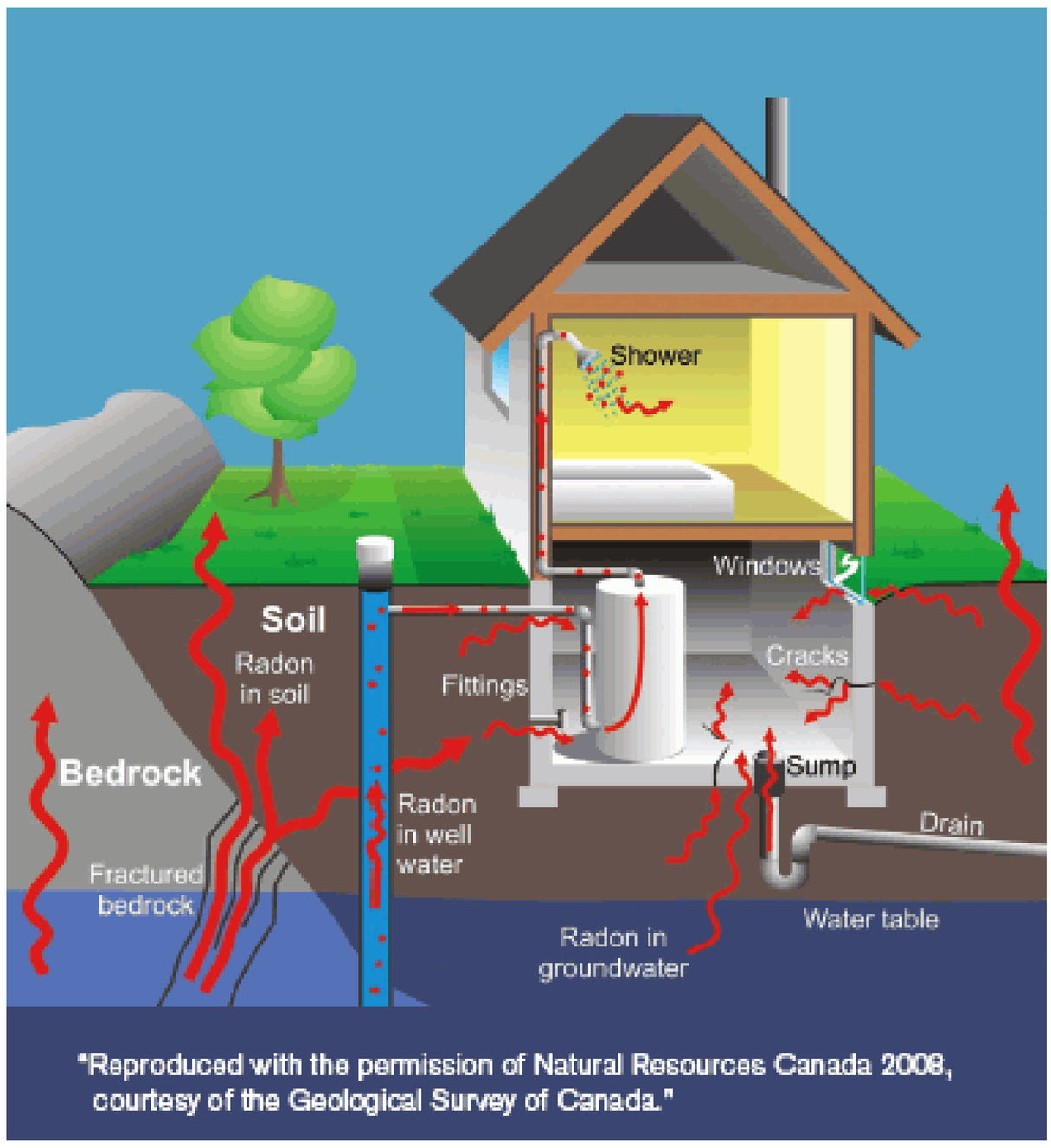
What is Radon?

Radon is a radioactive gas that is formed naturally by the radioactive breakdown of uranium in soil, rock and water. It cannot be detected by the senses, i.e., it is colourless and odourless; however, it can be detected with special instruments. Radon usually escapes from the ground into outdoor 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 high concentrations. The only known health risk associated with exposure to radon is an increased risk of developing lung cancer. The level of risk depends on the concentration of radon and length of exposure.

