Submit a comment

Proposed Change 1812

Code Reference(s):	**NBC20 Div.A 1.3.3. (first printing)**
Subject:	Alteration of Existing Buildings
Title:	Application of NBC Part 10 to the Alteration of Existing Buildings
Description:	This proposed change states the application of proposed NBC Part 10 to the alteration of existing buildings.
Related Proposed Change(s):	PCF 1813, PCF 1824, PCF 1839

This change could potentially affect the following topic areas:

- [x] Division A
- [ ] Division B
- [ ] Division C
- [x] Design and Construction
- [ ] Building operations
- [x] Housing
- [x] Small Buildings
- [x] 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

The National Building Code of Canada (NBC) currently applies to the alteration of existing buildings; however, authorities having jurisdiction may grant relaxations to specific Code requirements that are not practical to apply to existing buildings, relative to the importance of those requirements in meeting the Code objectives.

These relaxations may vary by jurisdiction, leading to confusion among Code users about the degree of work required for the alteration to meet the Code requirements. In order to provide a consistent set of requirements that apply to the alteration of existing buildings in a new Part in the NBC, the application of this set of requirements, including any appropriate relaxations, must be stated.

Given that it may not be practical to apply these requirements to the alteration of all building types, certain building types need to be explicitly excluded from the application of the new Part.

Justification

The voluntary alteration of an existing building presents an opportunity to upgrade the energy performance of the building. When significant repairs or alterations need to be made, the energy performance of the building should be improved at the same time where it is cost-effective to do so, thereby minimizing the incremental cost of the upgrade.

The Code requirements that apply to alterations must be identified, with any permitted relaxations provided where applicable.

The building types that are excluded from the requirements to upgrade during an alteration (e.g., tents) must be stated in order to clarify that the requirements are either impractical to apply to that building type, or that additional consideration should be given to prevent any negative consequences.

Providing a set of consistent, harmonized and cost-effective requirements that apply to the alteration of an existing building would provide Code users, the industry and authorities having jurisdiction with a clear expectation of the degree of work required to improve the energy performance of an existing building.

PROPOSED CHANGE

[1.3.3.] 1.3.3. Application of Division B

[1.3.3.1.] 1.3.3.1. Application of Parts 1, 7 and 8

[1.3.3.2.] 1.3.3.2. Application of Parts 3, 4, 5 and 6

[1.3.3.3.] 1.3.3.3. Application of Part 9

[1.3.3.4.] --- Application of Part 10

[1] --) Except as provided in Sentences (2) and (3), Part 10 of Division B applies to the *alteration* of *existing buildings* or parts of *existing buildings*. (See Note A-1.3.3.4.(1).)

[2] --) Part 10 of Division B does not apply to

[a] --) *farm buildings,*

[b] --) tents,

[c] --) *air-supported structures,*

[d] --) relocatable buildings,

[e] --) open-air *storage garages,*

[f] --) garages or carports described in Sentence 9.35.1.1.(1), or

[g] --) construction camps.

[3] --) Part 10 of Division B does not apply to *heritage buildings* or to parts of a *building* that have been formally recognized by a federal, provincial, territorial or municipal authority as having heritage value.

Note A-1.3.3.4.(1) Application of Part 10.

The requirements in Part 10 are intended to improve the energy performance of existing buildings that are undergoing alteration. However, the application of Part 10 does not preclude the application of the requirements in other Parts of the NBC. Until Part 10 requirements are developed to address all of the Code objectives, or to provide explicit relaxations to certain Code requirements, the requirements of all Parts of this Code continue to apply to the alteration of existing buildings, in accordance with Sentence 1.1.1.1.(1) of Division A.

[1.3.3.5.] 1.3.3.4. Building Size Determination

[1.3.3.6.] 1.3.3.5. Application of Part 2

[1.3.3.7.] 1.3.3.6. Classification of Buildings Containing Agricultural Occupancies

General information

See the summary for subject Alteration of Existing Buildings.

Impact analysis

The proposed changes to Division B that apply to the alteration of existing buildings provide the impact analysis for each technical requirement.

It is expected that the proposed Code requirements that apply to the alteration of existing buildings would provide a benefit to both the industry and authorities having jurisdiction by providing a consistent set of provisions to ensure an acceptable level of

safety and building performance, and to remove ambiguity with respect to the degree of work required to improve energy performance in the unaltered portion of the building.

This proposed change would help reduce the administrative and enforcement costs 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.

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. The proposed changes would aid enforcement by identifying the work necessary to improve energy performance in the unaltered portion of the building.

Who is affected

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

Submit a comment

Proposed Change 1813

Code Reference(s):	**NBC20 Div.A 1.4.1.2. (first printing)** **NECB20 Div.A 1.4.1.2. (first printing)**
Subject:	Defined Terms
Title:	"Existing Building" and "Heritage Building"
Description:	This proposed change introduces the defined terms "existing building" and "heritage building" in the NBC and the NECB.
Related Proposed Change(s):	PCF 1812, PCF 1824, PCF 1839

This change could potentially affect the following topic areas:

- [x] Division A
- [ ] Division B
- [ ] Division C
- [ ] Design and Construction
- [ ] Building operations
- [x] Housing
- [x] Small Buildings
- [x] 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

Problem

Existing definitions in the NBC and the NECB do not properly distinguish between a new building constructed to meet the requirements of the current edition of the Codes and a building constructed to meet the requirements of a previous edition of the Codes. A definition of "existing building" is required to differentiate the type of building to which the requirements for an alteration apply. These requirements may include relaxations of the requirements that apply to a new building.

Exemptions from Code requirements may be provided for heritage buildings where the alteration would adversely impact the heritage value of the building. As such, a definition of "heritage building" is required to qualify this exemption.

Failure to provide definitions of these terms may lead to the incorrect application of requirements to a building.

Justification

Including a definition of "existing building" would help to clarify whether the full requirements of the Code apply to the design and construction of the alteration of a building, or whether the set of relaxed requirements permitted for existing buildings applies to the alteration.

Including a definition of "heritage building" would help to clarify which buildings may be exempted from Code requirements where an alteration may accelerate the deterioration of the building or adversely affect the operation or heritage value of the building.

PROPOSED CHANGE

NBC20 Div.A 1.4.1.2. (first printing)

[1.4.1.2.] 1.4.1.2. Defined Terms

[1] 1) The words and terms in italics in this Code shall have the following meanings:

Existing building means a *building* that was constructed more than five years before the effective date of this Code.

Heritage building means an *existing building* that is formally recognized by a federal, provincial, territorial or municipal authority for its heritage value. (See Note A-1.4.1.2.(1).)

Note A-1.4.1.2.(1) Defined Terms.

Heritage Value

The heritage value of a building represents its aesthetic, historic, scientific, cultural, social or spiritual importance or significance for past, present or future generations. A building's heritage value is embodied in its character-defining materials, forms, locations, spatial configurations, uses and cultural associations or meanings, which must be retained in order to preserve the building's importance or significance. Further information can be found in "Standards and Guidelines for the Conservation of Historic Places in Canada," available at www.historicplaces.ca/en/pages/standards-normes.aspx.

NECB20 Div.A 1.4.1.2. (first printing)

[1.4.1.2.] 1.4.1.2. Defined Terms

[1] 1) The words and terms in italics in this Code shall have the following meanings:

*Existing building** means a *building* that was constructed more than five years before the effective date of this Code.

*Heritage building** means an *existing building* that is formally recognized by a federal, provincial, territorial or municipal authority for its heritage

value. (See Note A-1.4.1.2.(1).)

Note A-1.4.1.2.(1) Defined Terms.

Heritage Value

The heritage value of a building represents its aesthetic, historic, scientific, cultural, social or spiritual importance or significance for past, present or future generations. A building's heritage value is embodied in its character-defining materials, forms, locations, spatial configurations, uses and cultural associations or meanings, which must be retained in order to preserve the building's importance or significance. Further information can be found in "Standards and Guidelines for the Conservation of Historic Places in Canada," available at www.historicplaces.ca/en/pages/standards-normes.aspx.

Impact analysis

Providing the definition of "existing building" would provide a benefit in clarifying which requirements apply to the alteration of a building.

Providing a definition of "heritage building" would provide a benefit in clarifying which buildings may be exempted from Code requirements where application of the requirements may accelerate the deterioration of the building or adversely affect the operation or heritage value of the building.

Enforcement implications

Providing a definition of "existing building" would facilitate the enforcement of the requirements that apply to the alteration of a building by clarifying the application.

Providing a definition of "heritage building" would facilitate the enforcement of the requirements by clarifying which buildings may be exempted from Code requirements.

Who is affected

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

Submit a comment

Proposed Change 1843

Code Reference(s):	**NBC20 Div.A 2.1.1.2.(6) (first printing)** **NBC20 Div.A 2.2.1.1.(1) (first printing)** **NBC20 Div.A 3.1.1.2.(4) (first printing)** **NBC20 Div.A 3.2.1.1.(1) (first printing)**
Subject:	Greenhouse Gas Emissions
Title:	New Greenhouse Gas Emissions Objective and Functional Statement in the NBC
Description:	This proposed change adds a greenhouse gas emissions objective and functional statement to the NBC.
Related Code Change Request(s):	CCR 1805
Related Proposed Change(s):	PCF 1820, PCF 1989, PCF 2003, PCF 2004, PCF 2016

This change could potentially affect the following topic areas:

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

Problem

In 2011 and 2012, an energy efficiency objective (OE1.1, Excessive Use of Energy) and related design and construction requirements were introduced into the National Energy Code of Canada for Buildings (NECB) and the National Building Code of Canada (NBC).

At the time of the development of the energy efficiency objective, and when setting the Long-Term Strategy for Developing and Implementing More Ambitious Energy Codes in 2016, there was no consensus among provincial and territorial governments on an approach for addressing greenhouse gas (GHG) emissions. In addition, technical committees were directed to focus only on energy efficiency when proposing

performance requirements for future editions of the Codes. Thus, the National Model Codes do not presently address the type or quality of the energy source used by buildings and houses, nor do they address embodied GHG emissions.

In 2022, on advice from the provinces and territories, the Canadian Commission on Building and Fire Codes (CCBFC) decided that an objective related to limiting GHG emissions and requirements meeting this objective were needed in the National Model Codes to enable provincial and territorial regulation, and to further support provincial, territorial and federal GHG emissions reduction targets and climate action plans. The advice indicated that operational GHG emissions should be addressed in the 2025 editions of the Codes and that embodied GHG emissions should be addressed in the 2030 editions of the Codes. This direction was adopted by the newly formed Canadian Board for Harmonized Construction Codes (CBHCC) in November 2022.

"GHG" means any substance included in Canada’s GHG inventory in the National Inventory Report.

Justification

In order to meet provincial, territorial and federal GHG emissions reduction targets and climate action plans, including the goals to reduce Canada's total GHG emissions to 40–45% below the 2005 levels by 2030 and to reach net-zero GHG emissions by 2050, Code requirements need an objective and functional statement that pertain to limiting GHG emissions of new buildings and houses.

In the 2020 editions of the NECB and NBC, energy efficiency tiers were introduced with measures that progressively increase energy efficiency in new buildings and houses. While these requirements go a long way towards reducing the amount of energy used to operate a building or house, operational and embodied GHG emissions have not yet been addressed.

Excessive GHG emissions result in increased concentrations of GHGs in the atmosphere, which in turn can lead to climate change and a risk to the environment. This is the basis for the proposed change to add a new objective under the existing objective, OE Environment.

This proposed change would add an objective (OE2.1) and functional statement (F101) related to limiting GHG emissions to the NBC. A similar proposed change (PCF 1820) would add the GHG emissions objective and functional statement to the NECB.

The proposed objective and functional statement are needed for the introduction of objective-based technical requirements addressing GHG emissions. The objective and functional statement are not standalone and are not technical requirements of the NBC. Technical requirements that address this objective in the design and construction of buildings and houses are under development.

PROPOSED CHANGE

NBC20 Div.A 2.1.1.2.(6) (first printing)

[2.1.1.2.] 2.1.1.2. Application of Objectives

[1] 6) ~~Objective OE, Environment (including~~ Objective~~s OE1, Resources, and~~ OE1.1, Excessive Use of Energy~~)~~, applies only to

[a] a) *buildings* of *residential occupancy* to which Part 9 of Division B applies,

[b] b) *buildings* containing *business and personal services*, *mercantile* or *low-hazard industrial occupancies* to which Part 9 of Division B applies whose combined total *floor area* does not exceed 300 m^2, and

[c] c) *buildings* containing a mix of the *residential* and non-*residential occupancies* described in Clauses (a) and (b).

(See Note A-2.1.1.2.(6).) (See also Article 1.3.3.3.)

Note A-2.1.1.2.(6) Application of Objective OE1.1~~Environment Objective~~.

Objective ~~OE, Environment (including its sub-objectives)~~OE1.1, Excessive Use of Energy, is attributed to the requirements in Section 9.36. of Division B, which address energy efficiency for small residential buildings and certain small non-residential and mixed-use buildings (see Article 9.36.1.3. of Division B). The objectives, functional statements and energy efficiency requirements for larger Part 9 residential buildings as well as for non-residential buildings whose combined total floor area exceeds 300 m^2 and some mixed-use buildings are addressed in the National Energy Code for Buildings.

NBC20 Div.A 2.2.1.1.(1) (first printing)

[2.2.1.1.] 2.2.1.1. Objectives

[1] 1) The objectives of this Code are as follows (see Note A-2.2.1.1.(1)):

OE Environment

An objective of this Code is to limit the probability that, as a result of the design or construction of the *building*, the environment will be affected in an unacceptable manner.

OE2 Greenhouse Gas Emissions

An objective of this Code is to limit the probability that, as a result of the design or construction of the *building*, greenhouse gas emissions will have an unacceptable effect on the environment. The risks of unacceptable effect on the environment due to greenhouse gas emissions addressed in this Code are those caused by—

OE2.1 - excessive emissions of greenhouse gases

NBC20 Div.A 3.1.1.2.(4) (first printing)

[3.1.1.2.] 3.1.1.2. Application of Functional Statements

[1] 4) Functional Statements F90 to F93, F95, F96 and F98 to ~~F100~~ F101 apply only to

[a] a) *buildings* of *residential occupancy* to which Part 9 of Division B applies,

[b] b) *buildings* containing *business and personal services*, *mercantile* or *low-hazard industrial occupancies* to which Part 9 of Division B applies whose combined total *floor area* does not exceed 300 m^2, and

[c] c) *buildings* containing a mix of the *residential* and non-*residential occupancies* described in Clauses (a) and (b).

(See also Article 1.3.3.3.)

NBC20 Div.A 3.2.1.1.(1) (first printing)

[3.2.1.1.] 3.2.1.1. Functional Statements

[1] 1) The objectives of this Code are achieved by measures, such as those described in the acceptable solutions in Division B, that are intended to allow the *building* or its elements to perform the following functions (see Note A-3.2.1.1.(1)):

F01 To minimize the risk of accidental ignition.

F02 To limit the severity and effects of fire or explosions.

F03 To retard the effects of fire on areas beyond its point of origin.

F04 To retard failure or collapse due to the effects of fire.

F05 To retard the effects of fire on emergency egress facilities.

F06 To retard the effects of fire on facilities for notification, suppression and emergency response.

F10 To facilitate the timely movement of persons to a safe place in an emergency.

F11 To notify persons, in a timely manner, of the need to take action in an emergency.

F12 To facilitate emergency response.

F13 To notify emergency responders, in a timely manner, of the need to take action in an emergency.

F20 To support and withstand expected loads and forces.

F21 To limit or accommodate dimensional change.

F22 To limit movement under expected loads and forces.

F23 To maintain equipment in place during structural movement.

F30 To minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision.

F31 To minimize the risk of injury to persons as a result of contact with

hot surfaces or substances.

F32 To minimize the risk of injury to persons as a result of contact with energized equipment.

F33 To limit the level of sound of a fire alarm system.

F34 To resist or discourage unwanted access or entry.

F35 To facilitate the identification of potential intruders.

F36 To minimize the risk that persons will be trapped in confined spaces.

F40 To limit the level of contaminants.

F41 To minimize the risk of generation of contaminants.

F42 To resist the entry of vermin and insects.

F43 To minimize the risk of release of hazardous substances.

F44 To limit the spread of hazardous substances beyond their point of release.

F46 To minimize the risk of contamination of potable water.

F50 To provide air suitable for breathing.

F51 To maintain appropriate air and surface temperatures.

F52 To maintain appropriate relative humidity.

F53 To maintain appropriate indoor/outdoor air pressure differences.

F54 To limit drafts.

F55 To resist the transfer of air through environmental separators.

F56 To limit the transmission of airborne sound into a *dwelling unit* from spaces elsewhere in the *building* (see Sentence 3.1.1.2.(2) for application limitation).

F60 To control the accumulation and pressure of water on and in the ground.

F61 To resist the ingress of precipitation, water or moisture from the exterior or from the ground.

F62 To facilitate the dissipation of water and moisture from the *building*.

F63 To limit moisture condensation.

F70 To provide potable water.

F71 To provide facilities for personal hygiene.

F72 To provide facilities for the sanitary disposal of human and domestic wastes.

F73 To facilitate access to and circulation in the *building* and its facilities by persons with physical or sensory limitations (see Sentence 3.1.1.2.(3) for application limitation).

F74 To facilitate the use of the *building*'s facilities by persons with physical or sensory limitations (see Sentence 3.1.1.2.(3) for application limitation).

F80 To resist deterioration resulting from expected service conditions.

F81 To minimize the risk of malfunction, interference, damage, tampering, lack of use or misuse.

F82 To minimize the risk of inadequate performance due to improper maintenance or lack of maintenance.

F90 To limit the amount of uncontrolled air leakage through the *building* envelope.

F91 To limit the amount of uncontrolled air leakage through system components.

F92 To limit the amount of uncontrolled thermal transfer through the *building* envelope.

F93 To limit the amount of uncontrolled thermal transfer through system components.

F95 To limit the unnecessary demand and/or consumption of energy for heating and cooling.

F96 To limit the unnecessary demand and/or consumption of energy for service water heating.

F98 To limit the inefficiency of equipment.

F99 To limit the inefficiency of systems.

F100 To limit the unnecessary rejection of reusable waste energy.

F101 To limit operational greenhouse gas emissions.

Impact analysis

The impact analysis for proposed measures to limit GHG emissions will be provided in each of the respective proposed change forms that address the specific technical changes proposed for the NBC.

Enforcement implications

The addition of an objective and functional statement would provide important information to assist with the assessment of alternative solutions.

Who is affected

Designers, manufacturers, building officials, builders and specification writers.

Submit a comment

Proposed Change 1784

Code Reference(s):	**NBC20 Div.B 2.2.7.6. (first printing)**
Subject:	Large Farm Buildings (General)
Title:	Maximum Sill Height for Windows Used as Exits
Description:	This proposed change introduces a maximum sill height for openable windows used as exits in large farm buildings.
Related Code Change Request(s):	CCR 1603, CCR 1604

This change could potentially affect the following topic areas:

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

Problem

Farm buildings are unique in their occupancy, uses, hazards and expected performance. The National Building Code of Canada (NBC) 2020 reflects this by including suitable minimum requirements for farm buildings and agricultural occupancies in Part 2 of Division B.

Currently, openable windows or panels that are used as exits in farm buildings have no requirements for interior sill height. To ensure that the exit can be used in an emergency, a maximum sill height should be specified so that any farm building occupant can quickly evacuate through these openable windows. Window sills that are too high could expose the occupant to an unacceptable risk of being trapped in case of a fire emergency.

Justification

Parts 3 and 9 specify a maximum interior sill height of 900 mm for exits to fire escapes through windows in dwelling units. This proposed change uses the same height for the majority of locations within a farm building.

In areas where openable windows or panels are used as exits in areas of farm buildings that are occupied by livestock, low sill heights could allow access to the opening by the livestock, which could also disrupt ventilation systems, allow the livestock to escape, or defeat biosecurity measures within barns.

A minimum sill height of 1.5 m would be high enough to limit any interference from livestock, while still being a manageable height for occupant egress in an emergency. This height was chosen based on practical use and following the recommendations in explanatory Note A-9.9.10.1.(1) on escape windows from bedrooms in dwelling units.

PROPOSED CHANGE

[2.2.7.6.] 2.2.7.6. Width and Height of Exits

[1] 1) The minimum clear width of an exterior doorway used as an *exit* shall be 750 mm.

[2] 2) Except as provided in Sentence (3), the minimum headroom clearance in every *exit* shall conform to Article 3.4.3.4.

[3] --) Except as provided in Sentence (4)-2025, the bottom of an openable window or panel used as an *exit* shall be not more than 900 mm above the inside floor.

[4] --) Where an openable window or panel used as an *exit* is located in a livestock-occupied part of the *floor area*,

[a] --) the bottom of the openable window or panel shall be not more than 1 500 mm above the inside floor, and

[b] --) a foothold shall be installed not less than 600 mm above the inside floor.

[5] 3) An openable window or panel used as an *exit* shall have

[a] a) an opening not less than 900 mm by 550 mm, and

[b] b) a fire escape or stair, where required by Article 2.2.7.9.

Impact analysis

This proposed change is anticipated to have minimal cost implications as the foothold could have various forms and installations (e.g., a piece of wood attached to the wall, an appropriate sized hole in a concrete wall).

This proposed change provides enforceable, safe and practical requirements for the sill height of windows or panels used as exits in farm buildings, which is not currently specified in the NBC. It would also facilitate the quick evacuation of farm building occupants in case of an emergency.

Enforcement implications

This proposed change can be enforced using the existing regulatory framework. Authorities having jurisdiction would already be familiar with these requirements, as they have been in force for Part 3 and Part 9 buildings for some time. The application to Part 2 farm buildings would be similar, with a clear relaxation for livestock-occupied parts of farm buildings.

Who is affected

Those concerned with the design, construction and operation of farm buildings, namely, engineers, architects, building owners and regulators would be affected by this proposed change.

Building owners, in conjunction with designers, would be provided with clear requirements allowing them to design and construct farm buildings that meet their specific requirements.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[2.2.7.6.] 2.2.7.6. ([1] 1) no attributions

[2.2.7.6.] 2.2.7.6. ([1] 1) [F10-OS3.7]

[2.2.7.6.] 2.2.7.6. ([2] 2) no attributions

[2.2.7.6.] -- ([3] --) [F10-OS1.5]

[2.2.7.6.] -- ([3] --) [F10-OS3.7]

[2.2.7.6.] -- ([4] --) [F10-OS1.5]

[2.2.7.6.] -- ([4] --) [F10-OS3.7]

[2.2.7.6.] 2.2.7.6. ([5] 3) no attributions

[2.2.7.6.] 2.2.7.6. ([5] 3) [F10,F30-OS3.7]

[2.2.7.6.] 2.2.7.6. ([5] 3) [F10-OS1.5]

Submit a comment

Proposed Change 1965

Code Reference(s):	**NBC20 Div.B 3.1.1. (first printing)**
Subject:	Building Fire Safety
Title:	Removal of the Term "Storage Tank" from Part 3 of the NBC
Description:	This proposed change removes the definition of "storage tank" for the purposes of Part 3 by removing Article 3.1.1.3. from the NBC.
Related Code Change Request(s):	CCR 1880
Related Provision(s):	NBC 2020 Div. B 3.1.1.3.

This change could potentially affect the following topic areas:

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

Problem

The term "storage tank" was introduced in Part 3 of Division B of the NBC 2010, when Subsection 3.3.6. was also introduced. At that time, the definition was justified because the term was used in many of the referenced standards related to fuel tanks. As a result, Article 3.1.1.3. of the NBC 2020 currently defines "storage tank" for the purposes of Part 3.

However, Part 3 of the NBC does not contain any prescriptive requirements that specifically mention storage tanks or any other references to this term. As such, it was suggested that Article 3.1.1.3. be removed. Keeping it could potentially lead Code users to misinterpret the requirements as being more stringent than intended.

Justification

This proposed change deletes the definition of "storage tank" for the purposes of Part 3 by removing Article 3.1.1.3., on the basis that there are no references made to this term in Part 3.

Defining a term for the purposes of Part 3 and then not referring to that term anywhere in the Part could cause confusion for Code users when they try to understand and apply the requirements related to tanks. Retaining the definition could potentially lead to the requirements being misinterpreted as being more stringent than otherwise intended (also resulting in increased costs).

Furthermore, as flagged by Alberta Municipal Affairs, removing Article 3.1.1.3. eliminates a technical variation between the NBC and the National Building Code - Alberta Edition, which does not include this definition.

PROPOSED CHANGE

NBC20 Div.B 3.1.1. (first printing)

[3.1.1.] 3.1.1. Scope and Definitions

[3.1.1.1.] 3.1.1.1. Scope

[3.1.1.2.] 3.1.1.2. Defined Words

~~**[3.1.1.3.] 3.1.1.3. Use of Term Storage Tank**~~

~~**[1] 1)** For the purposes of this Part, the term "storage tank" shall mean a vessel for *flammable liquids* or *combustible liquids* having a capacity of more than 230 L and designed to be installed in a fixed location.~~

[3.1.1.4.] 3.1.1.4. Fire Protection Information

Impact analysis

This proposed change would clarify existing Code provisions and facilitate enforcement.

There is no increase in construction costs anticipated as there is no change to the intent or application of the Code provisions regarding tanks.

Enforcement implications

The clarification of current Code provisions facilitates consistent interpretation and enforcement by regulators.

There will be less confusion for or potential misinterpretation by regulators as they enforce the Code.

Who is affected

Builders, consumers, manufacturers, regulators and designers.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.1. (first printing)

[3.1.1.1.] 3.1.1.1. ([1] 1) no attributions

[3.1.1.2.] 3.1.1.2. ([1] 1) no attributions

[3.1.1.4.] 3.1.1.4. ([1] 1) no attributions

Submit a comment

Proposed Change 1841

Code Reference(s):	**NBC20 Div.B 3.1.5.13. (first printing)**
Subject:	Other — Fire Protection
Title:	Terminology for Gypsum Board (Part 3)
Description:	This proposed change replaces the term “tightly adhering paper” with “tightly adhered facer” in Sentence 3.1.5.13.(1).
Related Code Change Request(s):	CCR 1800

This change could potentially affect the following topic areas:

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

Problem

The gypsum industry has been dealing with issues related to the types of gypsum board that are specified in the NBC. The terminology used in the NBC is not consistent with modern gypsum products used in the industry. This inconsistency could cause confusion for Code users and result in a misuse of gypsum products in construction.

Currently, according to Sentence 3.1.5.13.(1), only gypsum board with a tightly adhering "paper" is permitted in noncombustible construction. However, this product is not desirable in high-moisture areas (e.g., bathrooms) where it may swell, develop mould and eventually deteriorate. This could lead to durability or occupant health issues due to potential rot and mould.

As such, there is a need to revise this Sentence to permit other types of gypsum board products so that the industry has the flexibility to select the appropriate product for the right application.

Justification

Replacing the term with "tightly adhered facer" in Sentence 3.1.5.13.(1) would provide greater flexibility to Code users by allowing the use of gypsum board products with different facer materials (e.g., glass mat, vinyl, foil-backed and fiberglass). This proposed change would not prevent the use of paper-faced gypsum board products.

Currently, several common gypsum board products are available and installed across Canada. While all the gypsum board products use cores that are very similar to traditional paper-faced gypsum board products, they also use various types of facers (e.g., glass mat or vinyl), which have individual ASTM standard specifications that reflect their characteristics.

It is important for Code language to be as consistent as possible with the products commonly used in the gypsum industry. The term "facer" is already used by the gypsum industry and would cover all facing materials that are currently found on the market and any facing materials used in the future. As such, this proposed change would update the terminology used in the NBC to reflect gypsum board products currently on the market and to harmonize the language used in the NBC with the terminology used by the gypsum industry.

PROPOSED CHANGE

NBC20 Div.B 3.1.5.13. (first printing)

[3.1.5.13.] 3.1.5.13. Gypsum Board

[1] 1) Gypsum board with a tightly ~~adhering paper~~adhered facer covering not more than 1 mm thick is permitted in a *building* required to be of *noncombustible construction* provided the *flame-spread rating* on the surface is not more than 25.

Impact analysis

This proposed change would expand the range of gypsum board products permitted for buildings required to be of noncombustible construction. As such, there would be no incremental cost because Code users could still choose to use paper-faced gypsum board products.

This proposed change would provide more flexibility to the construction industry by allowing for the selection of appropriate products for specific applications.

Enforcement implications

This proposed change can be enforced by the existing infrastructure. Since this proposed change would harmonize the Code language with the terminology used in the gypsum industry, there will be less confusion or misinterpretation when regulators enforce the Code requirement. This proposed changed would facilitate enforcement of the Code.

Who is affected

Builders, consumers, manufacturers, regulators and designers.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.5.13. (first printing)

[3.1.5.13.] 3.1.5.13. ([1] 1) no attributions

Submit a comment

Proposed Change 1870

Code Reference(s):	**NBC20 Div.B 3.1.6.4. (first printing)**
Subject:	Encapsulated Mass Timber Construction
Title:	Exposure of Mass Timber Elements
Description:	This proposed change revises the encapsulation requirements for mass timber elements based on recent research.
Related Code Change Request(s):	CCR 1381
Related Proposed Change(s):	PCF 1872, PCF 1963

This change could potentially affect the following topic areas:

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

Problem

Over the past decade, fire research on mass timber structures, specifically those constructed using cross-laminated timber (CLT), has shown that in certain fire scenarios (i.e., no automatic sprinkler activation and no fire department intervention), a secondary fire growth and even a secondary flashover can occur, due to the delamination of the CLT elements. As a result of the concerns arising from these fire phenomena, the encapsulation requirements and special exceptions for encapsulated mass timber construction (EMTC) were introduced in the National Building Code of Canada (NBC) 2020, which include restrictions on exposed mass timber surfaces as well as exposed surface flammability (via flame-spread ratings) for the different elements in Article 3.1.6.4.

The exceptions were based on the research conducted up to that point using CLT product that was manufactured in conformance with ANSI/APA PRG 320-2014, "Standard for Performance-Rated Cross-Laminated Timber." Since that time, additional fire research was performed that resulted in the 2018 edition of the standard, which was referenced in the NBC 2020, and includes additional fire-performance requirements for the adhesives used in CLT product to eliminate delamination in a fire.

Also, research testing was recently performed by the National Fire Laboratory of the National Research Council of Canada (NRC) using CLT product conforming to ANSI/APA PRG 320-2018, as well as nail-laminated timber (NLT) elements, and additional mass timber elements, such as glued-laminated timber (glulam) beams and columns. Furthermore, research on real-scale fire tests was conducted by the Research Institutes of Sweden (RISE) on compartments constructed of CLT product that is also compliant with ANSI/APA PRG 320-2018. These tests have demonstrated that the existing provisions in the NBC 2020 are now conservative in nature and can be safely expanded to provide additional options to designers and builders.

The current provisions for small areas of exposed ceilings are restrictive in that they are only allowed within suites, not in fire compartments. This can be confusing and restrictive, especially in cases where the entire storey is a single occupancy/tenant or in the case of classrooms where the concept of suites is not always clear. Research has shown that allowing for increased use of exposed ceilings would not result in an undue fire risk. As such, the requirements in Article 3.1.6.4. on the encapsulation of mass timber elements do not reflect the latest research and need to be revised to reflect the performance of the materials that are now available in the market.

Justification

This proposed change revises the exceptions to encapsulation of structural mass timber elements for EMTC in Article 3.1.6.4. of Division B of the NBC, based on new research performed by the Fire Laboratory at the NRC and RISE, as well as the recent changes made to ANSI/APA PRG 320 in 2018 that require the use of adhesives with additional fire performance characteristics in the manufacture of CLT.

In most cases, an automatic sprinkler system will ensure that, if a fire starts in a building, the fire never grows large enough to challenge the structure. This is equally true in a high-rise mass timber building with exposed mass timber. In the case that the sprinklers are unable to control the fire, the fire department is expected to arrive and extinguish the fire long before the structure is compromised, given that a two-hour fire-resistance-rated structure is required for buildings over six storeys in accordance with Articles 3.2.2.48. and 3.2.2.57. The primary concern regarding exposed mass timber in a high-rise building is what happens in the event the fire is not controlled by either the sprinkler system or the fire department, even though the probability of such an event occurring is acceptably low. Therefore, the question becomes: what happens when the fire continues to burn and the room’s combustible contents are consumed? More specifically, the question is whether the mass timber structure provides enough fuel for the fire to continue to burn at a level that will eventually lead to structural failure or the

fire will decay as would be expected in a noncombustible building. The concern for this low-probability scenario is the primary reason the EMTC provisions in the NBC 2020 have taken steps to limit the amount of exposed mass timber in Article 3.1.6.4.

As a result of the perceived fire hazard concerns arising from the potential for delamination in CLT (assuming no sprinkler activation or fire department intervention), recent changes were developed and adopted in ANSI/APA PRG 320-2018. The new requirements mandate the use of adhesives that must be pre-qualified through large-scale fire testing that is intended to evaluate the propensity for delamination of the CLT wood laminations.

Between 2018 and 2021, additional fire research was conducted by the NRC and RISE using CLT products manufactured using the "new generation" adhesives (qualified under the ANSI/APA PRG 320-2018 protocol) and other mass timber products such as NLT and glulam. Primarily, this research was initiated to specifically evaluate the Code provisions for EMTC that were introduced in the NBC 2020 as well as the limits prescribed in American codes, which relate to the percentages of permitted exposed mass timber surfaces using the CLT product with new generation adhesives. This research also explored other mass timber element scenarios with different amounts of mass timber elements exposed.

The NRC and RISE reports are listed below:

- "Fire Testing of Rooms with Exposed Wood Surfaces in Encapsulated Mass Timber Construction" (NRC CLT Report)[1]
- "Nail Laminated Timber Compartment Fire Tests" (NRC NLT Report)[2]
- "Fire Safe implementation of visible mass timber in tall buildings – compartment fire testing" (RISE Report)[3]

The NRC CLT Report describes a total of five CLT compartment fire tests (2018 NRC CLT compartment tests) that included varying amounts of exposed CLT wall and ceiling surfaces; two of the tests also incorporated glulam columns and beams.

The test rooms were relatively small (4.5 m × 2.4 m × 2.7 m tall) due to the test laboratory constraints. This test room size represents a severe scenario from the point of view of re-radiation of heat between surfaces, which is critical for the mass timber surfaces to continue to burn once the movable fuel load is consumed. The test room also had a door opening that provided a ventilation condition similar to the more severe one used in earlier tests performed by the NRC for the Fire Protection Research Foundation at the National Institute for Science and Technology (NIST) laboratory.[4] The smaller ventilation condition resulted in a longer duration and, therefore, more severe fire exposure to the compartment boundaries (walls and ceiling), as well as any beams and columns included. Table 1 provides a summary of the tests.

Table 1. Summary of the 2018 NRC CLT compartment test results by configuration[1]

Test No.	Compartment Configuration	Protected and Exposed Mass Timber Surfaces	Comparison to 2020 EMTC Provisions	Results
1	CLT walls and ceiling	All walls and ceiling protected	Baseline scenario: replication of fire in noncombustible construction with none of the permitted combustible interior finishes	Fire burned out, leading to self-extinguishment
2	CLT walls and ceiling	One long wall (representing 33% of perimeter wall area) and 10% of ceiling exposed, remainder protected	Compliant	Fire eventually burned out, leading to self-extinguishment
3	CLT walls and ceiling + 2 glulam columns + 3 glulam beams	Beams and columns fully exposed (representing 36% of the perimeter wall area); walls and ceiling protected	Exceeds current 10% max. exposed surface area for beams and columns	Fire reached the decay phase
4	CLT walls and ceiling + 1 glulam column + 2 glulam beams	Beams and column fully exposed (representing 19% of the perimeter wall area); ceiling 100% exposed; walls protected	Exceeds current 10% max. exposed surface area for beams and columns; exceeds current 25% for exposed ceiling with no walls exposed	Fire eventually burned out, leading to self-extinguishment
5	CLT walls and ceiling	Two short walls exposed facing each other (representing 35% of the perimeter wall area, 4.5 m apart); ceiling 100% exposed; remaining two walls protected	Exceeds current 10% max. for exposed ceiling with any exposed walls; exposed walls facing each other currently not permitted	Fire reached the decay phase; only after approximately 3.5 h, the fire began to regrow

With respect to the overall results of the various degrees and configurations of exposed mass timber surfaces, the NRC CLT Report states that "[i]n all tests with exposed mass timber, the peak room temperatures were similar to the baseline (fully encapsulated)."

With respect to the performance of the CLT, which used an adhesive compliant with ANSI/APA PRG 320-2018, the NRC CLT Report concludes that "[a]ll tests in this series showed that the second generation CLT with the thermal resistant adhesive improved significantly in fire performance to resist the char layer fall-off." This means that the changes made to ANSI/APA PRG 320 in early 2018 do ensure that adhesives that are approved for use in CLT (because they are compliant with that edition of the standard) will not delaminate, thereby significantly increasing the fire performance of the CLT panels. This increased performance was demonstrated in particular in Test 4 of the

recent NRC tests, where a fire in a compartment that had an exposed glulam beam and column and an exposed CLT ceiling still experienced the decay phase once the moveable fire load was consumed. This result is significant since the test set-up was rather challenging (i.e., severe). The room was small, thereby increasing the radiation feedback between burning surfaces, and the ventilation opening was a single doorway, resulting in a longer and more severe fire exposure than typically occurs in actual construction.

These results are for CLT products that conform to ANSI/APA PRG 320-2018, which is the latest version of the standard and is referenced in NBC Sentence 3.1.6.3.(3). The results are equally applicable to other mass timber products that are known not to delaminate, such as glulam, when exposed to fire temperatures.

The NRC NLT Report describes a total of four NLT compartment fire tests (2019 NRC NLT compartment tests) that included varying amounts of exposed NLT wall and ceiling surfaces; two of the tests also incorporated glulam columns and beams.

The same set-up was used for the test rooms as in the NRC CLT Report in terms of the size of the compartments and door ventilation openings. The compartment configurations were also similar to Tests 4 and 5 of the CLT compartment tests. Table 2 provides a summary of the NLT compartment tests.

Table 2. Summary of the 2019 NRC NLT compartment test results by configuration[2]

Test No.	Compartment Configuration	Protected and Exposed Mass Timber Surfaces	Comparison to 2020 EMTC Provisions	Differences Between Tests	Results
1 (Similar to CLT Test 4)	NLT walls and ceiling + 1 glulam column + 2 glulam beams	Beams and column fully exposed (representing 19% of the perimeter wall area); ceiling 100% exposed; walls protected	Exceeds current 10% max. exposed surface area for beams and columns; exceeds current 25% max. for exposed ceiling with no walls exposed	Test 1 ceiling had flat/smooth surface made by 2 × 8 lumber, while Test 2 ceiling had an uneven surface made with 2 × 8 and 2 × 10 lumber	Fire reached the decay phase

2 (Similar to CLT Test 4)	NLT walls and ceiling + 1 glulam column + 2 glulam beams	Beams and column fully exposed (representing 19% of the perimeter wall area); ceiling 100% exposed; walls protected	Exceeds current 10% max. exposed surface area for beams and columns; exceeds current 25% max. for exposed ceiling with no walls exposed		Fire reached the decay phase
3 (Similar to CLT Test 5)	NLT walls and ceiling	Two short walls exposed facing each other (representing 35% of the perimeter wall area, 4.5 m apart); ceiling 100% exposed; remaining two walls protected	Exceeds current 10% max. for exposed ceiling with any exposed walls; exposed walls facing each other currently not permitted	Test 3 used 2 layers of 12.7 mm thick Type X gypsum board to encapsulate the protected walls, while Test 4 used 3 layers of 12.7 mm thick Type X gypsum board to encapsulate the protected walls	Fire did not reach the decay phase
4 (Similar to CLT Test 5)	NLT walls and ceiling	Two short walls exposed facing each other (representing 35% of the perimeter wall area, 4.5 m apart); ceiling 100% exposed; remaining two walls protected	Exceeds current 10% max. for exposed ceiling with any exposed walls; exposed walls facing each other currently not permitted		Fire burned out, leading to self-extinguishment

Again, with respect to the overall results of the various degrees and configurations of exposed mass timber surfaces, the results of the NRC NLT Report show that the peak room temperatures were similar to the CLT baseline (fully encapsulated).

With respect to the performance of the NLT, the NRC NLT Report concludes that "NLT panels typically have some small gaps between laminations … These small gaps provided passages for the flame and hot pyrolysis gas to travel in the NLT panels. Test NLT-3 and Test NLT-4 demonstrated that, in the absence of operationally effective sprinklers, to reach full decay of the fire three layers of 12.7 mm thick Type X gypsum board were necessary for NLT rooms with partially encapsulated walls and fully exposed ceilings to limit undue contributions of the protected NLT elements to the compartment fires, while still keeping the same total area of exposed surfaces as in the two test configurations." It was also stated that, based on the test results from both NRC reports, "second generation CLT generally performed better than NLT in these compartment fire tests to limit contributions of timber to the fire."

The NRC NLT Report also notes, "it is reasonable to expect that, had the three-layer gypsum board protection been used on Wall A and Wall C in Test CLT-5, the recurrent fire at 2020 minutes would not have occurred in that CLT test." This would mean that if a third layer of 12.7 mm thick Type X gypsum board were added to CLT Test 5 the additional regrowth in that test would not occur and the fire would reach full decay.

The RISE Report describes another five CLT compartment fire tests (2021 RISE CLT compartment tests) that included varying amounts of exposed CLT wall and ceiling surfaces and glulam columns and beams.

The test compartments were larger outdoor structures (7.0 m × 6.85 m × 2.73 m tall) with two ventilation opening factors (0.062 $m^{1/2}$ or 0.25 $m^{1/2}$) representative of typical openings in tall residential and office buildings respectively. The CLT used in these tests were also products manufactured using the *new generation* adhesives that was qualified under ANSI/APA PRG 320-2018 protocol. Table 3 provides a summary of the tests.

Table 3. Summary of the 2021 RISE CLT compartment test results by configuration[3]

Test No.	Compartment Configuration	Protected and Exposed Mass Timber Surfaces	Comparison to 2020 EMTC Provisions	Results
1	CLT walls and ceiling + 1 glulam column + 1 glulam beam; ventilation opening factors 0.062 $m^{1/2}$	All mass timber elements protected	Baseline scenario: replication of fire in noncombustible construction with none of the permitted combustible interior finishes	Fire burned out, leading to self-extinguishment

2	CLT walls and ceiling + 1 glulam column + 1 glulam beam; ventilation opening factors 0.062 $m^{1/2}$	- Two side walls facing each other (representing 55% of the perimeter wall area, 7.0 m apart); - ceiling 100% exposed; - beam (representing 13% of the perimeter wall area); - remaining two walls protected	- Exceeds current 35% max. exposed surface area for walls; - exceeds current 10% max. exposed surface area for beams; - exceeds current 35% maximum exposed surface area for combined walls and beams; - exceeds current 10% max. for exposed ceiling with any exposed walls; - exposed walls facing each other currently not permitted	Fire eventually burned out, leading to self-extinguishment

3	CLT walls and ceiling + 1 glulam column + 1 glulam beam; ventilation opening factors 0.062 $m^{1/2}$	- Left wall and front wall fully exposed and partial right wall exposed (representing 66% of the perimeter wall area, walls adjacent/opposing); - ceiling 100% exposed; - beam and column (representing 19% of the perimeter wall area); - back wall protected		Fire reached the decay phase; only after approximately 3 h, the fire began to regrow
4	CLT walls and ceiling + 1 glulam column + 1 glulam beam; ventilation opening factors 0.25 $m^{1/2}$	- side walls and front wall fully exposed (representing 50% of the perimeter wall area, walls adjacent/opposing); - ceiling 100% exposed; - beam and column (representing 28% of the perimeter wall area); - back wall protected		Fire eventually burned out, leading to self-extinguishment
5	CLT walls and ceiling + 1 glulam column + 1 glulam beam; ventilation opening factors 0.062 $m^{1/2}$	- Left wall and right wall fully exposed and partial front wall exposed (representing 59% of the perimeter wall area, walls adjacent/opposing); - ceiling 100% exposed; - beam and column (representing 19% of the perimeter wall area); - back wall and partial front wall protected		Fire eventually burned out, leading to self-extinguishment

Again, with respect to the overall results of the various degrees and configurations of exposed mass timber surfaces, the results of the RISE Report show that the peak room temperatures were similar to the baseline (fully encapsulated).

With respect to the performance of the CLT that used an adhesive compliant with ANSI/APA PRG 320-2018, the RISE Report showed similar performance to the NRC CLT Report where thermal resistant adhesive improved significantly in fire performance to resist the char layer fall-off. This result means that the changes made

to ANSI/APA PRG 320 in early 2018 do ensure that the adhesives approved for use in CLT (because they are compliant with that edition of the standard) will not delaminate, thereby significantly increasing the fire performance of the panels.

Therefore, the findings of the NRC and RISE research would suggest that the current requirements are too restrictive and can be relaxed, while continuing to maintain a sufficient level of fire safety.

Table 4 provides a comparison of the NBC 2020 requirements and proposed changes for the NBC 2025 based on the most recent fire research.

Table 4. Comparison of NBC 2020 EMTC provisions and the proposed changes for the NBC 2025

Code Reference		Exposed beams, columns, arches	Exposed Walls	Exposed Ceiling	Flame-Spread Rating (FSR)	Suite (S) or Fire Compart-ment (FC)	Special Details
		% of total area of suite perimeter walls		% of total suite ceiling area			
3.1.6.4.(3)	NBC 2020	X ≤ 10%	–	–	≤150	S or FC	–
	Proposed	X ≤ 35%	–	–	≤150	S or FC	–
3.1.6.4.(4)	NBC 2020	–	Y ≤ 35%	–	≤150	S	Exposed wall surfaces face same direction
	Proposed	–	Y ≤ 35%	–	≤150	S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
3.1.6.4.(5)	NBC 2020	X ≤ 10%	Y ≤ 35%–X%	–	≤150	S	Exposed wall surfaces face same direction
	Proposed	X ≤ 35%	–	–	≤150	S	–

		–	Y ≤ 35%				Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
		X ≤ 35%	Y ≤ 35%–X%				Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
3.1.6.4.(6)	NBC 2020	X ≤ 10%	–	10%	≤150	S	–
		–	Y ≤ 35%			S	Exposed wall surfaces face same direction
		X ≤ 10%	Y ≤ 35%–X%			S	Exposed wall surfaces face same direction
		X ≤ 10%	NP	25%	CL ≤ 75	S	–
					B/C/A ≤150	S	
	Proposed	X ≤ 35%	–	10%	≤150	S or FC	Except exits/public corridors

		–	Y ≤ 35%			S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
		X ≤ 35%	Y ≤ 35%–X%			S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
		X ≤ 35%	–	25%	CL/W ≤ 75 B/C/A ≤150	S or FC	Except exits/public corridors
		–	Y ≤ 35%			S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
		X ≤ 35%	Y ≤ 35%–X%			S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m
3.1.6.4.(7)	NBC 2020	NP	NP	NP	NP	–	–

	Proposed	X ≤ 20%	–	≤100%	CL ≤ 75 B/C/A ≤150	S	Unexposed walls will be protected with an encapsulation rating of 50 min
		–	Y ≤ 35%	≤100%	CL ≤ 75 W ≤ 75	S	Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m and all unexposed walls will be protected with an encapsulation rating of either 50 min or 80 min (see also proposed revisions to Article 3.1.6.6)

		X ≤ 20%	Y ≤ 35%–X%	≤100%	CL ≤ 75 W ≤ 75 B/C/A ≤150		Exposed wall surfaces face same direction OR Exposed wall surfaces separated by 4.5 m and all unexposed walls will be protected with an encapsulation rating of either 50 min or 80 min (see also proposed revisions to Article 3.1.6.6.)

Notes to Table 4: CL = ceiling; W = walls; B/C/A = beams/columns/arches; S = suite; FC = fire compartment; FSR = flame-spread rating; NP = not permitted

Sentence 3.1.6.4.(3) on Beams, Columns and Arches

The proposed change to Clause 3.1.6.4.(3)(a) is based on Test 3 of the NRC CLT Report, which included three beams and two columns that were fully exposed, representing 36% of the perimeter wall area. Therefore, this proposed change increases the maximum permitted exposed surface area for beams, columns and arches from 10% to 35% of the perimeter wall area.

Sentence 3.1.6.4.(4) on Walls

This proposed change revises Clause 3.1.6.4.(4)(a). Instead of requiring all exposed surface areas for mass timber walls to face one direction, the proposed change aligns with the research that shows it also suffices to ensure that facing or adjacent surfaces are a minimum distance apart, so re-radiation between exposing surfaces is sufficiently minimized.

A distance of 4.5 m between the two facing or adjacent walls with exposed surface areas was used in the NRC CLT and NLT Reports. Specifying a minimum distance requirement between facing exposing surfaces is also a change made in the US building code regarding tall mass timber buildings.

Note A-3.1.6.4.(4) on Exposed Surfaces of Mass Timber Walls

As a result of the proposed revision to Sentence 3.1.6.4.(4), this proposed change also revises the explanatory Note to that Sentence for consistency.

Sentence 3.1.6.4.(6) on Ceilings

This proposed change revises Sentence 3.1.6.4.(6) to add "or *fire compartment*, other than an *exit* or *corridor*," which would also allow limited percentages of the total ceiling area (10% and 25%) of exposed mass timber outside a suite as specified.

This proposed change also removes the restriction on exposed mass timber walls within a suite where the exposed ceiling area is limited to 25% without permitting exposed mass timber walls outside a suite.

In the early stages of the development of the original EMTC changes, the limits imposed on exposed ceilings were established with the view that no exposed mass timber ceilings should be permitted within fire compartments such as exits, corridors and lobbies. Also, it was agreed that when the area of the exposed ceiling exceeded 10% of the suite, no exposed walls should be allowed. These restrictions were felt necessary, in part, due to the early generation fire research on mass timber elements that was available at the time (primarily CLT), which showed that in some cases fully developed fires would not decay or, with some decay, could result in regrowth (due to delamination of the CLT) to a fully developed fire.

A significant amount of fire research was conducted of greater scale and complexity since the original Code changes were developed in 2014 and 2015. This research has shown, among other things, that having a ceiling area of 100% exposed mass timber can still result in a fully developed fire reaching the decay phase and eventually burning out. (See proposed Sentence 3.1.6.4.(7)-2025.)

This proposed change maintains the NBC provisions permitting a maximum flame-spread rating (FSR) of 150 for any exposed mass timber surface in the case of only 10% of the ceiling being exposed. However, where the exposed ceiling area is increased to 25%, a maximum FSR of 75 is imposed, which includes any surface of exposed mass timber walls that might be present within the suite, which would otherwise be permitted to have a maximum FSR of 150 with no exposed ceiling.

The 10% and 25% upper limits on the total ceiling area of exposed mass timber (and the maximum FSR of 75 for the latter case) are expected to allow for a fully developed fire to enter the decay phase without any regrowth occurring.

Proposed Sentence 3.1.6.4.(7)-2025 on Additional Exceptions for Ceilings

The test results reported in NRC and RISE research demonstrate that having exposed beams and columns with a surface area that is 19% of the perimeter wall area in addition to a fully (100%) exposed ceiling with an FSR lower than 75 (black spruce lumber) resulted in the fire decaying on its own. This is an important finding since many tall mass timber buildings are of post-and-beam construction; therefore, a fully exposed structure results in exposed mass timber beams, columns and ceiling. As a result, designers are seeking permission to use this option.

Additionally, the NRC Reports (CLT Test 5 and NLT Test 3) demonstrated that having opposing exposed walls with a surface area that is 35% of the perimeter wall area in addition to a fully (100%) exposed ceiling resulted in a fire regrowth or no decay when the remaining unexposed walls were protected with two layers of 12.7 mm Type X gypsum board. By contrast, in NLT Test 4, with three layers of 12.7 mm Type X gypsum board protection on the unexposed walls, the compartment fire burned out and self-extinguished. Proposed Subclause 3.1.6.4.(7)(b)(ii)-2025 would require not less

than three layers of 12.7 mm Type X gypsum board protection on unexposed walls, which represents an encapsulation rating of 80 min, based on the NRC test report, "Intermediate Scale Encapsulation Tests"[5].

References

[1] Su, J.; Leroux, P.; Lafrance, P.-S.; Berzins, R.; Gratton, K.; Gibbs, E.; and, Weinfurter, M.; "Fire Testing of Rooms with Exposed Wood Surfaces in Encapsulated Mass Timber Construction"; National Research Council of Canada; Report No: A1-012710.1; Ottawa, Canada; August 2018.

[2] Su, J.; Leroux, P.; Lafrance, P.-S.; Berzins, R.; Gratton, K.; Gibbs, E.; and, Weinfurter, M.; "Nail Laminated Timber Compartment Fire Tests"; National Research Council of Canada; Report No: A1-014149.1; Ottawa, Canada; May 2019.

[3] Brandon, D.; Sjöström, L.; Temple, A.; Hallberg, E.; and, Kahl, F.; "Fire Safe implementation of visible mass timber in tall buildings – compartment fire testing"; Research Institutes of Sweden; Report No: 2021:40; Borås, Sweden; February 2021.

[4] Su, J.; Lafrance, P.; Hoehler, M.; Bundy, M.; "Fire Safety Challenges of Tall Wood Buildings Phase 2: Tasks 2 & 3 – Development and Implementation of Cross Laminated Timber (CLT) Compartment Fire Tests"; Fire Protection Research Foundation; 2018.

[5] Su, J.; Leroux, P.; Lafrance, P.-S.; Berzins, R.; Gratton, K.; Gibbs, E.; and, Frade, A.; "Intermediate Scale Encapsulation Tests"; National Research Council of Canada; Report No: A1-015805.1; Ottawa, Canada; December 2019.

PROPOSED CHANGE

NBC20 Div.B 3.1.6.4. (first printing)

[3.1.6.4.] 3.1.6.4. Encapsulation of Mass Timber Elements

(See also Note A-3.1.6.3.)

[1] 1) Except as provided in Sentences (3) ~~to (6)~~to (7), 3.1.6.3.(4), 3.1.6.16.(2) and 3.1.6.17.(2), and Articles 3.1.6.7. and 3.1.6.12., the exposed surfaces of structural mass timber elements conforming to Article 3.1.6.3. shall be protected from adjacent spaces in the *building*, including adjacent concealed spaces within wall, floor and roof assemblies, by a material or assembly of materials conforming to Sentence (2) that provides an *encapsulation rating* of not less than 50 min. (See Note A-3.1.6.4.(1).)

[2] 2) Except as provided in Sentence 3.1.6.11.(1), the material or assembly of materials referred to in Sentence (1) shall consist of

[a] a) gypsum board,

[b] b) gypsum concrete,

[c] c) *noncombustible* materials,

[d] d) materials that conform to Sentences 3.1.5.1.(2) to (4), or

[e] e) any combination of the materials listed in Clauses (a) to (d).

[3] 3) Except as provided in Sentences (5) and (7), the exposed surfaces of

mass timber beams, columns and arches within a *suite* or *fire compartment* need not be protected in accordance with Sentence (1), provided

[a] a) their aggregate exposed surface area does not exceed ~~10~~35% of the total wall area of the perimeter of the *suite* or *fire compartment* in which they are located, and

[b] b) the *flame-spread rating* on any exposed surface is not more than 150.

(See ~~Note A-3.1.6.4.(3) to (6)~~Note A-3.1.6.4.(3) to (7).)

[4] 4) Except as provided in Sentences (5) ~~and (6)~~ and (7), the exposed surfaces of mass timber walls within a *suite* need not be protected in accordance with Sentence (1), provided

[a] a) ~~each exposed surface faces the same direction, and~~all portions of the exposed surfaces

[i] --) face the same direction, or

[ii] --) are separated by a horizontal distance of not less than 4.5 m, and

[b] b) the *flame-spread rating* on any exposed surface is not more than 150.

(See Notes A-3.1.6.4.(4) ~~and A-3.1.6.4.(3) to (6)~~and A-3.1.6.4.(3) to (7).)

[5] 5) Except as provided in Subclause (7)(b)(ii), ~~T~~the aggregate exposed surface area of mass timber elements within a *suite* permitted in Sentences (3) and (4) shall not exceed 35% of the total wall area of the perimeter of the *suite*. (See ~~Note A-3.1.6.4.(3) to (6)~~Note A-3.1.6.4.(3) to (7).)

[6] 6) Except as provided in Sentence (7), ~~T~~the exposed surfaces of mass timber ceilings within a *suite* or *fire compartment*, other than an *exit* or *public corridor*, need not be protected in accordance with Sentence (1), provided their aggregate surface area does not exceed

[a] a) 10% of the total ceiling area of the *suite* or *fire compartment*, where the *flame-spread rating* on any exposed surface~~s~~ is ~~have a *flame-spread rating*~~ not more than 150, or

[b] b) 25% of the total ceiling area of the *suite* or *fire compartment*, where the *flame-spread rating* on any exposed surface of a mass timber wall or ceiling is not more than 75.

[i] i) ~~the *suite* contains no mass timber walls with exposed surfaces, and~~

[ii] ii) ~~the exposed surfaces of the mass timber ceiling have a *flame-spread rating* not more than 75.~~

(See ~~Note A-3.1.6.4.(3) to (6)~~Note A-3.1.6.4.(3) to (7).)

[7] --) The exposed surfaces of mass timber ceilings within a *suite* need not be protected in accordance with Sentence (1) or (6), provided

[a] --) the aggregate surface area of any exposed mass timber beams, columns and arches does not exceed 20% of the total wall area of

the perimeter of the *suite* in which they are located,

[b] --) all surfaces of mass timber walls are

[i] --) protected in accordance with Sentence (1), or

[ii] --) where the aggregate exposed surface area of mass timber elements exceeds the limit specified in Sentence (5), protected by a material or assembly of materials conforming to Sentence (2) that provides an *encapsulation rating* of not less than 80 min, and

[c] --) the *flame-spread rating* on any exposed surface of a mass timber wall or ceiling is not more than 75.

(See Note A-3.1.6.4.(3) to (7).)

Note A-3.1.6.4.(3) to (7~~6~~) Fire-Resistance Rating of Mass Timber with Exposed Surfaces.

Portions of mass timber elements required to have a fire-resistance rating are permitted to be exposed in accordance with the permissions stated in Sentences 3.1.6.4.(3) ~~to (6)~~to (7); however, it is important to note that applying those permissions does not waive the requirement for these elements to have a fire-resistance rating.

Note A-3.1.6.4.(4) Exposed Surfaces of Mass Timber Walls.

The primary objective of encapsulating mass timber elements is to limit the probability that these elements will significantly contribute to fire spread and fire duration in the event of a fire. Since thick wood members require a source of imposed heat flux to burn, ~~the stipulation in~~ Clause 3.1.6.4.(4)(a) stipulates that any portions of the exposed surfaces of different mass timber walls within a suite either face the same direction ~~within a suite~~ or have a minimum horizontal distance between one other. If the sprinkler system fails to operate or to control the fire, this directional orientation or minimum distance is intended to avoid or reduce the potential ~~of~~for re-radiation between portions of burning mass timber surfaces on different walls, and particularly those that either face or are in close proximity to ~~each~~one another, which could sustain flaming combustion into the decay phase of a fire. ~~if the sprinkler system failed to operate or to control the fire.~~ Additionally, if the sprinkler system fails to operate or to control the fire, the maximum percentages of exposed surface areas and maximum flame-spread ratings stated in Article 3.1.6.4. ~~is low~~ are intended to be ~~so that it is not~~ insufficient to sustain a ventilation-controlled fire that might provide the radiation required to sustain flaming combustion into the decay phase of a fire. ~~if the sprinkler system failed to operate or to control the fire.~~

Impact analysis

Cost

This proposed change is not likely to entail significant costs because it would not increase the stringency of the requirements for encapsulating mass timber elements. The proposed change would permit more timber elements to be left exposed, without requiring more of them to be left exposed. Not being required to install encapsulation materials reduces costs; however, the thickness and size of the exposed mass timber elements might need to increase, which could add cost.

A design complying with the NBC 2020 would remain in compliance with this proposed change.

Benefit

This proposed change would allow designers to leave exposed more of the mass timber construction elements of a building, an interest in which has been expressed by several regions of Ontario and British Columbia that have requested more biophilic construction (i.e., the use of natural finishes). Not being required to install encapsulation materials also provides benefits during the construction process, which can be challenging as relates to managing moisture effects.

Many Code users, including developers, architects, engineers and builders, across Canada are seeking additional options for the use of products such as wood that have demonstrable environmental benefits (e.g., low embodied carbon) in buildings of a greater variety of heights and sizes.

Enforcement implications

This proposed change can be enforced by the current Code enforcement infrastructure. This proposed change would not introduce conflict or create enforcement issues since it is generally a relaxation of the existing NBC 2020 provisions.

Who is affected

Architects, designers, developers, owners and engineers would benefit from the increased flexibility provided by this proposed change.

Authorities having jurisdiction, including fire departments, would need to continue to evaluate their operating procedures in accordance with the Code requirements for EMTC.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.6.4. (first printing)

[3.1.6.4.] 3.1.6.4. ([1] 1) [F02-OS1.2]

[3.1.6.4.] 3.1.6.4. ([1] 1) [F02-OP1.2]

[3.1.6.4.] 3.1.6.4. ([2] 2) [F02-OS1.2]

[3.1.6.4.] 3.1.6.4. ([2] 2) [F02-OP1.2]

[3.1.6.4.] 3.1.6.4. ([3] 3) no attributions

[3.1.6.4.] 3.1.6.4. ([4] 4) no attributions

[3.1.6.4.] 3.1.6.4. ([5] 5) no attributions

[3.1.6.4.] 3.1.6.4. ([6] 6) no attributions

[3.1.6.4.] -- ([7] --) no attributions

Submit a comment

Proposed Change 1963

Code Reference(s):	**NBC20 Div.B 3.1.6.6. (first printing)**
Subject:	Encapsulated Mass Timber Construction
Title:	Exposure of Mass Timber Elements
Description:	This proposed change expands the application of encapsulation materials from two to three layers of Type X gypsum board with a greater encapsulation rating.
Related Proposed Change(s):	PCF 1870, PCF 1872

This change could potentially affect the following topic areas:

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

Problem

Over the past decade, fire research on mass timber structures, specifically those constructed using cross-laminated timber (CLT), have shown that in some fire scenarios (i.e., no automatic sprinkler activation and no fire department intervention) a secondary fire growth and even a secondary flashover can occur, due to the delamination of the CLT elements. As a result of the concerns arising from these fire phenomena, the encapsulation requirements and special exceptions for encapsulated mass timber construction (EMTC) were introduced in the National Building Code of Canada (NBC) 2020, which include restrictions on exposed mass timber surfaces as well as exposed surface flammability (via flame-spread ratings) for the different elements.

The exceptions were based on the research conducted using CLT product that was manufactured in conformance with ANSI/APA PRG 320-2014, “Standard for Performance-Rated Cross-Laminated Timber.” Since that time, additional fire research was performed that resulted in a revision to that product specification, the 2018 edition

of the standard, which was referenced in the NBC 2020, and includes additional fire-performance requirements for the adhesives used in CLT product to stop it from delaminating in a fire.

Also, research testing was recently performed by the National Fire Laboratory of the National Research Council of Canada (NRC) using CLT product conforming to ANSI/APA PRG 320-2018, as well as nail-laminated timber (NLT) elements and additional mass timber elements, such as glued-laminated timber (glulam) beams and columns. Furthermore, research on real-scale fire tests was conducted by the Research Institutes of Sweden (RISE) on compartments constructed of CLT product that is also compliant with ANSI/APA PRG 320-2018. These tests have demonstrated that the existing provisions in the NBC 2020 are now conservative in nature and can be safely expanded to provide additional options to designers and builders.

The requirements in Article 3.1.6.6. of Division B of the NBC on the encapsulation of mass timber elements do not reflect the latest research and need to be revised to consider the performance levels of the materials that are now available on the market. As such, the requirements need to be updated to include the application of multiple layers of gypsum board to achieve a greater encapsulation rating for timber elements.

Justification

In alignment with the proposed higher encapsulation rating for unexposed walls in PCF 1870, this proposed change revises Article 3.1.6.6. to include a generic solution that meets the new 80 min encapsulation rating. (Please refer to the rationale provided for PCF 1870.)

An NRC encapsulation test report shows that three layers of 12.7 mm thick Type X gypsum board achieve an encapsulation rating of 80 min. This proposed change revises Article 3.1.6.6. to include the installation requirements for both two and three layers of gypsum board.

PROPOSED CHANGE

NBC20 Div.B 3.1.6.6. (first printing)

[3.1.6.6.] 3.1.6.6. Encapsulation Materials

(See Note A-3.1.6.6.)

[1] 1) Gypsum-concrete topping and concrete not less than 38 mm thick are deemed to have an *encapsulation rating* of 50 min when installed on the upper side of a mass timber floor or roof assembly.

[2] 2) Two layers of Type X gypsum board conforming to ASTM C1396/C1396M, "Standard Specification for Gypsum Board," or CAN/CSA-A82.27-M, "Gypsum Board," each not less than 12.7 mm thick, are deemed to have an *encapsulation rating* of 50 min when installed on a mass timber

element~~, provided they~~ in accordance with Sentence (4).

[a] a) ~~are fastened with a minimum of two rows of screws in each layer~~

[i] i) ~~directly to the mass timber element with screws of sufficient length to penetrate not less than 20 mm into the mass timber element that are spaced not more than 400 mm o.c. and 20 mm to 38 mm from the boards' edges, or~~

[ii] ii) ~~to wood furring or resilient metal or steel furring channels not more than 25 mm thick spaced not more than 400 mm o.c. on the mass timber element,~~

[b] b) ~~are installed with the joints in each layer staggered from those in the adjacent layer,~~

[c] c) ~~are installed in conformance with ASTM C840, "Standard Specification for Application and Finishing of Gypsum Board", except that their joints need not be taped and finished, and~~

[d] d)

[e] --) ~~conform to~~

[i] i) ~~ASTM C1396/C1396M, "Standard Specification for Gypsum Board", or~~

[ii] ii) ~~CAN/CSA A82.27-M, "Gypsum Board".~~

[f] --)

~~(See Note A-3.1.6.6.(2).)~~

[3] --) Three layers of Type X gypsum board conforming to ASTM C1396/C1396M, “Standard Specification for Gypsum Board,” or CAN/CSA-A82.27-M, “Gypsum Board,” each not less than 12.7 mm thick, are deemed to have an *encapsulation rating* of 80 min when installed on a mass timber element in accordance with Sentence (4).

[4] --) The gypsum board described in Sentences (2) and (3)-2025 shall be

[a] --) ~~are~~ fastened with a minimum of two rows of screws in each layer

[i] --) directly to the mass timber element with screws of sufficient length to penetrate not less than 20 mm into the mass timber element that are spaced not more than 400 mm o.c. and 20 mm to 38 mm from the boards' edges, or

[ii] --) to wood furring or resilient metal or steel furring channels not more than 25 mm thick spaced not more than 400 mm o.c. on the mass timber element,

[b] --) ~~are~~ installed with the joints in each layer staggered from those in the adjacent layer, and

[c] --) ~~are~~ installed in conformance with ASTM C840, "Standard Specification for Application and Finishing of Gypsum Board", except that their joints need not be taped and finished.

(See Note A-3.1.6.6.(~~2~~4).)

Note A-3.1.6.6. Encapsulation Materials.

Research has been conducted on different types of encapsulation materials, such as

gypsum board, gypsum concrete and cement board. The results of tests using an intermediate-scale furnace and of cone calorimeter tests indicate that a combustible timber element protected with a 38 mm thick layer of gypsum-concrete topping or with two or three layers of 12.7 mm Type X gypsum board will not ignite or contribute significant heat to a fire until average temperatures of 325°C to ~~–~~ 380°C are attained at the interface between the encapsulation material or assembly of materials and the combustible substrate. These temperatures are consistent with the ignition temperatures of wood-based materials.

Note A-3.1.6.6.(~~2~~4) Protection of Gypsum Board from Foot Traffic.

Where gypsum board is used as the encapsulation material on the top of a mass timber floor assembly, it should be protected from physical impact arising from normal pedestrian traffic that could damage it and possibly compromise its encapsulation rating.

Impact analysis

This proposed change does not entail any additional costs because it would not increase the stringency of the requirements for encapsulating mass timber elements. This proposed change merely clarifies the encapsulation rating attributed to assemblies using two layers of gypsum installed according to a referenced standard and it introduces an encapsulation rating for assemblies using three layers of gypsum.

Enforcement implications

This proposed change can be enforced by the current Code enforcement infrastructure. This proposed change would not introduce conflict or create enforcement issues since it clarifies the encapsulation rating of assemblies using two layers of gypsum and introduces an encapsulation rating for assemblies using three layers of gypsum.

Regulators are already familiar with the EMTC requirements that were introduced in the 2020 edition of the Code.

Who is affected

Architects, designers, developers, owners and engineers would benefit from the increased flexibility provided by this proposed change.

Authorities having jurisdiction, including fire departments, would need to continue to evaluate their operating procedures in accordance with the Code requirements for EMTC.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.6.6. (first printing)

[3.1.6.6.] 3.1.6.6. ([1] 1) no attributions

[3.1.6.6.] 3.1.6.6. ([2] 2) no attributions

[3.1.6.6.] -- ([3] --) no attributions

[3.1.6.6.] -- ([4] --) [F02-OS1.2]

[3.1.6.6.] -- ([4] --) [F04-OS1.3]

[3.1.6.6.] -- ([4] --) [F02-OP1.2]

[3.1.6.6.] -- ([4] --) [F04-OP1.3]

Submit a comment

Proposed Change 1874

Code Reference(s):	**NBC20 Div.B 3.1.7.5. (first printing)**
Subject:	Combustible Construction — Fire Protection and Safety
Title:	Fire Protection of Seismic Isolation Systems
Description:	This proposed change introduces explanatory Note A-3.1.7.5.(1) to clarify that seismic isolators are subject to the same fire protection requirements as other loadbearing building elements.

This change could potentially affect the following topic areas:

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

Problem

The use of seismic isolation systems is becoming more prevalent in Canada. Particularly, they are being used for the seismic retrofit or upgrade of heritage buildings to improve the buildings' seismic performance.

Seismic isolators are installed at the isolation plane in line with loadbearing elements of the structure that transfer gravity loads. There is confusion within the design community about the extent to which seismic isolators are required to be protected from fire exposure, as well as how to achieve that protection. There are few if any listed methods or systems available.

Clarification is needed in the Code to confirm that seismic isolators are subject to fire protection requirements. Otherwise, they may be damaged by fire and not able to perform as intended in terms of carrying certain loads and isolating others during an earthquake. The consequences of not having fire protection for seismic isolation systems may be severe for the building and its occupants.

Justification

A seismic isolator falls within the definition of a loadbearing building element according to Sentence 1.4.1.2.(1) of the National Building Code (NBC) 2020 by being subjected to or designed to carry loads in addition to its own dead load. Seismic isolators cannot only be considered connections because they also carry gravity loads. Therefore, seismic isolators are subject to the same fire-resistance requirements as other loadbearing building elements and must prevent both fire spread and collapse caused by the effects of fire in accordance with Article 3.1.7.5. and Subsection 3.2.2.

Guidance on the subject states: "All components of an isolation system that are located below a floor assembly required to have a fire-resistance rating must have a fire-resistance rating of no less than that required for the supported floor assembly. The fire-resistance rating of the components must also meet that required for loadbearing walls, columns and other gravity-bearing elements adjacent to the isolation system." [1]

Protecting seismic isolators from fire may be difficult because they move laterally during seismic events, require occasional inspection, and have few if any listed solutions. Despite these challenges, protecting seismic isolators from fire is the intention of the current provisions. The lack of available solutions should not negate the need for fire protection.

Adding an explanatory Note to Sentence 3.1.7.5.(1) would clarify that seismic isolators are subject to fire protection requirements because they carry gravity loads and are thus considered loadbearing building elements.

Reference

[1] "Commentary J: Design for Seismic Effects", *Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)*, Canadian Commission on Building and Fire Codes, NRCC-CONST-56529E, 2017.

PROPOSED CHANGE

NBC20 Div.B 3.1.7.5. (first printing)

[3.1.7.5.] 3.1.7.5. Rating of Supporting Construction

[1] 1) Except as permitted by Sentence (2) and by Articles 3.2.2.20. to 3.2.2.92. for mixed types of construction, all *loadbearing* walls, columns and arches in the *storey* immediately below a floor or roof assembly required to have a *fire-resistance rating* shall have a *fire-resistance rating* not less than that required for the supported floor or roof assembly. (See Note A-3.1.7.5.(1).)

[2] 2) *Loadbearing* walls, columns and arches supporting a *service room* or *service space* need not conform to Sentence (1).

[3] 3) Except as provided in Sentence (4) and except for *noncombustible* roof assemblies required by Clauses 3.2.2.51.(2)(c) and 3.2.2.60.(2)(c), if an

assembly is required to be of *noncombustible construction* and have a *fire-resistance rating*, it shall be supported by *noncombustible construction*.

[4] 4) Except for portions of a *building* constructed in accordance with Article 3.2.2.7. that are required to be of *noncombustible construction*, assemblies of *noncombustible construction* in *buildings* or portions of *buildings* permitted to be of *encapsulated mass timber construction* are permitted to be supported by *encapsulated mass timber construction*.

Note A-3.1.7.5.(1) Fire Protection of Seismic Isolators.

Seismic isolators, which are installed not only to allow controlled building movement during seismic events but also to carry gravity loads, should have the same degree of fire protection (i.e., fire-resistance rating) as the loadbearing walls, columns and arches of the building.

Impact analysis

This proposed change would clarify for Code users that seismic isolators must be considered loadbearing elements instead of as connectors. This clarification would improve consistency in interpretation of the Code requirement, which could facilitate its enforcement.

This proposed change is not expected to entail costs not otherwise intended by the current Code provision. However, until there is a full range of options to ensure that seismic isolators are protected from fire, project-specific testing (estimated at $25,000) may be required to demonstrate that a proposed solution meets the level of performance required by the Code. Otherwise, seismic isolators may not be a workable solution for some projects.

This proposed change could encourage manufacturers to develop fire-protection solutions for seismic isolators, which could benefit the construction industry by fostering innovation and introducing additional paths for Code compliance.

Enforcement implications

Since the proposed explanatory Note would clarify the Code provision, there would be less confusion for and misinterpretation by regulators enforcing the Code requirement. This proposed change would help facilitate the consistent enforcement of the Code.

In some cases, a unique design could result in additional costs and complexity upon review by the authority having jurisdiction because the design may require special analysis as an alternative solution.

Who is affected

Designers, engineers, regulators, manufacturers, testing agencies, builders, contractors, occupants and fire services.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.7.5. (first printing)

[3.1.7.5.] 3.1.7.5. ([1] 1) [F04-OS1.3]

[3.1.7.5.] 3.1.7.5. ([1] 1) [F04-OP1.3]

[3.1.7.5.] 3.1.7.5. ([2] 2) no attributions

[3.1.7.5.] 3.1.7.5. ([3] 3) [F04-OS1.3]

[3.1.7.5.] 3.1.7.5. ([3] 3) [F04-OP1.3]

[3.1.7.5.] 3.1.7.5. ([4] 4) no attributions

Submit a comment

Proposed Change 1847

Code Reference(s):	**NBC20 Div.B 3.1.9. (first printing)** **NBC20 Div.B 3.1.7.1. (first printing)**
Subject:	Penetrations
Title:	Firestopping of Penetrations in Tested Fire-Rated Assemblies
Description:	This proposed change expands explanatory Note A-3.1.9. to clarify that the requirements of Article 3.1.9.1. are not meant to supersede the design details of an otherwise tested assembly.

This change could potentially affect the following topic areas:

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

Problem

The NBC 2020 introduced significant changes to Subsection 3.1.9., including revised requirements for firestops and cast-in-place solutions for penetrations of a fire separation or a membrane forming part of an assembly that requires a fire-resistance rating (Article 3.1.9.1.).

There is confusion among Code users about whether penetrations that are part of an assembly that was tested to determine its fire-resistance rating are also subject to the requirements of Article 3.1.9.1.

Currently, Article 3.1.7.1. contains provisions to determine the fire-resistance rating of an assembly by either

- using the results of tests conducted in conformance with CAN/ULC-S101, "Standard Method of Fire Endurance Tests of Building Construction and Materials," or
- assigning a rating on the basis of Appendix D of the NBC.

The determination of the fire-resistance rating in accordance with Article 3.1.7.1. may already take into account service penetrations in the assembly. For example, the assembly may have included service penetrations when tested.

The implementation of Article 3.1.9.1. could result in the assemblies described above being subject to additional testing or protection requirements (beyond those detailed for the tested assembly). This situation risks creating confusion during implementation and enforcement and could increase costs if additional firestopping measures are applied unnecessarily.

Justification

The proposed change aims to reduce the risk of the Code not being applied as intended by assisting Code users in understanding the scope of Article 3.1.9.1.

The addition to explanatory Note A-3.1.9. clarifies that the requirements in Article 3.1.9.1. are not intended to supersede the design details of an assembly that has been tested to determine its fire-resistance rating. An assembly with a fire-resistance rating determined in accordance with Sentence 3.1.7.1.(1)—which may include openings or service penetrations, with or without protection—is thus exempted from any additional testing or protection of its penetrations (i.e., the firestopping provisions of Article 3.1.9.1.) beyond the design details of that particular tested assembly.

The addition of a cross-reference to explanatory Note A-3.1.9. in Sentence 3.1.7.1.(1) is also proposed on the basis that the proposed change makes reference to approved fire-resistance-rated assemblies. The cross-reference directs Code users to the revised explanatory Note A-3.1.9. to reduce potential confusion as to whether the additional testing or protection of the penetrations is needed for assemblies conforming to Sentence 3.1.7.1.(1).

PROPOSED CHANGE

NBC20 Div.B 3.1.9. (first printing)

[3.1.9.] 3.1.9. Penetrations in Fire Separations and Fire-Rated Assemblies

(See Note A-3.1.9.)

[3.1.9.1.] 3.1.9.1. Firestops

[3.1.9.2.] 3.1.9.2. Service Equipment Penetrations

[3.1.9.3.] 3.1.9.3. Penetration by Outlet Boxes

[3.1.9.4.] 3.1.9.4. Combustible Piping Penetrations

[3.1.9.5.] 3.1.9.5. Openings through a Membrane Ceiling

[3.1.9.6.] 3.1.9.6. Plenums

Note A-3.1.9. Penetrations.

In the application of Subsection 3.1.9., a building service or structural element is considered to penetrate an assembly if it passes into or through the assembly. In some situations a service item enters an assembly through a membrane at one location, runs within the assembly, and then leaves the assembly through a membrane at another location.

The term "membrane penetration" usually designates an opening made through one side (wall, floor or ceiling membrane) of an assembly, whereas the term "through-penetration" designates an opening that passes through an entire assembly. Firestopping of membrane penetrations and through-penetrations involves installing an assemblage of specific materials or products that are designed, tested and fire-resistance-rated to resist for a prescribed period of time the spread of fire through the penetrations.

Products for firestopping within a barrier are required to address movement of the assembly and to control smoke spread; as such, the flexibility of the material used at the flexible joints as well as the nature of the assembly and its potential movement must be taken into consideration.

In cases where an assembly conforming to Sentence 3.1.7.1.(1) contains penetrations or openings as part of the tested assembly, these specific penetrations or openings are not intended to be subjected to additional testing or provided with additional protection in accordance with Article 3.1.9.1.

NBC20 Div.B 3.1.7.1. (first printing)

[3.1.7.1.] 3.1.7.1. Determination of Ratings

[1] 1) Except as permitted by Sentence (2) and Articles 3.1.7.2. and 3.6.3.5., the rating of a material, assembly of materials or a structural member that is required to have a *fire-resistance rating*, shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101, "Standard Method of Fire Endurance Tests of Building Construction and Materials". (See Note A-3.1.9.)

[2] 2) A material, assembly of materials or a structural member is permitted to be assigned a *fire-resistance rating* on the basis of Appendix D.

Impact analysis

This proposed change is not expected to have additional cost implications.

The proposed change clarifies the application of Articles 3.1.7.1 and 3.1.9.1. to avoid the potential added costs of firestopping for otherwise tested assemblies. The clarification also facilitates the enforcement of the Code requirements.

Enforcement implications

This proposed change could be enforced by the infrastructure currently available to enforce the Code.

Since the revised explanatory Note and new cross-reference would clarify the application of Articles 3.1.7.1. and 3.1.9.1., there would be less confusion and misinterpretation when these Code requirements are enforced. This proposed change would facilitate the enforcement of the Code.

