Radon and Energy Efficiency: EAs making the connection

November 19, 2024



Purpose

An information session to equip EAs with:

- An understanding of radon as it applies to retrofits and new construction
- Build awareness about radon with clients
- Enable EAs to provide knowledgeable information that contributes to informed decisions and actions





FACILITATOR

Andrew Laroche Registered Home Inspector AmeriSpec of Mississauga



PRESENTER
Anne-Marie Nicol PhD

Associate Profession, Simon Fraser University, Faculty of Health Sciences



PRESENTER Toby Smith MEA

Senior Project Manager Building Knowledge Canada



PRESENTER Pam Warkentin

Executive Director Canadian Association of Radon Scientists and Technologists

Your Presenters



Agenda

- 1. What is Radon?
- 2. Health Effects
- 3. Building Science Impacts
- 4. Testing Procedures
- 5. Radon Prevention and Barrier Systems
- 6. Reducing Radon (Mitigation)
- 7. Building Code Requirements
- 8. Communicating with Customers
- 9. Resources



What is Radon?

Pam Warkentin



In the News and In Your Mailbox

RADON GAS

a low survival rate.

PURCHASE

Buy a long-term

radon test kit.

際語

Find out more: www.canada.ca/rado

Health Santé Canada Canada

ARE YOU AT RISK?

CAUSES LUNG CANCER

if your home has a high radon level is to test.

Radon is in every home in Canada. Long-term exposure to high radon levels is the #1 cause of lung cancer in non-smokers.

Lung cancer is the most common cancer in Canada and has

Radon is an invisible, radioactive gas. The only way to know

TEST

Follow the

instructions provided

Protect yourself and your family.

Test your home today. www.test4radon.ca

and test your home

______ TAKE

ACTION

If the radon level is

radon saves lives!

high, lower it. Reducing

Canadä

National radon study shows higher levels, exposure to radioactive gas in homes

An estimated 10.3 million Canadians living in houses with high radon, expert says



https://www.cbc.ca/news/canada/calgary/report-radoncanada-homes-public-health-1.7360707



Take Action on Radon https://knowvember.ca/en/





Radon is the leading cause of lung cancer in non-smokers, leading to over 3000 deaths per year in Canada.



Radon enters a home through contact with the ground and can build up to elevated levels.



Exposure to elevated levels of radon is linked to increased chances of developing lung cancer.



Images courtesy of CARST

Measuring Radon





- Becquerel (Bq) = measure of radioactive decay
- 1 Bq/m³ = 1 radioactive disintegration per second per cubic meter of air
- Radon gas = invisible, tasteless and odourless
- Testing is only way to know how much is in a building



C-NRPP Radon Map

• A tool but not absolute







https://c-nrpp.ca/radon-map/?center%5B%5D=58.81374171570782¢er%5B%5D=-94.482421875&zoom=4

Radon Levels?

- Health Canada recommends testing all buildings and high levels reduced
- Government of Canada recommends action when 91day tests are above 200 Bq/m³



CACF/



Health Effects

Anne-Marie Nicol & Pam Warkentin



Health Impacts of Radon



Lung Cancer Deaths



References:

1.www.tc.gc.ca/en/services/road/publications/canadian-motor-vehicle-traffic-collision-statistics-2016.html 2.www.injuryresearch.bc.ca/wp-content/uploads/2017/10/Carbon-Monoxide-Oct-2017-Final-UFV.pdf 3.www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3510019501





The **Canadian Lung Association** has a grant program to help people across Canada afford radon mitigation services. The *Lungs Matter Grant Program* provides financial support to individuals diagnosed with lung cancer and those considered a low-moderate income households (priority given to low-income households.)

To apply for the grant a homeowner must do the following:

CACEA

- Complete a 91-day long-term test (not a digital monitor)
- Receive a quote from a C-NRPP Mitigation Professional (before work is started)

• Receive confirmation of qualifying for the grant, **(household income or proof of lung cancer diagnosis)**

Building Science Impacts

Anne-Marie Nicol & Toby Smith



Energy Efficiency Upgrades and Radon

- Renovating home can change radon levels
- Increased air tightness may concentrate radon levels
- Some types of ventilation may reduce radon levels, others not
- Important to understand what is happening inside the home = **BUILDING SCIENCE!**





Image courtesy of the Canadian Home Builders' Association



Radon



- Air pressure changes inside building because of:
 - Temperature
 - \circ Wind
 - o Mechanical effects
- Radon levels inside building envelope impacted **first by a source**, which is found in ground/soil beneath or beside the building where it contacts the ground.
- Next, radon levels impacted by the **amount of soil gas drawn inside the building** (negative pressure). This varies with:
 - Presence of openings between the building and ground
 - Amount of pressure differential that exists between the inside and outside.
 - Soil saturation from rain and snow cover can increase levels



Health Canada, Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors

When air pressure inside a building becomes lower than in the soil surrounding the foundation, it draws in gases, including radon, through:

- construction joints
- gaps around service pipes
- support posts
- floor slabs
- floor drains, sumps
- cracks in the foundation
- walls and openings in concrete block walls







