

Building Standards Advisory

Promoting construction of safe, healthy, habitable buildings

Radon

What is radon?

Radon is a naturally occurring radioactive gas that is produced by the decay of uranium-bearing minerals in rocks and soils and enters buildings through cracks in building foundations below ground level. During the decay, radioactive alpha particles are given off. These particles are detrimental to our health. Radon is odorless, tasteless and colorless.

The potential for high levels of radon infiltration is very difficult to evaluate prior to construction and thus a radon problem may only become apparent once the building is completed and occupied. *The National Building Code of Canada* (NBC) 2015 Part 9 requires the application of certain measures in all dwellings.

These measures are:

- low in cost;
- easy to install at time of construction; and
- provide other benefits.

The principal method of limiting radon from entering a home is to seal all potential points where radon can enter.

Compliance with *The Uniform Building and Accessibility Standards Act, Regulations, and the National Building Code of Canada (NBC) 2015* is addressed in this advisory. Words in italics, other than Act and Regulation titles, are defined in the NBC 2015.

What is the concern?

Radon gas breaks down or decays to form radioactive elements that can be inhaled into the lungs. While in the lungs, the process of decay continues creating radioactive particles that release small bursts of energy. This energy is absorbed by nearby tissue, damaging the cells. When damaged cells reproduce, they may cause cancer.

Health Canada provides the following information with respect to radon:

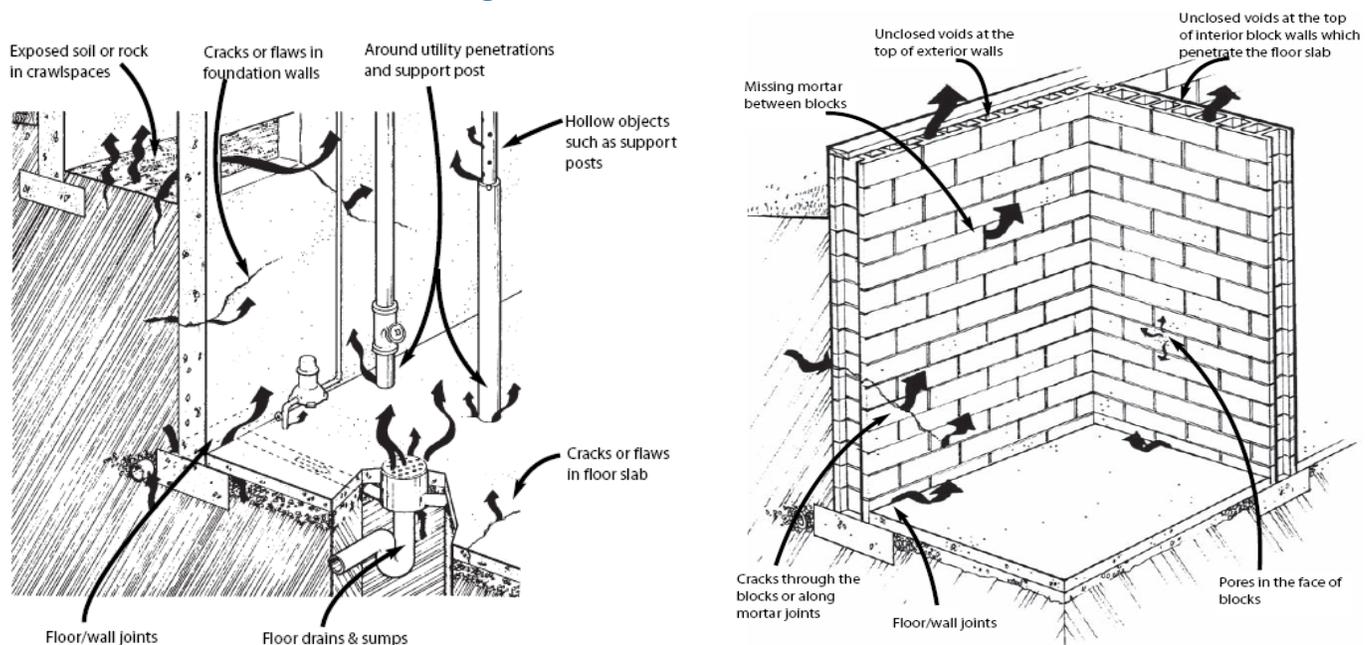
- 52 per cent of exposure of radon gas comes from inhalation.
- Its estimated that 16 per cent or 1,900 lung cancer deaths per year are related to radon.
- More time is spent indoors and the use of basement space has increased.
- Certain geographical areas are known for high risk of radon in the ground.

