

## PROPOSED CHANGE

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## MODIFICATION PROPOSÉE

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### Comment

### Commentaires

Document

Document	NBC 2005 CNB	Document	
Provision	9.13.4.6	Exigence	Provision
Committee	Joint ES-HSB Task Group on Protection from Radon Ingress	Comité	Committee
Minutes	2 <sup>nd</sup> TG meeting, 3 <sup>rd</sup> TG meeting, HSB 2005-06.13, HSB2005-07.06.22	Procès-verbaux	Minutes

### EXISTING PROVISION

#### 9.13.4.6. Providing for Subfloor Depressurization

(See Appendix A.)

- 1) Except as required in Sentence (3), granular material shall be installed below the floor-on-ground according to Sentence 9.16.2.1.(1).
- 2) A pipe not less than 100 mm in diameter shall be installed vertically through the floor, at or near its centre, such that
  - a) its bottom end opens into the granular *fill* described in Sentence (1), and
  - b) its top end will permit connection to depressurization equipment.
- 3) The granular material described in Sentence (1), near the centre of the floor, shall be not less than 150 mm deep for a radius of not less than 300 mm centred on the pipe described in Sentence (2).
- 4) The upper end of the pipe described in Sentence (2) shall be provided with a removable seal.
- 5) The pipe described in Sentence (2) shall be clearly labelled to indicate that it is intended only for the removal of *soil* gas from below the floor-on-ground.
- 6) Except as provided in Sentence (8), when a *building* constructed in accordance with Sentences (1) to (5) is complete, testing shall be conducted according to EPA 402-R-93-003, "Protocols for Radon and Radon Decay Product Measurements in Homes," to determine the radon concentration in the *building*.
- 7) A copy of the results of testing required in Sentence (6) shall be provided by the *building owner* to the *authority having jurisdiction*.
- 8) The testing required in Sentence (6) shall include *basement* concentration measurements.
- 9) Where the radon concentration determined as described in Sentences (6) and (8) exceeds the Canadian Action Level for radon in residential indoor air, as specified in HC H46-2/90-156E, "Exposure Guidelines for Residential Indoor Air Quality," a subfloor depressurization system shall be installed to reduce the radon concentration to a level below the Canadian Action Level.
- 10) Where a subfloor depressurization system is installed,
  - a) makeup air shall be provided as specified in Article 9.32.3.8., and
  - b) measures shall be taken to ensure that any resultant decrease in *soil* temperature will not adversely affect the *foundation*.

### PROPOSED CHANGE

Move Article 9.13.4.6.-2005 to Article 9.13.4.3.-2010 with changes as follows:

Other Code Provisions Affected: None

#### 9.13.4.6.3. Providing for Subfloor Depressurization

(See Appendix A [and A-9.13.4.3.\(1\) to \(3\) in Appendix A.](#))

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**1)** A gas-permeable layer shall be installed in the space between the air barrier and the ground to allow the depressurization of that space.

**2)** An inlet that allows for the effective depressurization of the gas-permeable layer shall be provided. (See A-9.13.4.3.(2) and (6)(a) in Appendix A.)

**3)** An outlet in the *conditioned space* shall

a) permit connection to depressurization equipment.

b) be sealed to maintain the integrity of the air barrier system, and

c) be clearly labeled to indicate that it is intended only for the removal of radon from below the floor-on-ground.

**4)** Where installations are constructed according to Sentences (5) to (8), they shall be deemed to comply with Sentences (1) to (3).

~~**1)5)** Except as required in Sentence (3), Clean granular material shall be installed below the floor-on-ground in accordance with Sentence 9.16.2.1.(1).~~

~~**2)6)** A pipe not less than 100 mm in diameter shall be installed ~~vertically~~ through the floor, ~~at or near its centre~~, such that~~

a) ~~its bottom end opens into the granular~~ layer required ~~fill described~~ in Sentence (5) at or near the centre of the floor and no less than 100 mm of granular material projects beyond the terminus of the pipe measured along its axis (see A-9.13.4.3.(2) and (6)(a) in Appendix A), and

b) ~~its top end permits connection to depressurization equipment.~~

~~**3)** The granular material described in Sentence (1), near the centre of the floor, shall be not less than 150 mm deep for a radius of not less than 300 mm centred on the pipe described in Sentence (2).~~