(Source: ICLR)



https://newcanadiandrain.com/backwater-valve-installationtoronto/#prettyPhoto[coregallery]/3/

Radon - Reduction Guide for Canadians, Government of Canada

Radon - Reduction Guide for Canadians -Canada.ca

Middle image courtesy of Health Canada, Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors







Figure 6 – Radon Entry Routes for a Slab on Grade Foundation

Ventilation and Radon

- HRV/ERVs must be balanced to function properly = same amount of air brought into the building as exhausted
- When out of balance, a positive or negative pressure can be created
- Exhaust fans can depressurize home
- These situations can be harmful
- HRVs and ERVs may be out of balance if improperly installed, if modifications were made to ducting or vents, or units aren't properly cleaned and maintained
- Regular filter cleaning is important for maintenance but often neglected



C-NRPP recommends all homes with an HRV/ ERV use a digital radon monitor to continually measure indoor radon levels



Summary Don't Do This





Do This



- Continuous air barrier helps to keep radon out
- Balanced ventilation ensures **no negative pressure** which might increase radon levels
- Radon diffusion is a small part of the problem













https://bclung.ca/lung-health/radon/radon-and-energy-efficiency/



What housing factors increase radon levels?

Activities that "seal up" homes

- More airtight double or triple glazed windows
- Air Sealing- Weatherstripping
- Continuous Insulation or Cavity Insulation with new Air Barrier

Increasing Air tightness influences gases

- Switzerland (Meyer et al 2019, Yang et al. 2020)
 - Radon levels ~2x in retrofitted homes (p<0.05)
 - Impacts of retrofits greater in high radon regions
- UK (Symonds 2019, Daraktchiev, 2021)
 - Double glazed windows- greatest impact on radon levels
 - The more EE options used, the higher the radon levels
 - Retrofitted homes have more measurement variation between rooms





Great Review: Fisk WJ, Singer BC, Chan WR. **Association of residential energy efficiency retrofits with indoor environmental quality, comfort, and health**: A review of empirical data. Building and Environment. 2020 Aug 1;180:107067.

USA Weatherization Assistance Program Research

US Department of Energy (DOE) researched Weatherization Assistance Program (WAP)

- Targeted at low-income housing
- Average energy cost reduction: \$283.00
- Support local employment

Review of program (Pigg et al 2018, Francisco 2020)

- 514 homes across USA radon zones
 - o Pre- and post- weatherization measurements
 - o Control homes included
 - o Short term (7-day) radon measurements

Results

 Small but statistically significant impact on radon levels after weatherization (avg 0.44 pCi/L=16 Bq/m³)

Greater impacts in higher radon regions

ORNL/TM-2020/1769

Building Assessment of Radon Reduction Interventions with Energy Retrofits Expansion (The BEX Study): Final Report





https://www.energy.gov/sites/default/files/2021/01/f82/WAPfact-sheet_2021_0.pdf



Environmental Topics 🗸

Laws & Regulations V

SEPA

Report a Violation 🗸

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Q

Indoor Air Quality (IAQ)

Indoor Air Quality Home

Learn about Indoor Air Quality

IAQ by Building Type

Network and Collaborate

Popular IAQ Topics

Frequently Asked Questions

Publications

Regional and State IAQ Information

Webinars, Meetings & Updates

Energy Savings Plus Health: IAQ Guidelines for Single-Family Renovations





This page contains the EPA-developed Energy Savings Plus Health: IAQ Guidelines for Single-Family Renovations, a PDF guide that provides a set of best practices for improving indoor air quality in conjunction with energy upgrade work in homes.

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PRIORITY ISSUE 4:	CARBON MONOXIDE AND OTHER COMBUSTION APPLIANCE	
	EMISSIONS (NITROGEN OXIDES, VOCs AND PARTICULATES)	
PRIORITY ISSUE 5:	ENVIRONMENTAL TOBACCO SMOKE	
PRIORITY ISSUE 6:	GARAGE AIR POLLUTANTS (CO, BENZENE AND OTHER VOCs).	
PRIORITY ISSUE 7:	LEAD.	
PRIORITY ISSUE 8:	MOISTURE (MOLD AND OTHER BIOLOGICALS)	
PRIORITY ISSUE 9:	PESTS.	
PRIORITY ISSUE 10:	POLYCHLORINATED BIPHENYLS	
PRIORITY ISSUE 11:	RADON	
PRIORITY ISSUE 12:	WOOD SMOKE AND OTHER SOLID FUEL EMISSIONS	

https://www.epa.gov/indoor-air-quality-iaq/energy-savings-plushealth-iag-guidelines-single-family-renovations



Testing Procedures

Pam Warkentin



- Indoor radon levels can change, even over a 24-hour period
- Several factors, e.g., building design, building condition, occupancy pattern influence radon levels
- Two houses, built side-by-side, can have different indoor radon levels
- Measurements gathered over 90 days provide better estimate of annual average exposure

NOTE: Testing should be done during the heating season.



