# Status Update of Radon Measurement & Mitigation in Canada

11th International Workshop on the Geological Aspects of Radon Risk Mapping

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September 18 - 20, 2012

Health Canada Santé Canada

Canada

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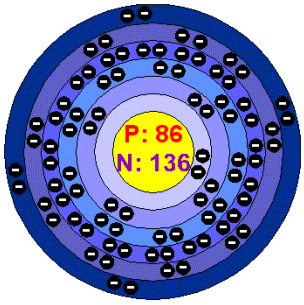
Engineering Environmental and Health & Safety Solutions

## Presentation Outline

- Radon potential maps
- Measurement & Mitigation Guidelines
- Radon resistant construction
- Health Studies
- Certification Program
- Canadian Association of Radon Scientists and Technologists (CARST)

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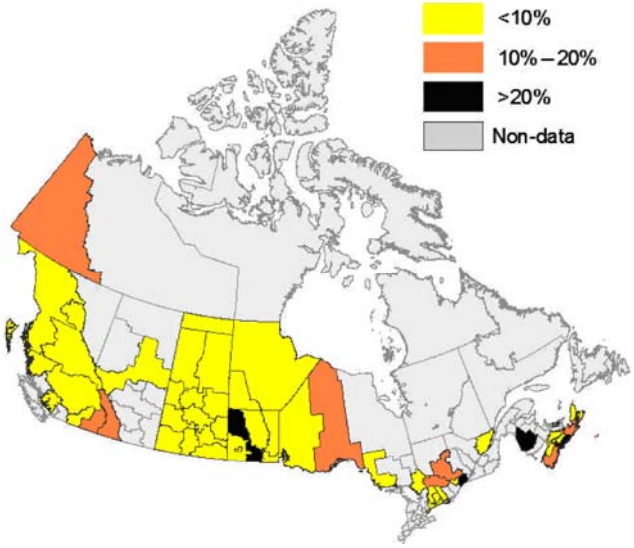
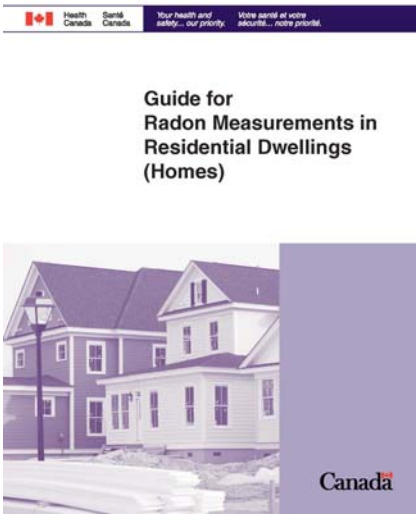
# Early Radon Map of Canada

Percent of Tested Dwellings Above 200 Bq/m³ Guideline (1977-1980)




J. Chen et al., 2008

# Health Canada Measurement Guidelines (2008)




- test in the lowest occupied area of the house (i.e. occupied for at least 4 hours per day
- Recommends testing during the heating season
- Does not recommend short-term testing

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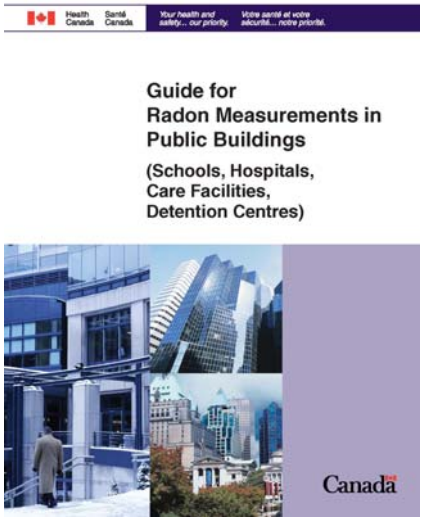
# Health Canada Measurement Guidelines (2008)




- **Test in each room occupied for 4 hours/day in the lowest occupied level (basement or slab-on-grade)**
- **Testing required on upper floors as well**

# Health Canada Mitigation Guideline

- Time Frame to Remediate

| Radon Concentration | Recommended Remedial Action Time |
|---|---|
| > 600 Bq/$m^3$ | In less than 1 year |
| 200 – 600 Bq/$m^3$ | In less than 2 years |
| < 200 Bq/$m^3$ | No action required* |

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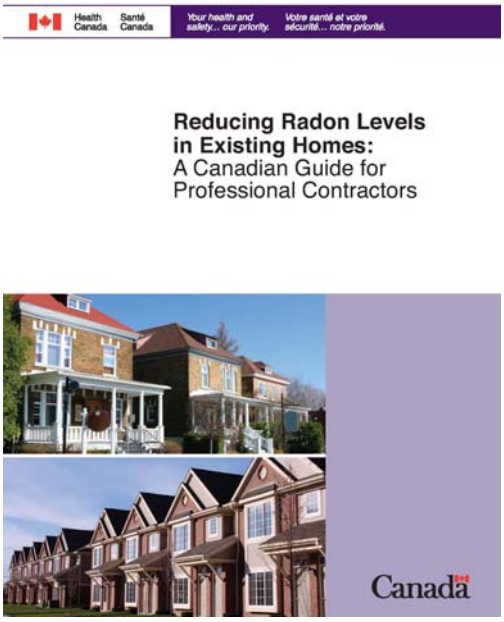
## Health Canada Mitigation Guideline (2010)

- **Primary author - Arthur Scott**
- **Covers virtually all mitigation techniques**
- **Different from US guideline in some aspects (e.g. fan can go inside)**




## National Building Code & Radon (2010)

- Allows for basic protection of all buildings (residential and non-residential). Specific provisions to address radon mitigation in new residential homes and small residential buildings
- Sump pit cover required to be airtight
- Caulking slab perimeter and penetrations
- Granular fill under slab and soil gas membrane between fill and slab
- Inspections
- Roughed-in piping for SSD systems
- Owner to test following occupancy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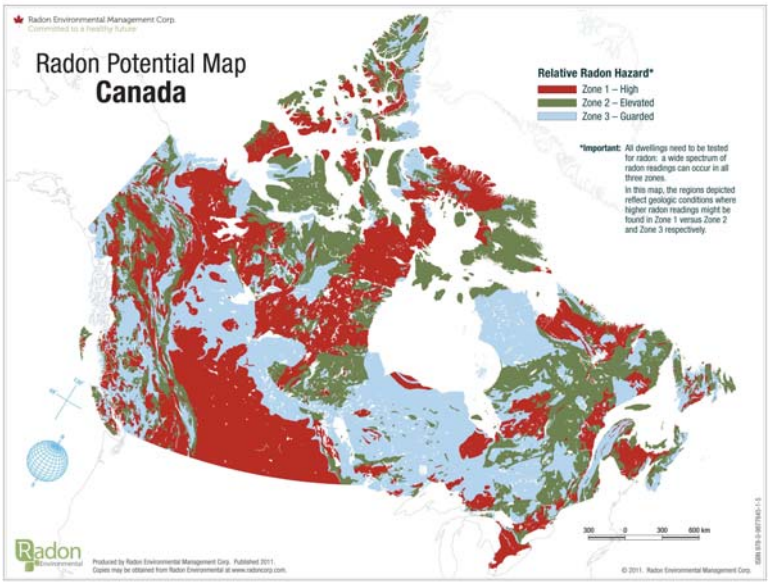
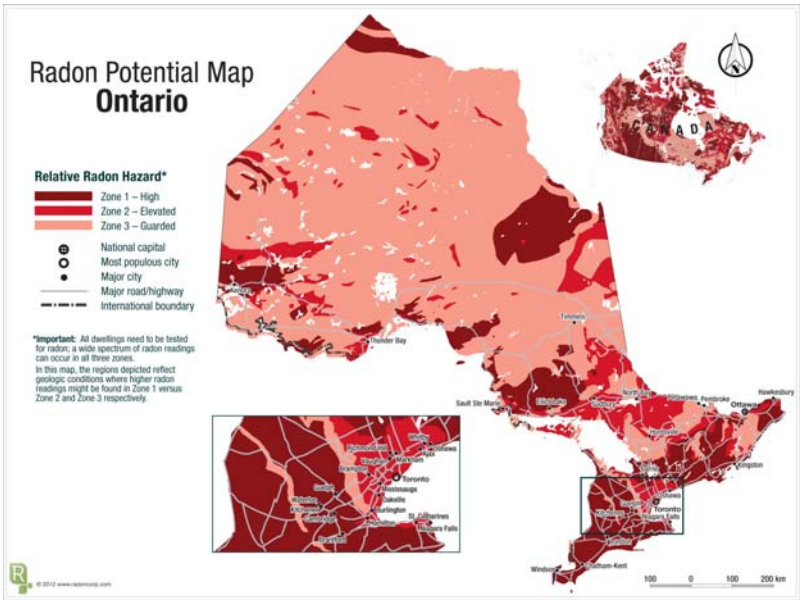
# Geologic Radon Potential Map (2011)




# Geologic Radon Potential Map (2012)

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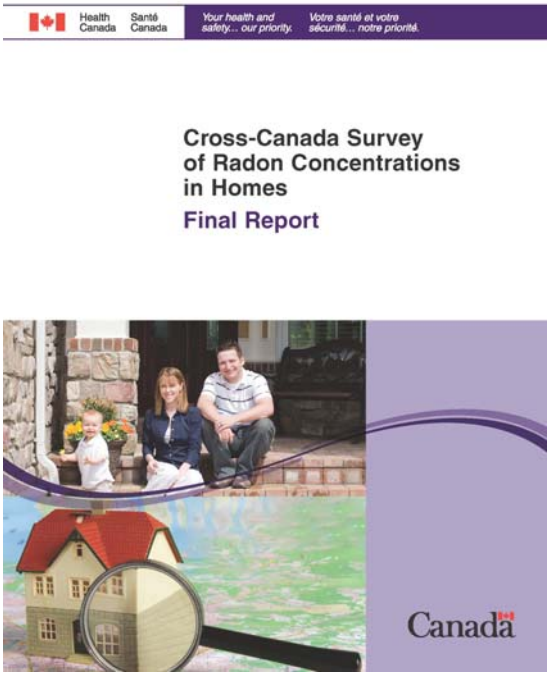
## Geologic Radon Potential Maps (2011/12)

- Geologic units provide the basic framework for the radon potential maps
- Geographic information system processing was used to evaluate each rock unit contained in the geological dataset with respect to its:
  - US radon potential classification
  - Uranium geochemistry
  - Radiometric geophysical response




**(2012) Health Canada Survey results from testing 14,000 homes across Canada ~ 7% of homes have radon concentrations above the guideline**

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# Health Canada Radon Data (Provincial Averages)

**Table 2: Percentage of Homes Tested with Radon Concentrations Below 200 Bq/m$^3$, Between 200 and 600 Bq/m$^3$, Above 600 Bq/m$^3$ and Above 200 Bq/m$^3$ for Each Province and Territory**

| | "Raw" Percentage of Homes with Radon Concentrations: | | | |
|---|---|---|---|---|
| **Province/Territory** | **% Below 200 Bq/m$^3$** | **% 200 to 600 Bq/m$^3$** | **% Above 600 Bq/m$^3$** | **% Above 200 Bq/m$^3$** |
| Alberta (AB) | 93.4 | 6.0 | 0.6 | 6.6 |
| British Columbia (BC) | 92.1 | 6.7 | 1.2 | 7.9 |
| Manitoba (MB) | 76.3 | 21.1 | 2.6 | 23.7 |
| New Brunswick (NB) | 75.2 | 18.7 | 6.1 | 24.8 |
| Newfoundland and Labrador (NL) | 94.1 | 4.6 | 1.3 | 5.9 |
| Nova Scotia (NS) | 91.2 | 6.3 | 2.5 | 8.8 |
| Northwest Territories (NT) | 94.6 | 4.9 | 0.5 | 5.4 |
| Nunavut (NU) | 100.0 | 0.0 | 0.0 | 0.0 |
| Ontario (ON) | 91.8 | 7.3 | 0.9 | 8.2 |
| Prince Edward Island (PE) | 96.5 | 3.5 | 0.0 | 3.5 |
| Quebec (QC) | 89.9 | 9.0 | 1.1 | 10.1 |
| Saskatchewan (SK) | 83.7 | 15.3 | 1.0 | 16.3 |
| Yukon (YT) | 80.4 | 13.8 | 5.8 | 19.6 |

# Health Canada Radon Results per Health Region

| Province or Territory | Health Region | Health Region Name | Number of Survey Participants | % Below 200 Bq/m$^3$ | % 200 to 600 Bq/m$^3$ | % Above 600 Bq/m$^3$ | % Above 200 Bq/m$^3$ |
|---|---|---|---|---|---|---|---|
| ON | 3531 | Elgin-St. Thomas Health Unit | 92 | 92.4 | 6.5 | 1.1 | 7.6 |
| ON | 3533 | Grey Bruce Health Unit | 99 | 88.9 | 10.1 | 1.0 | 11.1 |
| ON | 3534 | Haldimand-Norfolk Health Unit | 116 | 97.4 | 2.6 | 0.0 | 2.6 |
| ON | 3535 | Haliburton, Kawartha, Pine Ridge District Health Unit | 98 | 93.9 | 5.1 | 1.0 | 6.1 |
| ON | 3536 | Halton Regional Health Unit | 102 | 95.1 | 4.9 | 0.0 | 4.9 |
| ON | 3537 | City of Hamilton Health Unit | 100 | 95.0 | 5.0 | 0.0 | 5.0 |
| ON | 3538 | Hastings and Prince Edward Counties Health Unit | 99 | 87.9 | 10.1 | 2.0 | 12.1 |
| ON | 3539 | Huron County Health Unit | 109 | 89.0 | 10.1 | 0.9 | 11.0 |
| ON | 3540 | Chatham-Kent Health Unit | 201 | 81.6 | 15.4 | 3.0 | 18.4 |
| ON | 3541 | Kingston, Frontenac and Lennox and Addington Health Unit | 99 | 88.9 | 10.1 | 1.0 | 11.1 |
| ON | 3542 | Lambton Health Unit | 176 | 91.5 | 7.9 | 0.6 | 8.5 |
| ON | 3543 | Leeds, Grenville and Lanark District Health Unit | 108 | 80.6 | 17.6 | 1.8 | 19.4 |
| ON | 3544 | Middlesex-London Health Unit | 109 | 98.2 | 1.8 | 0.0 | 1.8 |
| ON | 3546 | Niagara Regional Area Health Unit | 100 | 98.0 | 0.0 | 2.0 | 2.0 |
| ON | 3547 | North Bay Parry Sound District Health Unit | 104 | 98.1 | 1.9 | 0.0 | 1.9 |
| ON | 3549 | Northwestern Health Unit | 209 | 86.1 | 12.0 | 1.9 | 13.9 |
| ON | 3551 | City of Ottawa Health Unit | 64 | 93.8 | 6.2 | 0.0 | 6.2 |
| ON | 3552 | Oxford County Health Unit | 104 | 88.5 | 10.6 | 0.9 | 11.5 |
| ON | 3553 | Peel Regional Health Unit | 89 | 100.0 | 0.0 | 0.0 | 0.0 |
| ON | 3554 | Perth District Health Unit | 108 | 88.0 | 11.1 | 0.9 | 12.0 |
| ON | 3555 | Peterborough County-City Health Unit | 112 | 90.2 | 8.9 | 0.9 | 9.8 |
| ON | 3556 | Porcupine Health Unit | 96 | 99.0 | 1.0 | 0.0 | 1.0 |
| ON | 3557 | Renfrew County and District Health Unit | 100 | 91.0 | 8.0 | 1.0 | 9.0 |
| ON | 3558 | Eastern Ontario Health Unit | 99 | 93.9 | 5.1 | 1.0 | 6.1 |
| ON | 3560 | Simcoe Muskoka District Health Unit | 110 | 99.1 | 0.9 | 0.0 | 0.9 |
| ON | 3561 | Sudbury and District Health Unit | 97 | 94.9 | 4.1 | 1.0 | 5.1 |
| ON | 3562 | Thunder Bay District Health Unit | 108 | 88.0 | 11.1 | 0.9 | 12.0 |
| ON | 3563 | Timiskaming Health Unit | 102 | 92.2 | 6.8 | 1.0 | 7.8 |
| ON | 3565 | Waterloo Health Unit | 101 | 96.0 | 4.0 | 0.0 | 4.0 |
| ON | 3566 | Wellington-Dufferin-Guelph Health Unit | 92 | 89.1 | 8.7 | 2.2 | 10.9 |
| ON | 3568 | Windsor-Essex County Health Unit | 195 | 86.2 | 12.8 | 1.0 | 13.8 |
| ON | 3570 | York Regional Health Unit | 95 | 100.0 | 0.0 | 0.0 | 0.0 |
| ON | 3595 | City of Toronto Health Unit | 73 | 97.3 | 2.7 | 0.0 | 2.7 |
| MB | 4610 | Winnipeg Regional Health Authority | 66 | 87.9 | 12.1 | 0.0 | 12.1 |
| MB | 4615 | Brandon Regional Health Authority | 79 | 55.7 | 40.5 | 3.8 | 44.3 |
| MB | 4620 | North Eastman Regional Health Authority | 100 | 79.0 | 20.0 | 1.0 | 21.0 |
| MB | 4625 | South Eastman Regional Health Authority | 113 | 90.3 | 9.7 | 0.0 | 9.7 |

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## Health Canada – Radon Risk Paper (2012)

Radiation Protection Dosimetry Advance Access published August 8, 2012

Radiation Protection Dosimetry (2012), pp. 1–5 doi:10.1093/rpd/ncs147

### CANADIAN POPULATION RISK OF RADON INDUCED LUNG CANCER: A RE-ASSESSMENT BASED ON THE RECENT CROSS-CANADA RADON SURVEY

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**Exposure to indoor radon has been determined to be the second leading cause of lung cancer after tobacco smoking. Canadian population risk of radon induced lung cancer was assessed in 2005 with the radon distribution characteristics determined from a radon survey carried out in the late 1970s in 19 cities. In that survey, a grab sampling method was used to measure radon levels. The observed radon concentration in 14 000 Canadian homes surveyed followed a log–normal distribution with a geometric mean (GM) of 11.2 Bq $m^{-3}$ and a geometric standard deviation (GSD) of 3.9. Based on the information from that survey, it was estimated that ~10 % of lung cancers in Canada resulted from indoor radon exposure. To gain a better understanding of radon concentrations in homes across the country, a national residential radon survey was launched in April 2009. In the recent survey, long-term (3 month or longer) indoor radon measurements were made in roughly 14 000 homes in 121 health regions across Canada. The observed radon concentrations follow, as expected, a log–normal distribution with a GM of 41.9 Bq $m^{-3}$ and a GSD of 2.8. Based on the more accurate radon distribution characteristics obtained from the recent cross-Canada radon survey, a re-assessment of Canadian population risk for radon induced lung cancer was undertaken. The theoretical estimates show that 16 % of lung cancer deaths among Canadians are attributable to indoor radon exposure. These results strongly suggest the ongoing need for the Canadian National Radon Program. In particular, there is a need for a focus on education and awareness by all levels of government, and in partnership with key stakeholders, to encourage Canadians to take action to reduce the risk from indoor radon exposure.**

## Certification

- Health Canada recognizes the National Radon Proficiency Program (NRPP) – (American - renamed as of October 1, 2012)
- Health Canada has just recently adopted it's own certification program (C-NRPP) as of April 1, 2012

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## Canadian Association of Radon Scientists & Technologists (CARST)

- A Canadian association dedicated to:
  - Ensuring quality standards are developed
  - Educate Canadians on identifying and managing radon in dwellings and workplaces
  - Provide a bridge between radon professionals and public and private organizations
- The idea started in 2008, 1st founding meeting in May 2011 and Inc. by Sept 26, 2011
- Currently has 47 members
- www.carst.ca

## Dekui!


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