Managing Radon in Existing Buildings & New Construction

PRESENTATION HANDOUT

2012 Ontario Building Code
Radon Specific Clauses

April 23, 2019

Presented by

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This handout lists radon specific clauses in the 2012 Ontario Building Code to supplement the presentation. Key items have been bolded and explanatory notes have been added to some clauses.

2.2.1.1. Objectives

(1) The objectives of this Code shall be those set out in Table 2.2.1.1.

Table 2.2.1.1.

OH1: .An objective of this Code is to limit the probability that, as a result of the design or construction of a building, a person in the building will be exposed to an **unacceptable risk of illness** due to indoor conditions.

OH1.1: An objective of this Code is to limit the probability that, as a result of the design or construction of a building, a person in the building will be exposed to an **unacceptable risk of illness** due to indoor conditions **caused by inadequate indoor air quality.**

3.1.1.2. 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.

Note: Health Canada's Cross-Canada Survey of Radon Concentrations in Homes, March 2012 identified other provincial health regions with an equal or higher frequency of indoor radon that exceeds the action level. Table A below summarizes the results of the study. The shown percentage represent the number of homes in each health region that exceeded an indoor radon concentration of 200 Bq/m^3.

Table A: Ontario Health Regions and the percentage of homes that have indoor radon levels of greater than 200 Bq/m^3

Health Region Name	%	Health Region Name	%
***District of Algoma**	**8.6**	Halton	4.9
***Hastings and Prince Edward Counties**	**12.1**	City of Hamilton	5.0
***Sudbury**	**5.1**	**Huron County**	**11.0**
Brant County	**10.4**	**Chatham-Kent**	**18.4**
Durham Regional	0.0	**Lambton**	**8.5**
Elgin-St. Thomas	**7.6**	Middlesex-London	1.8
Grey Bruce	**11.1**	Niagara Regional	2.0
Haldimand-Norfolk	2.6	**Northwestern**	**13.9**
Haliburton, Kawartha, Pine Ridge	**6.1**	**Kingston, Frontenac and Lennox and**	**11.1**
Leeds, Grenville and Lanark	**19.4**	North Bay Parry Sound	1.9
City of Ottawa	**6.2**	Porcupine Health	1.0
Oxford County	**11.5**	**Renfrew County**	**9.0**
Peel	0.0	**Eastern Ontario**	**6.1**
Perth	**9.8**	Simcoe Muskoka	0.9
Peterborough County-City	**9.8**	**Wellington-Dufferin-Guelph**	**10.9**
Thunder Bay	**12.0**	**Windsor-Essex**	**13.8**
Timiskaming	**7.8**	York Regional	0.0
Waterloo	4.0	City of Toronto	2.7

Section 5.4. Air Leakage

5.4.1. Air Barrier Systems

5.4.1.1. Required Resistance to Air Leakage

(1) Where a *building* component or assembly separates interior *conditioned space* from exterior space, **interior space from the ground**, or environmentally dissimilar interior spaces, the properties and position of the materials and components in those components or **assemblies shall be such that they control air leakage or permit venting to the exterior so as to**,

(a) provide acceptable conditions for the *building* occupants,
(b) maintain appropriate conditions for the intended use of the *building*,
(c) minimize the accumulation of condensation in and penetration of precipitation into the *building* component or assembly,
(d) control heat transfer to roofs where ice damming can occur, and
(e) not compromise the operation of *building* services.

(2) Except as provided in Sentence (3), an *air barrier system* shall be installed to provide the principal resistance to air leakage.

(3) An *air barrier system* is not required where it can be shown that uncontrolled air leakage will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

Note: It is not possible to determine if uncontrolled air (i.e. soil gas/radon) leakage will adversely affect the health or safety of the building users until the structure is built and occupied. Therefore it is practically impossible to show that omitting an air/radon barrier is acceptable.

5.4.1.2. Air Barrier System Properties

(2) The air leakage limit specified in Sentence (1) is permitted to be increased where it can be shown that the higher rate of leakage will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

(3) The *air barrier system* shall be continuous,
(a) across construction, control and expansion joints,
(b) across junctions between different *building* assemblies, and
(c) around penetrations through the *building* assembly.