Image courtesy of CARST

Radon Testing Devices

C-NRPP lists approved professional devices:

- Alpha Track devices
- Electret Ion (E-Perm)
- Continuous Radon Monitors

C-NRPP has developed Quality Assurance requirements to be used with radon measurements

Reference: <u>https://c-nrpp.ca/approved-radon-measurement-devices</u>

Continuous Radon Monitors

Alpha Track

Electret Ion

(E-Perm)

Devices





RE





Detectors must be placed by homeowner or measurement professionals per Health Canada placement guidelines in occupied rooms

https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html









Consumer-Grade Electronic Radon Monitors



There are digital radon monitors for homeowner testing:

Can't be calibrated

Journal of Radiological Protection

PAPER • OPEN ACCESS

A comparison of consumer-grade electronic radon monitors

Pam Warkentin¹, Erin Curry², Oghenekome Michael¹ and Brian Bjorndal³ Published 21 October 2020 • © 2020 Society for Radiological Protection. Published on behalf of SRP by IOP Publishing Limited. All rights reserved Journal of Radiological Protection, Volume 40, Number 4

Citation Pam Warkentin et al 2020 J. Radiol. Prot. 40 1258

🔁 Article PDF

Article: https://iopscience.iop.org/article/10.1088/1361-6498/ab96d6

Library Detector Programs: https://takeactiononradon.ca/resources/lending-programs/



Purchase Radon Test Kits: https://takeactiononradon.ca/test-for-radon/radon-test-kits/#buykit



Canadian National Radon Proficiency Program

2023 Intercomparison Report

		Manufacturers stated Accuracy	Frequency of Reading	Digital Display or cell-phone app	Battery or Plug-in	Passed C-NRPP Performance Test For more details click here.		
1 f ²	Airthings Corentium Home	±10% (after 7 days at 200 Bq/m ³), ±5% after 2 months of monitoring	12 hours 24 hours 7 days (first reading will take 24 hrs)	Short-term and long-term average shown on monitor display.	Battery	~		
Ö	Airthings Wave Plus	±10% (after 7 days at 200 Bq/m ³), ±5% after 2 months of monitoring	Hourly	Long-term average shown on cell phone app. Color-coded indication of levels on monitor.	Battery	~		
	Airthings View Plus	After 30 days at 200 Bq/m ³ , ±10% on the 7 day average and +/- 5% on the 2 month average	Hourly	Short-term average shown on monitor display; long-term average shown on app.	Battery or plug in (USB- C)	~		
	EcoSense EcoQube	+/-10% at 370 Bq/m³ after 10 hours	Measures every 10 minutes and displays an hourly rolling average.	Hourly level shown on display, long term average available on the app.	Plug in	~		
253°	EcoSense EcoQube Blue	+/-14% at 370Bq/m ³	10 mins	Device displays 1 hour, 1 day, 1 week and 1 month rolling averages.	Plug in	~		
1	EcoSense Radon Eye RD200	±10% at 370 Bq/m ³ after 10 hours	10 mins	Displays 1 hour rolling average; long-term display on app.	Plug-in	~		
	SunRadon Luft	±10% (after 7 days at 200 Bq/m³)	Initial reading takes 90 mins, hourly.	Long-term and short- term averages shown on the app. Color coded indication of levels on monitor display.	Plug-in	~		
info@c-nrpp.ca www.c-nrpp.ca								

The following devices are not recommended by C-NRPP



https://c-nrpp.ca/wp-content/uploads/2023/10/Digital-Device-Report-Oct-2023.pdf



Radon Levels BEFORE and AFTER Mitigation



https://takeactiononradon.ca/radon-reduction-sweepstakes-report-2018-2019



200 Bq/m³ = Canada's Guideline **100 Bq/m³** = World Health Organization (WHO) Guideline

Radon Prevention and Barrier Systems

Pam Warkentin



Owens Corning FOAMULAR® RadonBARRIER™

Considers basement building science – addressing occupant comfort, indoor air quality, and safety.





Radon Control with Walltite

CACFA

https://walltite.basf.ca/pdf/Protecting%20Homes %20from%20Radon%20-%20Brochure.pdf

TYPICAL BASEMENT FLOOR TO FOUNDATION WALL JUNCTION COMPLYING WITH BUILDING CODE SEALING REQUIREMENTS



required as per NBCC) VALLTITE® CM01 as a thermal break WALLTITE® CM01 100 mm granular fil with geotextile, or 115 mm granular fill



WALLTITE® CM01 sprayed directly on gravel for under slab

WALLTITE® CM01, when used as a soil gas (radon) barrier has been evaluated by CCMC to comply with: Sentence 9.13.4.2.(1), Protection from Soil Gas Ingress (air barrier system for floor assemblies) and as an alternative solution to:

Sentence 9.25.3.6.(1), Air Barrier Systems in Floors-on- ground (6-mil polyethylene)

Sealing the joint between the foundation wall and slab with a flexible sealant provides additional control of air leakage to satisfy the requirements of Sentence 9.25.3.6(5).

