Radiation Safety Institute of Canada
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Radon in Canada: Understanding Regulation and Building Codes

Guest: Pam Warkentin, Executive Director of the Canadian Association of Radon Scientists and Technologists (CARST) and the Canadian–National Radon Proficiency Program (C-NRPP)

November 13, 2025

Good Science in Plain Language®

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Land Acknowledgement

Webinar Functionality

Audio and video

- During the presentation, from the presenters only
- Captions: More>Language and speech>Turn on live captions

Use the Chat feature to talk to discuss with everyone

Use Q&A feature to ask questions for Q&A portion

Posted on webinar page

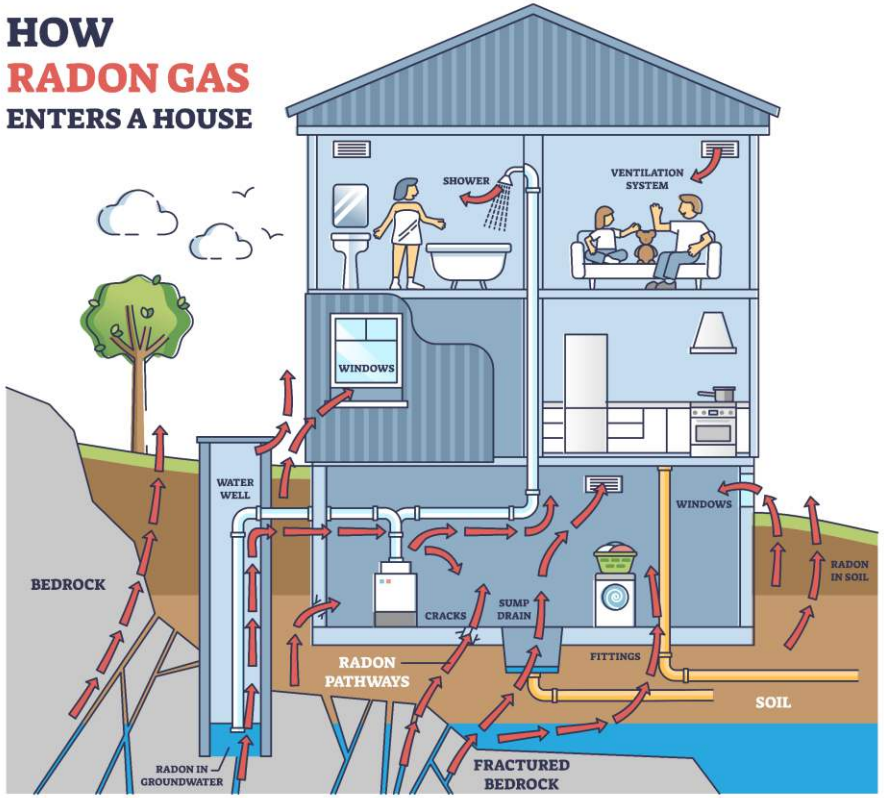
- Video, answers to questions, copy of the slides

Follow up email will be sent

- Topics covered, time of attendance

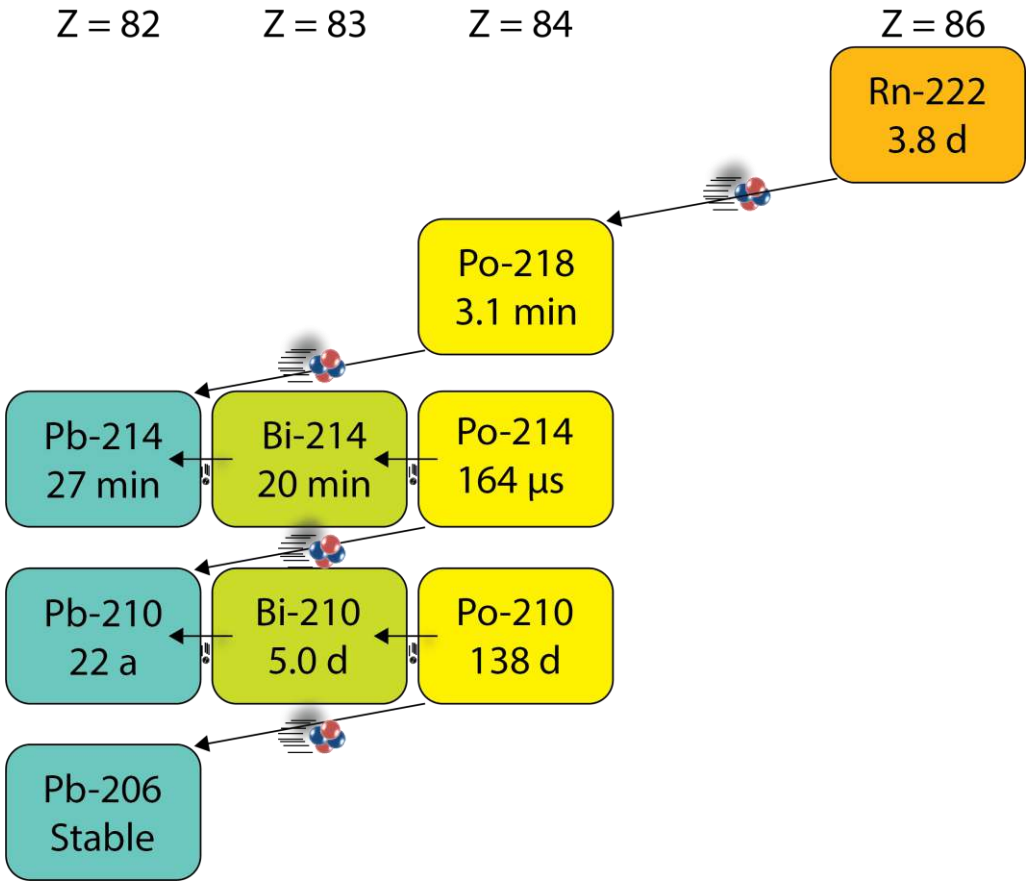
In This Session

- Introduction
- CARST/C-NRPP
- Radon
- Regulation
- Building Codes
- Q&A
- Movement break
  - Charlmane Wong
  - Ji Hong Tai Chi & Qi Gong Richmond Hill



Radon

- Naturally-occurring radioactive gas
- Decay product in uranium-238 series that emits carcinogenic alpha particles
- Uranium is common on Earth
- Decays into radioactive progeny that also emit alpha
- 2nd leading cause of lung cancer
- Primary cause of lung cancer in non-smokers



Corie lives in Winnipeg. Never smoked. Tested her home and found over 400 Bq/m^3 of radon.

She was diagnosed with lung cancer. It was caught early, she had some other tests done which coincidentally showed lesions on her lungs.

RADON FACTS:

- The only way to know radon levels is to test the radon level in an occupied home.
- Testing the soil does not provide accurate prediction of indoor radon levels.
- A homeowner is responsible to test their home (post-occupancy) after they have moved in.

RADON FACTS:

- Radon testing is not included in the building code, because it needs to be done post-occupancy and the building code only covers pre-occupancy.
- Each home needs to be tested. Radon levels cannot be predicted based on a neighbours radon levels.
- Radon test should be done using a long-term radon test (91 days or longer, 3 months).
- Radon test should be conducted in the living space of the house, in an area which is the lowest lived-in level, occupied 4 hours a day or more, during the heating season.

The Canadian Association of Radon Scientists and Technologists (CARST) is a national association funded by memberships to reduce radon risk in Canada.

The Canadian National Radon Proficiency Program (C-NRPP) is a subsidiary of CARST funded by certification fees and by a grant through Health Canada to establish guidelines, training and resources for the provision of radon services by professionals.

Take Action on Radon is a national initiative, funded through a grant by Health Canada, to bring together radon stakeholders and raise awareness on radon across Canada.

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C-NRPP PNCR-C

Canadian - National RADON Proficiency Program

- **C-NRPP Measurement Certification** – 16hrs course work (available in French and English; online)
- **C-NRPP Mitigation Certification** – 24hrs course work, plus full hands-on mitigation install; (available in French and English; online and in-person); measurement is a pre-requisite
- **C-NRPP CRNCH** (Controlling Radon in New Canadian Home) course for New Construction – 4-6hrs course work; (available in French and English; online and in-person)
- **Real Estate Certificate Course** – 2 1-hr sessions

C-NRPP PNCR-C

Search...