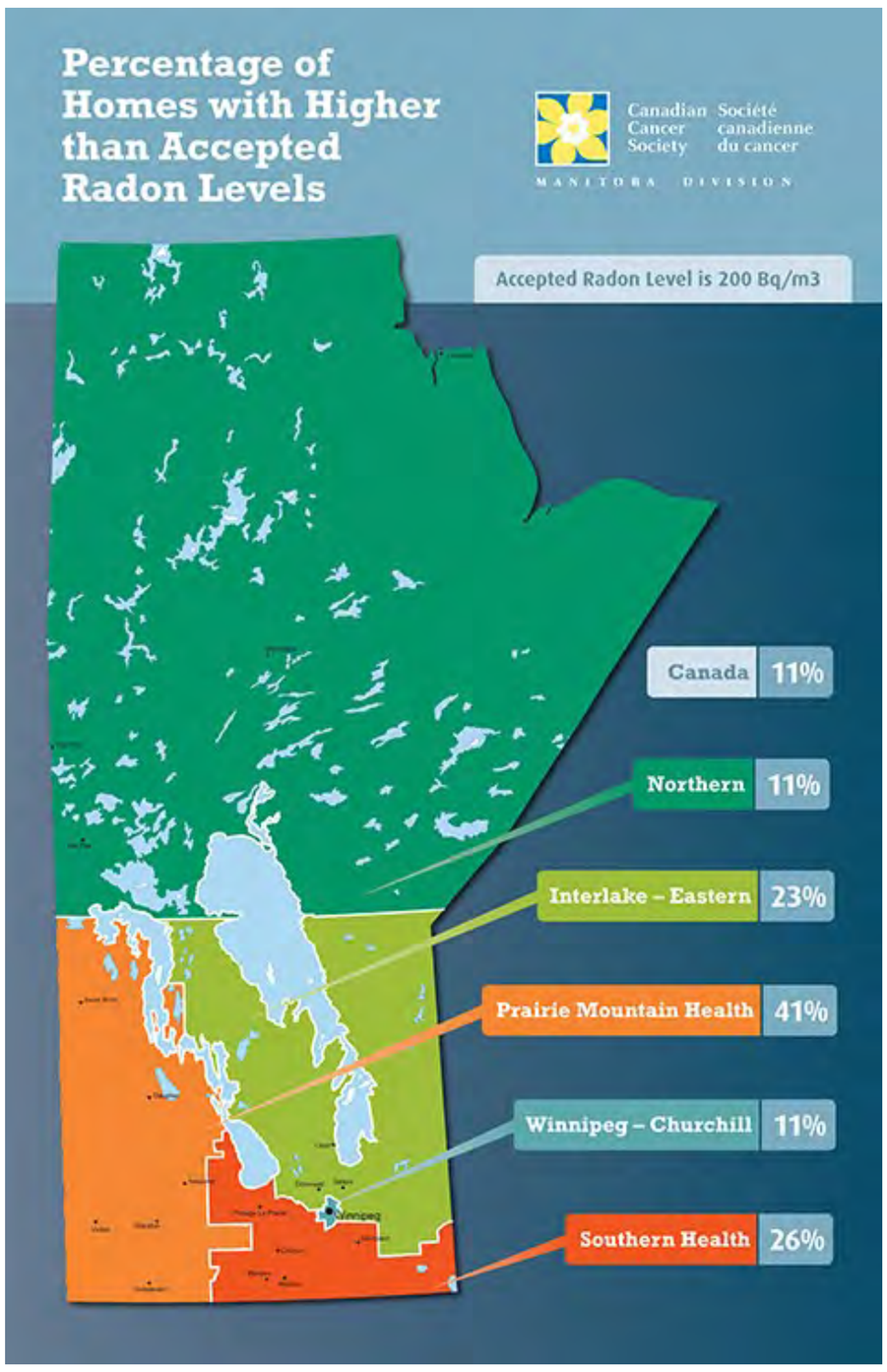


Radon gas breaks down or decays to form radioactive elements that can be inhaled into the lungs. In the lungs, decay continues, creating radioactive particles that release small bursts of energy. This energy is absorbed by nearby lung tissue, damaging the lung cells. When cells are damaged, they have the potential to result in cancer when they reproduce.