For more information refer to CCMC 14152-R

ALTERNATIVE BASEMENT FLOOR TO FOUNDATION WALL JUNCTION



100 mm granular fil with geotextile.



WALLTITE® CM01 applied on basement walls and under slab







Commercial








- Prefabricated sump covers come with holes precut
- Sump covers can be made from PVC or polycarbonate plastic
- Lid seals can be purchased separately
- For new construction, must have air-tight sealed cover installed

Radon Equipment and Floor Drains









http://www.radondetect.ca/ Radon Detect Inc. Canada's On-line Radon Store



Moisture/Air Barriers









Soil-Gas Retarder







Reducing Radon (Mitigation)

Pam Warkentin



Radon Mitigation Systems

Passive System

- Installation easier with new construction
- Needs more design and planning

Active System

• Installation easier with existing homes especially side wall vented



https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/radon-reduction-guide-canadians-health-canada.html

- Sub-slab depressurization systems reduce radon levels by an average of over 90%
- Cost ranges depending on the complexity of the house
- Cost can range from: \$3,000 and up
- Generally installed in one day
- Most effective when installed by C-NRPP Radon Mitigation Professional







Photos courtesy of C-CRPP and CARST

Radon professional must do communication testing





Photos courtesy of C-CRPP and CARST

A system can be installed in an 'out-of-the-way' place, e.g. furnace room







Photos courtesy of C-CRPP and CARST

CAN/CGSB -149.11-2024 Radon Control Options for New Buildings

- Level 1 Radon rough-in system for active soil depressurization (CAN/CGSB-149.11) requirement for a passive stack (Level 2) or active system (Level 3). Level 1 systems include a gas permeable layer, soil gas barrier and soil gas collector. The barrier reduces the convection and diffusion of radon from the ground into the building. The soil gas collector is connected to a solid pipe that is accessible above the finished floor. There are two options for the installation of a Level 1 system based on the termination of this pipe, either Level 1a, where the pipe is capped and sealed within the building (typically above the floor of the lowest level), or Level 1b, in which the pipe extends outside through a rim-joist or sidewall where it is capped. The authority having jurisdiction may already require a Level 1a system for future radon mitigation in a building.
- Level 2 Passive vertical radon stack (includes Level 1a plus a stack) (CAN/CGSB-149.11) requirement for an active system (Level 3), includes Level 1. Level 2 features a stack which runs vertically up through the building and exhausts above the roofline. The system reduces indoor radon gas infiltration into the building through passive soil depressurization due to the stack effect. This does not require electrical power. Research has demonstrated that Level 2 systems have reduced indoor radon gas concentrations by 40 to 90%^[2-8]. The authority having jurisdiction may already require a full passive vertical radon stack for radon mitigation in a building.
- **Full active soil depressurization system (includes Levels 1a and 2 plus an ASD fan or Level 1b plus an ASD fan) – (CAN/CGSB-149.12)** – includes Level 2 or Level 1b. This is the most effective radon control system, requiring an ASD fan to operate continuously to provide active soil depressurization. A reduction of the indoor radon concentration of approximately 90% or more (in the case of high indoor radon gas concentrations) can be obtained by installing a properly implemented Level 3 [full active (ASD fan driven)] radon control system. Level 1b and Level 2 systems as described in this standard can be upgraded to a Level 3 system by the addition of an ASD fan as outlined in CAN/CGSB-149.12.



CAN/CGSB 149.11 - Level 1b and 1a: Radon Rough-In System



Figure 2a - Illustrative diagram of a Level 1a radon rough-in system and its three components

CAN/CGSB 149.11 – Level 2: Passive System Vertical Stack

Figure 10 - Level 2 system - Illustrative example of a passive vertical radon stack (not to scale)







CAN/CGSB 149.11 – Level 3: Active Radon Reductive System (ASD – Active Soil Depressurization)

- AKA Sub Slab Depressurization
- Active system with fan in attic or basement installation
- Note: Pipe should be far enough away from eave to permit installation of fan and electrical





Fodes 1000 (C) 2009 InspectAPedia













Photos courtesy of C-CRPP and CARST



Questions to ask a Mitigation Professional

- Do you have insurance?
- What steps/tests will you complete before installing radon mitigation system?
- What areas will be sealed?
- How do you decide which fan to use?
- What clearances will follow for the discharge?

Things to look for in well-installed mitigation system

- Did they seal around the openings in the foundation?
- Did they follow proper discharge clearances?
- Is it properly labeled (DO NOT UNPLUG)?
- Did they provide leave behind information?

Building Code Requirements

Toby Smith



National Building Code



NBC applies to all provinces and territories, except BC. ON must meet NBC by Jan 1, 2025.

