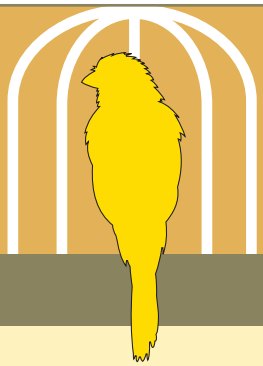
Radon

HEALTH AND SAFETY FACT SHEET

CUPE Canadian Union of Public Employees



What is radon?

Radon is a chemically inert, naturally occurring radioactive gas. It is odourless, colourless and tasteless. Radon is produced from radium which occurs as part of the decay chain of naturally occurring uranium in the soil. Though most commonly thought of when talking about nuclear power, uranium is a natural element found in small amounts in rocks and soil all over the world. The amount of uranium that is present can be very different depending on the makeup of the soil, but it's usually not higher than a few parts per million. As uranium decays, a portion of it becomes radium, which in turn degrades and is released as radon gas. As a result, some amounts of radon gas are present everywhere in soil, water and air.

Radon gas escapes from the ground into the air and eventually further breaks down. The breakdown of radon gas also releases alpha radiation. Though generally harmless (alpha particles cannot penetrate skin), problems do arise when the solid particles are inhaled into the lungs where the alpha radiation interacts with lung tissue.

Radon gas can be found in indoor air and can accumulate in confined air spaces that are not well ventilated, such as basements and crawl spaces. While most commonly advertised as a residential problem, the risk of exposure in occupational settings is also present when working on the ground level of poorly ventilated areas.

What are the health effects of radon?

Radon has been classified by the International Agency on the Research of Cancer (IARC) as a Group 1 carcinogen, meaning that it is known to be carcinogenic to humans. According to the World Health Organization (WHO), radon is the most important cause of lung cancer after smoking , and Health Canada estimates that it accounts for 3300 deaths annually. The route of the cancer occurs as the radon is inhaled and particles are deposited in the lungs. The solid particles continue to emit radiation for a short time (around several days). Lung tissue is not as resilient as skin tissue, and it absorbs the alpha particles emitted from the radon. Since alpha particles cannot penetrate more than a fraction of a millimeter into the tissue, the damage is confined to the lung tissue in the immediate area. The resulting radiation dose can damage DNA and increase the risk of lung cancer. Research has also determined that cigarette smoke exposure has a compounding effect, further increasing the likelihood of cancer.

How does exposure occur?

The presence of uranium in soil and rock is an important indicator of places where radium and radon can be present. Radium in the soil directly under a building is normally the major source of indoor radon (less important sources of radium are ground water and building materials). Concrete floors and walls in basements slow down the movement of radon from the soil into buildings. However, radon gas may enter workplaces through openings such as cracks and gaps at concrete floor-wall junctions, small pores in hollow-block walls, and through sumps and drains. Consequently, radon levels are usually higher in basements, cellars or other structural areas in contact with soil.

Indoor radon concentrations are almost always higher than outdoor concentrations. Once inside a building, radon cannot easily escape, especially in areas where ventilation is not a priority. The design of modern buildings to conserve energy reduces the intake of outside air and worsens the situation. Radon levels are generally highest in cellars and basements because these areas are nearest to the source and are usually poorly ventilated.

The concentration of radon – and radon in indoor air – depends on:

- The amount of radium in the soil, and
- The ease with which the radon that the radium produces can move through soil and building walls where it can then mix with indoor air.

Because radon is a gas, changes in the atmospheric pressure also affect its emission from the ground and its accumulation in indoor air.

How is radon detected?

Testing for radon is quite simple and fairly inexpensive. There are two methods for testing. Since the amount of radon can vary from day to day (due simply in changes in weather patterns and atmospheric pressure), Health Canada recommends that testing be performed over a longer period of time (weeks or months) for a more accurate result. Inexpensive testing kits are available at most home supply stores. These kits frequently use passive collection equipment that are placed in the suspected location and collected when the testing is complete. The passive container is then sent back to the company's lab for the final radon level determination.

Understand exposure levels

In Canada (and most other countries), the concentration of radon in the air is measured in units of *becquerels per cubic meter* (Bq/m^3). Outdoor levels are usually around 20 Bq/m^3, and the average dwelling usually has a level around 60 Bq/m^3. Health Canada has set the "action level" at 200 Bq/m^3. However, radon readings lower than 200 Bq/m^3 can still pose a risk to health, especially if the exposed individual is – or has been – a smoker.

The WHO notes that the risk of lung cancer increases by 16 percent per 100 Bq/m^3 increase in long-term average radon concentration. In short, the risk of lung cancer increases proportionally with increasing radon exposure. As such, the WHO recommends keeping below the annual average concentration reference level of 100 Bq/m^3. Legal occupational exposure levels are not set in most provinces, and where they are, the resultant exposure levels would allow for exposure of up to 800 Bq/m^3 or higher. This should not be considered safe.

Reduce your risk

If levels of radon are found to be high at your workplace, your employer can take the following steps to reduce your exposure:

- Increase the ventilation to allow an exchange of air (proper air filtration can reduce radon by up to 90%)
- Seal all cracks and openings in foundation walls and floors, and around pipes and drains
- Paint basement floors and foundation walls with two coats of polyurethane paint and a sealant
- Ventilate the basement sub-flooring by installing a small pump to draw the radon from below the concrete slab to the outside before it can enter the workplace
- Renovate existing basement floors, particularly earth floors, and
- Install a positive pressurization or positive supply ventilation system.

FIND MORE RESOURCES: cupe.ca/health-and-safety

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