6.2.1.1. Good Engineering Practice

(1) Heating, ventilating and *air-conditioning* systems, including related mechanical refrigeration systems, shall be designed, constructed and installed to conform to good engineering practice appropriate to the circumstances such as described in,

(l) EPA/625/R-92/016, “Radon Prevention in the Design and Construction of Schools and Other Large Buildings”.
Note: This document is intended for industrial, commercial and institutional buildings and does not apply to single residential dwelling construction. The document goes well beyond heating, ventilating and air-conditioning systems. It discusses in detail sealing of radon entry points, installation of gas permeable layers beneath the floor slabs, installation of soil gas extraction pits and piping. This document was one of the first of its kind. Newer documents have been produced that provide a more engineered approach to radon resistant new construction.

- ***ANSI/AARST CC-1000 2017 “Soil Gas Control Systems In New Construction of Buildings.***

PART 9 - Residential

9.1.1.7. 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/m3 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* for,
(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.

9.13. Dampproofing, Waterproofing and Soil Gas Control
9.13.1. General
9.13.1.1. Application

(1) This Section applies to the control of moisture and *soil* gas ingress through walls, floors, and roofs in contact with the ground.

Note: Damproofing and drainage planes are not the same thing. If only a drainage plane (e.g. dimple board, etc.) is provided it will have no ability to resist radon ingress. Any cracks in the walls, floors or roofs that are not sealed will permit radon entry.

9.13.4. Soil Gas Control

9.13.4.1. Soil Gas Control

(1) Where methane or radon gases are known to be a problem, **construction shall comply with the requirements for *soil* gas control in MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".**

9.13.4.2. Required Soil Gas Control

(1) Except as provided in Sentence (2), all wall, roof and floor assemblies in contact with the ground shall be constructed to resist the leakage of *soil* gas from the ground into the *building*.

(2) Construction to resist leakage of *soil* gas into the *building* is not required for,
(a) garages and unenclosed portions of *buildings*,
(b) *buildings* constructed in areas where it can be **demonstrated** that *soil* gas does not constitute a hazard, or

Note: This can often be misinterpreted as an out clause. Duty is on the builder to demonstrate (i.e. prove) radon does not constitute a hazard. Indoor radon levels can't be determined until a building is built and occupied. Health Canada's survey proves radon exists across the province and the only way to know a radon level in a building is to test. It is not practical or possible to determine (i.e. prove) is the planned building will or will not have elevated radon prior to construction. Radon has been shown to have potential health affects at concentrations below the action levels. It is not possible to prove that radon poses no hazard, even at low levels. Using this clause without the support of extensive preconstruction soil testing could result in not complying with code. It is important to note that in most situations the cost to implement radon resistant construction is less expensive than trying to prove the proposed building will not have elevated radon.

(c) *buildings* that contain a single *dwelling unit* and are constructed to provide for subfloor depressurization in accordance with MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(3) Where *soil* gas control is required, a *soil* gas barrier shall be installed at walls and roofs in contact with the ground according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(4) Where *soil* gas control is required, it shall consist of one of the following at floors in contact with the ground:
(a) a *soil* gas barrier installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control", or
(b) where the *building* contains a single *dwelling unit* only, a subfloor depressurization system installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

9.16.2. Material Beneath Floors
9.16.2.1. Required Installation of Granular Fill

(1) Except as provided in Sentence (2), not less than 100 mm of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve shall be placed beneath floors-on-ground.

(2) Granular material need not be installed under,
(a) slabs in garages, carports or accessory *buildings*, or
(b) *buildings* of *industrial occupancy* where the nature of the process contained in the *occupancy* permits or requires the use of large openings in the *building* envelope even during the winter.

9.25.3. Air Barrier Systems
9.25.3.1. Required Barrier to Air Leakage

(1) Wall, ceiling and floor assemblies that separate *conditioned spaces* from unconditioned spaces or from the ground shall be constructed so as to include an *air barrier system* that will provide a continuous barrier to air leakage,

(a) from the interior of the *building* into wall, floor, *attic or roof spaces* sufficient to prevent excessive moisture condensation in such spaces during the heating season, and

(b) from the exterior inward sufficient to prevent moisture condensation on the room side during the heating season.

(2) The continuity of the *air barrier system* shall extend throughout the *basement*.

Note: This includes caulking of the floor slab to wall joint (cold joint) and all other cracks and penetrations. Alternatively a barrier may be sealed to walls below the slab (i.e. polyethylene, radon specific barrier, a sprayfoam or spray applied product approved as a radon barrier)

9.25.3.3. Continuity of the Air Barrier System

(15) Where the *foundation* wall and floor slab are used as an air barrier, they shall be caulked at all joints, intersections and penetrations.

(16) Sump pit covers shall be sealed to maintain continuity of the *air barrier system*.