

FAST FACTS

Radon - Bill 11 Update

Bill 11 is proposed legislation titled **Radon Awareness and Prevention Act, 2014**. It has currently passed the second reading. If enacted employers will be required to monitor for radon levels in any workplace in Ontario.

This proposed legislation includes articles that would require the province to:

- educate the public about radon gas exposure;
- promote the measurement of radon levels in residential dwellings;
- require the province to measure radon levels in every provincially owned building;
- require building owners to measure radon levels in every workplace;
- to take steps to remediate the exposure levels to levels below guidelines; and
- amend the Building Code Act to require any dwelling be constructed to minimize radon entry and facilitate post-construction removal

What is Radon

Radon is a colourless, odourless radioactive gas found naturally in the environment. It is produced by the natural breakdown of uranium commonly found in Ontario soils and rocks.

As a gas, Radon can easily move through small spaces in soils and other materials, allowing it to enter buildings. If radon enters an enclosed or poorly ventilated space in a building, it can accumulate to levels that can pose a risk to health.

Risk factors from exposure

Exposure to radon increases the risk of developing lung cancer. This has prompted concern that radon levels in some Ontario homes, workplaces and buildings may pose a health risk. The level of the risk depends on the amount of radon present, the length of time you are exposed and whether or not you smoke.

Radioactivity - a Review

The periodic table identifies over one hundred distinct elements. These elements (atoms) are composed of protons and neutrons (which make up the nucleus) plus orbiting electrons described as probability clouds around the nucleus.



Helium is an element and is sometimes represented as He⁴. The nucleus of Helium contains 2 protons and 2 neutrons, resulting in an atomic mass of 4 (superscript).

Radioactivity or radioactive decay is a process where an unstable element loses energy by spontaneously emitting ionizing radiation. There are 3 types of ionizing radiation (alpha (α), beta (β), and gamma (γ)). Thus there are many types of radio-active decay (combinations) and some of these energy releases result in a nuclear **transmutation**. This means that the parent radioisotope is a completely different element than the daughter.

Radium-226 is a radioactive element (created by a series of nuclear transmutations starting from Uranium-238). In addition to beta and gamma emissions, many parent elements will also undergoes radioactive transmutation by ejecting a Helium nucleus (2 protons and 2 neutrons (alpha particle)). Radium-226 undergoes radioactive decay by emitting a helium nucleus. The result is a atom with an atomic mass that has been reduced by a weight of 4. The new element is Radon-222. Radon-222 is also an alpha emitter and the transmutations continue to a stable isotope of Lead (Pb-206)

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What does the term “Half-Life” (λ) mean?

Radioactive disintegrations occur at different rates for different elements. Half life is the amount of time it takes for half of the original concentration to disappear.

$$C_n = C_o e^{-\lambda T}$$

The half life for Radon-222 is 3.82 days. The half-life of an element is typically represented by the Greek letter Lambda (λ).

Radon and the daughters are easily absorbed on to dust particles in the atmosphere which may be deposited on the epithelial cell that line the respiratory tract when contaminated air is breathed

The radioactive daughters are characterized by relatively short half lives and release a significant amount of ionizing radiation (76% of the total irradiation is from the daughters).

The ionizing radiation impacts on the lungs and respiratory tract increase the risk of lung cancers.

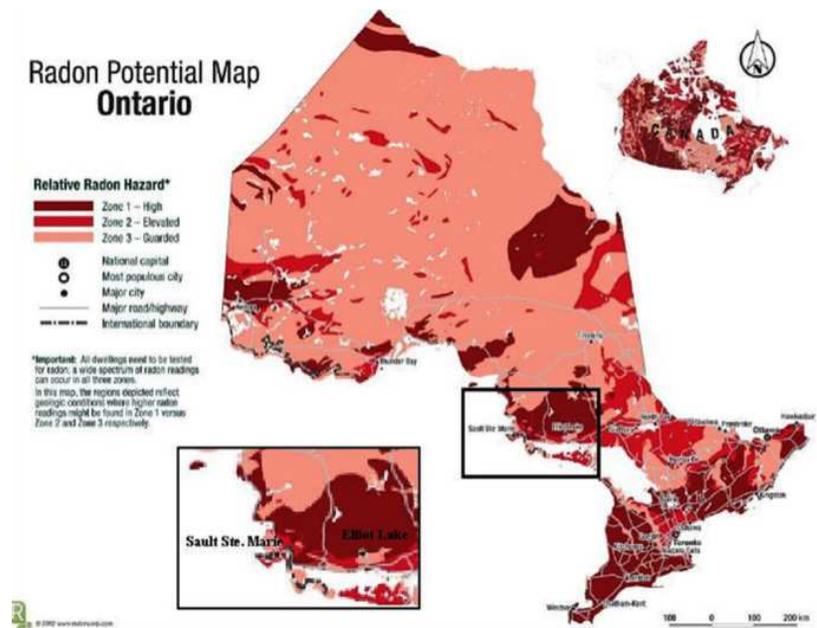
It is estimated that about 16% of all lung cancers in Canada are related to radon exposure.

Radon gas is approximately 7 to 8 times heavier than air and will tend to accumulate in low, poorly ventilated areas, such a crawl spaces or basements. Radon is sparingly soluble in water.

Health Effects

The health effects related to radon exposure occur as a result of long term exposures (chronic). In most low level exposures the latency period for health effects is years or even decades.

WHERE IS IT FOUND



Building Code Requirements

In 2010, National Building Codes required new homes to have a ‘roughed-in’ vent under the foundations and a vapor barrier to reduce the radon entry

- Bill 11 proposes change to Section 34 of the Building Code Act and will require *“any building that will be used as a dwelling to be constructed in a manner and using materials that minimize radon entry and facilitate post-construction radon removal;”* and require building owners to measure radon levels in every workplace;

Exposure Guideline Limits

The current Canadian target guideline for Radon levels within a home are 200 Bq/m³ (Becquerel). By definition, one Becquerel is 1 disintegration per second. Action should be considered for any location where the levels exceed the guidelines illustrated below.



200 - 600 Bq/m³
fix your home
within 2 years



Above 600 Bq/m³
fix your home
within 1 year

Various types of Passive Radon Dosimeters can be used over a time period from 3 days to as much as one year to sample the indoor condition. A photo of one type of radon dosimeter is shown below.



Alternately a Radon Measurement and/or a Mitigation Specialist can provide these services.

Minimizing the Risks

The first step is to arrange for testing appropriately and immediately if you are in a high radon exposure risk area. Various devices may be used including alpha track detectors, electret ion chamber detectors and charcoal/liquid scintillation. Do it yourself kits are available at reasonable costs. It is critical to follow the directions that come with your sampling kit.

Radon typically enters a building through the foundation and crawl spaces. Preliminary remedial actions may include:

- Increasing the ventilation in the area
- Sealing cracks and openings in walls and floors,
- Minimizing air infiltration around pipes and drains.

These actions can significantly reduce the radon levels in your home or workplace.

Summary

Workplaces that are located in poorly ventilated areas or basements could have high radon levels depending on the location in Ontario. Employers should assess the radon exposure potential to workers under their care. Regardless of the changes to legislation, radon can cause adverse health effects after prolonged exposure.