In 2007, Health Canada reduced the permissible radon level from 800 Bq/m³ to 200 Bq/m³, making the Canadian guideline on radon more stringent.

In Saskatchewan, a March 2012 'Cross-Canada Survey of Radon Concentration' by Health Canada revealed the raw percentage of homes testing above the current acceptable radon guidelines ranged up to 25.5 per cent. The survey confirmed that Saskatchewan is among the provinces with the highest recorded percentage of indoor radon levels.

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How does radon enter a building?



Source: Radon – A Guide for Canadian Homeowners published by Canada Mortgage and Housing Corporation (CMHC)

Some examples of how radon can penetrate include:

- cracks in walls
- open perimeters between slabs and walls
- pipes
- openings to unprotected soil
- unsealed floor drains
- gaps between masonry blocks

Are there Codes which address radon in new construction? (refer to Appendix B for design references)

The NBC 2015 contains requirements for radon gas mitigation systems for new buildings which has been in force in Saskatchewan for new construction on May 1, 2013.

Article 9.13.4.2. - Protection from Soil Gas Ingress

- 1) All wall, roof and floor assemblies separating *conditioned space* from the ground shall be protected by an *air barrier system* conforming to Subsection 9.25.3. (Air Barrier System Properties)
- 2) Unless the space between the *air barrier system* and the ground is designed to be accessible for the future installation of a subfloor depressurization system, *dwelling units* and *buildings* containing *residential occupancies* shall be provided with the rough-in for a radon extraction system conforming to Article 9.13.4.3.
- 3) Where *buildings* are used for *occupancies* other than those described in Sentence (2), protection from radon ingress and the means to address high radon concentrations in the future shall conform to
 - a) Article 9.13.4.3., or
 - b) Parts 5 and 6 (see Article 5.4.1.1. and 6.2.1.1.). (See Note A-9.13.4.2.(3).)



Article - 9.25.3.2. Air Barrier System Properties

- 2) Where polyethylene sheet is used to provide airtightness in the air barrier system, it shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."

Article 9.13.4.3. - Providing for the Rough-in for a Subfloor Depressurization System

- 1) Floors-on-ground shall be provided with a rough-in for subfloor depressurization consisting of
 - a) a gas-permeable layer, an inlet and an outlet as described in Sentence (2), or
 - b) clean granular material and a pipe as described in Sentence (3).
- 2) The rough-in referred to in Clause (1)(a) shall include:
 - a) a gas-permeable layer installed in the space between the air barrier and the ground to allow the depressurization of that space,
 - b) an inlet that allows for the effective depressurization of the gas-permeable layer (see Note A-9.13.4.3.(2)(b) and (3)(b)(i)), and
 - c) an outlet in the *conditioned space* that
 - i) permits connection to depressurization equipment,
 - ii) is sealed to maintain the integrity of the *air barrier system*, and
 - iii) is clearly labeled to indicate that it is intended only for the removal of radon from below the floor-on-ground.
- 3) The rough-in referred to in Clause (1)(b) shall include
 - a) clean granular material installed below the floor-on-ground in accordance with Sentence 9.16.2.1.(1), and
 - b) a pipe not less than 100 mm in diameter installed through the floor, such that
 - i) its bottom end opens into the granular layer required Clause (a) at or near the centre of the floor and not less than 100 mm of granular material projects beyond the terminus of the pipe measured along its axis (see Note A-9.13.4.3.(2)(b) and (3)(b)(i)),
 - ii) its top end permits connection to depressurization equipment and is provided with an airtight cap, and
 - iii) the pipe is clearly labeled near the cap and, if applicable, every 1.8 m and at every change in direction to indicate that it is intended only for the removal of radon from below the floor on the ground.

