

Shared Services BC Radon Testing Pilot Project

RESULTS OF AN INDOOR RADON TESTING PROJECT ON A SAMPLE OF
PROVINCIAL GOVERNMENT SSBC OWNED AND LEASED BUILDINGS

This pilot project was completed in partnership with the BC Lung Association and the BC Public Service Agency. Report prepared for Shared Services BC by the BC Lung Association's RadonAware team.

MAY 24, 2016



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SUMMARY

A Radon Testing Project conducted by Shared Services BC (SSBC) and in partnership with the BC Lung Association (BCLA) and the BC Public Service Agency (PSA) was completed in the fall and winter of 2015/2016. The project was completed on a sample of government owned and leased residential and commercial buildings to test for radon and to determine any need for mitigation. A total of 50 buildings were tested in 12 communities. Testing began mid-November of 2015 and ended in March 2016. All testing was completed with Canadian National Radon Proficiency Program (C-NRPP) recognized, long-term alpha track detectors. Deployment and collection of all detectors was completed by a Certified Radon Professional from Pinchin West. SSBC utilized the Health Canada action level of 200 Bq/m³ to determine any need for mitigation. To-date, lab analysis of tests returned indicates no buildings with radon above the Health Canada action level. As such, no mitigation is required in any of these buildings.

BACKGROUND

Radon and Exposure

Radon is a radioactive gas that occurs naturally in the environment. It is produced by the decay of uranium found in soil, rock or water. Radon is colourless, odourless, and tasteless. As a gas, radon moves freely through soils. When it reaches the atmosphere it is diluted to low levels and does not pose a significant health risk. However, when radon is 'trapped' within a building and can't escape it can be a serious health risk to occupants. Radon can infiltrate into a building at any point where the foundation comes into direct contact with the soil.

Health Risks

Radon has been identified as the second leading cause of lung cancer in Canada after smoking. Health Canada estimates that as many as 16 per cent of lung cancer deaths each year in Canada can be attributed to radon exposure. In fact, radon accounts for an average of 55 per cent of a person's lifetime exposure to radiation. The longer a person is exposed to radon, and the higher the radon level, the greater the risk for a person developing lung cancer in their lifetime. The lifetime risk of developing lung cancer when exposed to high levels of radon over many years is estimated to be 1 in 20. Smoking increases this risk. People that smoke (or have smoked) and are also exposed to high levels of radon have an estimated 1 in 3 lifetime risk of developing lung cancer.

Provincial Risk Level

It's important to note that not every person exposed to high levels of radon will develop lung cancer, and not every building in British Columbia (BC) in a high radon risk region will have unsafe levels of radon. Indoor radon levels collected from across BC indicate that the exposure risk is primarily geological, with test results pointing to radon 'hot-spots' throughout the province. Geological mapping can provide some guidance as to whether or not uranium may be present in the area; however, it is very difficult to know what the radon level will be inside any building until it is constructed, occupied, and the indoor air tested. This is because there are many forces that can draw radon gas into a home, such as ventilation, and available pathways for radon to infiltrate into a building. With this in mind, the BCLA and Health Canada recommend that every building, regardless of location, be tested for radon.

RADON HEALTH GUIDELINES

Radon exposure guidelines exist to guide both personal and regulatory decision making on which combination of building techniques, materials and technologies can best achieve the goal of minimizing indoor radon exposure. In 2007 Health Canada published a radon exposure guideline of 200 Becquerel per cubic metre (Bq/m³). A Becquerel is a standard unit in Canada for measuring radon exposure levels. Health Canada and the BCLA recommend remedial measures be undertaken in an occupied building whenever the average annual radon concentration exceeds 200 Bq/m³ in the normal occupancy area. However, it should be noted that these are guidelines only and the overall recommendation from the BCLA is to always aim to get indoor radon levels to as low as reasonably possible. The higher the radon concentration, the sooner remedial measures should be undertaken. Table 1 outlines the Health Canada recommended time-frame to remediate:

Table 1. Radon Mitigation Timeline

| Radon Concentration | Recommended Remedial Action Time |
|--|---|
| Greater than 600 Bq/m³ | In less than 1 year |
| Between 200 Bq/m³ and 600 Bq/m³ | In less than 2 years |
| Less than 200 Bq/m³ | No action required |

SSBC RADON ACTION LEVEL

The SSBC Radon Testing Project implemented the Health Canada radon action level of 200 Bq/m³ for all of the test sites and to determine any need for mitigation.

