



Radon Testing in the Workplace Webinar Q&A

These are questions we did not get the opportunity to answer during the webinar. Please note, the answers below are based on our readings and experience and are not legal or medical advice.

Q: This problem about radon has lingered for years; is there no way this could be avoided?

A: Radon is natural, and we have always been exposed to it. Construction techniques did not account for it (because they didn't know about it) and inadvertently concentrated radon in some homes. There is no way to get rid of it entirely since it occurs naturally, but now that we know the harm, we have come up with ways to mitigate it. It's like UV from the Sun. We've always lived with it; we recently understood its harms; it's impossible to avoid entirely when outdoors; we have come up with ways to reduce the harms.

Q: How does one to convince upper management to agree to do radon testing even if it is not required by law?

A: It is a possible workplace carcinogen, so the requirement for testing and mitigation could be argued to fall under general duty occupational health and safety legislation when it is not explicitly mentioned. Good places to start the conversation are with upper management, the joint health and safety committee, and/or the union, if applicable.

Q: What are the concerned areas for radon?

A: Geographically speaking, there are certain areas of the country known to have higher levels of U-238 in the soil. Health Canada completed a study of radon levels across the country and published the results in 2012: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/cross-canada-survey-radon-concentrations-homes-final-report-health-canada-2012.html>. The Canadian – National Radon Proficiency Program (C-NRPP) maintains a map of radon levels from their testing programs: <https://c-nrpp.ca/radon-map/?center%5B%5D=58.81374171570782¢er%5B%5D=-94.482421875&zoom=4>. Although these give an indication of where may be at a higher risk of being over the recommended limits, high levels of radon have been found in buildings across Canada. It is possible for two buildings side by side to have drastically different results, as the level does not depend on the geology alone. The only way to know if the levels are high is to test for it.

Q: What sort of workplaces seem to be most at risk? Are there certain facilities to be less at risk due to ventilation etc. i.e. commercial kitchen vs. a general office space.

A: To our knowledge, there have been no studies of this nature in Canada. In general, better air exchange tends to indicate lower levels of radon, but the only real way to know is to test.

Q: How should one measure/assess if there a risk of high radon levels?

A: Because workplace testing can be more complex than testing a residence, it is good practice to hire a radon testing professional. To ensure the company doing the testing is legitimate, please see <https://c-nrpp.ca/find-a-professional/> to find a registered professional.

Health Canada has a guide for measurement in public buildings, which are buildings which have a high occupancy rate for members of the public: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/guide-radon-measurements-public-buildings-schools-hospitals-care-facilities-detention-centres.html>. Guidance in the document could be extended to private workplaces.

On the topic of radon, the International Atomic Energy Agency (IAEA) also has the following publications available:

Safety Standard SSG-91: Protection of Workers Against Exposure Due to Radon:

<https://www.iaea.org/publications/15711/protection-of-workers-against-exposure-due-to-radon>

Safety Report 98: Design and Conduct of Indoor Radon Surveys: https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1848_web.pdf

Safety Report 33: Radiation Protection Against Radon in Workplaces Other Than Mines: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1168_web.pdf

Q: How can someone address the need to do radon testing in their workplace when they have transitioned to working from home?

A: You will need to check to see if the legislation around health and safety extends to your home workplace in your workplace jurisdiction (provincial/territorial OHS or Canada Labour Code). If so, it is a possible workplace carcinogen, so the requirement for testing and mitigation could be argued to fall under general duty occupational health and safety legislation when it is not explicitly mentioned. Good places to start the conversation are with upper management, the joint health and safety committee, and/or the union, if applicable.

Q: What are the most reliable detectors at present?

A: Please refer to the C-NRPP list of professional devices: <https://c-nrpp.ca/approved-radon-measurement-devices/>. These can be obtained through various testing providers, not just the company that produces or analyzes them. See <https://www.carst.ca/measurementprofessionals> to find a radon testing professional or <https://www.carst.ca/radonwebsales> for do it yourself tests. Because radon levels vary throughout the day and with the seasons, it is recommended to perform testing for greater than 90 days during the heating months, as that is when buildings tend to have fewer air exchanges with outside air.

Q: I worked with E-PERM® radon monitors in houses and offices. What are other options in Canada?

A: Alpha track and calibrated electronic radon monitors. See <https://c-nrpp.ca/approved-radon-measurement-devices/> for devices which have met the C-NRPP approval criteria for professional use.

Q: What are the best detectors for radon testing in water and soil?

A: Testing for radon in water or soil requires samples to be sent to a laboratory. If you search for companies in Canada which do this type of work, checking that they are a member of CARST (<https://c-nrpp.ca/find-a-professional/>) will ensure they are using accepted methods and equipment.

Q: What sort of testing program complies with NORM guidelines?

A: For those not familiar, the Canadian Guidelines for the Management of Naturally Occurring Radioactive Material (NORM) for overall guidance for all NORM. <https://www.canada.ca/en/health->

[canada/services/publications/health-risks-safety/canadian-guidelines-management-naturally-occurring-radioactive-materials.html](https://www.radiationsafety.ca/services/publications/health-risks-safety/canadian-guidelines-management-naturally-occurring-radioactive-materials.html) Section 4.2 is specific to radon concentration. Note that it is expected that Health Canada will soon be releasing a NORM guideline that focuses on radon.

The NORM Guidelines do not specify a methodology for conducting the testing. Hiring a C-NRPP registered professional or taking a C-NRPP certification course (<https://c-nrpp.ca/find-entry-level-courses/>) and passing their exam would provide reassurance that your testing is being performed correctly.