What can an owner do for existing homes and buildings? (refer to Appendix 'A' for a checklist)

How do you remove high levels of radon?

If tests find a high level of radon, a contractor competent in radon remediation can reduce radon gas infiltration by:

- sealing cracks in all surfaces (foundation walls and basement floors) in contact with the soil; and
- providing sub slab depressurization and venting to reduce the level of radon below the basement floor slab or from crawl spaces.

What to do if you suspect or want to have your building tested for radon?

- Health Canada recommends that all homes be tested for radon levels.
- You can hire a qualified tester to do the test, or you can use a do-it-yourself test kit. You can buy radon test kits on the internet or from home improvement stores. You can also contact the SRC Environmental Analytical Laboratories at the Saskatchewan Research Council for advice and test kits by contacting 1-800-240-8808 or analytical@src.sk.ca. There are two types of tests. Both measure radon levels in the air.

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- The **short-term test** kit stays in your home or office for 2 to 90 days. Radon levels vary daily and from season to season. So you may want to follow up the first short-term test with a second test.
- The **long-term test** kit stays in your home or office for more than 90 days. A long-term test will give more accurate results.

If you have questions about radon in your house, you can get help from the Canada Mortgage and Housing Corporation by calling 1-800-668-2642.

Radon Information Links

- CMHC Guide
website: https://eppdscrmssa01.blob.core.windows.net/cmhcprodcontainer/sf/project/archive/publications_2/61945_22_11_2010.pdf
- Health Canada - Environmental and Workplace Health
website: <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/radon/take-action-on-radon.html>
- Saskatchewan Research Council – Radon Testing
Website: <https://www.src.sk.ca/services/radon-testing>
- The Lung Association – Saskatchewan
Website: <https://www.lungsask.ca/>
Email: info@sk.lung.ca
Tel: 1-306-343-9511
- U.S. Environmental Protection Agency
Website: <http://www.epa.gov/radon>



Appendix 'A'

Radon Gas Mitigation System Checklist	✓	X
<p>Existing Homes</p> <ul style="list-style-type: none"> • Has the home in question been tested for radon gas where tests reveal that levels are higher than 200 Bq/m³? <input type="radio"/> • If testing has occurred and it was revealed that the radon gas concentration is under 200 Bq/m³ then, a mitigation system would not necessarily be warranted. <input type="radio"/> 		
<p>New Homes (constructed after May 1, 2013)</p> <ul style="list-style-type: none"> • New homes are required by Code to have a radon gas mitigation system roughed-in. The following three questions are to verify components of the system that should be present (Refer to Appendix 'B' for design clarification) • Is there a roughed-in radon gas mitigation system installed under the basement floor slab (should be capped off and clearly labelled)? <input type="radio"/> • Does the mitigation system have pipes that are a minimum of 100 mm (4 inches) in diameter? (NBC 2015, Div. B, Article 9.13.4.3.) <input type="radio"/> • Is there a minimum of 100 mm (4 inches) of granular material under the foundation slab? (NBC 2015, Div. B, Article 9.13.4.3.) <input type="radio"/> <p>NOTE: If your home was constructed after May 1, 2013, and components of the radon mitigation system are not able to be located, contact your local authority for further direction.</p>		



Appendix 'B'

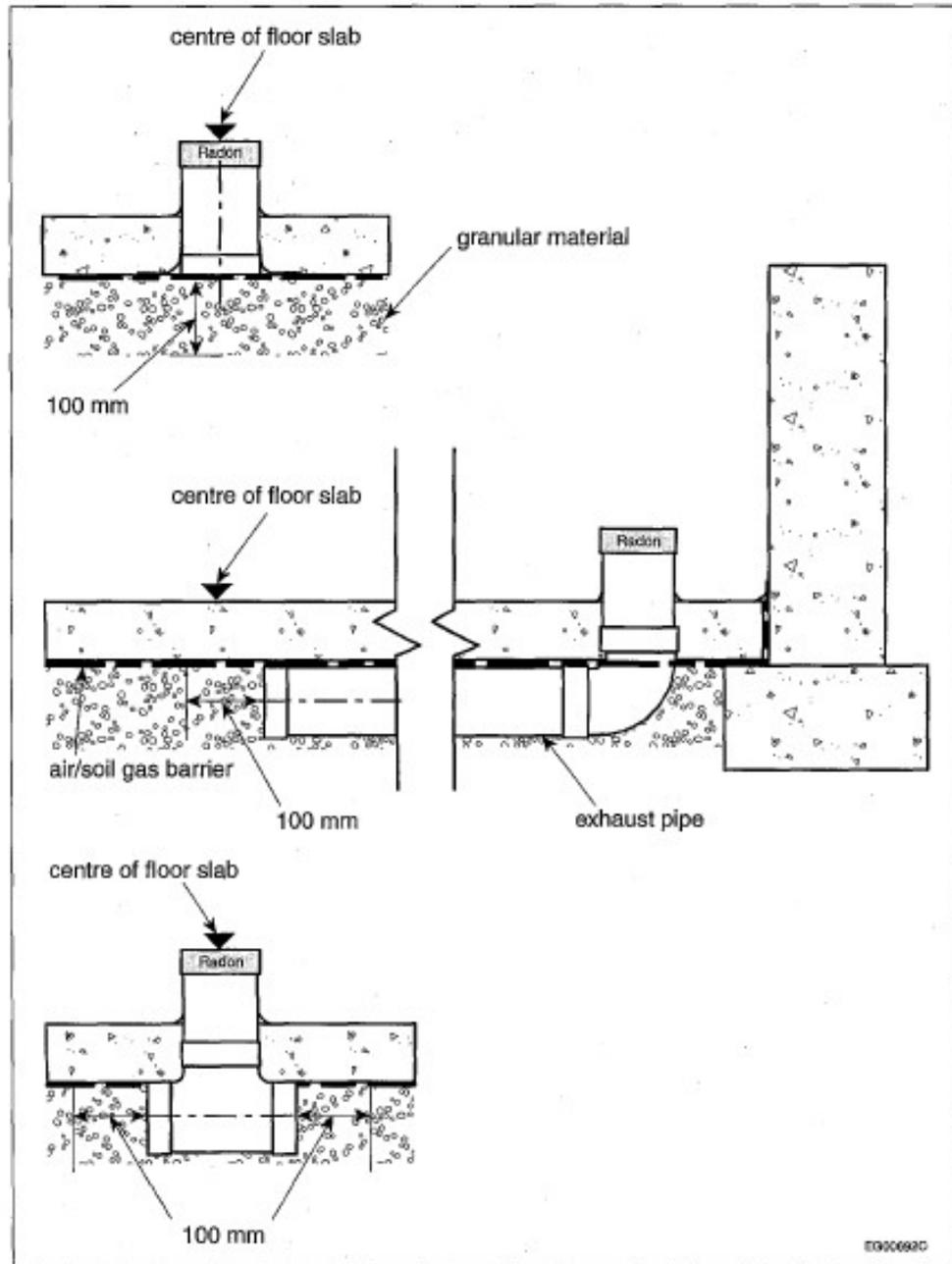


Figure A-9.13.4.3.(2)(b) and (3)(b)(i)
Acceptable configurations for the extraction opening in a depressurization system

Source: National Building Code of Canada 2015 Edition

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<p>This advisory is published by the Saskatchewan Ministry of Government Relations for purposes of providing information to users on the topic contained herein. In case of conflict between <i>The Uniform Building and Accessibility Standards Act</i> (the UBAS Act) and Regulations, and the National Building Code 2015 (NBC 2015) and this advisory, provisions of the UBAS Act, Regulations, and the NBC 2015 shall apply.</p>	