~~**4)7)** The ~~upper top~~ end of the pipe described in Sentence (6) shall be provided with an airtight cap removable seal.~~

~~**5)8)** The pipe described in Sentence (6) shall be clearly labelled near the cap and, if applicable, every 1.8 m and at every change in direction to indicate that it is intended only for the removal of radon soil gas from below the floor-on-ground.~~

~~**6)** Except as provided in Sentence (8), when a building constructed in accordance with Sentences (1) to (5) is complete, testing shall be conducted according to EPA 402-R-93-003, "Protocols for Radon and Radon Decay Product Measurements in Homes," to determine the radon concentration in the building.~~

~~**7)** A copy of the results of testing required in Sentence (6) shall be provided by the building owner to the authority having jurisdiction.~~

~~**8)** The testing required in Sentence (6) shall include basement concentration measurements.~~

~~**9)** Where the radon concentration determined as described in Sentences (6) and (8) exceeds the Canadian Action Level for radon in residential indoor air, as specified in HC H46-2/90-156E, "Exposure Guidelines for Residential Indoor Air Quality," a subfloor depressurization system shall be installed to reduce the radon concentration to a level below the Canadian Action Level.~~

~~**10)** Where a subfloor depressurization system is installed,~~

a) ~~makeup air shall be provided as specified in Article 9.32.3.8., and~~

b) ~~measures shall be taken to ensure that any resultant decrease in soil temperature will not adversely affect the foundation.~~

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### RATIONALE

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#### Problem

##### General

See the Summary of Significant Proposed Changes to NBC Parts 5, 6 and 9.

##### Technical

###### Article 9.13.4.6.-2005

- The current requirements including referenced documents do not reflect the new Health Canada guideline.
- The terms “granular fill” and “granular material” are not used consistently within the current Code and performance criteria are not identified.
- Article 9.13.4.6. does not include performance-oriented solutions.
- Sentences 9.13.4.6.(6) to (9) describe the measures of activating, testing and adjusting the subfloor depressurization system, which should only be done in a heating or cooling season and which should not be done for periods shorter than 4 to 6 weeks. This testing protocol is therefore very impractical considering the normal process of constructing, inspecting and providing ownership of buildings.
- Clause (10)(a) currently requires that, where a subfloor depressurization system is installed, makeup air be provided to protect a house against depressurization. However, the risk of depressurizing a house by running a subfloor depressurization system is considerably small, especially when one considers that this system mitigates another risk.
- Clause (10)(b) currently requires that foundations be protected against any effect resulting from the eventual decrease in soil temperature due to the depressurization system. This requirement cannot be enforced at the time of construction as no verifiable construction details are provided.

#### Justification - Explanation

##### General

See the Summary of Significant Proposed Changes to NBC Parts 5, 6 and 9.

##### Technical

- The proposed requirements are based on the new Health Canada guideline.
- The proposed wording includes performance requirements as well as a deemed-to-comply prescriptive solution and a sentence that clarifies this concept (Sentence (4)-2010).
- The terms “granular fill” and “granular material” have been made consistent. The term “granular material” was chosen because it is the more general term; the proposed wording makes this Article consistent with other Articles in the Code. Performance criteria for a layer of material under the slab are now identified.
- Sentences (6) to (9)-2005 are deleted. Additional guidance on radon testing and the completion of a subfloor depressurization system is provided in the Appendix, which points to further guidance provided by Health Canada and CMHC.
- The existing requirements have been clarified, so that the suction point of the pipe has to be at or near the centre, but not the pipe stub, which penetrates the slab; this should allow more design flexibility without compromising the acceptable performance of a subfloor depressurization system.
- Deleting Clause (10)(a)-2005 exempts subfloor depressurization equipment from the requirement for makeup air (see also the related proposed change on 9.32.3.8.(1)(b)).

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- Deleting Clause (10)(b)-2005 removes an unenforceable requirement (see also the related proposed change for an additional appendix note that discusses the risk of freezing soil).

### Cost implications

#### **Requiring the granular material under floors-on-ground and the rough-in for a future radon mitigation system**

Conventional practice in many areas across Canada includes the installation of granular material under floors-on-ground, which means this proposed change is largely cost-neutral, except for the rough-in (a capped pipe).

