
Soil Gas Mitigation Program

Due to the recent release of Health Canada Radon Testing Study in Niagara Region, Radon was found to be above World Health Organization guideline levels in 10% of tested structures and 2% of these structures were above the Canada Health guidelines.

In Niagara Region, several sampling studies have been done to assess radon levels. It is estimated that 13.3% of lung cancer deaths in Niagara Region are due to radon. Further, 5-10 deaths per year could be prevented through radon remediation to Health Canada or WHO standards, with further lives saved if radon levels are reduced even further.⁴

Residential Construction Requirements

The City of Welland is addressing radon gas in new low-rise residential dwellings through its Soil Gas Mitigation Program. All building permit applications for new construction and additions to low rise residential buildings in the City of Welland are required to incorporate radon gas mitigation construction requirements in compliance with the Ontario Building Code. This program applies to all building permits applied for after June 30, 2023.

The following are the options as per Ontario Building Code Section 9.13.4.1. and Supplementary Standard SB-9. Building permit drawings shall clearly indicate details associated with one of the three radon mitigation options in accordance with the Building Code.

Option #1: Radon Ready

- a) Provide a minimum 100mm (4") of granular fill under the basement floor slab
- b) Rough-in a soil gas pipe in accordance with Supplementary Standard SB-9
- c) Mandatory radon gas testing

This option will provide for the future connection of an extraction system should it become necessary.

Option #2: Radon Gas Barrier

- a) Provide a minimum 100mm (4") of granular fill under the basement floor slab
- b) Provide a soil gas barrier on exterior foundation walls in accordance with Supplementary Standard SB-9
- c) Provide a soil gas barrier under the basement floor slab in accordance with Supplementary Standard SB-9
- d) Voluntary radon gas testing

This option will provide a barrier to soil gas ingress.

Option #3: Radon Extraction

- a) Provide a minimum 100mm (4") of granular fill under the basement floor slab
- b) Provide a soil gas pipe in accordance with Supplementary Standard SB-9
- c) Provide an active sub-slab depressurization system in accordance with Supplementary Standard SB-9
- d) Voluntary radon gas testing

This option will remove soil gases from under the floor slab before they can enter the home.

9.13.4.2. Required Soil Gas Control

- (1) Where methane or radon gases are known to be a problem, construction shall comply with the requirements for *soil* gas control in MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

9.13.4.2. Required Soil Gas Control

- (1) Except as provided in Sentence (2), all wall, roof and floor assemblies in contact with the ground shall be constructed to resist the leakage of *soil* gas from the ground into the *building*.
- (2) Construction to resist leakage of *soil* gas into the *building* is not required for,
 - (a) garages and unenclosed portions of *buildings*,
 - (b) *buildings* constructed in areas where it can be demonstrated that *soil* gas does not constitute a hazard, or

(c) *buildings* that contain a single *dwelling unit* and are constructed to provide for subfloor depressurization in accordance with MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(3) Where *soil* gas control is required, a *soil* gas barrier shall be installed at walls and roofs in contact with the ground according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(4) Where *soil* gas control is required, it shall consist of one of the following at floors in contact with the ground:

(a) a *soil* gas barrier installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control", or

(b) where the *building* contains a single *dwelling unit* only, a subfloor depressurization system installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

9.13.4.3. Material Standards

(1) Materials used to provide a barrier to *soil* gas ingress through floors-on-ground shall conform to CAN/CGSB- 51.34-M, "Vapour Barrier, Polyethylene Sheet, for Use in Building Construction".

SB-9 Requirements for Soil Gas Control

Section 1 Soil Gas Control in Masonry Walls

1.1. Sealing of Masonry Walls

- (1) Masonry walls required to provide a barrier to soil gas ingress shall
 - (a) include a course of masonry units without voids, or
 - (b) be sealed with flashing material extending across the full width of the masonry.
- (2) The masonry course or flashing described in Sentence (1) shall
 - (c) be located at the level of the adjoining floor and be sealed to it in accordance with Subsection 3.3., or
 - (d) in the absence of a floor, be located at the level of the ground cover required by Article 9.18.6.1. of Division B of the Building Code and be sealed to it.

