W.; Normandin, N.; Marchand, R.G. - In-Situe Performance Evaluation of Exterior Insulation Basement System (EIBS) Spray Polyurethane Foam. Institute for Research in Construction, NRC/CNRC Ottawa, 2000 (A-3132.3)
10. National Building Code of Canada 2010, 2015