As well, where conventional practice includes the provision of the rough-in in addition to providing granular material in accordance with the current wording in Article 9.13.4.6., this proposed change would remain entirely cost-neutral.

Where neither granular material nor the rough-in are currently installed, the incremental costs incurred could be in the range of:

- \$700 for providing the granular material for a 100 m<sup>2</sup> floor slab to a depth of 100 mm (based on trucking costs, distance to the quarry and regional pricing methods),
- \$5 for a simple pipe stub in the centre of the floor slab or \$72 for supplying and installing the pipe stub (\$5), an elbow (\$7) and a pipe-run of 4 metres (\$15 per linear metre) to a convenient location in the floor plan, and
- \$7 for supplying and installing a removable pipe cap (\$7) and labelling the pipe (\$0).

In addition, the cost of lag time for waiting for/scheduling an inspection may have to be added.

The cost of providing other than the deemed-to-comply solutions (other air-permeable layer, inlet and connection point) is difficult to establish and depends on design and the technology utilized.

#### **Deleting Sentences 9.13.4.6.(6) to (9)-2005**

Deleting Sentences 9.13.4.6.(6) to (9)-2005 and moving the requirements for the testing and activating of a depressurization system into the Appendix reduces the cost and time for builders at the time of construction. This cost reduction of not having to provide an active depressurization system could be as much as:

- \$230 for supplying piping (\$100 for 8 metres) and one radon exhaust fan (\$130 for 150 CFM fan)
- between \$400 and \$1,000 of labour cost depending on building design and whether the exhaust is installed at the roof or the side-wall, and
- between \$10 and \$80 annually to operate the fan depending on the design of the pipe run, selected flow rate of the fan, the fan's efficiency and on the local price for electricity.

However these costs (and time resources) would have to be carried by the owner or operator of the building after the time on construction if the need arises. In most locations in Canada, the requirements for the test and the activation of a subfloor depressurization system are currently not enforced, which means this proposed change is cost-neutral.

#### **Deleting Sentence (10)-2005**

The deletion of Sentence (10)-2005 would reduce the possibility for expensive soil temperature measurements and the potential cost of makeup air systems in addition to a subfloor depressurization system. Where active soil gas mitigation systems are installed, the implementation of this proposed change might in some cases increase the risk of freezing the footings. The issue is addressed in proposed Appendix Note A-9.13.4.3.-2010.

### Enforcement implications

The proposed requirements are enforceable at the time of construction, and can be enforced within the current infrastructure.

### Who is affected

Builders, building officials, owners.

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## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION

Provision: [9.13.4.3.\(1\)-2010](#)

Analysis: New

Attributions

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[\[F40-OH1.1\]](#)

**Objective**

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(2\)-2010](#)

Analysis: New

**Attributions**

[\[F40-OH1.1\]](#)

**Objective**

[OH1 Indoor Conditions](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(3\)](#)

Analysis: New

**Attributions**

[\[F40-OH1.1\]](#)

**Objective**

[OH1 Indoor Conditions](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(4\)](#)

Analysis: New

**Attributions**

[N/A](#)

**Objective**

[N/A](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(5\)](#)

Analysis: [Based on 9.13.4.6.\(1\)-2005 with changes](#)

**Attributions**

[\[F40-OH1.1\]](#)

**Objective**

[OH1 Indoor Conditions](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(6\)](#)

Analysis: [Based on 9.13.4.6.\(2\)-2005 with changes](#)

**Attributions**

[\[F40-OH1.1\]](#)

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OH1 Indoor Conditions

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(3\)-2005](#) Analysis: [Deleted](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(7\)](#) Analysis: [Based on 9.13.4.6.\(4\)-2005 with changes](#)

**Attributions**

[F40-OH1.1]

**Objective**

OH1 Indoor Conditions

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.3.\(8\)](#) Analysis: [Based on 9.13.4.6.\(5\)-2005 with changes](#)

**Attributions**

[F40-OH1.1]

**Objective**

OH1 Indoor Conditions

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(6\)-2005](#) Analysis: [Deleted](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(7\)-2005](#) Analysis: [Deleted](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(8\)-2005](#) Analysis: [Deleted](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(9\)-2005](#) Analysis: [Deleted](#)

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**OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION**

Provision: [9.13.4.6.\(10\)-2005](#) Analysis: [Deleted](#)

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