Q: What are steps that can be taken to identify and/or safeguard workers working on new construction projects including civil construction in which deep excavations are part of the scope and in areas where radon may be suspected or needs to be properly identified?

A: A place to start for an overall structure would be the Canadian NORM Guidelines linked in the previous answer. The next step would be to perform a risk assessment (https://www.ccohs.ca/oshanswers/hsprograms/hazard/risk_assessment.html), which would require that measurements to be taken, but also take into account factors unique to the work site.

Sidenote: RSIC has a course on NORM Awareness (<https://radiationsafety.ca/events/norm-awareness-training/>), which explains radioactivity, the health effects of ionizing radiation, NORM including radon, and the NORM guidelines.

Q: Please provide your insights on producing long term radon exposure levels for only the occupied hours at workplaces. What protocol is most accepted for normalization of occupied/non-occupied hours using short term CRMs after the long-term measurements? Any examples for implementing this analysis in large facilities with a large number of radon monitoring points would be useful. Thank you!

A: If a long-term passive test shows high results, Health Canada's Guide for Radon Measurement in Public Buildings Annex 1 (<https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/guide-radon-measurements-public-buildings-schools-hospitals-care-facilities-detention-centres.html#aa>) has information on follow-up measurements in HVAC controlled buildings using continuous radon monitoring (CRM).

Q: For office buildings with HVAC running 24 hours/day or have approximate 3 to 4 air exchanges per hour, is there any air monitoring data for radon correlated to continuous ventilation?

A: To our knowledge, there have been no studies of this nature performed in Canada.

Q: How should one act on any high results? What are the best ways to mitigate radon in the workplace? Are there any radon reductions systems?

A: Health Canada recommends that mitigation happen within 1 year if levels are above 800 Bq/m³ and within 2 years if between 200 and 800 Bq/m³. A common and effective method of mitigation is active soil depressurization (ASD), where the air beneath a building is removed before it can enter. Other methods include sealing the home to prevent soil gas entry and ventilation to dilute the indoor radon concentrations.

Q: How should one monitor any changes to the premise or its use and assess the need to retest?

A: Health Canada recommends short-term testing a minimum of 24 hours after completing mitigation activities, with long-term testing during the next heating season. They state that retesting should be

done every five years (<https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/guide-radon-measurements-public-buildings-schools-hospitals-care-facilities-detention-centres.html#ab2>).

The Canadian Association of Radon Scientists and Technologists recommends retesting homes every five years or sooner if major renovations occur (<https://www.carst.ca/StepsToReduceRadon>).

Q: How can a workplace manage the radon emitted from alpha emitter generators such as Pb-212 generators?

A: As a point of clarification, the isotope of radon which forms in the decay chain leading to Pb-212 is Rn-220 and not the Rn-222 that is part of the decay chain of U-238 found naturally in the soil. Rn-220 and Pb-212 are in the decay chain of Th-232. Rn-220 has different radiological properties than Rn-222, but chemically, they are the same. So, the principles of managing Rn-220 in the workplace would be the same, except you are the one generating it, not the soil, and you want to collect the progeny because one of them will be used as a radiopharmaceutical.

Because you need the radon to decay to lead, you want it to be well contained. If you ventilate the radon, there will be no radiopharmaceutical. Alpha particles will not be able to leave any structures which would contain the gas itself, but there may be justification to shield the gamma radiation produced from the decay of various progeny depending upon amounts.

Outside of the containment ventilation and continuous radon monitoring could be used to prevent the buildup of radon and give notification in the case of a failure of containment.

Q: Does the nature of building materials (eg. brick versus gyprock) play much of a role in contributing to radon levels? Or is this overwhelmed by contributions from earth and soil?

A: The contribution from the soil is usually the greatest. The amount of radon contributed by building materials varies, but this study by the Radiation Protection Bureau of Health Canada looks at drywall, marble, porcelain, ceramic, and slate. It concludes that, “[g]enerally speaking, building materials used in home decoration make no significant contribution to indoor radon for a house with adequate air exchange.” But it does note that without adequate air exchange, the radon exhalation rates from some of these materials are enough to noticeably contribute to elevated radon levels.

https://www.naturalstoneinstitute.org/default/assets/file/consumers/chen_etal_2010.pdf

Q: Could you comment on the cost of radon testing, i.e., annual budget for the radon testing program, typical testing for small employers, etc.

A: As the cost can vary across the country and complexity of the workplace, it is best to get quotations from professionals in your area. Please see <https://c-nrpp.ca/find-a-professional/>.

Q: What is the reference for current guidance for testing in a workplace building in Ontario (under Ontario jurisdiction)?

A: Please see “Key Legal Requirements” here: <https://www.ontario.ca/page/radon-workplace>. For other jurisdictions, please see <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/radon/action-guides/provinces-territories/policies-specific-locations.html>.

Q: How are buildings prioritized for testing? Would you use indicators like low/no air circulation, known water filtration, subgrade areas, etc.?

A: For one of the interview guests, relative risk of exposure to elevated radon levels was based on radon geological potential and soil permeability maps, Health Canada test data, and professional expertise. In later test cycles, we made minor adjustments to the priority list based on building foundation type, heating system type, and proximity to sites with known elevated levels – keeping in mind that adjacent buildings could have different radon levels.

Q: Are there online training courses in radon measurement and mitigation?

A: Yes. These can be found on the C-NRPP site at <https://c-nrpp.ca/find-entry-level-courses/>.