NBC 9.13.4. - Soil Gas Control

- Course clean granular material under slab
 - No less than 4" layer
 - Less than 10% fines
 - Void area content 35-40% (ASTM E1465)
- Well-sealed sub-slab membrane
 - Continuous barrier
 - Sealed in all areas to prevent air leakage
 - Including sealed floor to wall joint
- Sealed Sump Pit
 - Sealed with an airtight lid
- Radon rough-in for future installation
 - Ideally minimum 12" above floor
 - Sealed, capped and labeled in above floor section
 - In location for future installation of mitigation system

Refer to:

Appendix Note A-9.13.4.3.(2)(b) and (3)(b)(l) Effective Depressurization

 Acceptable configurations for extraction opening in a depressurization system



Current BC Building Code

- Includes a CAN/CGSB 149,11 Level 2
 installation
- Includes all measures from National Building Code
- **BUT** radon pipe must exit building envelope





Radon Rough-in





Radon rough-in pipe is meant to extend to the outside with a fan, if required.



What's Coming in the Future?

- Proposed change (PCF 1713) for NBC 2025 (Adoption ~2027)
- Requires all new homes to have passive stack installed

1713	Passive Vertical	This proposed change adds	NBC20 Div.B
	Radon Stack	requirements for radon	9.13.4.
		mitigation by use of a passive	
		vertical radon stack in dwelling	

https://codes.nrc-cnrc.gc.ca/en/certifications-evaluations-standards/codes-canada/codes-development-process/proposed_changes.html



Communicating with Customers

Toby Smith



Role of the Energy Advisor

- EAs can improve clients' health by informing them about radon during an assessment
- Engage in a health-focused discussion, highlight testing for radon is a cancer prevention measure
- For renovation clients:
 - Inform clients about radon and encourage testing before starting a renovation as a mitigation system (if needed) can be more easily installed at less cost
 - Share information about mitigation strategies to prepare them for potential mitigation decisions after testing
 - Recommend more testing <u>after</u> renovating as radon levels can change



Homeowner Resources

- Health Canada: Radon and Energy Retrofits
- <u>Betterhomesbc.ca</u>



Role of the Energy Advisor

- ERS procedures do not <u>require</u> EAs to specifically mention radon
- NRCan provides standard text in RUR about radon and where to access information. It considers homeowner responsible for radon testing
- **BEST PRACTICE**: Inform clients about radon and what they can do
- Refer homeowners to professionals at CARST or C-NRPP
- NOTE: CACEA was advised by their preferred insurance provider that currently, their Errors and Omissions insurance policy would cover related claims



Ontario Home Warranty and Radon

- Within first 7 years of a newly constructed home, if radon gas exceeds Health Canada's acceptable levels of 200Bq/m³, Tarion will cover mitigation costs up to \$15,000 using a C-NRPP Mitigation professional
- Note it is the builder who pays the bill
- For an accepted claim, the homeowner must supply test results to show test was conducting properly





https://www.tarion.com/homeowners/ your-warranty-coverage/radon-andyour-warranty





Anne-Marie & Pam Warkentin





Canadian Association of Radon Scientist and Technologist



Provides:

- Resources for homeowners
- Training for radon professionals
- Source for measurement (testing) and mitigation professionals
- Visit <u>https://carst.ca</u>



C-NRPP: Canadian National Radon Proficiency Program



Radon training and certification program for radon professionals certifying Radon Measurement and Radon Mitigation Professionals. Visit<u>https://c-nrpp.ca/</u>

- C-NRPP Measurement Certification
 16hr online course
- C-NRPP Mitigation Certification

24hrs online and in-person course plus full hands-on mitigation install; Measurement is a pre-requisite

C-NRPP CRNCH

Controlling Radon in New Canadian Home course for New Construction 4-6hrs online and in-person course

Real Estate Certificate Course



2x1-hr sessions



Radon Guidelines and Standards



Resources and Information



HRVs/ERVs and Radon

need to test for radon?

per the manufacturer's instructions.

facturer's website or YouTube

CACEA

No areas of Canada are radon free.		
The level of radon in a newly constructed home cannot be predicted, herefore all homeowners need to test their homes for radon by conducting a long-term test during the first heating season after completion of the home.		
We also know that in the first three years of construction, concrete cures and the building envelope in a home can change significantly, and so we ecommend that new homes should be tested for radon again during the eating season at three years after construction.		
The Canadian radon guideline is set at 200 Bq/m ³ for indoor radon concentrations at which mitigation is recommended.	Find Do it Yourself Redon Tests	Votes Balan Mingelen Pythonanet