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Consumer-Grade Electronic Radon Monitors

Over the past few years, electronic radon monitors have become increasingly available and popular with consumers. In order to provide Canadian consumers with an unbiased performance-based comparison of these monitors, the Canadian National Radon Proficiency Program (C-NRPP) regularly conducts a series of performance

	Make/Model	Manufacturers stated Accuracy	Frequency of Reading	Digital Display or cell-phone app	Battery or Plug-in	Approved Find details here:
	Airthings Corentium Home	±10% (after 7 days at 200 Bq/m3), ±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	APPROVED ✓
	Airthings View	After 30 days at 200 Bq/m3, ±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)	APPROVED ✓
	Aranet RN+	±8% Accuracy of 24 h, 7 d, 30 d averages	Can be adjusted to show 10 min, 24h, 7 d or 30d	Display on device shows either short-term or long-term level depending on setting. Long-term shown on app.	Battery	APPROVED ✓
	Ecosense EcoQube	±10% at 370 Bq/m³ after 10 hours of measurement	Takes measurements every 10 minutes; displays an hourly rolling average	Hourly levels are displayed on LED; short-term and long-term averages, and hourly data points on the mobile app.	Plug in	APPROVED ✓
	Ecosense RadonEye	±10% at 370 Bq/m³ after 10 hours of measurement	Takes measurements every 10 minutes; displays an hourly rolling average	Hourly levels are shown on the OLED display; short-term and long-term averages are available in the mobile app	Plug in	APPROVED ✓
	SunRadon Luft	±10% (after 7 days at 200 Bq/m3)	Hourly, (Initial reading takes 90 mins)	Long-term and short-term averages shown on the app. Color coded indication of levels on monitor display.	Plug in	APPROVED ✓

o leave them in place for at

ick here.

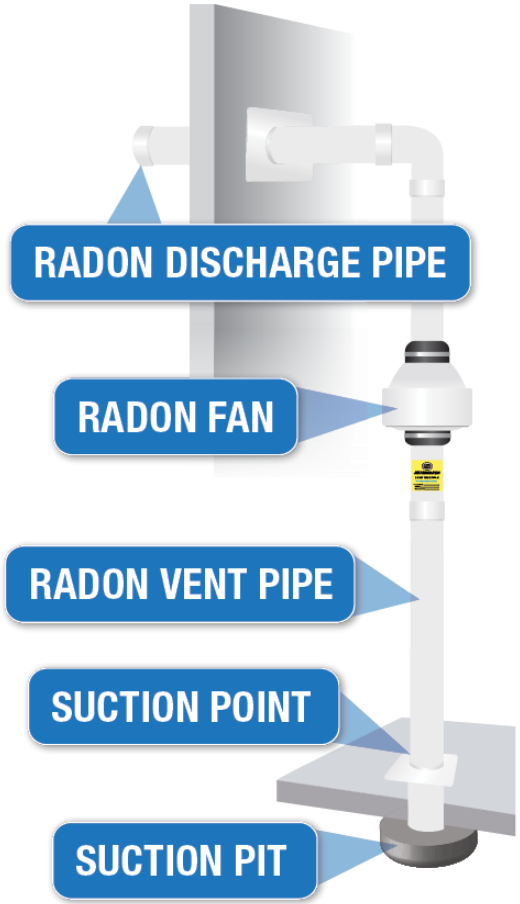
d a list of online retailers

nethod of averaging the data;

t approved by C-NRPP for use

	Manufacturer / Brand	Model / Link to Health Canada recall (when applicable)	NOT APPROVED
	Air Steward	Recalled by Health Canada	✗
	Biontu	RN-80	✗
	Boyd Gresham	Radon Detector – Recalled by Health Canada	✗
	CRADTEC	PRM-02H	✗
	CRADTEC	PRM-02H	✗
	Funny Kitchen	HRDM-02 – Recalled by Health Canada	✗
	HAKINAKU	Smart Radon Gas Detector	✗
	Honchen	Home Radon Detector Recalled by Health Canada	✗
	INKBIRD	Home Radon Meter – Recalled by Health Canada	✗
	INKBIRD	INK-RD2 – Recalled by Health Canada	✗
	LifeBasis	INK-RD2 – Recalled by Health Canada	✗
	LifeBasis	LCARM001 – Recalled by Health Canada	✗
	Radon Guard	Recalled by Health Canada	✗
	Spolehl	Radon Detector – Recalled by Health Canada	✗

Edit



- Health Canada recommends reducing radon levels to as low as possible.
- The most common (& effective) radon mitigation system is a sub-slab depressurization system.
- Sub-slab depressurization systems reduce radon levels by an average of over 90%
- Average cost of $ 3,000
- Generally installed in one day
- C-NRPP Radon Mitigation Professionals

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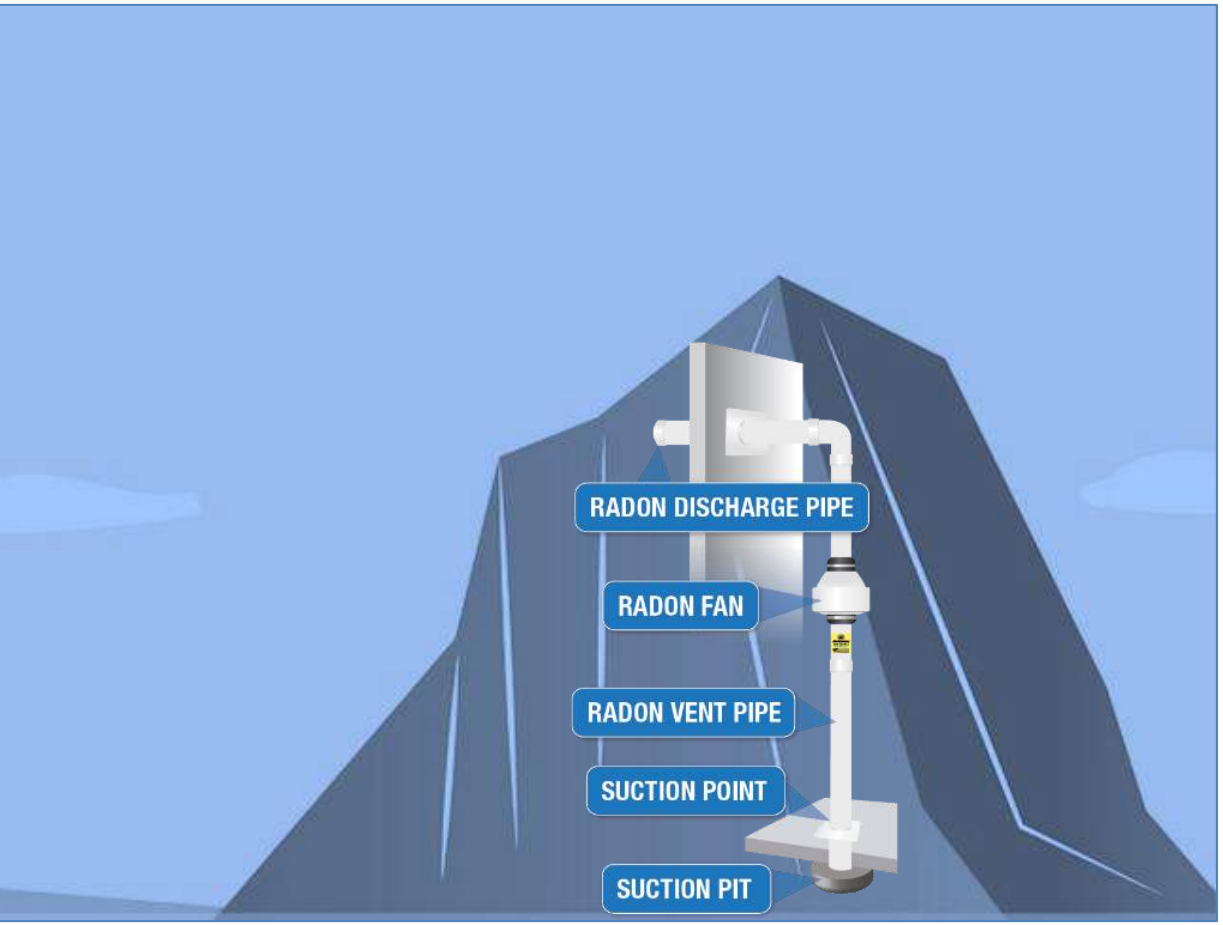


Radon Mitigation Systems:

Understand what goes into the install

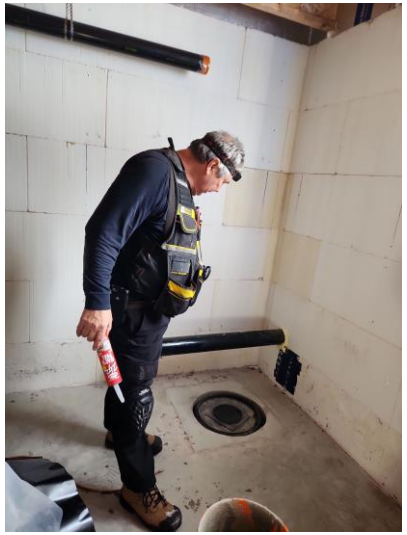
Find Information on Certification:
https://c-nrpp.ca/how-to-become-certified/