Health Canada recommends the placement of at least one long-term detector in a home for a minimum of 3 to 12 months (12 months is optimal). For periods less than 12 months, the testing period should include a mix of seasons or be in a mid-season to best provide a measurement that reflects the annual average level. The ideal 3 month testing period would be in the typical heating season that runs from October thru to April. The least ideal period is during the summer since open window conditions often prevail.

Levels

Although there is no regulation that governs an acceptable level of radon in Canadian homes or public buildings (considered as "dwellings"), Health Canada, in partnership with the provinces and territories, has developed a guideline. This guideline provides Canadians with guidance on when remedial action should be taken to reduce radon levels. The following guideline was approved by the Federal Provincial Territorial Radiation Protection Committee in October 2006 and adopted by the Government of Canada on June 9, 2007:



"Remedial measures should be undertaken in a dwelling whenever the average annual radon concentration exceeds 200 Bq/m^3 in the normal occupancy area.

The higher the radon concentration, the sooner remedial measures should be undertaken.

When remedial action is taken, the radon level should be reduced to a value as low as practicable.

The construction of new dwellings should employ techniques that will minimize radon entry and will facilitate post-construction radon removal, should this subsequently prove necessary."

Radon Concentration	Recommended Remedial Action Time
Greater than 600 Bq/m^3	In less than 1 year
Between 200 Bq/m^3 and 600 Bq/m^3	In less than 2 years
Less than 200 Bq/m^3	No action required

Health Canada Radon Survey 2012

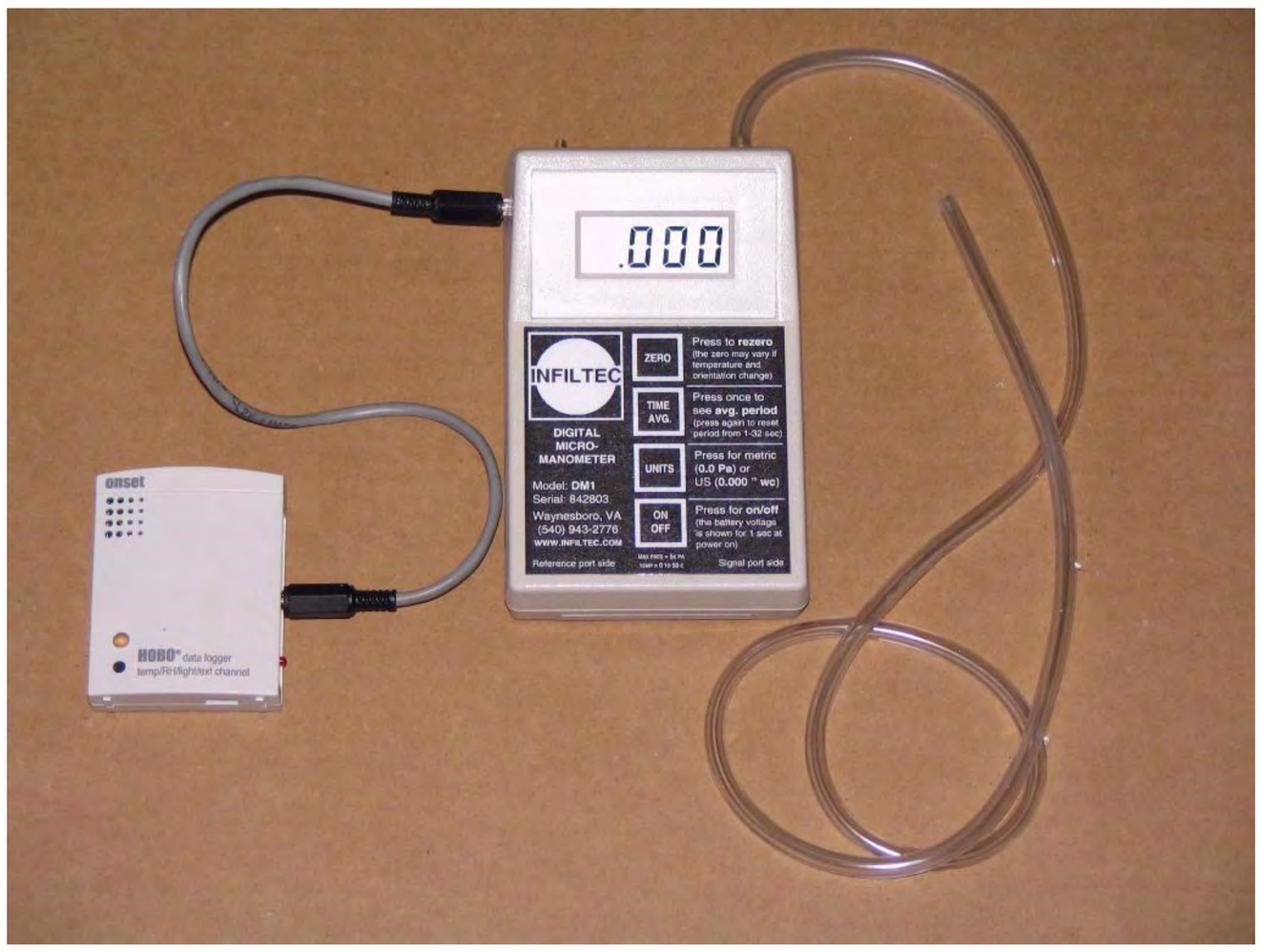
Province/Territory	"Raw" Percentage of Homes with Radon Concentrations:			
	% Below 200 Bq/m³	% 200 to 600 Bq/m³	% Above 600 Bq/m³	% Above 200 Bq/m³
Alberta (AB)	93.4	6.0	0.6	6.6
British Columbia (BC)	92.1	6.7	1.2	7.9
Manitoba (MB)	**76.3**	**21.1**	**2.6**	**23.7**
New Brunswick (NB)	75.2	18.7	6.1	24.8
Newfoundland and Labrador (NL)	94.1	4.6	1.3	5.9
Nova Scotia (NS)	91.2	6.3	2.5	8.8
Northwest Territories (NT)	94.6	4.9	0.5	5.4
Nunavut (NU)	100.0	0.0	0.0	0.0
Ontario (ON)	91.8	7.3	0.9	8.2
Prince Edward Island (PE)	96.5	3.5	0.0	3.5
Quebec (QC)	89.9	9.0	1.1	10.1
Saskatchewan (SK)	83.7	15.3	1.0	16.3
Yukon (YT)	80.4	13.8	5.8	19.6