Web-based Builder Information





LANDIG WHAT YOUN Redon is a naturally occur floors, pipes, and ide walls Long-term exposure to high Smifar to having smita-edi your liability and test your n	INCLUSION OF A CONTRACT OF A C	ADON ers buildings through reguncer.
ALL HOMES AN IN CANADA HAY	D COMMERCIAL BUILDINGS VE SOME LEVEL OF RADONI	
NEED TO KNOW:		
a Testing for radius is sime	de with DIV or professional optimes.	71
To test large commercial certified professional	I buildings with HVAC systems, consult a C-NRPP	
 All buildings with high la 	mais can be lowered with mitiration	C
 Minuting weinight 	the installed within Mark should only be	Territ m m
completed in consult by	professionals with official C-NRPP certification.	C finds
RESOURCES		
CARST: Canadian Association of	Hire a registered professional to test your building and mitigate high radon.	carst.ca/Mtiontion-System
Radon Scientists and Technologists	Learn about mitigation systems and types of questions to ask a professional. Participate in educational seminars.	
C-NBUPP: Canadian National Radon Proficiency Program	Canada's certifying program for radon. Find a local certified professional or get certified.	C-MIRLER
TAOP: Take Action on	Public health education campaign led by Health Canada, CARST, CAREX, the Canadian Cancer Society, and supported by health authenties and groups rationwide.	
Radon	Find a DIF test kit, learn about radon health effects, join community testing campaigns, or enter contests including rebates for mitiastion.	takeactiononradon.ca
Government of Canada - Health Canada	Access videos, factsheets, materials to share, and a list of additional resources.	canada.ca What you need to know
CELA: Canadian Environmental Law Association	Find reports of radion law and policy, as well as advocacy campaigns for policy changes and homeowner rebates	cela.ca/radon
WHO: World Health Organization	Learn about the WHO recommendations for policies to prevent and mitigate residential radon exposure	who int/ionizing_radiation redon

Landlord and Tenant Information





Homeowner Information

CARS		C-NRF	C-NRPP Technical Bulletin		
RA	Shuldings through regular gaps in	Understanding RADON impact of ENERGY EFFIC AIR TIGHTNESS	and the CIENCY –	INICAL AUDIENCE: Energy Advisor	
providi	ng a safe space for tenants. Reduce	DRAFT: March 2024	-0		
		What is Radon?			
		Radon is a naturally occurring, radioactiv Radon is invisible, odourless, and taste regions of Canada have some level of ra	ve gas formed from the breakdown o less, making it undetectable with don, and it is found in all homes at v	of uranium in soil, rock, and water. Nut proper testing equipment. All arging levels.	
		Why is Radon Harmful?			
		Health Canada recommends that all ho carcinogen, and action should be taken I Canadian guideline level of 200 Big(m). E in non-smokers and is responsible for ov	mes and buildings should be teste to reduce radon levels in homes why sposure to elevated levels of radon ver 3000 deaths each year.	d for radon, as radon is a known one the radon levels are above the is the leading cause of lung cancer	
1		The link between Energ	y Retrofits and Rador	1	
Ш		Since radion is found in indoor air, its leve artight. If the amount of fresh air leakin This doesn't mean that energy retrofits consider air quality (and specifically rade	en can be affected by any renovation g into a home is reduced, the radom s are a bad idea, it simply means t on) when planning energy retrofits.	n work that renders a house more levels inside are likely to increase, hat it's all the more important to	
d	carst ca/Milantion-Systems	Link to RESEARCH: DC Lung's Environment Focus on Health Withe balance of energy	centry and Radion Making the Conn- centrolitizand indoor air duality, Dr.	Anne-Marie Nicol	
no to		Informing Clients About	Radon		
	C-MERICA	As an Energy Advisor, you can literally sa your energy assessment. Clients will lea	we lives, simply be informing clients in it is important to test for radon a	about radon while performing fter a retrofit and can plan the	
da,		retrofit process to make any needed rad mitigation at a time when homeowners	Ion mitigation easier. Your guidance are making important decisions abo	can lead to radon testing and ut changes to their home and	
ie. in ding	takeas:dionooraalon.ca	reducing radion levels significantly reduc clients about radion testing and mitigation also reinforces their trust in your service conscientious professional. Link to BESE	es the risk of lung cancer. Taking thi on not only demonstrates your come n, and ensures you are working as a ARCH.	s proactive approach in advising nitment to their well-being, but comprehensive and not being. Recommendent	
t of	canada.ca What you need to know	Lublities			
tecy ts	oria.ca/netori	www.c-nrpp.ca ph: 1-855-722-6777	info@c-nrpp.ca	CARPP	
	Vanlastebra antiooltsi odu			CHUR -	

EA Information

Real Estate



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radon levels inside my house?

The most accurate way to determine levels inside a home is to test the home for radion using a long-term radion monitor. High radion levels can essily be reduced.	Radon is radioactive gas
To reduce radon levels, a radon mitigation system can be installed. A CNRPP Certified Radon Mitigation Professional is trained to install a system in accordance with all pertinent standards and guidelines.	Radon is odouri way to know you Exposure to ele
A radio militipation system consists of a pipe stending from below the basement floor slab or membrane, up through the interior where it connects to a fan, then terminate outside the home in the modol discharp pipe. This method of radio mitigation, if properly installed, creates a negative pressure below the slab and/or membrane thus diwing the soil gase out through the installed system rather than allowing then to move from the oil space beneasit the building and into the home.	linked to increase lung cancer. 16% of lung cancer radon exposure cause of lung ca Radon enters & with the ground.
The radon discharge pipe can be located at the side of a house or through the roof, but there are specifications that must be met in order to prevent the radon gas from re-entering the house or entering the neighbouring houses.	Health Canada be tested for rad
If my neighbour has a radon system installed, and the discharge	8400

pipe is pointed at my house, how do I know it's not increasing the radon levels in my house? Research shows that radon disperses quickly once discharged outdoors. Installations standards have set minimum clearance distances for radio system discharge pipes to further ensure that radon-laden air doesn't re-enter the original house or enter the neighbouring house (see reverse). If you are concerned about the radon levels within your home, you should test your own home for radon. Detectors are easily available.