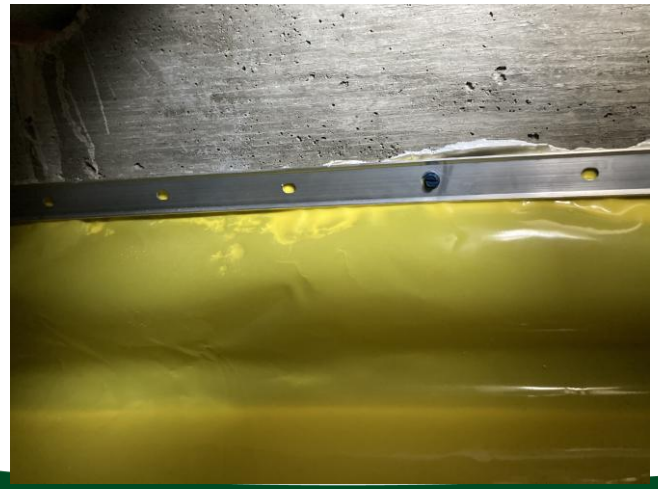
CGSB Standard for Existing Residential Construction – 149.12.2025

Canadian General Standards Board – Radon Mitigation options for EXISTING HOMES

(CGSB 149.12)

- includes existing buildings, not just low-rise residential buildings
- Includes information for both:
  - Active soil depressurization – the preferred method for reducing radon levels in existing buildings.
  - Ventilation – an alternative method for reducing radon levels that may be more feasible when active soil depressurization is not possible for a particular building.
- **Note: Sealing of potential entry points is considered a prerequisite for both of the above methods.**
- A more comprehensive step-by-step description of fan-sizing and system design has been included; sections have been rearranged; definitions updated.





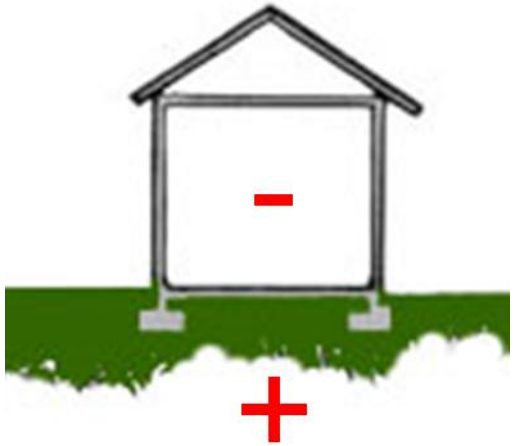
Radon Mitigation Systems:

Understand what goes into an effective system

PREPARING THE SLAB:

- pressure measurements to ensure well sealed foundation
- proper sealing to seal the foundation (especially the floor to wall joint)
- assess barriers impeding airflow and underslab ‘communication’

IT'S ABOUT BEING ABLE TO EASILY TURN A NEGATIVE TO A POSITIVE



Positive pressure under the slab demonstrated with a smoke pencil

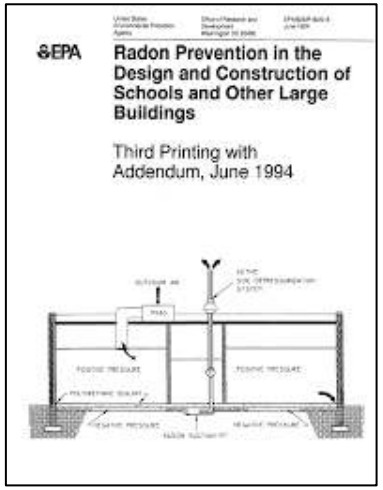
Negative pressure under the slab.

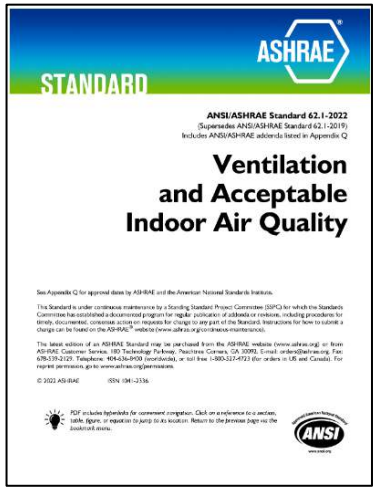
IT'S NOT JUST ABOUT GEOGRAPHY!

- Source Strength
- Construction Methods
- Construction Materials
- Construction Quality
- Basement Depth
- HVAC
- Heat Recovery Ventilators
- Heating Methods
- Occupant Activity
- Wind Forces
- Renovations

BUILDING TYPES, CODE & DESIGN REFERENCES

- Radon Control in New Construction
  - Residential
    - Prescriptive Part 9
  - Industrial, Commercial, Institutional
    - Design Professionals Part 6
      - 6.2.1.1 Good Engineering Practice
        - EPA 625/R-92/016, "Radon Prevention in the Design and Construction of Schools and Other Large Buildings
      - 6.3.1.1. Required Ventilation
        - ANSI/ASHRAE 62.1, "Ventilation for Acceptable Indoor Air Quality,"





ONTARIO ONLY

3.1.1.5. Radon

(1) In addition to all other requirements, a *building* in the following designated areas shall be designed and constructed so that the annual average concentration of radon 222 does not exceed 200 Bq/m^3 of air and the annual average concentration of the short lived daughters of radon 222 does not exceed 0.02 working levels inside the *building*:

(a) the City of Elliot Lake in the Territorial District of Algoma,

(b) the Township of Faraday in the County of Hastings, and

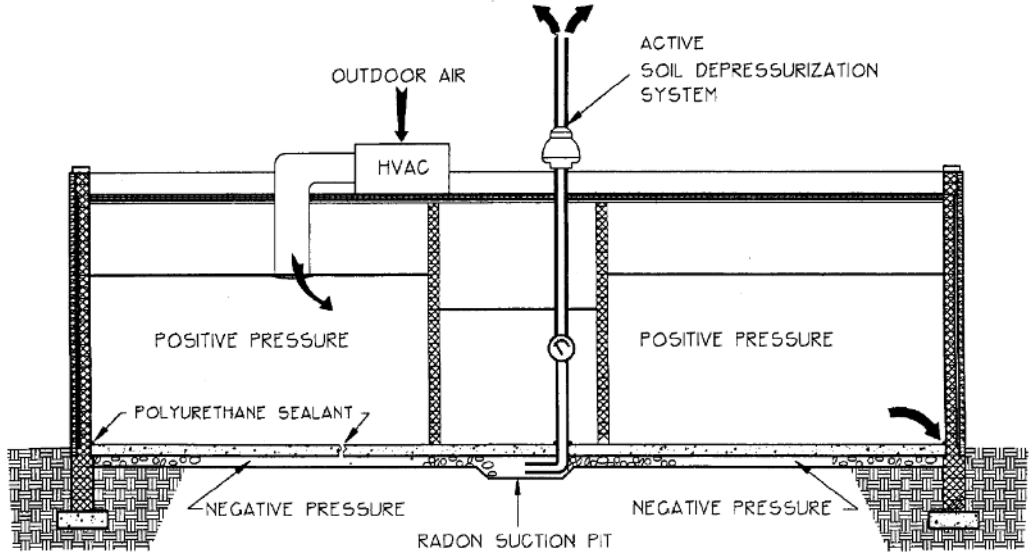
(c) the geographic Township of Hyman in the Territorial District of Sudbury.