Province	Health Region	Health Region Name	Number of Survey Participants	% Below 200 Bq/m³	% 200 to 600 Bq/m³	% Above 600 Bq/m³	% Above 200 Bq/m³
MB	4610	Winnipeg Regional Health Authority	66	87.9	12.1	0.0	12.1
MB	**4615**	**Brandon Regional Health Authority**	**79**	**55.7**	**40.5**	**3.8**	**44.3**
MB	4620	North Eastman Regional Health Authority	100	79.0	20.0	1.0	21.0
MB	4625	South Eastman Regional Health Authority	113	90.3	9.7	0.0	9.7
MB	4630	Interlake Regional Health Authority	121	75.2	24.8	0.0	24.8
MB	4640	Central Regional Health Authority	108	57.4	35.2	7.4	42.6
MB	4645	Assiniboine Regional Health Authority	110	65.5	32.7	1.8	34.5
MB	4660	Parkland Regional Health Authority	122	56.6	31.9	11.5	43.4
MB	4670	Nor-Man Regional Health Authority	212	87.7	11.8	0.5	12.3
MB	4685	Burntwood/Churchill	152	92.1	7.2	0.7	7.9

The only way to know if a home has an elevated level of radon is to test, regardless of location.

Measurements

Radon levels in a home or building can vary significantly over time. In fact, it is not uncommon to see radon levels in a home change by a factor of 2 to 3 over a 1-day period and variations from season to season can be even larger. The highest radon levels are usually observed during winter months. As a result, a long-term measurement period will give a much better indication of the annual average radon concentration than measurements of shorter duration. **Long-term measurements are typically 3 to 12 months in duration.** During this type of measurement, there are no requirements for the occupants to change their life-style once the measurement devices have been put in place. **Health Canada recommends that the radon test performed in a home or public building be a long-term measurement. Health Canada does not recommend a test of duration less than 1 month, a minimum of 3 months is recommended and 12 months is optimum.**



Radon Measurement Device

In rare cases, a more rapid indication of the radon concentration may be required. Under such circumstances a short-term measurement of duration less than 3 months (more typically 2 to 7 days) can be performed. However, short-term measurements should be used with caution for the reasons cited above. **Testing durations of less than 2 days (48 hours) are never acceptable to determine radon concentrations for purposes of assessing the need for remedial actions.** Since radon concentrations vary over time, **it is strongly recommended that the result of any short-term measurement be confirmed with a "follow-up" long-term measurement**. The follow-up measurement should be made at the same location as the initial measurement. **A single short-term measurement is not a sufficient basis for a decision to mitigate.** In this case a follow-up measurement is always necessary for mitigation decision-making regardless of the initial measurement result.

Measurement Devices

There are several radon measurement devices that may be used to test a home or building for radon. These devices fall into two broad categories: those used for long-term measurements (testing period of 3 to 12 months in duration) or those designed for short-term measurements (testing period of less than 3 months and more typically 2 to 7 days). The detection methods listed below are currently recognized by Health Canada as acceptable for measuring radon in homes and public buildings.

Devices for Long-Term Measurements

Alpha Track Detector

These detectors use a small piece of special plastic or film inside a container with a filter-covered opening. Air being tested diffuses (passive detector) or is pumped (active detector) through a filter covering a hole in the container. When alpha particles from radon and its decay products strike the detector, they cause damage tracks. At the end of the test period the container is sealed and returned to a laboratory for reading. The radon exposure duration of an alpha track detector is usually 1 to 12 months.

Electret Ion Chamber

This device consists of a special plastic canister (ion chamber) containing an electrostatically charged disk detector (electret). The detector is exposed during the measurement period, allowing radon to diffuse through a filter-covered opening into the chamber. Ionization resulting from the decay of radon produces a reduction in the charge on the electret. The drop in voltage on the electret is related to the radon concentration. The detectors may be read in the home using a special analysis device to measure the voltage or mailed to a laboratory for analysis. This type of detector may be deployed for 1 to 12 months.

Digital Detector

This detector plugs into a standard wall outlet much like a consumer carbon monoxide detector, and continuously monitors for radon. It is a passive device based on an ion chamber. It allows the homeowner to make radon measurements in different areas of the home. After being plugged in for an initial period of 48 hours, the device displays the average radon concentration continuously

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Activated Charcoal Adsorption

These devices utilize an airtight container filled with activated charcoal and covered with a screen and filter. The detector is opened in the area to be sampled and exposed to the air for a specified period of time. Radon present in the air adsorbs onto the charcoal. At the end of the sampling period, the container is sealed and then sent to a laboratory for analysis using a scintillation detector. Charcoal detectors may be subject to effects from drafts and high humidity. These detectors are normally deployed for measurement periods of 2 to 7 days.

Charcoal Liquid Scintillation

This method is very similar to the activated charcoal detector in that it employs a small vial of activated charcoal for sampling the radon. Following exposure, the vial is sealed and returned to a laboratory for analysis by treating the charcoal with a scintillation fluid, then analyzing the fluid using a scintillation counter. These detectors are also deployed for normal periods of 2 to 7 days.

Electret Ion Chamber

This is the same device described for long-term tests. However, variations in the design of the electret allows for a short-term measurement as well. The short-term electret ion chamber is deployed for 2 to 7 days.

Continuous Radon Monitoring

This detection category includes devices that record real-time continuous measurements of radon gas over a series of minutes and report the results in hourly increments. Air is either pumped or diffuses into a counting chamber, typically a scintillation cell or ionization chamber. The result using this type of detector is normally available at the completion of the test in the home or building without additional processing or analysis. These detectors are normally deployed for a minimum of 48 hours.

Continuous Working Level Monitoring

These devices record real-time continuous measurement of the radioactive decay products of radon in the air. Radon decay products are sampled by continuously pumping air through a filter. Alpha particles from the decay of products trapped on the filter are counted to determine the concentration of radon decay products in the air sampled. Continuous working level monitors should be deployed for a minimum of 48 hours.