a nature	ing the		
		Table 1: Clearances	
	Minimal clearances for all types of radon discharges	Locations	Required minimal clearances (m)
	Placement of radon discharge pipes shall follow the required minimal clearances	Clearance to a mechanical air supply inlet	1.8
listed in Table 1.	listed in Table 1.	Clearance to permanently closed window	0.3
	What recearch is available on eide wall	Clearance to an openable window	1.0
	discharge?	Clearance from a door that may be opened	0.3
	Fixing Houses with High Radon – A Canadian Demonstration CMHC March 2008, Scott.	Clearance from a door that has an openable window	1.0
	A.G.; Fugler, D.	Clearance to outside corner	0.3
	A test case in Kanata in fall 2007 provided an opportunity to test	Clearance to Inside corner	0.3
	a side wall installation in Canada in a high-radon home.	Clearance above paved sidewalk or located on public prope	
	Depressurization Residential Radon Mitigations at Kitigan Zibi Anishinabeg: Comparison of Above Ground Level (RIM	Clearance above grade- from a vera deck, or a balcony	
	JOIST) and Above Roof Line Discharge of Radon Mitigation SUB-SLAB Systems; Health	Vertical clearance below soffts or venting component	A Your
	Brazeau, C; Falcomer, R; Ottawa, B; Scott, A; Whyte, J	Horizontal clearance from an area di discharge where there is a risk of injur	
	Radon Mitigation in Cold Climates at Kitigan Zibi Anishinabeg, Brossard, M; Ottawa, C. B. Falcomer, R; Whyte, J	NOTE: The selection of the exhaust po maximal available clearances from bu pocupancy areas.	

Other questions? Feel free to contact C-NRPP Offices Ph: 204-798-9649 Toll free: 1-855-722-6777 Email: info@c-nrpp.ca





fresh air Er brakk

ADoes

If your h

ERV, con

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good first :

ERV has be

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taking fur

install a rad

need to test for radon? The short answer is yes: if you haven't already tested for radon, it's very important to do so regardless of whether your home has an HRV/ERV. Heat and energy recovery ventilators (HRV/ERV) are systems designed to improve indoor air quality by bringing fresh outdoor air into a home while exhausting stale indoor air. The design of these units allows for some heat (in the case of an HRV) or heat and humidity (in the case of an ERV) to be exchanged between the outgoing indoor air and incoming fresh air, in order to save energy. Depending on how they are functioning, HRV/ERVs could affect your radon levels for better, for worse, inconsistently, or not at all. That's why it's so important to test your home for radon! HRV/ERVs must be balanced to function properly, which means that

the same amount of air is being brought into the home as is being exhausted. When out of balance, a positive or negative pressure can be created in the home. Both situations can have harmful side effects. HRVs and FRVs may be out of balance if they weren't properly installed if modifications have been made to the ducting or vents, or if the units aren't properly cleaned and maintained. Regular cleaning of the filters is an important part of maintenance that is often neglected. HRV/ERVs should be cleaned and balanced as

per the manufacturer's instructions. There are simple videos available online, accessible either through the manufacturer's website or YouTube.

Continual Radon Monitoring and your HRV/ERV

If you are using an HRV or ERV to manage your radon levels, we recommend the continually measure your radon levels. If your HRV/ERV starts to become unba you to increasing radon levels. The digital monitor will also alert you to season v find a list of consumer-grade continual radon monitors reviewed by C-NRPP as here: www.c-nrpp.ca

> www.c-nrpp.ca ph: 1-855-722-6777 info@c-nrpp.ca

> > When mitigating a multi-unit dwelling, ensure you have proper insurance (includin and training for the building type. C-NRPP Radon Mitigation training only covers (mend you have special training for any commercial buildings.

- When installing a mitigation system in a multi-unit dwelling the following things s 1. Remember your client may not be the owner of the building. Talk to the own to doing any work; there may be restrictions on work that can be done to the b in the exterior or any addition to the structure. Not confirming this first may can
- time and could result in fines from the ownership group. 2. Buildings must be considered as systems. Many townhouse complexes or sen common foundation, and this is the typical pathway for radon gas entry into

bulletin is intended to assist mitigation professionals when faced with a mitig

Multi-unit dwellings include any building used as a residence by more than one famil

and duplexes. Buildings with shared ownership or maintenance such as co-ops, t stratas or vacation timeshare properties may also be considered multi-unit dwelli

When measuring radon in multi-unit dwellings, whenever possible, best practice

following Health Canada's guidance on public buildings, which includes testing ev

When mitigating these units, best practice is to access all ground-contact lev diagnostic testing and to ensure that the mitigation system does not create ba effects on other units. You should discuss a strateev for communicating with a and explain that the most effective strategy will also benefit them by reducin

www.c-nrpp.ca ph: 1-855-677-7222 info@c-nrpp.ca

Echient to cutoide

Mitigation in Multi-Unit

When mitigating a multi-unit

dwelling, ensure you discuss

the process with the building

owner prior to starting

Dwellings

installation.

part of a multi-unit dwelling.