6.2.1.1. Good Engineering Practice (See Note A-6.2.1.1)

- 1) Heating, ventilation and air-conditioning systems, including mechanical refrigeration equipment, shall be designed, constructed and installed in conformance with good engineering practice such as that described in, but not limited to,
- …. i) EPA 625/R-92/016, “Radon Prevention in the Design and Construction of Schools and Other Large Buildings,”…

US EPA 625/R-92/016

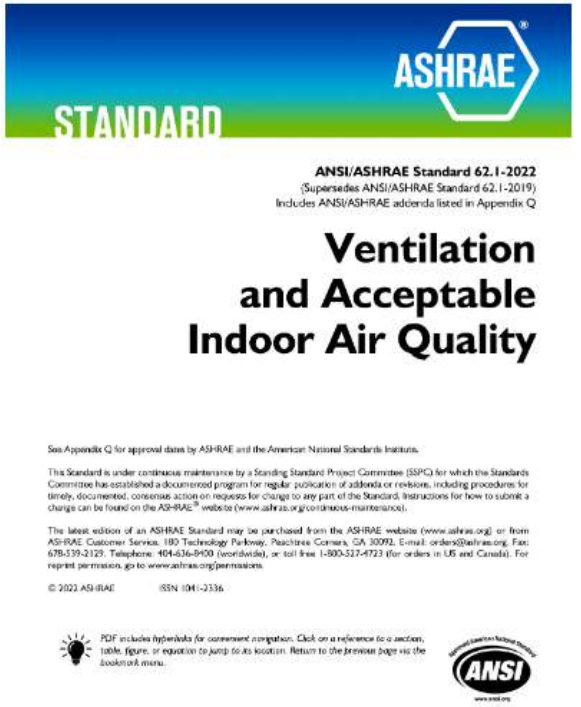
- Discusses both ventilation control and active depressurization
- Covers all components of radon control system
  - Sealing, subsurface gas collection layer, suction pits, soil and membrane depressurizations, below grade wall coatings
  - **ASD discharge 7.6m (25ft) from intakes (excessive)**
- Foundation separations that prohibit depressurization
- Wall Types
  - Block vs concrete
- Covers HVAC controls
  - Building Pressurization
  - Dilution
- Operation and Maintenance
- Crawl spaces



- Published in 1994
- Still main code reference document
- More recent design guidelines available
  - Prove equivalent for compliance

ASHRAE 62.1- ASD DISCHARGE

- ASHRAE 62.1 was not written with intent of addressing radon
- Radon falls under Class 4 Air:
  - *"Air with highly objectionable fumes or gases or with potentially dangerous particles, bioaerosols, or gases, at concentrations high enough to be considered as harmful."*
    - *Canada* ≥ 200 Bq/m^3
    - *United States* ≥ *148* Bq/m^3
- **Discharge point of ASD:**
  - As per Table 5-1 Air Intake Minimum Separation Distance is 10m (30ft) which:
    - is excessive,
    - contradicts EPA 625/R-92/016 @ 7.6m (25 ft), and
    - contradicts Health Canada and CGSB @ 3m (10ft)
  - Calculations of ASHRAE 62.1 Normative Appendix B demonstrate 3m (10ft) clearance is acceptable
- CARST has received clarification on these items from ASHRAE



Alberta Infrastructure Radon Mitigation Rough-in System

Section Cover Page

2024-06-18 — **Section 31 21 13 Radon Mitigation Rough-in System**

Use this Section to specify a radon mitigation rough-in system, as listed below.

This Master Specification Section contains:

.1 This Cover Page

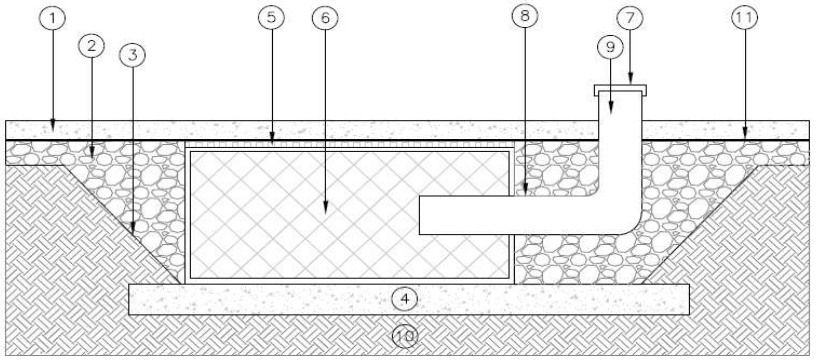
.2 Specification Section Text:

1. General
1.1 Intent
1.2 References
1.3 Definitions
1.4 Administration Requirements
1.5 Delivery, Handling and Storage
1.6 Environmental / Site Conditions
1.7 Warranty
1.8 Performance Requirements
1.9 Site Inspection Requirements

2. Products
2.1 Manufacturer
2.2 Geotextile Fabric
2.3 Gas Permeable Venting Layer
2.4 Membrane Barrier System
2.5 Suction Pit and Cage
2.6 Collection Pipe Extensions from the Suction Pit and Cage

3. Execution
3.1 Installation

TYPICAL RADON SUCTION PIT AND MEMBRANE ASSEMBLY DIAGRAMS



NATIONAL BUILDING CODE

includes radon control measures:

- Gravel under the slab
- Well-sealed liner
- Sealed sump pit
- Radon rough-in for future installation, Capped, sealed

BC Building code includes radon control measures:

- Gravel under the slab
- Well-sealed liner
- Sealed sump pit
- EXTENDED Radon rough-in for future installation
- Extended to outside of the building envelope

THIS DATA IS CURRENT TO NOVEMBER 2025.

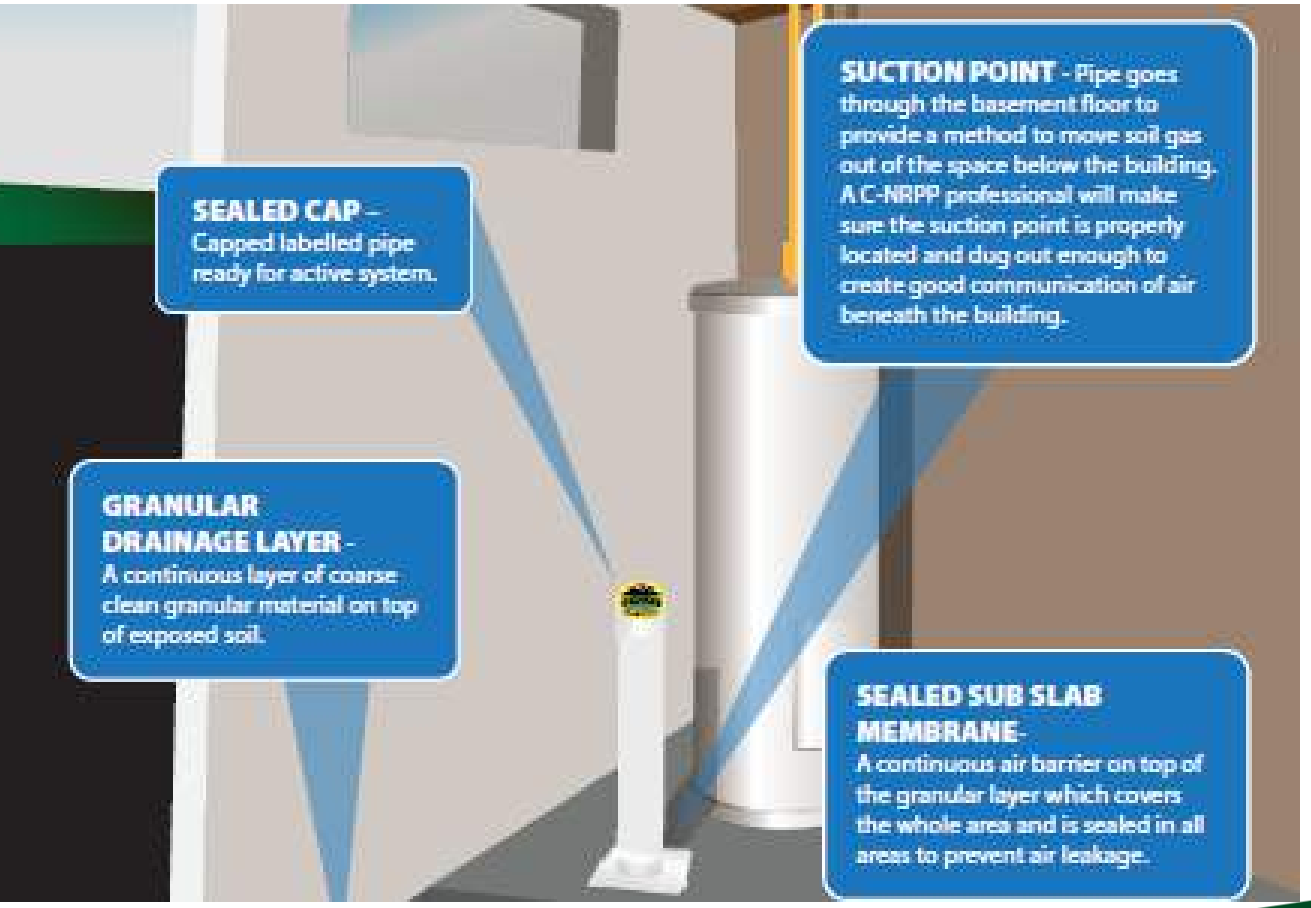
CGSB Standard

Level 1
- granular layer
- Poly liner
- rough-in for active soil depressurization;

Level 2
- Level 1
- full passive vertical radon stack

Level 3
- Level 1
- Level 2
- full active soil depressurization system

CURRENT NATIONAL BUILDING CODE



Course clean granular material under the slab

- No less than 4” layer
- Less than 10% fines
- Void area content 35-40% (ASTM E1465)

Well-sealed sub slab membrane

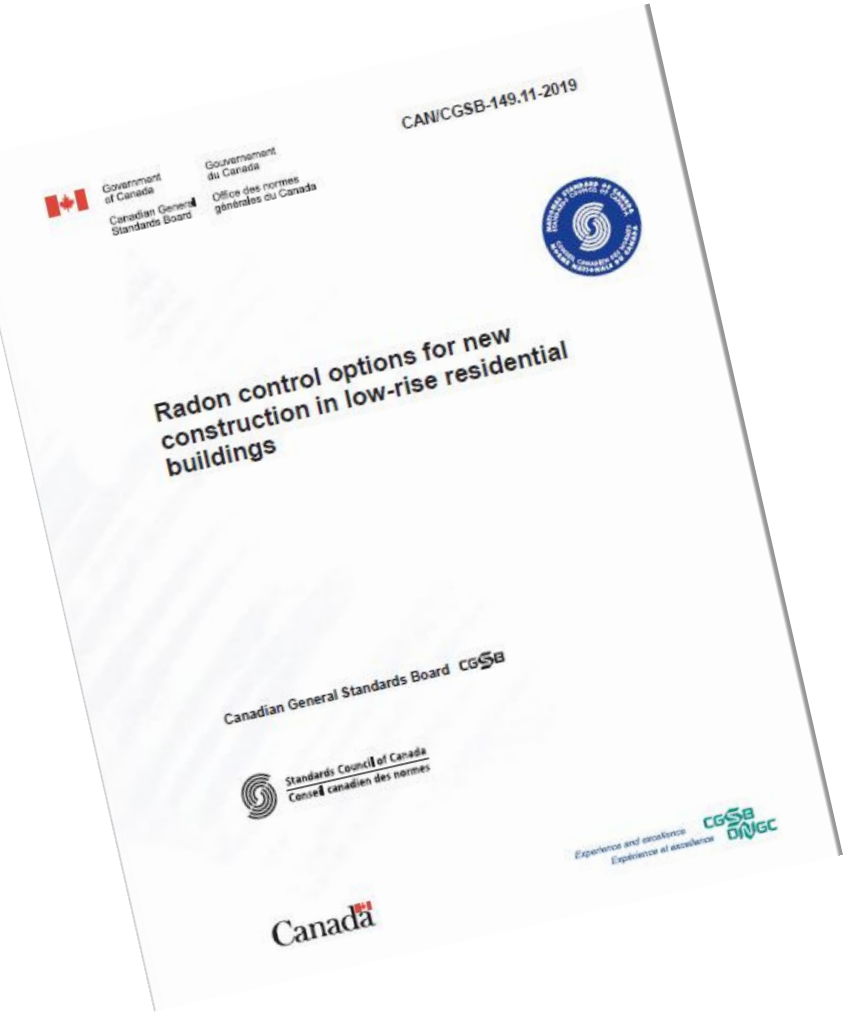
- Continuous barrier
- Sealed in all areas to prevent air leakage
- Including sealed floor to wall joint

Sealed sump pit

- Sealed with an airtight lid

Radon rough-in for future installation

- Ideally minimum 12” above the floor
- Sealed, capped and labeled in above floor section
- In a location for future installation of mitigation system



The three levels of protection from radon ingress are the following:

Level 1 = rough-in for active soil depressurization;
Level 2 = full passive vertical radon stack (level 1 plus a stack);
Level 3 = full active soil depressurization system (level 2 plus a fan).

Most provinces and territories already require protection from radon similar to level 1 in all new homes

- level 2 and level 3 requirements in this national standard are intended for higher risk areas.

In areas where significant proportions of homes are likely to test above the 200 Bq/m^3 Canadian radon guideline, authorities may find it prudent to adopt either a level 2 or level 3 protection requirement in new construction.

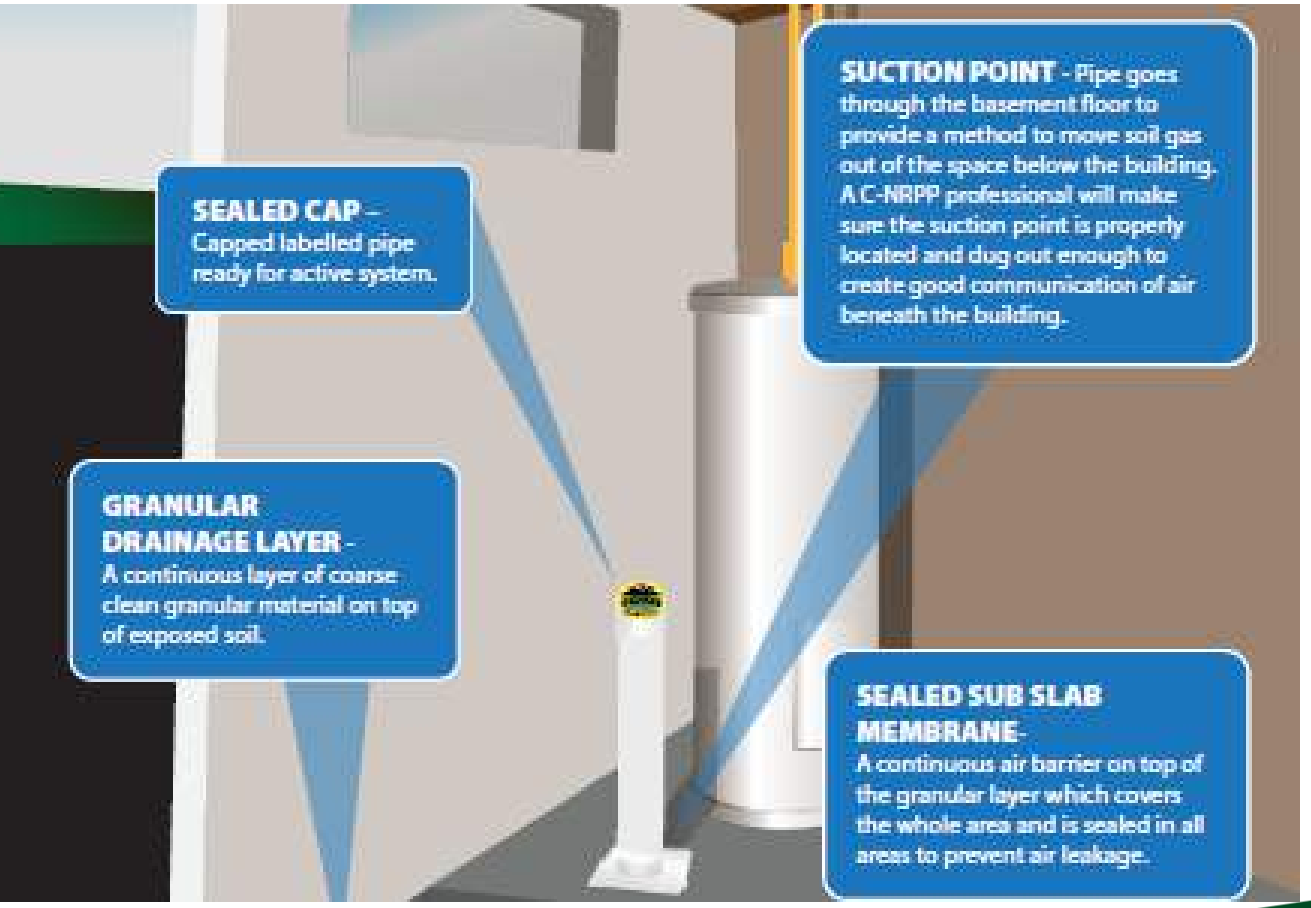
CANADIAN GENERAL STANDARD BOARD CAN/CGSB-149.11-2024

RADON CONTROL OPTIONS FOR NEW BUILDINGS

CAN CGSB-149.11 Requirements

1. Gas permeable layer (clear stone, gas mat)
2. Soil gas barrier system (10mil)
3. Suction pit (pipe, cage, excavated pit)
4. Sealing entry points
5. Rough in / vent pipe (100mm dia)
6. Fan if home tests over

CURRENT NATIONAL BUILDING CODE

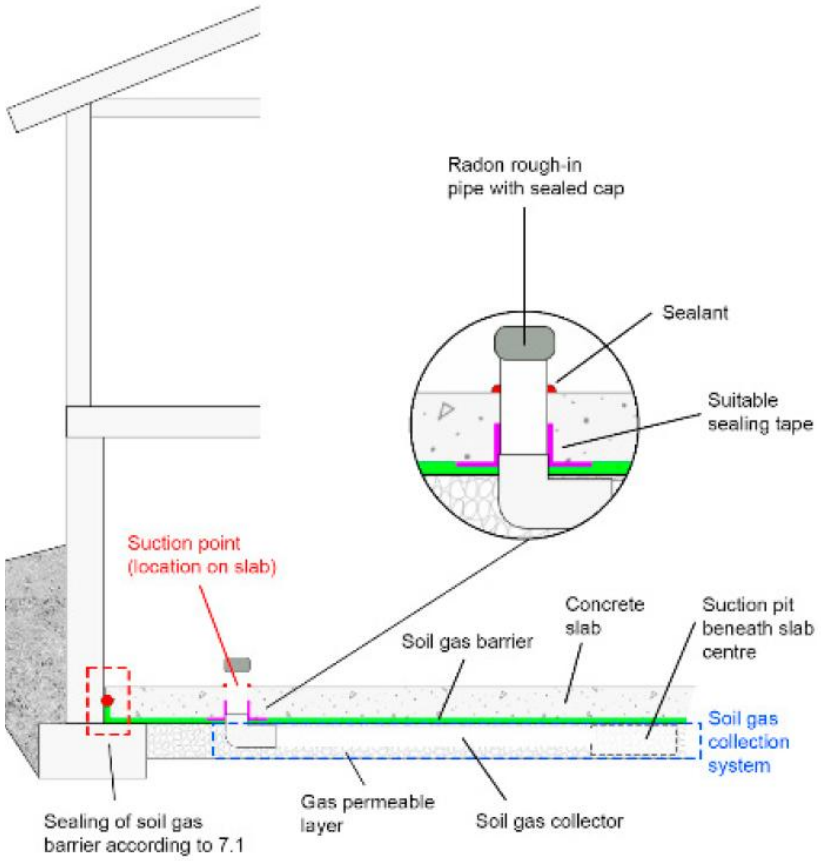


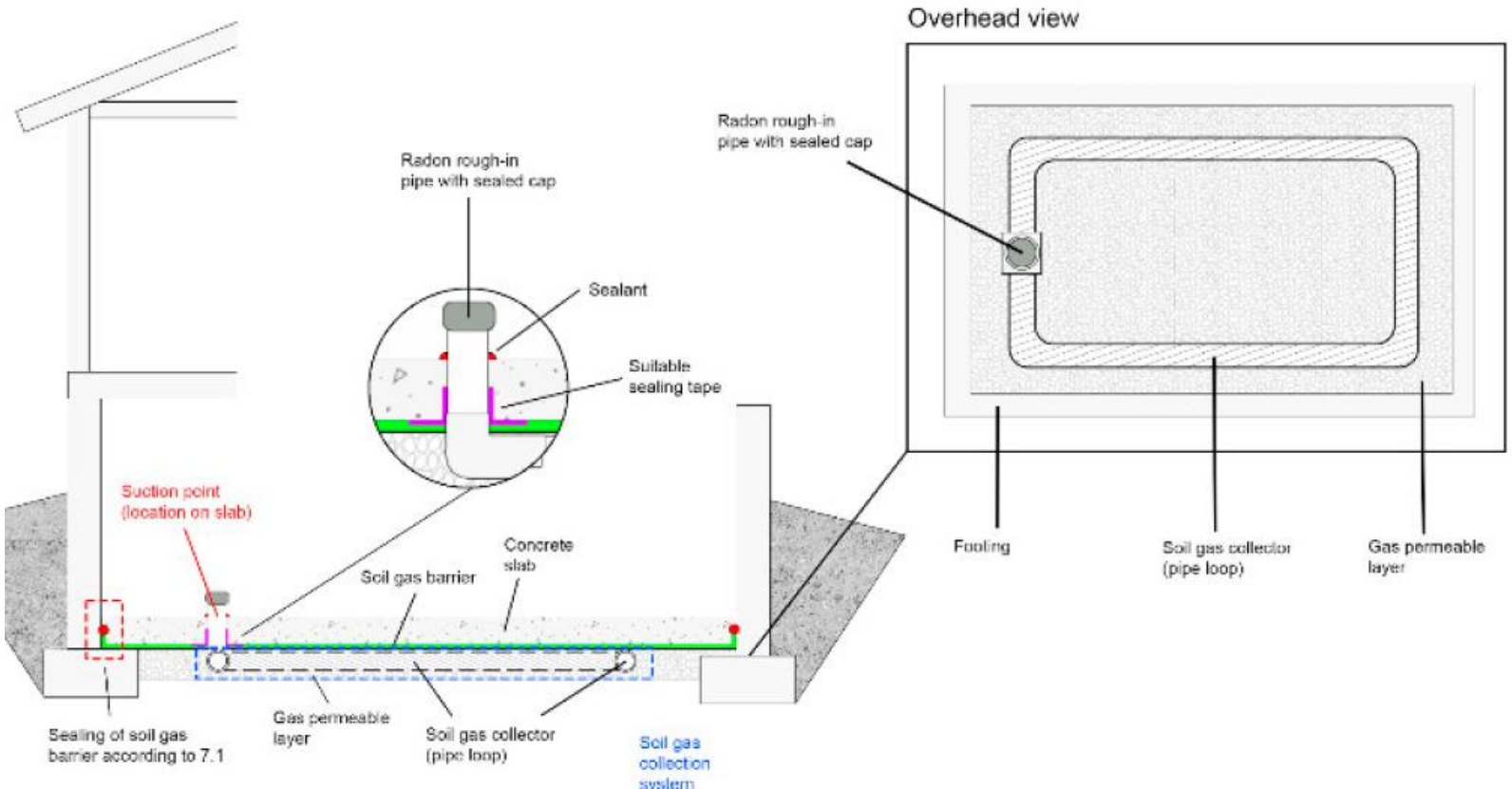
Radon rough-in for future installation

- Ideally minimum 12” above the floor
- Sealed, capped and labeled in above floor section
- In a location for future installation of mitigation system

ILLUSTRATIVE DIAGRAM OF A LEVEL 1A RADON ROUGH-IN

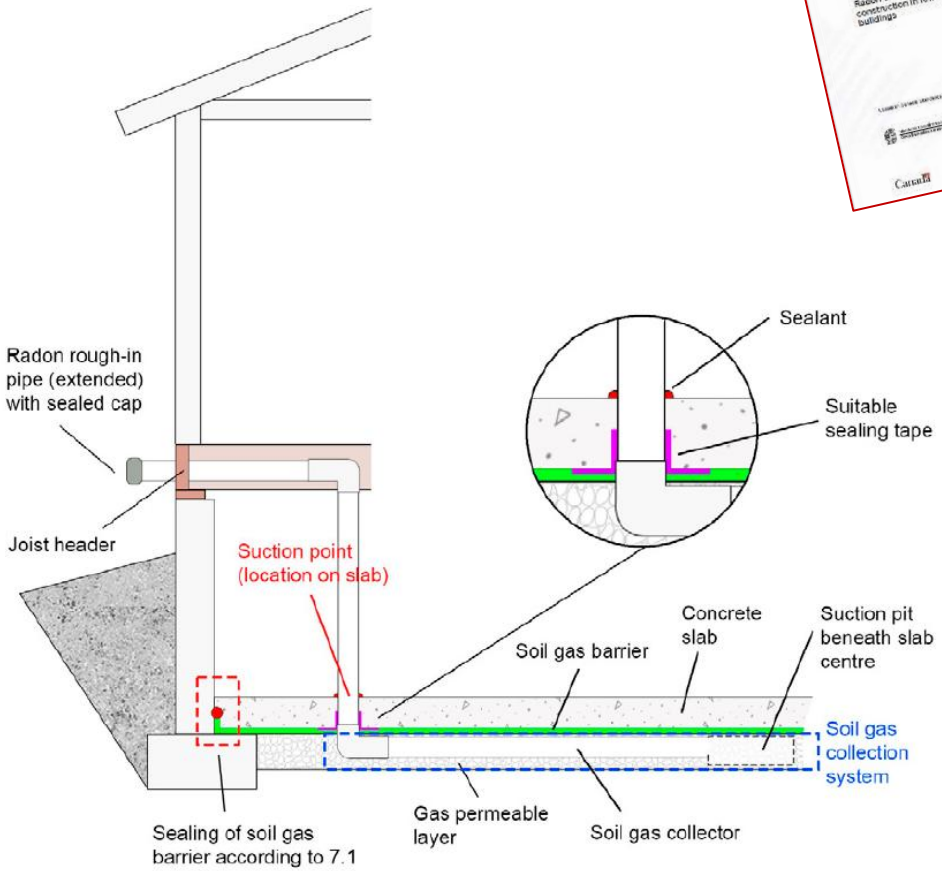
(FIGURE 2A AND 2B)





CGSB LEVEL 1B RADON ROUGH IN SYSTEM (FIGURE 3)

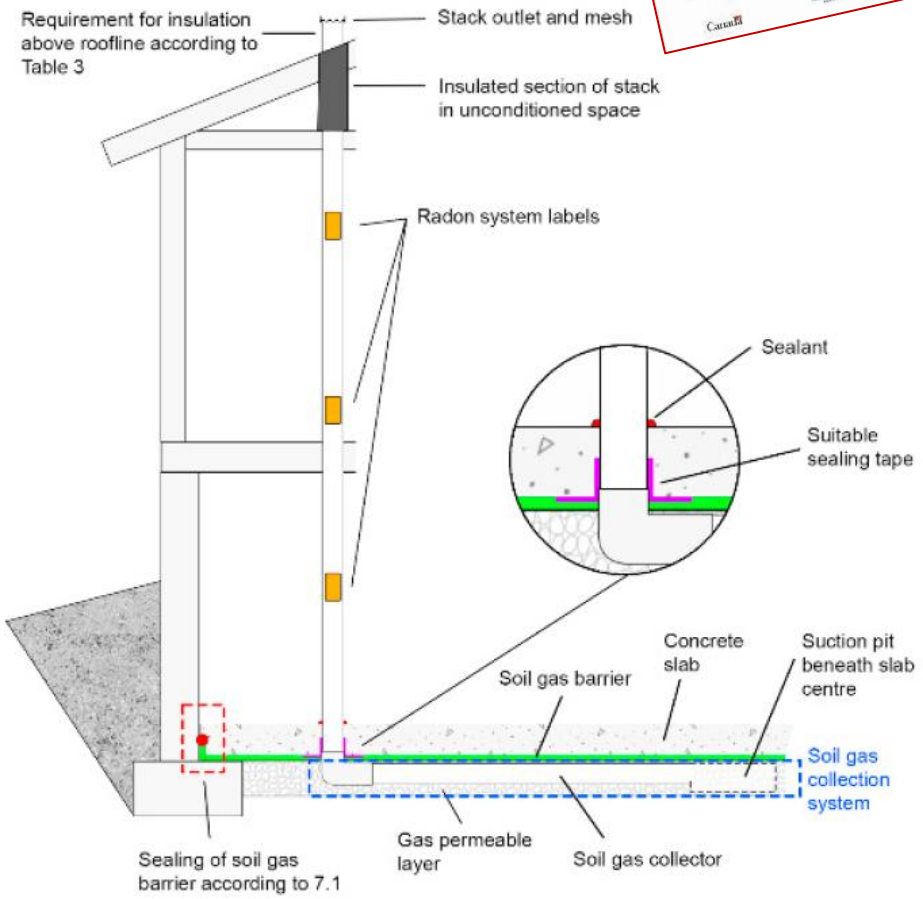
The pipe route has at least been planned here ahead of time.



CGSB LEVEL 2 RADON ROUGH IN SYSTEM

(FIGURE 10)

Preferably no bends



CGSB STANDARD - LABELLING

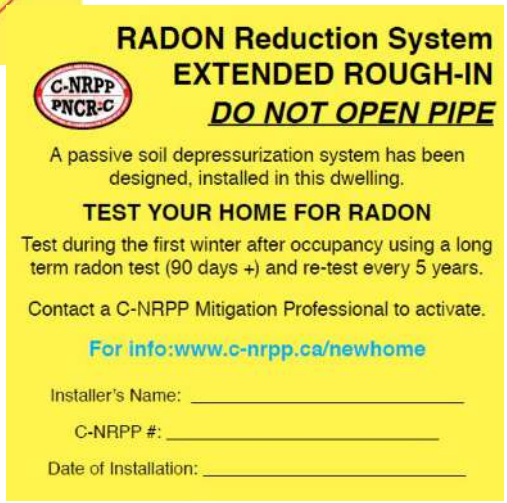
- **There are five label types:**

1. soil gas barrier labels,
2. soil gas collector (pipe) labels,
3. radon rough-in pipe labels,
4. sump labels, and
5. electrical panel labels

- **Six if you activate the system:**
- 6. Radon fan label

Labels Shall:

- be durable.
- be in both official languages.
- be applied to clean dry surfaces
- use lettering that is in a contrasting colour to the background



MORE TOPICS

BC Codes

- BC Codes 2024
- BC Codes 2018
- Errata & Revisions
- Technical Bulletins
- Code Interpretations
- Other Code Resources
- Letters of Assurance
- BC Public Review
- National Model Codes

BC Codes 2024

Last updated on March 8, 2024

BC Codes 2024 are now in effect, except for adaptable dwellings and earthquake changes which take effect March 10, 2025.

An updated version of the BC Codes 2024 is now available, offering code users new interactive features.

New technical bulletins for the 2024 BC Building Code are now available.

About the BC Codes 2024

BC Codes 2024 are largely based on the National Codes 2020 with some BC-specific variations to reflect the province's geography, climate, local government needs, industry practices, and provincial priorities. Book I (General) and Book II (Plumbing Systems) together form the BC Building Code 2024.

National Code changes incorporated into BC Building Code 2024:

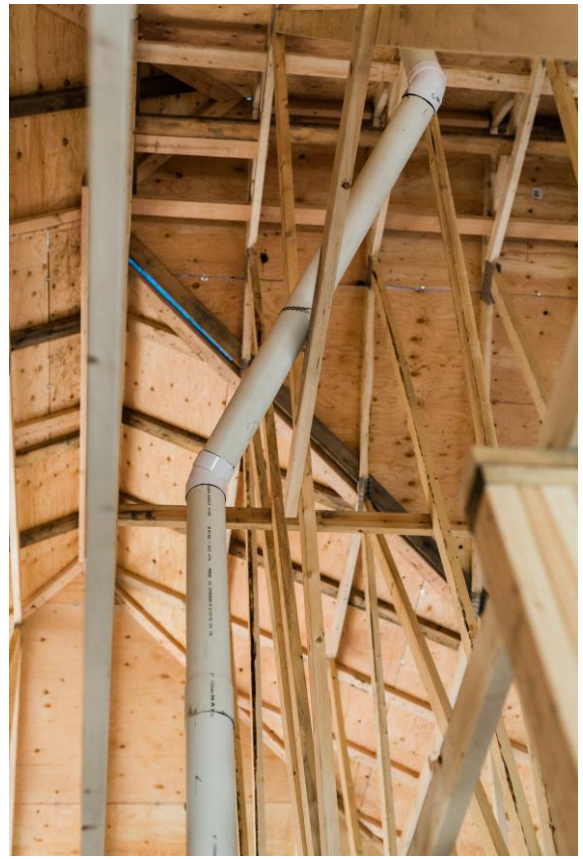
- Enabling mass timber construction
- Requiring rough-ins for radon safety province-wide

BC-specific changes effective March 2024:

- More complete and specific language for constructing extended rough-ins for radon subfloor depressurization systems
- Adopting cooling requirements to provide one living space that does not exceed 26 degrees Celsius
- Retaining existing ventilation requirements for systems serving single dwelling units

BC-specific changes effective March 2025:

- Requiring 100% adaptable dwellings in large condominium and apartment buildings and the first floor dwelling units in new small apartments and condominiums to be adaptable
- Reinforcement of bathroom walls to allow future installation of grab bars
- Early adopting national provisions to improve earthquake design changes for housing and small buildings with high seismic hazard values



Radon Demonstration: Application of Building Code Changes in Winnipeg New Home Construction

April 2014

CHALLENGES:

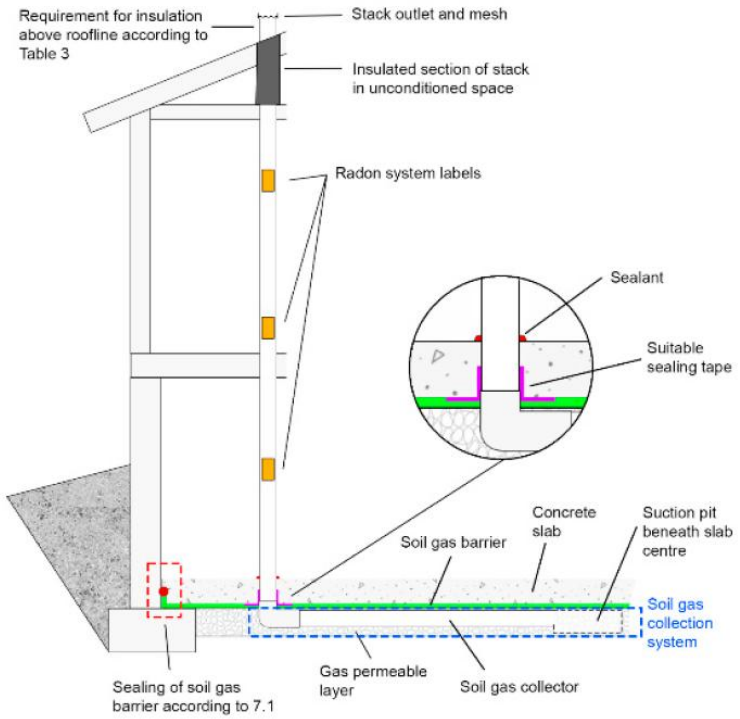
- Poor sealing of membrane
- Poor location of rough-in
- Poor installation of rough-in
- Poor labelling of rough-in
- Rough-in not sealed
- Improper pipe used

Radon Demonstration:
Application of Building Code Changes in Winnipeg New Home Construction

April 2014

PROPOSED BUILDING CODE CHANGES 2025

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



Passive Vertical Radon Stack

This proposed change adds requirements for radon mitigation by use of a passive vertical radon stack in dwelling units and home-type care occupancies that have a wall, roof or floor assembly in contact with the ground.

TABLE 1: RADON INSPECTIONS

Town	Total Homes Inspected	Under construction	Post-Construction/ Occupied
Blind Bay	1	1	–
Coldstream	1	–	1
Golden	1	–	1
Kamloops	14	4	10
Kelowna	28	18	10
Lake Country	7	1	6
Revelstoke	14	7	7
Salmon Arm	3	0	3
Vernon	20	14	6
Total	89	45	44

https://bclung.ca/wp-content/uploads/2024/06/BC-Building-Code-Report.pdf

Concerns with implementation

- Gravel and fill
- Multiple footings
- Blocked or ineffective soil gas collector (pipe under the slab)
- Gaps in the foundation
- Location of pipe and room for fan
- Electrical outlet for fan
- Elbows and horizontal runs
- Incorrect pipe used
- Labelling
- Insulation and Freezing
- Termination of pipe;

Challenges with Pipe Location

Incorrect Pipe type

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Home

Eight quick facts about radon

8. **The new home warranty covers it.** If your home is less than seven years old and a long-term radon test of at least three months indicates levels higher than 200bq/m3, there is help available for you. Your new home warranty provides radon remediation coverage for seven years from the original possession date, and the maximum coverage was recently increased to $50,000 for homes who have a signed Agreement of Purchase and Sale after February 1, 2021. Report the situation to your builder and Tarion on the applicable warranty claim form. Your builder is required to take appropriate measures to reduce the radon in your home to an acceptable level. And if your builder fails to take action, then Tarion will step in to help.

https://www.tarion.com/media/eight-quick-facts-about-radon

In Ontario, Tarion Warranty covers new homes for the first seven years after construction.

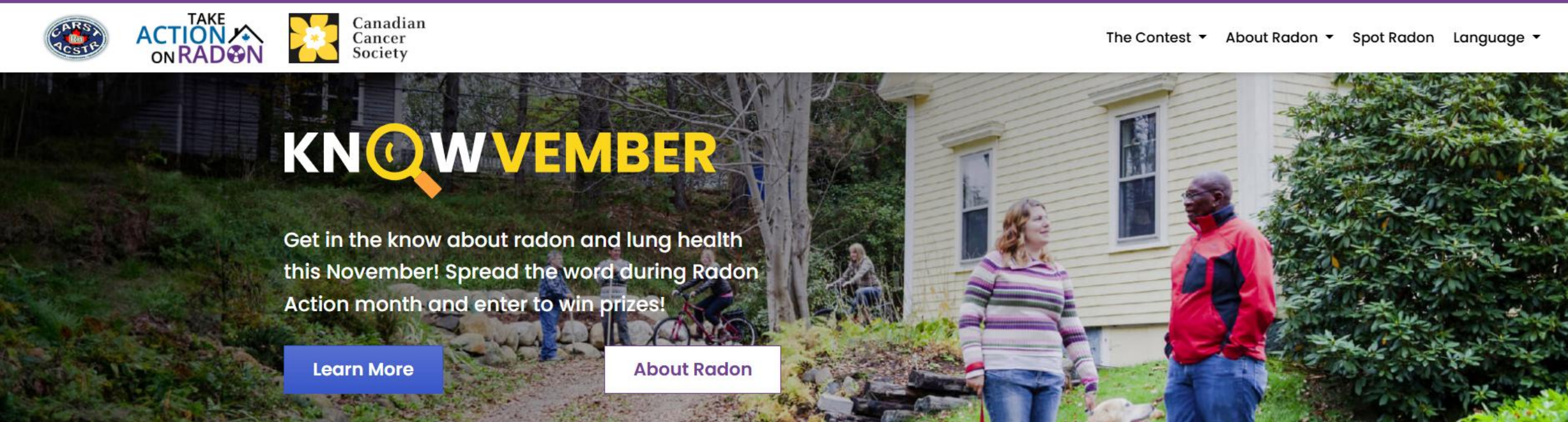
If homes test above the Health Canada guideline then the warranty program covers the cost of the radon mitigation system if installed by a C-NRPP Professional.

Radiation Safety Institute of Canada
Institut de radioprotection du Canada

KNOWVEMBER

A contest to reward Canadians for spreading RADON AWARENESS!

Knowvember.ca



KNOWVEMBER

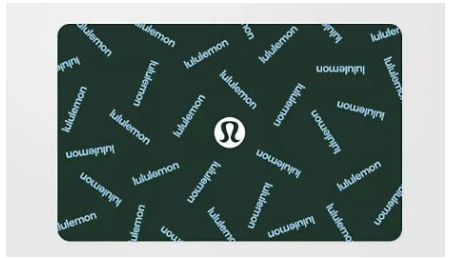
Grand Prize Draws – December 1

Eight (8) $50.00 retail gift cards (two weekly prizes during each Weekly Entry Period).

Draw dates:

- November 3
- November 10
- November 17
- November 24

•One (1) $100 Gift Card for Raw Canvas, VALUE: $100



One (1) $150 Gift Card for Lulu Lemon, VALUE: $150

One (1) Fitbit Versa 4 Fitness Smartwatch Waterfall Blue/Platinum Bundle, APPROXIMATE VALUE: $348

•One (1) PELICAN Boracay NXT Inflatable Stand-up Paddle Board - 10 ft. 4 in., APPROXIMATE VALUE: $399

$400 Gift Card for Footsource- Calgary orthotics, VALUE: $400

One (1) KitchenAid Artisan Mini Stand Mixer (approximate retail value (“APR”) $479.99).

KNOWVEMBER

Get to know radon

Have fun while you get “in the know” about radon! Take a look at various locations around your community and discover the answers to some common radon questions.

Character select

Instructions

Check out the Radon Game at:
www.knowvember.ca

Questions?

- Please post questions in the Q&A.
  - If you cannot see it, post in chat and we will copy them over.
- Questions we do not get to
  - Answers will be posted to our website and a link to resources emailed out

"Good science in plain language"®

Thank you for listening!

www.radiationsafety.ca

1-800-263-5803

info@radiationsafety.ca

Wellness Break

Ji Hong Tai Chi & Qi Gong, Richmond Hill, ON

Resources

- C-NRPP Consumer grade electronic monitors
- C-NRPP How to become certified
- CSA Standard 149.12-2024 Radon mitigation options for existing buildings
- US EPA Radon Prevention in the Design and Construction of Schools and Other Large Buildings
- ANSI/ASHRAE 62.1-2022: Ventilation for Indoor Air Quality

Resources

- Alberta Infrastructure Radon Mitigation Rough-in System
- National Building Code of Canada 2020
- Provincial/territorial adoption of the National Building Code
- BC Radon Rough-in Requirements
- CAN/CGSB-149.11-2024 Radon control options for new buildings
- BC Lung - Radon and the Building Code: Assessing Implementation

Resources

- Ontario Tarion Warranty Radon Coverage
- Tarion Warranty – 8 Quick Facts about Radon
- Knowvember
- RSIC – How to test for radon gas in your home
- RSIC - Why should you test your home for radon in the winter?
- RSIC Factsheet – Radon Gas
- RSIC Factsheet – Radon in Your Home