Radon in Canada – Protecting Canadians in their Indoor Environment

9th International Conference NORM IX

· September 2019
Overview:

- Canada 101
- Radon from our perspective; buildings/radon levels
- Growing a strong Foundation
  - Strong collaboration
  - Measurement in Existing Buildings - Workplaces
  - Measurement in Existing Buildings - Homes
  - Unique perspectives – Working with the Real Estate Community
  - Mitigating existing building stock
  - New Construction
You may know a little about Canada.

“Sorry”
• Large Land Mass

• Sparsely populated areas with large remote areas

Canada vs USA
35.8 million vs 321 million
• Broad range of geographical and Physical conditions
Radon from our perspective

Geological Radon Potential

Relative Radon Hazard:
- Zone 1 – High
- Zone 2 – Elevated
- Zone 3 – Guarded

Important: All dwellings need to be tested for radon. In welds perspective of radon readings can occur in all three zones.
In this map, the regions depicted reflect geographic conditions where higher radon readings might be found in Zone 1 versus Zone 2 and Zone 3 respectively.
• Canada’s Radon Action level is 200 Bq/m³
  • Currently, Canada Labour Code is legislated at 800 Bq/m³ (will be harmonized with Health Canada level of 200 Bq/m³)
• Long-term radon tests 91 days or longer (alpha track) during the heating season
Radon from our perspective

Canada’s Radon Levels

Data from Health Canada’s Radon Survey, 2012

Overall, ~ 7% homes above 200 Bq/m
Collaboration – A Canadian Success Story

- Represents, supports and assists radon professionals
- Provides outreach and awareness to all Canadians
- A certification program that establishes guidelines, standards of excellence and best practices
- Created National Radon Program and Survey
- Developed guidance on measurement and mitigation
- Established the C-NRPP
- Provides funding to C-NRPP
- Maintains communication and provides input on direction

Growing a strong Foundation

Collaboration
Recruit, motivate, engage and bring together stakeholders to increase radon awareness. Motivate Canadians to take action to reduce radon and to promote radon action month.
Collaboration – A Canadian Success Story

Government Organizations
(Federal, Provincial/Territorial and Municipal)

Health-based Organizations

Other Industry Associations

Not-for-Profit Organizations

Private Sector Companies
Driving forces…Why do Canadians care about radon? - Workplaces

**Motivations:**
- Legislation (limited)… Canadian Labour Code
- Reduce liability/Risk averse companies
- Strong health and safety policy/culture
- Strong union presence
- BOMA Best and LEEDS certification points
Driving forces…Why do Canadians care about radon? - **Workplaces**

**Challenges:**
- Lack of awareness
- Cost
- Deciding how to prioritize a large number of buildings
- Cooperation with employees, access to spaces or disappearing detectors
Driving forces…Why do Canadians care about radon? - **Workplaces**

**Of Note:**
- Action level
  - It’s their choice…100 or 200 Bq/m³.
  - Some still abide by Canada Labour Code level of 800 Bq/m³³
- Use certified professionals to conduct testing to limit liability and reduce potential for failure
Driving forces…Why do Canadians care about radon? - HOMES

Motivations:
- Personal health
- Protect ones they love (Grandkids, children, pets)
Driving forces…Why do Canadians care about radon? - HOMES

Challenges:

• Lack of awareness
• Indifference
• Cost
• “If I have a high level then I’ll have to fix it”
Driving forces…Why do Canadians care about radon? - HOMES

Of Note:
- Community testing projects successful at a municipal level
- Real estate agents
CARST Real Estate Assessment Guideline

- Short-term test, minimum 4 days, closed-house conditions

- **Green** – result $\leq 75$ Bq/m$^3$ (50 in summer) suggests annual average below 200 Bq/m$^3$

- **Yellow** – 75 Bq/m$^3$ (50 in summer) to 400 Bq/m$^3$ suggests annual average above 200 Bq/m$^3$

- **Red** – 400 Bq/m$^3$ and above, suggests annual average below 200 Bq/m$^3$

- Yellow/Red – funds in escrow
  - Always recommends follow-up long-term test in next heating season
Initially:
- No Canadian Guidance
- Relied on NRPP for guidance

Photo credit:
Utah Department of Environmental Quality - Utah.gov:
In 2010 Health Canada created our first mitigation guideline

**Canadian Approach:**

- A **design** process to address unique Canadian climate
- Priority on quiet, energy efficient systems
- Priority on reducing radon levels to as low as possible
Installation Process:
- Fan is allowed indoors
- Sidewall exhaust allowed
Design Process: Quantitative vs. qualitative
Thermal Stack: Major Driving Factor in Cold Climate

Greatest negative pressure furthest from the NPP

Neutral Pressure Plane (NPP)

Radon

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Natural Pressure (Spring)

What happens in winter?

+10 °C

Natural Pressure
= 0.5 Pa @ 10 °C
Natural Pressure (Winter)

Natural Pressure
= 1.1 Pa @ -20°C

-20°C
Determine Target Pressure

Step 1: Natural Pressure
0.5 Pa @ 10° C

Step 2: Design Pressure
0.5 Pa X 2.2 = 1.1 Pa

Step 3: Target Pressure
0.5 Pa - 1.1 Pa = -0.6 Pa

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Pressure Field Extension

- Need to demonstrate target pressure across entire footprint to protect all year around
- Protect entire building because we don’t know where the radon is coming from

Suction Point

Target = -0.6Pa
Design Process: qualitative vs. quantitative

1. Calculation factor to compensate for Stack Effect in various season of installation
2. Soil resistance
3. Pipe resistance
4. Total system resistance (Soil + Pipe + Stack Effect)
5. Overlay radon fan curves and determine operating points
6. Choose the fan that meets the minimum air flow target
Design Process: qualitative vs. quantitative

1. Calculation factor to compensate for seasonal effect on STACK EFFECT
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<table>
<thead>
<tr>
<th>Region</th>
<th># of Entries</th>
<th>Highest Radon Level</th>
<th>Average Reduced Radon Level</th>
<th>Average Percentage of Reduction</th>
<th>Average Cost</th>
<th>Highest Cost</th>
<th>Lowest Cost</th>
<th># of Different Mitigation Professionals</th>
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Data from CARST Radon Sweepstakes mitigation program

Data points for costs
The National Building Code addresses radon

- Gravel under the slab
- Sealed sump pit
- Well-sealed liner
- Radon rough-in for future installation
- National Building Code is adopted by provinces
- Municipalities can amend
Thank you....Questions?

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