PROJECT TIMELINE

Long-term alpha track radon detectors were deployed by Pinchin West in late November to Early December 2015, and retrieved mid to late March 2016. The average test duration was ~110 days.

PROJECT COMMUNICATION

The SSBC Radon Testing Project team developed and implemented various radon communique to building managers, building tenants, and local government officials. Building tenants were provided with information on what radon is, the health risks, and the SSBC Radon Testing Project (See Appendix 1). Various project stakeholders were provided with background information on radon and the SSBC Radon Testing Project (See Appendix 2). Local government officials (Mayor and Council), as well as 2 Members of the Legislative Assembly representing the communities where radon testing was taking place were provided with information on radon, the health risks, and the SSBC Radon Testing Project (See Appendix 3). A radon 'Health Risk' document was developed and made available upon request (See Appendix 4). Finally, a 'Test Notice' document was developed and placed beside each deployed detector (See Appendix 5).

There were 2 websites utilized to disseminate information about radon, the health risks, and the SSBC Radon Testing Project. These included:

1. RadonAware: www.radonaware.ca

2. BC Government web site for Occupational Health & Safety:
<http://www2.gov.bc.ca/gov/content/careers-myhr/managers-supervisors/occupational-health-safety/radon-testing-mitigation>

Most of the communication materials developed were accessible throughout the project timeline from either of the web sites listed. Finally, SSBC organized 2 'Question and Answer' sessions as an opportunity for SSBC senior managers and various ministry representatives to learn more about the Radon Testing Project, ask questions, and seek clarification on any aspect of the project testing.

TEST METHOD

Long-term radon measurements (minimum 3 months) were collected using alpha track detectors. The alpha track detectors used for the SSBC Radon Testing Project were the AccuStar AT-100 radon gas detector. This device is listed as an approved passive radon measurement device by the C-NRPP. Alpha track detectors are passive monitoring devices. This means radon passively diffuses into the radon detector. The radon then decays and emits alpha particles. These particles are very fast, damaging, and leave small 'tracks' on a thin plastic film located inside the detector casing.

LOCATIONS FOR BUILDING TESTING

Testing was conducted in the following BC communities:

- Alexis Creek
- Anahim Lake
- Bella Bella
- Bella Coola
- Hagensborg
- Masset
- Port Clements
- Queen Charlotte City
- Riske Creek
- Sandspit
- Tlell
- Williams Lake

DEPLOYMENT

A total of 300 long-term indoor air radon detectors were deployed throughout the 50 buildings. There were two types of building classifications for the SSBC Radon Testing Project:

1. Residential Buildings (30 total)
2. Public Buildings (20)

Residential Buildings required 1 alpha track detector be placed in the lowest lived in level of the house for a period of no less than 3 months (91 days). Health Canada determines 'lived in' to be any space in a house that is occupied for a minimum of 4 hours per day.

Public Buildings required 1 long-term alpha track detector be placed in a location occupied for at least 4 hours per day. Detectors were deployed in each occupied room and open area based on information provided regarding occupancy. For large open areas 1 detector was deployed for every 200 m².

ANALYSIS

When testing was complete, each alpha track detector was placed inside an air tight bag and returned to a certified laboratory for analysis. The thin plastic film located inside each detector was analyzed by counting the number of alpha tracks on the plastic film. The number of tracks counted over a determined area, along with the total deployment period, was used to calculate the average annual radon exposure concentration of each location tested. A radon level was then produced that was either above the Health Canada action level of 200 Bq/m³, or below.

QUALITY ASSURANCE PROCESS

Health Canada’s recommendations regarding the appropriate number of quality control measurements (i.e. blanks and duplicates) that should be collected during testing were followed for the SSBC Radon Testing Project. Duplicate and blank detectors were deployed at a minimum rate of 10% and 5% respectively for the total number of testing locations. A total of 14 blank and 25 duplicate detectors were deployed at various locations within the buildings. Table 2 provides additional information on the type of Quality Assurance test utilized and its purpose.

Table 2. Quality Assurance

| Type of Quality Assurance Test | % of total radon tests | Quality Assurance Procedure | Purpose |
|--------------------------------|------------------------|--|--|
| Duplicate | 10% | A second radon detector was placed 4” from the primary detector in the same location of the building for the same exposure period. | To confirm the results of the primary detector applied in the same location. |
| Blank | 5% | Detectors were left in original sealed packages for the entire testing period. The package was opened, immediately re-sealed to simulate an actual test, and shipped to the lab for analysis with a batch of field deployed detectors. | To assess whether detectors that had not been exposed to any radon had any amounts of exposure due to shipping and/or storage processes. |

RESULTS

Of the 50 buildings tested, 43 reported results. All results indicated levels below the Health Canada action level of 200 Bq/m³ as outlined in Table 3. It must be noted that the Radon Testing Project used the Canada Post Forward Service Area (FSA) to track the number of tests completed by geographic location and should not be viewed as an indicator of whether or not any building may have radon levels above or below 200 Bq/m³ in any of these areas.

Table 3. Radon Test Results

| Forward Service Area | # Buildings Tested | Below 200 Bq/m ³ | Above 200 Bq/m ³ |
|----------------------|--------------------|-----------------------------|-----------------------------|
| VOL | 12 | 12 | 0 |
| VOT | 28 | 28 | 0 |
| V2G | 3 | 3 | 0 |

CONCLUSIONS

- To date, all of the SSBC buildings reporting results tested below the Health Canada action level of 200 Bq/m³. As such, mitigation is not recommended for any of the 43 buildings.
- Distributing information to building tenants and managers about the Radon Testing Project in advance of deployment is an effective strategy for managing tenant concerns.
- Including outreach to various levels of government that represent communities where buildings are being tested is an effective approach to ensure decision makers are provided with accurate information.
- Partnerships are an effective strategy for disseminating project communication to various sectors and stakeholder groups that may be directly impacted by the project, or that have a vested interest in the issue.

APPENDICES

APPENDIX 1.

Radon Testing Tenant Notification



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TENANT NOTIFICATION – RADON TESTING PROJECT

PROJECT SYNOPSIS

A Radon Testing Project being conducted by Shared Services BC (SSBC) will be completed in the fall and winter of 2015/2016 in buildings owned and leased by SSBC.

In 2007 Health Canada established a health guideline of 200 Bq/m³, above which action is recommended to reduce occupant exposure levels. The Radon Testing Project will begin in a sample of government owned and leased residential and commercial buildings to test for radon and to determine any requirement for mitigation.

WHAT IS RADON?

Radon is a colourless, odourless, tasteless gas produced by the radioactive decay of naturally occurring uranium. Uranium-bearing rocks and soils decay into radon gas, which migrates from underground to the surface of the earth where it is normally diluted with fresh air to very low concentrations. However, radon can also find its way into any building where the foundation is in direct contact with the soil. Indoors, radon can get trapped and accumulate to much higher concentrations. The only way to know if a building has high levels of radon is to test.

WHY IS RADON A CONCERN?

Radon has been shown to cause lung cancer over many years of exposure and is estimated to be the second leading cause of lung cancer, after smoking. The only known health impact from radon exposure is lung cancer.

WHEN AND HOW WILL TESTING BE CONDUCTED?

Testing will require radon detectors be deployed in your building for a period of at least 3 months, beginning fall of 2015. The detectors are passive and **do not emit radiation**. Detectors will be labelled, and only placed in occupied areas. **It is very important that no one (including pets) disturb the detectors**. Disturbed detectors might require re-deployment and an extended testing period. Information on how the detector works will be provided at the time of deployment.



Figure 1: Long term radon detector

WHO WILL PERFORM TESTING?

All detectors will be placed by certified consultants according to protocols developed by SSBC and the BC Lung Association using Health Canada guidelines. Occupants will be provided with written notice 2 days prior to testing. All mitigation work will be completed by certified consultants.

Once testing is complete, and lab results known, they will be provided to SSBC and Facilities Management Units. Tenants will be notified of the results once they have been reviewed. In the interim, if you require additional information or have any concerns you can visit www.radonaware.ca, contact your Facilities Management Unit or email the Public Service Agency at myhr@gov.bc.ca

APPENDIX 2.

Radon Testing Project Backgrounder



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PROJECT BACKGROUNDER – RADON TESTING PROJECT

PROJECT SYNOPSIS

A Radon Testing Project being conducted by Shared Services BC (SSBC) will be completed in the fall and winter of 2015/2016 in buildings owned and leased by SSBC.

In 2007 Health Canada established a health guideline of 200 Bq/m³, above which action is recommended to reduce occupant exposure levels. The Radon Testing Project will begin in a sample of government owned and leased residential and commercial buildings to test for radon and to determine any requirement for mitigation.

WHAT IS RADON?

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WHY IS RADON A CONCERN?

Radon has been shown to cause lung cancer over many years of exposure and is estimated to be the second leading cause of lung cancer, after smoking. The only known health impact from radon exposure is lung cancer.

WHEN AND HOW WILL TESTING BE CONDUCTED?

Radon testing is scheduled to begin in the fall of 2015. Occupants will be provided with written notice 2 days prior to testing. The radon detectors will be placed by a professional environmental consultant according to a testing protocol developed by SSBC and the BC Lung Association using Health Canada guidelines. The following guidelines will be used for all buildings in the project:

1. A three month test period with passive radon detectors that do not have power requirements and **do not emit radon**.
2. Only occupied buildings (where occupied is defined as greater than 4 hours per day) will be tested.
3. Residential buildings will deploy a single detector, while larger, commercial buildings may require several tests located in various occupied locations.
4. All detectors will be placed away from forced air ductwork, ceiling fans, direct sunlight, electrical influences, and high humidity.
5. Areas not to be tested include: bathrooms, kitchens, closets, hallways, utility rooms and unoccupied warehouses.
6. Detectors will remain in the same location, undisturbed, for the duration of the testing period.



Figure 1: Long term radon detector



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7. Detectors will be labelled.
8. The certified radon testing consultant will retrieve all the radon detectors, and ship them to a certified lab for analysis.

Once testing is complete, and lab results known, they will be provided to SSBC and Facilities Management Units. Tenants will be notified of the results once they have been reviewed. In the interim, if you require additional information or have any concerns you can visit www.radonaware.ca contact your Facilities Management Unit or email the Public Service Agency at myhr@gov.bc.ca

APPENDIX 3.

Radon Testing Information to Government Representatives



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February 1st, 2016

Mayor and Council
City of Williams Lake
450 Mart Street
Williams Lake, BC
V2G 1N3
Canada

To: Mayor and Council

A Radon Testing Project conducted by Shared Services BC (SSBC) and in partnership with the Public Service Agency and the BC Lung Association will be completed in the fall and winter of 2015/2016 in buildings owned and leased by SSBC. Your community contains at least one government building that will be part of the SSBC Radon Testing Project.

BACKGROUND

In 2007 Health Canada established a health guideline of 200 Bq/m³, above which action is recommended to reduce occupant exposure levels. There is no legislative requirement to test for radon in government buildings. SSBC is proactively initiating radon testing to protect occupant health. The Radon Testing Project will begin in a sample of government owned and leased residential and commercial buildings to test radon levels and to determine any requirement for mitigation.

WHAT IS RADON?

Radon is a colourless, odourless, tasteless gas produced by the radioactive decay of naturally occurring uranium. Uranium-bearing rocks and soils decay into radon gas, which migrates from underground to the surface of the earth where it is normally diluted with fresh air to very low concentrations. However, radon can also find its way into any building where the foundation is in direct contact with the soil. Indoors, radon can get trapped and accumulate to higher concentrations.

WHY IS RADON A CONCERN?

Radon has been shown to cause lung cancer over many years of exposure and is estimated to be the second leading cause of lung cancer, after smoking. The only known health impact from radon exposure is lung cancer.

IS YOUR COMMUNITY AT RISK?

Radon is found in all regions of British Columbia. Buildings included in the SSBC Radon Testing Project were not selected based on any known risk; rather, the project aimed to include a mix of building types in order to evaluate best practices in radon testing and mitigation.

QUESTIONS?

If you have questions or concerns regarding the SSBC Radon Testing Project please contact Mark Donaldson, SSBC Radon Testing Project Manager at 250.952.9330. For general information and resources on radon please visit the BC Lung Association's website at www.radonaware.ca or call 250.686.1597 and request the RadonAware Manager.

APPENDIX 4.

Communicating Radon Health Risks



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COMMUNICATING RADON HEALTH RISKS – RADON TESTING PROJECT

PROJECT SYNOPSIS

A Radon Testing Project being conducted by Shared Services BC (SSBC) will be completed in the fall and winter of 2015/2016 in a sample of buildings owned and leased by SSBC.

In 2007 Health Canada established a health guideline of 200 Bq/m³, above which action is recommended to reduce occupant exposure levels. The Radon Testing Project will begin in a sample of government owned and leased residential and commercial buildings to test for radon and to determine any requirement for mitigation.

COMMUNICATING RADON HEALTH RISKS

Most British Columbians are unaware of the health risks associated with radon gas exposure. SSBC, the British Columbia Lung Association and the Public Service Agency are working together to promote healthy workplaces by starting to test government owned and leased buildings.

KEY MESSAGES

- Radon is a colourless, odourless, tasteless gas produced by the radioactive decay of uranium in soil, rock and water.
- Radon can find its way into any building where the foundation is in direct contact with the soil.
- Indoors, radon can get trapped and with the potential to accumulate to high levels.
- The only way to know if a building has high levels of radon is to test.
- Radon has been shown to cause lung cancer over many years of exposure to high levels.
- Radon is estimated to be the second leading cause of lung cancer, after smoking.
- An estimated 16% of annual lung cancer deaths in Canada can be attributed to radon exposure.
- Smoking and exposure to high levels of radon leads to an estimated 1 in 3 lifetime risk of developing lung cancer.
- Exposure to high levels of radon over many years leads to an estimated 1 in 20 lifetime risk of developing lung cancer.
- There are no noticeable side-effects from immediate radon exposure.
- The only known health impact from radon exposure is lung cancer.

Lung cancer is a serious disease and people may have questions beyond the key messages provided in this document.

Any serious health related concern should be addressed to a person's primary care physician.

Once testing is complete, and lab results known, they will be provided to SSBC and Facilities Management Units. Tenants will be notified of the results once they have been reviewed. In the interim, if you require additional information or have any concerns you can visit www.radonaware.ca or contact your Facilities Management Unit or the Public Service Agency at myhr@gov.bc.ca.

APPENDIX 5.

Radon Test Notice

RADON TESTING PROJECT

A Radon Testing Project is underway in your building.

Please **DO NOT DISTURB** the detector or place objects within 20 cm (8 inches) of the detector. Tampering with the detector can impact the radon result.

If you have any questions or concerns please contact your Facilities Management Unit or email the Public Service Agency at myhr@gov.bc.ca

ABOUT THE TEST DEVICE



Figure 1: Long term radon detector

Alpha-track detectors use a thin piece of plastic film in a container with a filter covered opening. The detector is exposed to the air in a building for a defined period (minimum 91 days). Alpha particles from the decay of radon enter the container and leave marks on the plastic film. The marks are counted under a microscope at a certified lab. The number of marks are converted to a radon level.