November 2021





C-NRPP Technical Bulletin C-NRPP certified professionals are to reflect high standards and ethics in their work, and comply with recognize standards of practice to protect public health and refety. They communicate clearly and accurately with consumers about their process and the barmful effects of radon gas https://c-nrpp.ca/about/

C-NRPP Technical Bulletin

We recognize that communication in these situations can be challenging and so we have developed a "What is redon" for multi-unit buildings and we have also developed a simple checklist that you can ask neighbouring units to complete.

- 3. If it is not possible to access all areas in contact with the foundation, consider mitigation options which will minimize the potential impact on other units and can be executed in compliance with any restrictions in place. Options could include sealing and increasing the ventilation rate or ensuring the fan doesn't draw air past the perimeter of the individual unit at all conditions.
- 4 When mitigating in multisunit residential buildings consider or memory and the state of t
 - Unsealed Sump pit if the unit you are working on has an unsealed sump pit, this may be true of other units, which could increase the possibility of drawing conditioned air from neighbouring
 - units and a risk of back drafting o Check for evidence of strip footings (see paragraphs below) o Mid-efficient het weter tank and furnace or any other combustion appliance, look for vents
 - during the exterior inspection (combustion appliances present in a home will increase concern related to back drafting) o Conduct a visual inspection of the condition of the accessible slab without removing any wall or
 - floor coverings; look for excessive cracks which may provide pathways for conditioned air and risk of back drafting.
- Determine if there is a strip footing (grade beam) between the units which would provide a barrier limiting the airliow between the units: the structure of the party-wall between the units will provide some insight into thil, if the party wall is used there may not be a footing. if the party wall is concrete it is likely there is also a strip footing under the slab; best practices would be to ask the owner for structural drawine of the buildine: use caution as the drawines may not include all features of the house
- III. If there is no indication of strip footings (grade beams) between the units, locate the suction point at In other is no induction of any induing gives being Devices whe units, notice the account joint six the farshes point from other units (in interior units) it will be near the centre of the sib, or in end units, it will be near the farshest will) When calculating negative pressure achieve the bare minimum negative pressure at the points of the sib connected to other units, in order to minimize it movement in the sub-slab space under adjoining units.
- IV. If you are unable to access neighbouring units, limit the amount of airflow at the connecting wall of the unit(s), during disgnostics and also verify airflow after installing and turning on the radon mitigation fan.
- V. We recommend that you include a long-term radon monitor and a carbon monoxide detector for the neighbouring unit(s).
- www.c-nrpp.ca ph: 1-855-677-7222 C-NRPP PNCB-C info@c-nrpp.ca



Understanding the Energy Use of a RADON MITIGATION FAN

C-NRPP PNCR-C

Homeowner Bulletin Draft: March 2024

Single Serve Coffee Maker certain regions of the country, a variety of Mitigation Fan - smaller fan electricity rates are available; we've used the Table lamp (incandescent) average rate for each region. Table lamp (LED) Bathroom Exhaust Fan 0 2 KWhr/year 10 12 C-NRPP PNCR:C www.c-nrpp.ca ph: 1-855-677-722 info@e-nrpp ca

New Resources





Postcard (French on reverse)







Poster (French on reverse)



www.TakeActionOnRadon.ca

Pull-up banner (bilingual)

RADON



Medical Practitioners Information (French on reverse)

Also provides playing cards, carpenter pencils and measuring tapes handed out at events.

https://knowvember.ca/en/





Order online: <u>https://form.jotform.com/91975565858277</u>

Research and Papers

BC Lung Association

- Energy Efficiency and Radon: Making the Connection reviews academic literature on the links between efficiency measures and radon.
- Energy Efficiency and Radon: Recognizing Legal Liabilities emphasizes that the duty of care on personnel in the energy efficiency industry to ensure they do not put clients at elevated health risk.
- Energy Efficiency and Radon: Gaps in the System analyzes current energy efficiency system in Canada and reviewed building codes, green building standards, as well as training and certification for energy advisors and key grant programs.

https://bclung.ca/lung-health/radon/



Questions?



Thank you






Our Mission

To support a sustainable and recognized profession of valued and credible Canadian Energy Advisors (EA).

Our Mandate

Ensure credible, skilled members and be a valued, respected sector partner.

Our Members

Includes EAs; suppliers; building community stakeholders; and those in the process of becoming registered EAs. **Members are held to a high standard:** E&O; 18 hrs CEC; Code of Ethics and Professional Conduct; SO verification letter

Members across Canada access to:

- knowledge and information;
- a supportive network;
- a unified voice to influence change; and
- discounts to equipment, training, and more.

Contact

Cindy Gareau, Executive Director <u>manager@cacea.ca</u> • 888-315-2774 • <u>www.cacea.ca</u>

CACEA promotes sustainable building practices and contributes to:







