Canadian Radon Program - Measurement

Differences between the Canadian and U.S. Programs

- Consumer Guidance
- Units of Measure
- Large Buildings

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Mitigation differences addressed in another course

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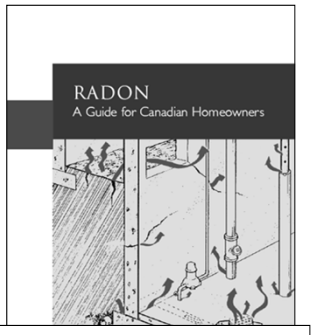
Canadian Guidance Health Risk Estimates Distribution



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Canadian Radon Guidance for Dwellings

- Current Guidance: 200 Bq/M3 of Radon
  - Federal Provincial Territorial Radiation Protection Committee – October 2006
  - Government of Canada – June 9, 2007
- Previous Guidance: 800 Bq/M3 of Radon

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Canadian Radon Levels

Situation	Current
Average Outdoor Radon Levels	10 Bq/M3
Geometric Mean of Indoor Levels	41.9 Bq/M3
Level to which most homes can be mitigated	75 Bq/M3
% Homes Above 200 Bq/M3 (Population Weighted)	6.9% Previously was 3.3%

References

1. Radon A Guide for Canadian Homeowners
2. Cross-Canada Survey of Radon Concentrations in Homes March 2012 http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/radiation/radon/survey-sondage-eng.pdf

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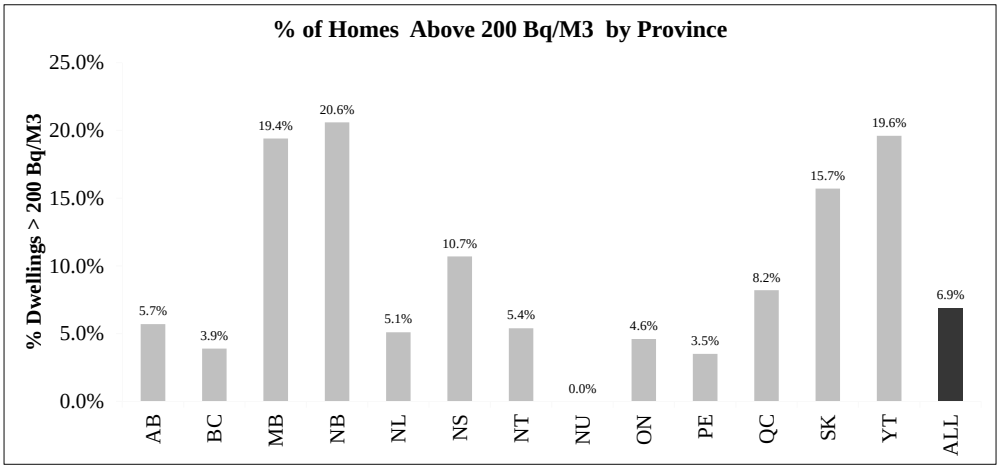
Canadian Incidence by Province

Cross-Canada Survey of Radon Concentrations in Homes March 2012
13,976 homes http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/radiation/radon/survey-sondage-eng.pdf



Percentage of Canadian dwellings above 200 Bq/M3: 6.9 %
Average Indoor Exposure: 41.9 Bq/M3

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Canadian Health Risk Assumptions

Situation	2006 (Ref 1)	2011 (Ref 2)
Lung Cancer – Men	10,700	11,300
Lung Cancer Women	8,600	9,300
Lung Cancer Total	19,300	20,300
Lung Cancer Attributed to Radon	10%	16%
Attributed to Radon (cases)	1,930	3,261

Assumptions:

- Average time spent in home: 18 hours/day (75%)
- Average indoor radon: 41.9 Bq/M3 – 45 Bq/M3

References

1. Radon A Guide for Canadian Homeowners
2. Canadian Population Risk of Radon Induced Lung Cancer – A Reassessment Based On the Recent Cross Canada Radon Survey

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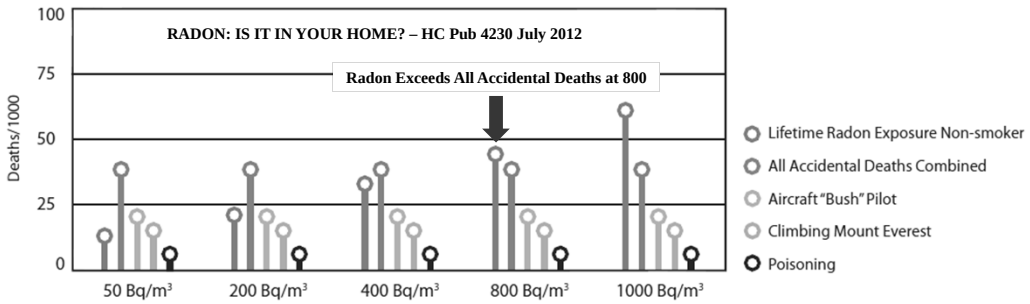
Lifetime Risk Comparison (Non-Smoker)

RADON: IS IT IN YOUR HOME?



- Risk is linear with radon exposure
- 12 deaths/1000 people for every 50 Bq/M3 average lifetime exposure
- Exceeds all accidental deaths at 800 Bq/M3

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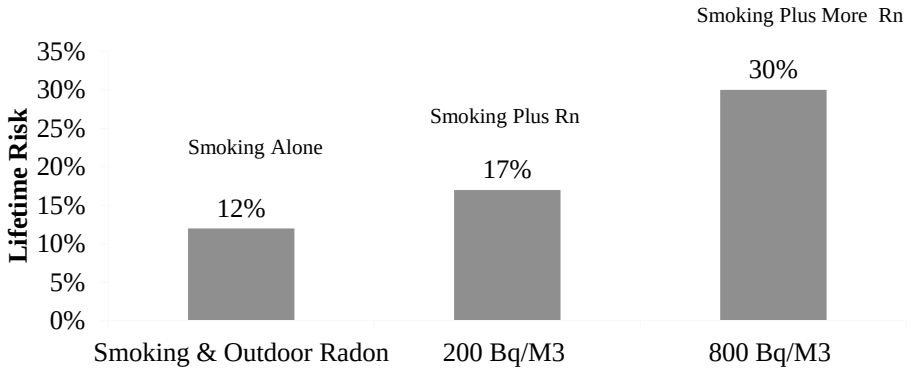
Radon and Smoking

RADON: IS IT IN YOUR HOME? Information for Health Professionals

Lung Cancer Risk from Smoking and Increasing Lifetime Exposure to Radon



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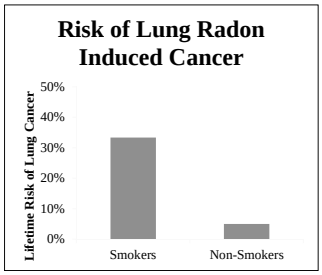
Radon Induced Lung Cancer
Smokers vs. Non-Smokers

RADON – ANOTHER REASON TO QUIT

- Lung cancer risk from radon essentially 6 times greater for smokers than non-smokers.
- 16% of lung cancers from radon (previously was 10%)
- Radon is the second leading cause of lung cancer.



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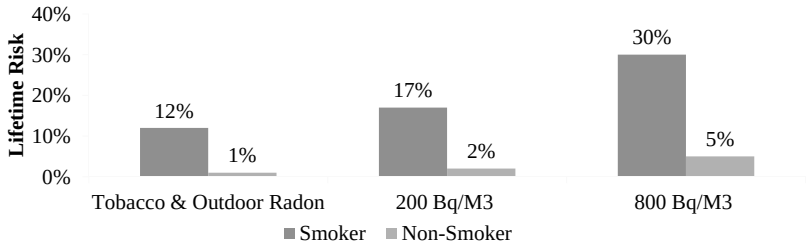
Radon Risk Smokers vs. Non-Smokers

Lifetime Risks from Radon Smokers vs. Non-Smokers



LIFETIME RISKS TO A SMOKER EXPOSED TO RADON	
Lung cancer risk for lifetime exposure to radon at 800 Bq/m³	30%
Lung cancer risk for lifetime exposure to radon at 200 Bq/m³	17%
Lung cancer risk from smoking only	12%

LIFETIME RISKS TO A NON-SMOKER EXPOSED TO RADON	
Lung cancer risk for lifetime exposure to radon at 800 Bq/m³	5%
Lung cancer risk for lifetime exposure to radon at 200 Bq/m³	2%
Lung cancer risk for exposure to radon at low outdoor levels	1%

(Source: Report of the Radon Working Group on a New Radon Guideline for Canada)

RADON: IS IT IN YOUR HOME? Information for Health Professionals

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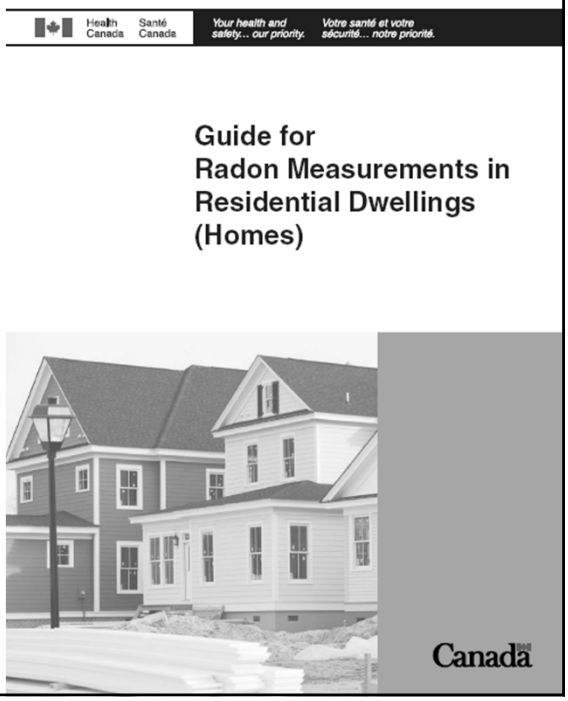
Physics and Radon Measurements



Canadian Approaches to Radon Measurement

- Differences between Health Canada Guidance and U.S. EPA Protocols
  - Residential
  - Public Buildings
  - Schools
  - Post-Mitigation Testing

There are more similarities than there are differences!

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What is Similar?

- Device types
  - Device use and approvals are identical
- Quality Assurance and Quality Control
  - Identical requirements for duplicates, blanks, spikes, performance testing, etc.
  - Both refer to US EPA Document
    - Guidance on Quality Assurance EPA 402-R-95-012 October 1997.
- Common certification oversight
  - National Radon Proficiency Program
- Radon behavior
  - Radon acts the same on either side of the 49th parallel

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What are Basic Differences?

- Measurement Units
  - SI units
- Canadian preference for Long-Term measurements
  - US also prefers long-term measurements as better indicator but emphasizes short-term as first step in identifying problem
  - Canada recommends long-term (3 month minimum as first step)
- Canada requires knowledge of public building protocols
  - Public buildings considered to be “dwellings”
- Real Estate Testing
  - Need for short-term testing recognized, but long-term is still recommended.

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Applicable SI Units

SI: systeme internationale

- Radioactivity
- Exposure
- Dose
- Pressure Measurements

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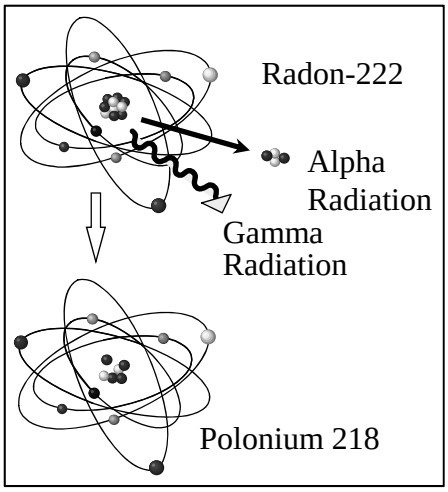
Radioactivity



Rate that a radioactive element decays or disintegrates down to another element.

Type	Unit	Rate/Second	Rate/Minute
U.S.	Pico Curie (pCi)	.037 decays per second	2.22 decays per minute
SI/Canada	Becquerel (Bq)	1 decay per second	60 decays per minute

A source at 1 Bq is 27 times stronger than one at 1 pCi (1/0.037 = 27)

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Radioactivity per Unit Volume

- U.S.
  - Liter
- Canada
  - Cubic Meter

Type	Unit	Rate/Minute per Unit Volume
U.S.	Pico Curie/Liter (pCi/L)	2.22 decays per minute per liter
SI/Canada	Becquerel per cubic meter (Bq/M3)	60 decays per minute per cubic meter

$$1 \text{ pCi/L} = \frac{2.22\ DPM}{L} \times \frac{1{,}000\ L}{1M^3} \text{ x } \frac{Bq}{60\ DPM} = 37\ Bq/M^3$$

$$1 \text{ Bq/M}^3 = \frac{60\ DPM}{M^3} \times \frac{1\ M^3}{1000\ L} \text{ x } \frac{pCi}{2.22\ DPM} = 0.027\ pCi/L$$

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Converting Between Bq/M3 & pCi/L

$$\frac{Bq/M^3}{37} = \text{pCi/L}$$

pCi/L x 37 = Bq/M^3

Tips:

- Remember 37
- To convert --- either multiply or divide by 37
- If sampling same location -- Bq/M3 will always be numerically larger than pCi/L
  - Divide by 37 when converting Bq/M3 to pCi/L
  - Multiply by 37 when converting pCi/L to Bq/M3

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Conversion Examples: Bq/M3 to pCi/L

$$\frac{Bq/M^3}{37} = \text{pCi/L}$$

- What is the Canadian radon guidance in pCi/L?

  $\frac{200\ Bq/M^3}{37}$ = 5.4 pCi/L

- What is World Health Organization's Reference Level of 100 Bq/M3 in terms of pCi/L?

  $\frac{100\ Bq/M^3}{37}$ = 2.7 pCi/L

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Conversion Examples: pCi/L to Bq/M3

pCi/L x 37 = Bq/M^3

- What is the U.S. radon guidance in Bq/M3 ?

  4.0 pCi/L x 37 = 148 Bq/M^3

- What is U.S. EPA's suggestion to which homes can be reduced when mitigated in Bq/M3?

  2.0 pCi/L x 37 = 74 Bq/M^3

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Radon Decay Product Units

- Working Levels (WL) are used in Canadian occupational guidance documents
- SI Units:
  - Micro joules/cubic meter abbreviated: µJ/M^3
  - Measure of energy per unit volume (cubic meter)

___ WL x 20.8 = __micro joules per cubic meter

Example: 0.020 WL x 20.8 = 0.416 µJ/M^3

This can also be expressed in milli joules (factor of 1,000) or 416 mJ/M^3

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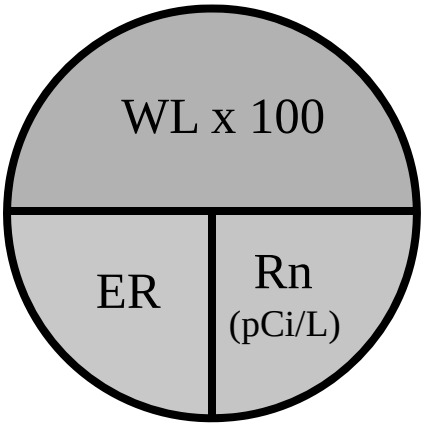
Equilibrium Equation (English)

A Means for Estimating RDP Levels from Radon Measurements

Where Radon is Measured in **pCi/L**



- ER = $\frac{\text{WL x 100}}{\text{Rn}}$
- Rn = $\frac{\text{WL x 100}}{\text{ER}}$
- WL = $\frac{\text{ER x Rn}}{100}$

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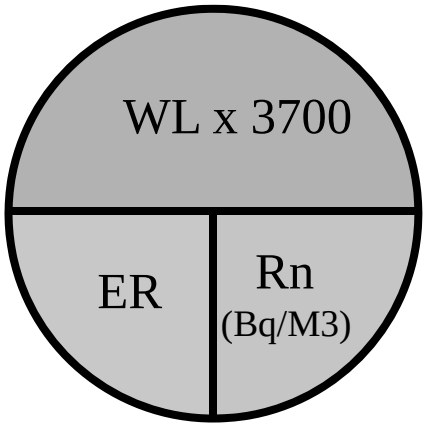
Equilibrium Equation (SI)

A Means for Estimating RDP Levels from Radon Measurements

Where Radon is Measured in **Bq/M3**



- ER = $\frac{\text{WL x 3700}}{\text{Rn}}$
- Rn = $\frac{\text{WL x 3700}}{\text{ER}}$
- WL = $\frac{\text{ER x Rn}}{3700}$

$\frac{Bq/M^3}{37}$ = pCi/L

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Equilibrium Equation Example 1 Calculate RDPs

If EF = 40% and radon is 800 Bq/M3, what is Radon Decay Product activity in units of WL?

$$WL = \frac{ER\ x\ Rn}{3700} = \frac{0.4\ x\ 800}{3700} = 0.086\ \text{WL}$$

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Equilibrium Equation Example 2 Calculate Equilibrium Factor

If Rn = 250 Bq/M3 and RDPs = .042 WL what is EF?

$$\text{ER} = \frac{WL\ x\ 3700}{Rn} = \frac{0.042\ x\ 3700}{250} = 0.62 \text{ or } 62\%$$

Note: Percentage of decay products in air is referred to as equilibrium factor (EF) or Equilibrium Ratio (ER)

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Equilibrium Equation Example 3 Calculate Radon

How much radon is needed to create 0.020 WL in a room assumed to have an equilibrium factor of 40% EF?

$$\text{Rn} = \frac{WL\ x\ 3700}{ER} = \frac{0.020\ x\ 3700}{0.4} = 185 \text{ Bq/M3}$$

Note: Canada (and others) assume an EF of 40% (0.4)

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Dose – WLM and milli Sieverts

- Working Level Month is a combination of exposure and time of exposure:
  - WLM = $\frac{WL\ x\ hours}{170\ hours/year}$
  - Conversion Factors:

Situation*	Conversion
Workplace	___ WLM x 5 = ___ mSv
Public	___ WLM x 4 = ___ mSv

* Canadian Centre for Occupational Health and Safety - http://www.ccohs.ca/oshanswers/phys_agents/ionizing.html
* ICRP Publication 65, Protection Against Radon at Home and at Work

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Dose Example (1)

What is dose in mSv for working a full year (2,000 hours) at average radon level of 150 Bq/M3?

1. Convert Bq/M3 to pCi/L : 150 Bq/M3 / 37 = 4.05 pCi/L
2. Estimate RDP in WL using Canadian EF assumption (40%)

   WL = RN x EF/100 = 4.05 x .4/100 = .016 WL
3. Determine Dose in WLM

   WLM = WL x hours/170 = .016 x 2000/170 = 0.188 WLM
4. Apply appropriate conversion factor

   0.188 WLM x 5 mSv/WLM = 0.94 mSv (Essentially 1mSv)

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Another Way for Calculating Dose*

300,000 Bq/M3 – hours = 1 mSv*
or
300 kBq/M3 – hours = 1 mSv

Assumes 40% Equilibrium Factor

1. Multiply radon in Bq/M3 x hours worked
2. Divide by 300,000 to obtain mSv

* Reducing Radon Levels in Existing Homes A Canadian Guide for Professional Contractors

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Dose Example (2)

What is dose in mSv for working 4 weeks at average radon level of 450 Bq/M3?

1. Calculate hours during period

   4 (weeks) x 40 (work hours per week) = 160 hours

2. Calculate k Bq/M3 – hours

   450 Bq/M3 x 160 hours = 72000 Bq/M3 hours/1000

   = 72 kBq/M3 hours

3. Determine Dose in mSv $\frac{72\ \frac{kBq}{M3}\ hours}{300\ \frac{kBq}{M3}\ hours\ per\ mSv}$ = 0.24 mSv

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What is Significance of Annual Dose to a Radon Professional?*

According to the Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials there are specific exposure brackets where specific Management Plans are to be in place:

Annual Effective Dose mSv	Equivalent Annual Radon Exposure kBq/M3 – hours	Average Radon for 2,000 hours per year & 40% EF Bq/M3	Action
Less than 1	Less than 300	Less than 150	No action
1 to 5	300 - 1500	150 - 750	Dose Management Program
5-20	1500 - 6000	750 - 3000	Radiation Protection Program
20 and above	6000	3000	Dose Limit

*Reducing Radon Levels in Existing Homes A Canadian Guide for Professional Contractors

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Measurement Protocol Differences

Device characteristics are identical to materials covered in CERTI course

(U.S. Device Protocols)

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Residential Deployment Locations

- Residential dwellings:
  - Single family residences
  - Apartment units
    - Locations below 3rd floor
- One device per dwelling (plus QA/QC)
  - Normal occupancy area in lowest level of home
    - Where one would spend 4 hours or more per day
- No stipulation for duplicate, passive, short-term integrating devices in real estate transactions

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Test Device Placement

Distance from:	Metric	English
Floor	0.8 to 2 meters above floor	3 To 6.5 feet above floor
Ceiling	At least 50 cm from ceiling	At least 20 inches from ceiling
Interior wall	At least 40 cm from interior wall	At least 16 inches from interior wall
Exterior wall	At least 50 cm from exterior wall	At least 20 inches from exterior wall
Other objects*	At least 20 cm from other objects	At least 8 inches from other objects

* Objects that might interfere with normal air movement to device like behind a bookcase

Avoid	Avoid
High humidity areas	• Kitchen, laundry room, bathrooms
Non occupied areas	• Closets cupboards, sumps, crawlspaces, foundation nooks
Air currents and Heat	• Path of forced air from HVAC system • Over radiators • Near fireplaces • In direct sunlight

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Residential Building Conditions Long-Term Tests

- No special building operating conditions
- Test Duration:
  - Minimum: 3 months*
  - Optimum: 12 months
- Testing Period:
  - Ideal: October to April – but not mandatory

*1 month tests are listed in Canadian Guidance but strongly discouraged

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Residential Building Conditions Short-Term Test

Item	Status during S.T. Test	Comment
Exterior windows*	Closed	
Exterior doors*	Closed except for normal entry and exit	Do not leave open for more than a few minutes
Heat Recovery Ventilators	Operate as normal	Probably should note on report
Air Conditioning	OK if recirculates interior air only	Window units- turn to total recycle
Attic Fans	Operate as normal	
Radon mitigation system	Operate as normal	Probably should note on report
Whole house fans	OFF	Not stipulated in guidance
Exhaust fans	Operate as normal	Do not run continuously

* If test is less than 4 days, doors and windows should be closed 12 hours prior as well as all during test

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Long-Term Devices Listed

Long-Term Devices	Duration
Alpha Track Detectors	1 to 12 months
Electret Ion Chamber	1 to 12 months
Digital Detector*	Running average

*Not an officially approved device by NRPP as of 2/1/2013

- Canadian program emphasizes use of long-term test devices to characterize indoor radon levels
- Although 1 month test is allowed -- 3 month minimum is strongly suggested

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Short-Term Devices Listed

Short-Term Devices	Duration
Activated Charcoal	2 to 7 days
Charcoal Liquid Scintillation	2 to 7 days
Electret Ion Chamber	2 to 7 days
Continuous Radon Monitor	Normally 48 hours (Can be longer)
Continuous Working Level Monitor (RDPs)	Minimum 48 hours (Can be longer)
Radon Progeny Integrating Sampling Unit	Normally 48 hours (Can be longer)
Three Day Integrating Evacuated Scintillation Cell	Three days
Grab Radon / Activated Carbon	Typically 5 minute diagnostic samples
Grab Radon / Scintillation Cell	Typically 5 minute diagnostic samples
Grab Radon / Pump Collapsible Bag	Typically 5 minute diagnostic samples
Grab Working Level (RDPs)	Typically 5 minute diagnostic samples

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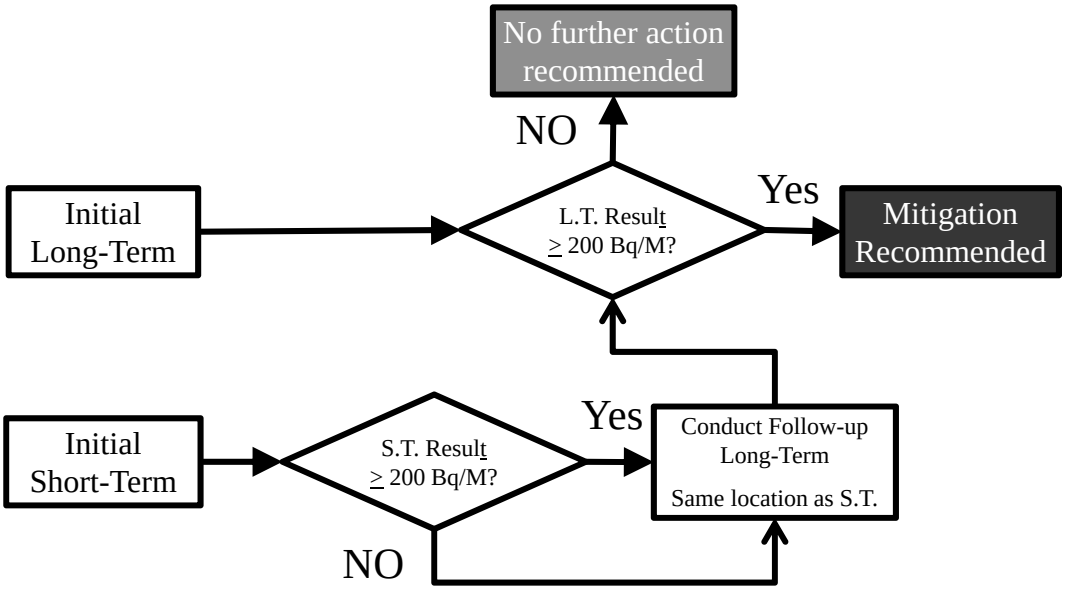
Interpretation of Results - Residential Dwellings



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Use of Short-Term Test Results

- Regardless of ST test result, it should be followed up with a long-term test.
- A single short-term test is not sufficient for making a mitigation decision.
- Test duration less than 2 days is never acceptable to determine radon concentrations.

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Remediation Time Frame

Radon Concentration Bq/M3 (Assumed from Long-Term Test)	Recommended Remedial Action Time
Greater than 600 Bq/M3	Less than 1 year
Between 200 – 600 Bq/M3	In less than 2 years
Less than 200	No action required

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Post-Mitigation Testing

Event	Type of Test	Timing	Comment
Immediately After mitigation	Short-Term		• After system has operated 24 hours • Same location as pre-mitigation test • Effective: If result less than 100 Bq/M3 • Ineffective if result greater than 200 Bq/M3
1st Follow-up	Long-Term	In winter after ST test	• Assumed to be within 12 months after mitigation
2nd Follow-up	Long-Term	Within 2 years after mitigation	
Subsequent follow-ups	Long-Term	Every 5 years after mitigation	

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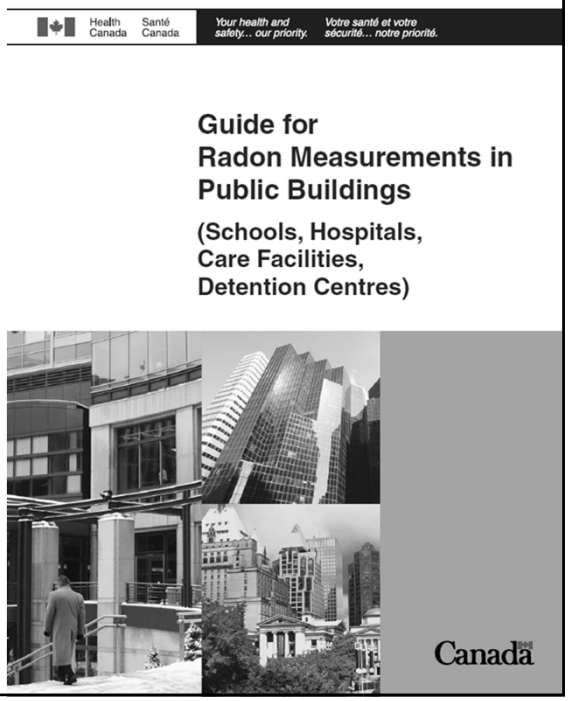
Public Buildings

- Indoor areas for public considered to be dwellings
  - Long-term care residences
  - Hospitals
  - Schools
  - Detention Centres



Public Building Guidance

- Public : 200 Bq/M3

- Workers: Not covered in Public Building Document
  - *Canadian Guidelines for Management of Naturally Occurring Radioactive Materials (NORM)*
  - Canadian Labour Code

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Long-Term Testing of Federal Buildings

Following is a breakdown of the Federal Building radon test results as of December 2011.

Total number of Buildings	7239
Number of Buildings with average Radon below 200 Bq/m^3	6887
Number of Buildings with average Radon between 200 and 600 Bq/m^3	301
Number of Buildings with average Radon above 600 Bq/m^3	51

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Public Buildings vs. Schools

- Public Buildings
  - Assumed to be occupied 100% of time
  - Test duration: 3-12 months
- Schools
  - Assumed to be occupied:
    - 5 days per week
    - 10 months/ year
    - Special calculation is used to estimate student exposure
      - Long-term weighted by CRM results (later)

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Test Locations
Public Buildings and Schools

1. Test all rooms with floors or walls that are in direct contact with the ground or a crawl space.
   - If none of these levels have occupied rooms, test all occupied rooms on the first occupied level.
2. Test every 3rd room on the floor level above the floor meeting criterion #1.
3. Test every 3rd room on the top floor of the building.
4. Test every 3rd room of every 5th floor (e.g. Floor 5, 10, 15, 20, 25,…).

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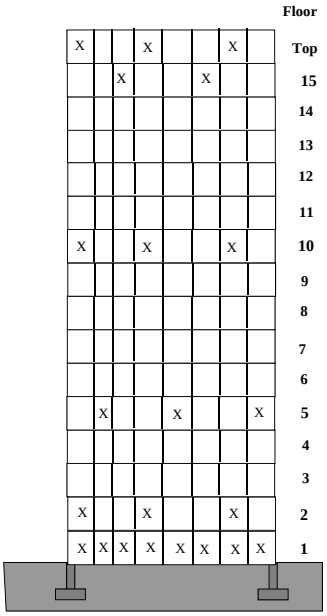
Public Building Measurement Locations

- Test
  - All ground contact rooms occupied more than 4 hours per day
  - 1 out of 3 occupied rooms on:
    - Floor above lowest occupied level
    - Top floor of building
    - Every 5th floor
- Do not test
  - Storage areas, closets, warehouse space, kitchens
  - Rooms occupied < 4 hours/day



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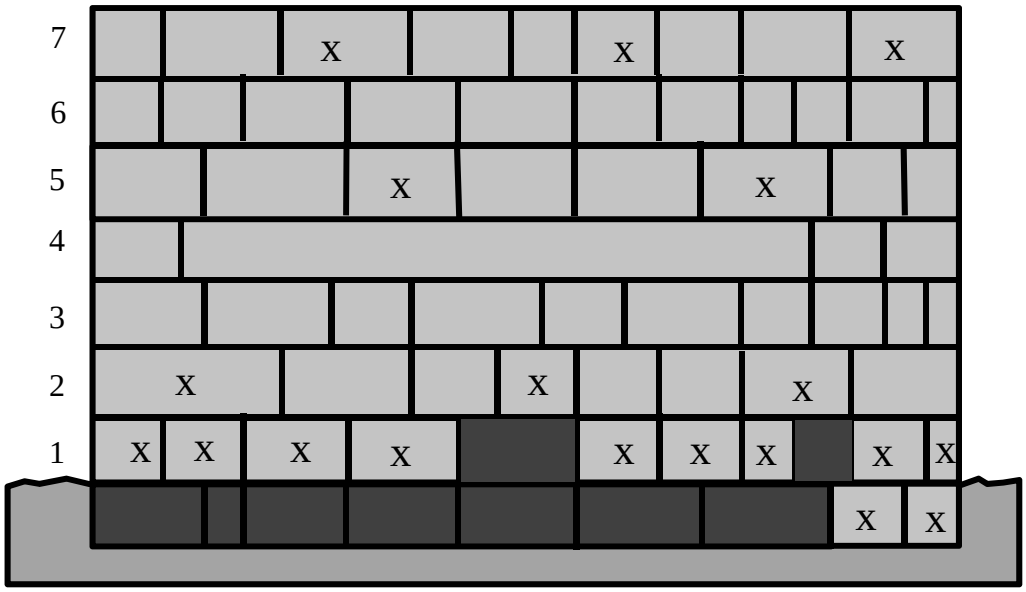
Example 1 Essentially Unoccupied Basement



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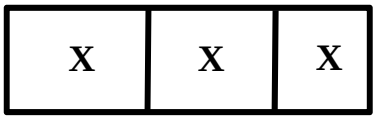
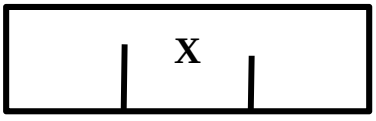
Public Buildings – Measurement Locations

- Test all ground floor occupied rooms
- Room Definition:
  - Occupied 4 hours or more per day
  - Has floor to ceiling walls
    - Partitions do not constitute a room
- Large rooms 1 device per 200 square meters



Floor to ceiling walls: 3 locations



Partial dividers: 1 location

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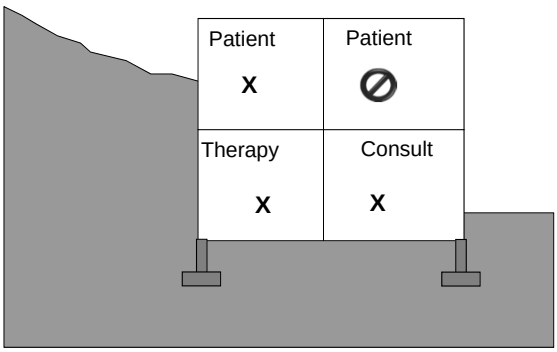
Rooms in Contact with The Soil



X = Test Location **Not a Test Location**

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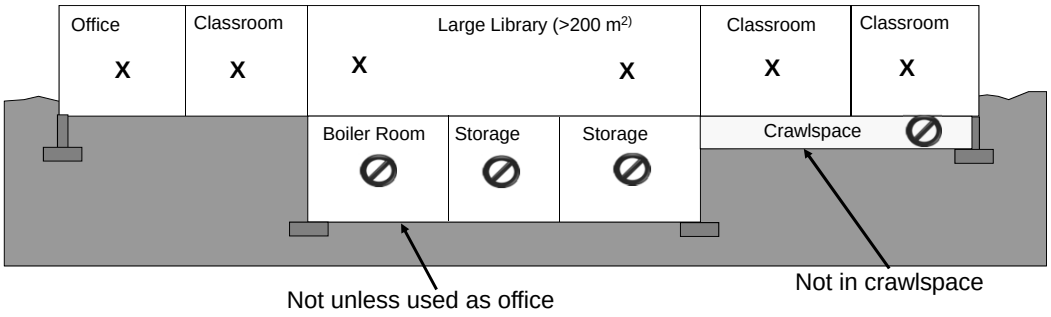
Lowest Location in Contact with Soil



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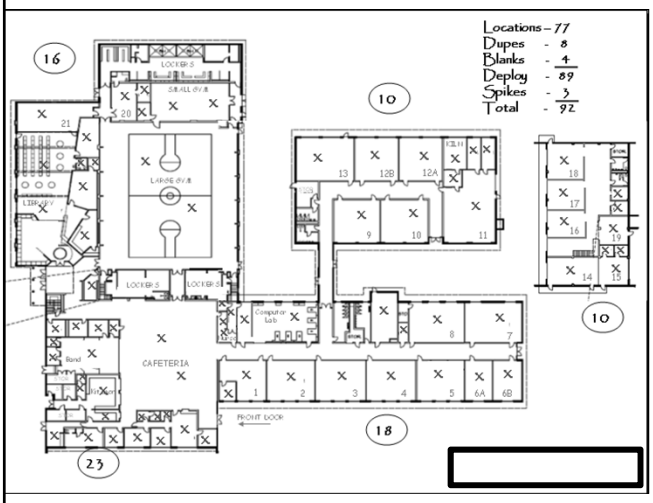
Single Story School Example



- Every occupied room
- 1 per 200 m^2
- 10% Duplicates
- Additional QA/QC:
  - 5% Blanks
  - 3% Spikes

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Examples of Rooms Not to Test

- Rooms not occupied more than 4 hours per day
- Locker rooms
- Hallways if not occupied more than 4 hours per day
- Storage areas
  - Consider testing if they could be occupied in future
- Bathrooms
- Crawlspaces
- Utility tunnels
- Boiler rooms unless occupied as office
- Rooms where wall does not extend to ceiling

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Deployment Considerations-Public Buildings

- Deploy devices identically to placement in residences
- If several buildings in a complex, test each separately
- Additional recommendations – Public Buildings
  - Avoid high heat zones such as over radiators
  - Out of direct path of air supply ducts
  - Avoid being close to electrically powered equipment
    - Computers
    - Televisions
    - Stereos and speakers

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QA/QC Duplicates Public Buildings & Schools

- Duplicates in 10% of locations
  - Required if more than 10 locations to be tested
    - Recommendation: Always at least one
  - Distribute systematically throughout
- Locate 10 cm (4 inches apart)

Duplicate devices

If one result is more than twice the other:

- Report to supplier/laboratory
- Room or area tested may need to be re-tested

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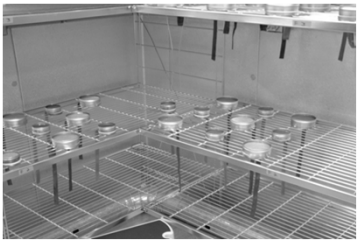
Additional QA/QC Measures to Consider

Field Blank



Spikes

- Blanks - 5% (Should be at LLD of device - typically less than 1.0)
  - Unexposed device sent in for analysis
- Spikes - 3% (Should be at least within 25% of chamber value)
  - Sent to radon chamber for exposure to known environment

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Follow-Up & Interpretation of Measurements

Facility Type	Follow-Up
Public Building other than School	No follow-up required • Assumes minimum 3 month test was conducted • If long-term result is greater than 200 Bq/M3 proceed to mitigation
School	Follow-up with hourly measurements during school week • Estimate exposure during occupied periods

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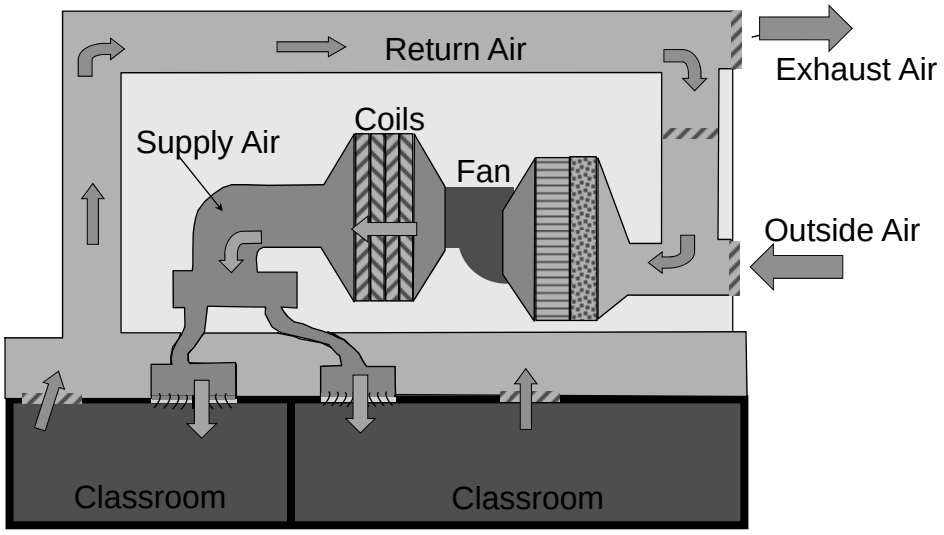
Fresh Air Make-up – Schools



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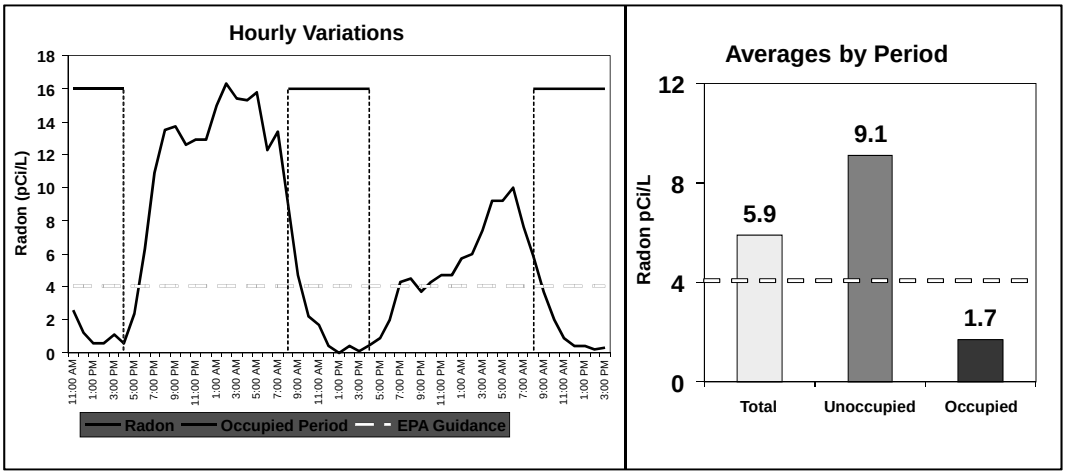
Effect of Fresh Air Make-up in Schools



Occupied periods assumed to be: 7:30 AM to 3:30 AM / Hourly measurements are average for preceding hour
Test Period: April 18-20, 2007 - Post HVAC adjustments
Pre-HVAC ST Measurement: 6.0 pCi/L overall

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Follow up to Long-Term Results - Schools

- Conduct a short-term measurement in locations with elevated long-term results.
  - Use Continuous Monitor that measures in hourly increments
  - Test period
    - 48 hour to 7 days (7 days preferred)
    - During occupied week
- Segregate hourly measurements for occupied hours and determine average radon for occupied periods
- Obtain ratio of occupied average to total short-term result
  - Multiply ratio times previous long-tem result to obtain assumed occupied exposure
  - Make recommendation on assumed occupied exposure

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Follow-up to L.T. – Schools – Example 1

$$\text{Rn}_{\text{(long-term average during school hours)}} = \frac{S.T.Occupied\ Average}{S.T.Average} \text{ x LT Result}$$

An initial long-term result in a classroom was 300 Bq/M3. A CRM was deployed for 7 days and an hourly average was obtained for occupied periods as follows:

Data from7 day Follow-up S.T. Test	Result
Monday – Friday Average (8:00 AM to 3:00 PM	122 Bq/M3
Total Average for 7 day S.T. Test	560 Bq/M3

$$\text{RN L.T. Occupied} = \frac{122}{560} \text{ x 300 Bq/M3} = 65 \text{ Bq/M3}$$

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Follow-up to L.T. – Schools – Example 2

$$Rn_{\text{(long-term average during school hours)}} = \frac{S.T.Occupied\ Average}{S.T.Average} \text{ x LT Result}$$

An initial long-term result in a classroom was 220 Bq/M3. A CRM was deployed for 48 hours and an hourly average was obtained for occupied periods as follows:

Data from7 day Follow-up S.T. Test	Result
Tuesday – Wednesday Average (8:00 AM to 3:00 PM	430 Bq/M3
Total Average for 2 day S.T. Test	310 Bq/M3

$$\text{RN L.T. Occupied} = \frac{430}{310} \text{ x 220 Bq/M3} = 305 \text{ Bq/M3}$$

Its larger - how can this be?

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Cautions on Continuous S.T. Measurements as Follow-up

- Select a time when economizers are not operating
  - 100% fresh air for A/C can give false low ratio
- The longer the deployment period the better
  - The shorter the test, the greater weather and building use variations can have on obtained ratio
- Utilize normal CRM precautions
  - Eliminate first four hours of data from averages
  - Recognize that passive CRM hourly averages lag real time exposures by ~ 1 hour
- Every school can have different pupil occupied time periods
- Look for unusual changes in hourly measurements

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Remediation Time Frame – Public Buildings

Same Guidance as for Residences

Radon Concentration Bq/M3 (Assumed from Long-Term Test)	Recommended Remedial Action Time
Greater than 600 Bq/M3	Less than 1 year
Between 200 – 600 Bq/M3	In less than 2 years
Less than 200	No action required

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Pressure Differential Units

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Differential Pressure Measurements

English Units (U.S.)
Inches of Water Column

Most instruments can measure in either unit

Switch

SI Units (Canada)
Pascals

1 pascal = 0.004 inches of water column

A thousandth of an inch is ¼ of a pascal

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Additional Resources and Updates

Organization	URL
Health Canada	http://hc-sc.gc.ca/index-eng.php
Center for Environmental Research and Technology, Inc.	www.certi.us
Canadian National Radon Proficiency Program	http://nrpp.info/cnrpp.shtml

If you are viewing this program as part of a CERTI course be sure to check out the resource section for additional tools and resources

Center for Environmental Research and Technology, Inc.

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