Submit a comment

Proposed Change 1850

Code Reference(s):	**NBC20 Div.B 10.9.36. (first printing)**
Subject:	Alteration of Existing Buildings
Title:	Thermal Characteristics of Building Assemblies Below-Grade or in Contact with the Ground
Description:	This proposed change introduces requirements for the thermal characteristics of building assemblies that are below-grade or in contact with the ground in existing buildings subjected to alteration.
Related Proposed Change(s):	PCF 1812, PCF 1813, PCF 1824, PCF 1826, PCF 1829, PCF 1839

This change could potentially affect the following topic areas:

- ☐ Division A
- ☐ Division B
- ☐ Division C
- ☐ Design and Construction
- ☐ Building operations
- ☑ Housing
- ☑ Small Buildings
- ☐ Large Buildings
- ☐ Fire Protection
- ☐ Occupant safety in use
- ☐ Accessibility
- ☐ Structural Requirements
- ☐ Building Envelope
- ☑ Energy Efficiency
- ☐ Heating, Ventilating and Air Conditioning
- ☐ Plumbing
- ☐ Construction and Demolition Sites

General information

See the summary for subject Alteration of Existing Buildings.

Problem

See the "Problem" section of the summary for the subject Alteration of Existing Buildings.

When a voluntary alteration is made to below-grade or in contact with the ground building assemblies in an existing building, there is an opportunity to improve the energy performance of the building assembly. This proposed change provides the requirements for the thermal characteristics of building assemblies below-grade or in contact with the ground that are subjected to alteration.

If the thermal characteristics of the building assembly do not achieve the required performance after an alteration, excessive energy would be consumed.

Justification

When alterations are made to building assemblies that are below-grade or in contact with the ground in an existing building, there is an opportunity to upgrade the performance level of the assembly to increase the overall energy performance of the building, thereby minimizing the incremental cost of the upgrade.

This proposed change aims to clarify the requirements for authorities having jurisdiction, designers and building professionals. The enhanced clarity would ensure that building owners could benefit from energy performance upgrades while avoiding an undue burden, ultimately promoting energy efficiency and reducing the incremental cost of the upgrade.

PROPOSED CHANGE

[10.9.36.] -- Energy Efficiency

[10.9.36.1.] ---

[10.9.36.2.] --- Thermal Characteristics of Building Assemblies Below-Grade or in Contact with the Ground

(See Note A-10.9.36.1. and 10.9.36.2.-2025 (PCF 1829).) (See also Note A-10.1.1.1.(1)-2025 (PCF 1824).)

[1] --) Except for maintenance and repair, and except as provided in Sentence (7), where *building* assemblies that are below-grade or in contact with the ground are subjected to *alteration*, the effective thermal resistance of the *building* assembly shall conform to Sentences (3) to (6).

[2] --) Where insulation is installed to meet the requirements of Sentence (1), all applicable requirements of Part 9 shall be met.

[3] --) Except as provided in Sentence (7), where the stud cavity of an exterior *foundation* wall or interior surface of an exterior mass *foundation* wall is exposed or made accessible by the *alteration* or is within the extent of the *alteration*, the effective thermal resistance of the wall shall

[a] --) be assessed in accordance with Article 9.36.2.2., and

[b] --) conform to Article 9.36.2.8.

[4] --) Except as provided in Sentence (7), where a floor-on-ground is replaced within the extent of the *alteration*, effective thermal resistance of the floor-on-ground shall conform to Article 9.36.2.8. (See Note A-10.9.36.1.(4).)

[5] --) Except as provided in Sentence (7), where a heated floor or an unheated floor above the frost line is exposed or made accessible by the *alteration* or is within the extent of the *alteration* and has accessible space below it, the effective thermal resistance of the floor shall

[a] --) be assessed in accordance with Article 9.36.2.2., and

[b] --) conform to Article 9.36.2.8.

[6] --) Except as provided in Sentence (7), where the exterior perimeter of a slab-on-grade with an integral footing or a heated or unheated floor on permafrost is exposed or made accessible by the *alteration* or within the extent of the *alteration*, the effective thermal resistance of the slab-on-grade or floor shall

[a] --) be assessed in accordance with Article 9.36.2.2., and

[b] --) conform to Article 9.36.2.8.

[7] --) Where the effective thermal resistance of the *building* assembly cannot be improved to meet the requirements of Sentences (2) to (6) due to construction limitations, structural constraints or loss of functionality of the space, the effective thermal resistance shall be improved to the extent possible. (See Note A-10.9.36.1.(7) and 10.9.36.2.(7)-2025 (PCF 1829).)

Note A-10.9.36.1.(4) Alteration of Unheated Floors-on-Ground Below the Frost Line.

Table 9.36.2.8.-A does not require insulation below unheated floors-on-ground that are below the frost line (i.e., typical basement slabs). If, within the extent of an alteration, a basement slab or a portion thereof is replaced or newly installed, additional insulation above or below this floor and further sealing of the air barrier to reduce the ingress of soil gases will offer additional benefits to occupants.

Impact analysis

According to Statistics Canada, the greatest number of permits were issued for single-family houses in the late 1980s, peaking at around 130 000 permits annually [1]. For the purpose of providing a simplified calculation for estimating the cost-benefit of alterations, a demonstrative house (circa 1984–1995, two-storey, single detached, 2 000 ft.^{2} to 2 500 ft.^{2} of heated floor area and natural gas-fired furnace) in London, Ontario, (Zone 6) was used from a study conducted by CanmetEnergy [2].

Note that it is impossible to explore all permutations of alterations occurring in the country. As such, this representative case has been selected to provide an illustrative example. The actual energy savings would greatly differ (i.e., may be understated or overstated), as they are based on the current thermal resistance value of the below-grade assembly being altered.

Where the building envelope is improved by this proposed change, the amount of energy required to heat the building is typically expected to be nearly 30% less than that of the original building envelope. Up to 3% of this energy savings results from the improved thermal resistance of below-grade assemblies. This statement implies that potential annual average energy savings would be around $9 per year (i.e., 3% of 30% of $995, which is the annual average natural gas bill for Canadian residences [3]).

The incremental cost of the installation of batt insulation in a frost wall to an RSI value of 2.97, assuming there was no insulation in the original framed wall, is $2.47/$m^2$, for a total cost of up to $1 636 for the entire basement of the archetype.

References

(1) Statistics Canada. Housing Permit.

(2) Clean Air Partnership. Archetyping Guide for Energy-Efficiency Programs, www.cleanairpartnership.org

(3) Canadian Gas Association. Natural Gas Facts, www.cga.ca

Enforcement implications

It is expected that a consistent set of provisions that apply to the alteration of existing buildings would help reduce the administrative and enforcement work of assessing the degree to which any particular requirement could be relaxed without affecting the level of performance of the building with respect to the Code objectives.

This proposed change would aid enforcement by identifying the work necessary to improve the energy performance of an alteration.

Who is affected

Designers, engineers, architects, building officials, manufacturers, suppliers and energy advisors.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[10.9.36.2.] -- ([1] --) no attributions

[10.9.36.2.] -- ([2] --) no attributions

[10.9.36.2.] -- ([3] --) no attributions

[10.9.36.2.] -- ([3] --) [F92-OE1.1]

[10.9.36.2.] -- ([4] --) no attributions

[10.9.36.2.] -- ([4] --) [F92-OE1.1]

[10.9.36.2.] -- ([5] --) no attributions

[10.9.36.2.] -- ([5] --) [F92-OE1.1]

[10.9.36.2.] -- ([6] --) no attributions

[10.9.36.2.] -- ([6] --) [F92-OE1.1]

[10.9.36.2.] -- ([7] --) no attributions