Section 2 Soil Gas Control in Underground Roofs

2.1. Sealing of Underground Roofs

- (1) Waterproofing systems for roofs of underground structures shall be sealed to the soil gas barrier in the walls.

Section 3 Soil Gas Control in Floors

3.1. Soil Gas Barriers in Floors

- (1) Where the floor-on-ground is a concrete slab, the soil gas barrier shall be
 - (a) installed below the slab, or
 - (b) applied to the top of the slab, provided a separate floor is installed over the slab.
- (2) Where the soil gas barrier is installed below a slab-on-ground, joints in the barrier shall be lapped not less than 300 mm.
- (3) Where the soil gas barrier is installed above a slab-on-ground, joints in the barrier shall be sealed.
- (4) Where installed in conjunction with a framed floor-on-ground, the soil gas barrier shall be installed in accordance with Articles 9.25.3.2. and 9.25.3.3. of Division B of the Building Code.

3.2. Providing for Subfloor Depressurization

- (1) Except as required in Sentence (3), granular material shall be installed below the floor-on-ground according to Sentence 9.16.2.1.(1) of Division B of the Building Code.
- (2) A pipe not less than 100 mm in diameter shall be installed vertically through the floor, at or near its centre, such that
 - (a) its bottom end opens into the granular fill described in Sentence (1), and
 - (b) its top end will permit connection to depressurization equipment.
- (3) The granular material described in Sentence (1), near the centre of the floor, shall be not less than 150 mm deep for a radius of not less than 300 mm centred on the pipe described in Sentence (2).
- (4) The upper end of the pipe described in Sentence (2) shall be provided with a removable seal.
- (5) The pipe described in Sentence (2) shall be clearly labelled to indicate that it is intended only for the removal of soil gas from below the floor-on-ground.
- (6) Except as provided in Sentence (8), when a building constructed in accordance with Sentences (1) to (5) is complete, testing shall be conducted according to HC Pub. 4171, "Guide for Radon Measurements in Residential Dwellings (Homes), 2008", to determine the radon concentration in the building.
- (7) A copy of the results of testing required in Sentence (6) shall be provided by the building owner to the authority having jurisdiction.
- (8) The testing required in Sentence (6) shall include basement concentration measurements.
- (9) Where the average annual radon concentration determined as described in Sentences (6) and (8) exceeds 200 Bq/m³ in the normal occupancy area, a subfloor depressurization system shall be installed to reduce the radon concentration to a level below 200 Bq/m³ in the normal occupancy area.
- (10) Where a subfloor depressurization system is installed,
 - (a) makeup air shall be provided as specified in Article 9.32.3.8. of Division B of the Building Code, and

(b) measures shall be taken to ensure that any resultant decrease in soil temperature will not adversely affect the foundation.

3.3 Sealing of the Perimeter and Penetrations

- (1) A floor-on-ground shall be sealed around its perimeter to the inner surfaces of adjacent walls using flexible sealant.
- (2) All penetrations of a floor-on-ground by pipes or other objects shall be sealed against soil gas leakage.
- (3) All penetrations of a floor-on-ground that are required to drain water from the floor surface shall be sealed in a manner that prevents the upward flow of soil gas without preventing the downward flow of liquid water.

Notes to SB-9 Soil Gas Barriers:

There are two principal methods of excluding soil gas:

- Sealing the interface between the soil and the occupied space, so far as is reasonably practicable.
- Ensuring that the pressure difference across the soil/space interface is positive (i.e., towards the outside) so that inward soil gas flow through any remaining leaks will be prevented.

Soil Gas Mitigation Program

Radon is a colourless, odourless and tasteless gas that is formed naturally by the radioactive breakdown of uranium contained in soil and rock. Radon usually escapes from the ground into the air where it mixes with fresh air resulting in concentrations too low to be of concern. However, when radon enters an enclosed space such as a building, it can accumulate to higher concentrations, and the only way to know is to test.

[Health Canada guidelines](#) dictate that radon gas concentrations above 200 Becquerel's per cubic metre (Bq/m³) require remediation. As such, this program requires an Owner to install a sub-slab depressurization rough-in soil gas pipe and perform mandatory radon gas testing when constructing a new low-rise residential dwelling.

Construction Requirements

The following minimum rough-in requirements are to be constructed on site *see figures 6a and 6b*:

1. A pipe not less than 100mm in diameter installed at or near the center of the floor slab and extending to an exterior wall for future subfloor depressurization installation (where required),
2. Minimum 150mm granular material for a radius not less than 300mm centered on the pipe, with the bottom of the pipe open to the granular, and
3. The upper end of the pipe shall be provided with a removable seal and labeled to indicate for "soil gas removal only".

Required Inspections

The owner of a property on which construction takes place or their authorized agent shall arrange for the following inspections:

1. The installation of the rough-in soil gas pipe, and granular material prior to pouring the basement slab, and
2. Sealing of the perimeter of the slab adjacent to the foundation wall and any slab penetrations prior to covering.

Testing

With respect to both existing buildings and new construction, it is the Owners responsibility to conduct the radon test to determine the radon concentration in the building, including basement concentration levels, and submit the results to the City of Welland at All radon testing will consist of long-term tests (minimum 91 days)

completed during the winter season when windows and doors are generally closed. Test should be carried out by a [Canadian National Radon Proficiency Program \(C-NRPP\)](#) certified professional, or by use of and following the directions in the radon testing devices supplied (at cost) by Niagara Region Public Health.

Results

The following is required where radon gas testing results come back over 200 Becquerel's per cubic metre (Bq/m³):

1. The Owner is responsible for mitigation and installation of a subfloor depressurization system.
2. Measures shall be taken to ensure that any resultant decrease in soil temperature will not adversely affect the foundation, documentation shall be provided by a Professional Engineer.
3. After installation the Owner is to submit testing results indicating levels below 200 Becquerel's to City of Welland Building Division for file closure.

Health Canada recommends that you hire a professional certified under the Canadian National Radon Proficiency Program (C-NRPP) as lowering radon levels in a home requires specific technical knowledge and skills to ensure the job is done properly.

To find a list of certified professionals contact the Canadian National Radon Proficiency Program (C-NRPP) at 1-855-722-6777, visit www.c-nrpp.ca or email radon@hc-sc.gc.ca.

Tarion Warranty

All new homes in Ontario come with a new home warranty that is provided by your builder and backed by [Tarion](#). This warranty also covers excessive radon gas levels in new homes.

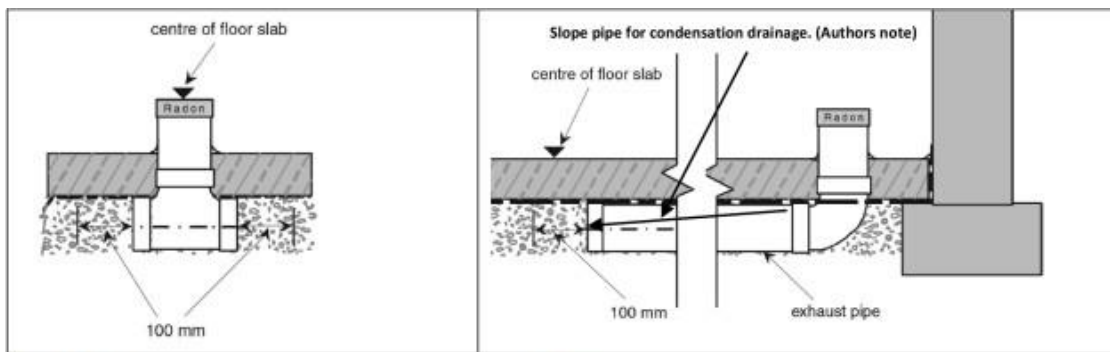


FIGURE 6a

FIGURE 6b

SUB-SLAB DEPRESSUIZATION ROUGH-IN. – Radon – Reduction Guide for Canadians _ Information for Canadians on How to Reduce Exposures to Radon, Health Canada 2013. p. 29