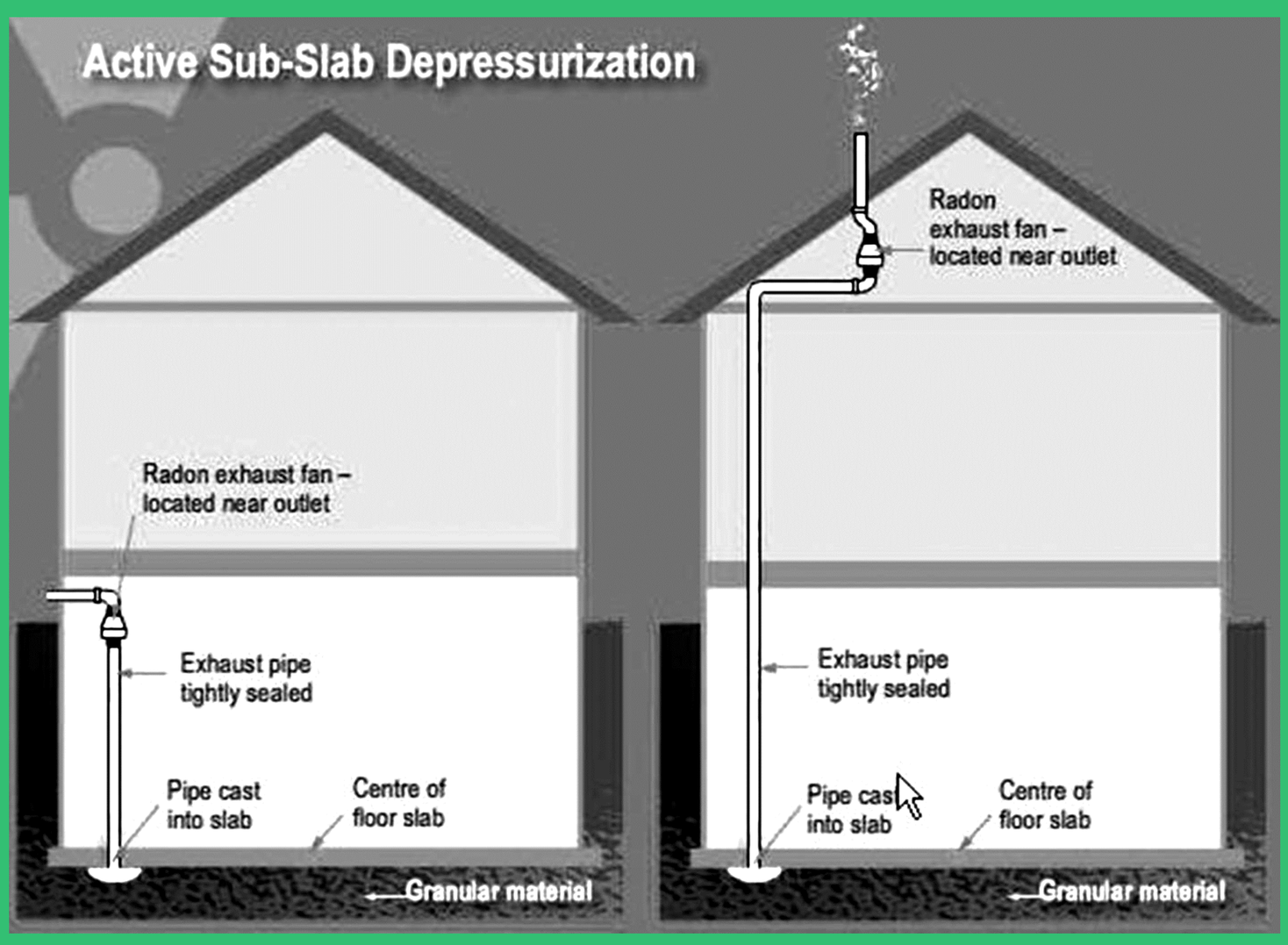
HOW TO LIVE WITH RADON GAS

Mitigation

Gas Membrane

Heat Recovery Ventilator
(Air Exchanger)

GAC (Granular Activated Carbon) Tank



View a helpful video on Radon Gas at this web address: https://www.youtube.com/watch?v=UnqIPtZt3Go