Who is affected

Builders, consumers, manufacturers, regulators, designers, engineers, contractors and fire services.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.1.9. (first printing)

[3.1.9.1.] 3.1.9.1. ([1] 1) [F03-OS1.2] [F04-OS1.3]

[3.1.9.1.] 3.1.9.1. ([1] 1) [F03-OP1.2] [F04-OP1.3]

[3.1.9.1.] 3.1.9.1. ([2] 2) [F03-OS1.2]

[3.1.9.1.] 3.1.9.1. ([2] 2) [F03-OP3.1]

[3.1.9.1.] 3.1.9.1. ([2] 2) [F03-OP1.2]

[3.1.9.1.] 3.1.9.1. ([3] 3) [F03-OS1.2]

[3.1.9.1.] 3.1.9.1. ([3] 3) [F03-OP1.2]

[3.1.9.1.] 3.1.9.1. ([4] 4) no attributions

[3.1.9.1.] 3.1.9.1. ([5] 5) no attributions

[3.1.9.1.] 3.1.9.1. ([6] 6) no attributions

[3.1.9.1.] 3.1.9.1. ([6] 6) [F03-OS1.2]

[3.1.9.1.] 3.1.9.1. ([6] 6) [F03-OP1.2]

[3.1.9.1.] 3.1.9.1. ([7] 7) no attributions

[3.1.9.1.] 3.1.9.1. ([7] 7) [F03-OS1.2]

[3.1.9.1.] 3.1.9.1. ([7] 7) [F03-OP1.2]

[3.1.9.2.] 3.1.9.2. ([1] 1) no attributions

[3.1.9.2.] 3.1.9.2. ([2] 2) no attributions

[3.1.9.3.] 3.1.9.3. ([1] 1) [F03-OS1.2]

[3.1.9.3.] 3.1.9.3. ([1] 1) [F03-OP1.2]

[3.1.9.3.] 3.1.9.3. ([2] 2) [F03-OS1.2]

[3.1.9.3.] 3.1.9.3. ([2] 2) [F03-OP1.2]

[3.1.9.3.] 3.1.9.3. ([3] 3) no attributions

[3.1.9.3.] 3.1.9.3. ([4] 4) [F03-OS1.2]

[3.1.9.3.] 3.1.9.3. ([4] 4) [F03-OP1.2]

[3.1.9.4.] 3.1.9.4. ([1] 1) no attributions

[3.1.9.4.] 3.1.9.4. ([2] 2) no attributions

[3.1.9.4.] 3.1.9.4. ([3] 3) [F03-OS1.2] [F02,F04-OS1.3]

[3.1.9.4.] 3.1.9.4. ([3] 3) [F03-OP1.2] [F02,F04-OP1.3]

[3.1.9.4.] 3.1.9.4. ([4] 4) no attributions

[3.1.9.4.] 3.1.9.4. ([5] 5) no attributions

[3.1.9.4.] 3.1.9.4. ([6] 6) no attributions

[3.1.9.4.] 3.1.9.4. ([7] 7) [F03-OS1.2] [F02-OS1.3] [F04-OS1.3]

[3.1.9.4.] 3.1.9.4. ([7] 7) [F03-OP1.2] [F02-OP1.3] [F04-OP1.3]

[3.1.9.4.] 3.1.9.4. ([8] 8) no attributions

[3.1.9.5.] 3.1.9.5. ([1] 1) [F04-OS1.3]

[3.1.9.5.] 3.1.9.5. ([1] 1) [F04-OP1.3]

[3.1.9.6.] 3.1.9.6. ([1] 1) no attributions

NBC20 Div.B 3.1.7.1. (first printing)

[3.1.7.1.] 3.1.7.1. ([1] 1) [F03-OS1.2] [F04-OS1.3]

[3.1.7.1.] 3.1.7.1. ([1] 1) [F03-OP1.2] [F04-OP1.3]

[3.1.7.1.] 3.1.7.1. ([2] 2) no attributions

Submit a comment

Proposed Change 1768

Code Reference(s):	**NBC20 Div.B 3.2.4.16. (first printing)** **NBC20 Div.B 3.8.2.6. (first printing)**
Subject:	Other — Use and Egress
Title:	Accessible Controls for Manual Fire Alarm Stations
Description:	This proposed change clarifies the application of the accessible control requirements for manual stations.
Related Code Change Request(s):	CCR 1520

This change could potentially affect the following topic areas:

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

Problem

The National Building Code of Canada (NBC) 2020 requires building controls that are intended to be used by building occupants to be accessible. This means that the controls should be operable with a closed fist position with limited force, so that people with disabilities related to dexterity are able to operate them. Furthermore, when in barrier-free paths of travel, these controls should be installed within a particular height range and in a location that can be reached by a person using an assistive mobility device. These provisions are especially important for the about 5% of Canadians with disabilities related to dexterity (Statistics Canada, 2017) and about 1% of community-dwelling Canadians who regularly use wheeled mobility aids (Smith et al., 2016).

Manual stations (or manual pull stations) are controls that are typically available so that building occupants can trigger the fire alarm system in the event of an emergency. However, the NBC does not clearly identify manual stations as building controls that must comply with the accessibility requirements with respect to reachability and dexterity. Some styles of manual stations, such as the common T-shape, may not comply with the requirements for accessible controls, thereby preventing a person with limited dexterity from triggering the fire alarm system.

Furthermore, the lack of clarity that manual stations are intended as "controls" covered by the accessibility provisions in the Code and the lack of explicit requirements for the installation location may result in manual stations being installed too high or low for users of wheeled

mobility aids. Manual stations that are inaccessible could lead to delays in notifying building occupants of an emergency to minimize the loss of life and property. This situation is inconsistent with the accessibility objective, which intends to limit the probability of a person with a disability related to dexterity or mobility being unacceptably impeded from using a building's facilities.

References:

Smith, E., Giesbrecht, E., Mortenson, W., Miller, W. Prevalence of Wheelchair and Scooter Use Among Community-Dwelling Canadians. *Physical Therapy.* 2016; 96(8):1135-42.

Statistics Canada (2017), "New Data on Disability in Canada, 2017", https://www150.statcan.gc.ca/n1/en/pub/11-627-m/11-627-m2018035-eng.pdf?st=v5UqujRh

Justification

This proposed change adds a cross-reference in Article 3.2.4.16. on manual stations to Article 3.8.2.6. on accessible controls, to highlight that manual stations should be considered as a control intended to be used by building occupants. This proposed change also adds "manual stations" to the list of examples of building controls in Sentence 3.8.2.6.(1) for clarity. This proposed change would inform Code users that manual stations are intended to conform to the accessibility design requirements specified in Article 3.8.3.8.

This proposed change is intended to clarify the interpretation of the NBC provisions without changing them substantially. By explicitly denoting manual stations as controls that are covered by the NBC provisions on accessibility, this proposed change would limit the probability that persons with disabilities related to dexterity or mobility will be unable to quickly trigger a fire alarm to notify building occupants of an emergency.

PROPOSED CHANGE

[3.2.4.16.] 3.2.4.16. Manual Stations

(See also Article 3.8.2.6.)

[1] 1) Except as permitted by Sentences (2) and (3), where a fire alarm system is installed, a manual station shall be installed in every *floor area* near

[a] a) every principal entrance to the *building*, and

[b] b) every *exit*.

(See Note A-3.2.4.16.(1).)

[2] 2) In a *building* that is *sprinklered* throughout, a manual station is not required at an exterior egress doorway from a *suite* that does not lead to an interior shared *means of egress* in a hotel or motel not more than 3 *storeys* in *building height*, provided each *suite* is served by an exterior *exit* facility leading directly to ground level.

[3] 3) In a *building* that is *sprinklered* throughout, a manual station is not required at an exterior egress doorway from a *dwelling unit* that does not lead to an interior shared *means of egress* in a *building* not more than 3 *storeys* in *building height* containing only *dwelling units*, provided each *dwelling unit* is served by an

exterior *exit* facility leading directly to ground level.

[4] 4) In a *building* referred to in Sentence (2) or (3), manual stations shall be installed near doorways leading from shared interior corridors to the exterior.

[5] 5) Where a fire alarm system is installed, a manually operated fire alarm station shall be installed on the roof at each *exit* from a helicopter landing area.

[3.8.2.6.] 3.8.2.6. Controls

[1] 1) Except as provided in Sentence 3.5.2.1.(3), controls for the operation of *building* services or safety devices, including electrical switches, thermostats, faucets, door hardware, manual stations and intercom switches, that are intended to be operated by the occupant shall comply with Subsection 3.8.3. (See Note A-3.8.2.6.(1).)

Impact analysis

Impact on accessibility and safety: This proposed change would clarify the need to install manual stations that are accessible to persons with disabilities related to dexterity or mobility. Five percent of Canadians have been diagnosed with disabilities related to dexterity (Statistics Canada, 2017) and would benefit from more inclusive provisions in the NBC for accessibility both within and outside of barrier-free paths of travel. Approximately 10% of Canadians have disabilities related to mobility (Statistics Canada, 2017), and 1% of community-dwelling Canadians regularly use wheeled mobility aids, such as wheelchairs or scooters (Smith et al., 2016), and would benefit from a restricted installation range for manual stations. While the percentage is low, these persons still need to be able to operate manual stations in case of a fire emergency.

The consequences of not quickly activating an alarm can be catastrophic for all building occupants, given the importance of alarms in prompting timely evacuations and emergency responses (Proulx, 1995). By explicitly denoting manual stations as controls that must comply with the accessibility requirements for dexterity and reachability, this proposed change would enable the many Canadians with disabilities related to dexterity or mobility to quickly trigger an alarm and prompt an evacuation. This would help prevent injury and death, as well as illness due to smoke inhalation, not only to the persons with disabilities who activate the alarm, but also to the other building occupants who need to evacuate quickly.

Impact on cost and manufacturing: The costs associated with the new provisions for mounting location are negligible, as this proposed change would simply restrict the installation height of manual stations, which are already required in buildings.

The dexterity requirements would enhance access to Canadian markets for manual stations that comply with this proposed change, although market access for non-compliant manual stations would be limited. Most manufacturers have at least one model that complies with the requirements for controls in the Americans with Disabilities Act (ADA) Standard (Section 309.4), as well as CAN/ULC-S528, "Standard for Manual Stations for Fire Alarm Systems," and the Ontario Building Code. These standards align with this proposed change to the NBC in most areas except the requirements for closed-fist operation and actuation force limits for manual stations not in the barrier-free path of travel (i.e., 67 N versus 22 N). At present, only one model of manual station is advertised online as offering "closed-fist

operation." However, the several manufacturers that were conferred with during the development of this proposed change were confident that their ADA-compliant models would meet the closed-fist operation requirement.

Regarding consumer costs, the cost differential between manual stations that comply with this proposed change versus non-compliant stations is negligible in relation to the construction cost of a building. With the widespread use of this technology that would be encouraged, consumer costs may decrease with innovation in the design, manufacturing and distribution of accessible manual stations. This proposed change may also reduce the costs associated with loss of property by enabling persons with disabilities related to dexterity or mobility to quickly activate alarms in the event of an emergency.

Impact on the provinces and territories: The impact of this proposed change would differ by jurisdiction, depending both on current provisions and their enforcement with respect to the definition of a "control." The Ontario Building Code includes explicit guidance on the design and installation of manual stations that is mostly identical to this proposed change, with the exception of the proposed NBC requirement for closed-fist operation and removal of the exemption for barrier-free paths of travel. The requirements in other provinces and territories are currently consistent with the NBC; hence, the impact on accessibility and enforcement elsewhere would exceed that in Ontario.

References:

Proulx, G. (1995). Evacuation time and movement in apartment buildings. *Fire Safety Journal. 24*(3):229-46.

Smith, E., Giesbrecht, E., Mortenson, W., Miller, W. Prevalence of Wheelchair and Scooter Use Among Community-Dwelling Canadians. *Physical Therapy.* 2016; 96(8):1135-42.

Statistics Canada (2017), "New Data on Disability in Canada, 2017", https://www150.statcan.gc.ca/n1/en/pub/11-627-m/11-627-m2018035-eng.pdf?st=v5UqujRh

Enforcement implications

Some typical designs for manual stations, despite being ULC-rated, may not comply with the NBC requirements for accessible controls. Building officials would need to be made aware that manual stations are explicitly covered under the controls that must conform to the accessibility requirements.

During inspections, building officials would also need to enforce the appropriate selection and installation of manual stations (e.g., adequate height, clear floor space and closed-fist operation). This enforcement could be completed by visual inspection and with basic measurement tools, similar to the inspection of other controls that comply with accessibility requirements.

Who is affected

Building occupants, particularly those with dexterity or mobility disabilities, including those who use wheeled mobility aids, would be able to use the manual stations in case of emergency.

Building officials would need to verify that the designs for the manual stations are appropriate and the manual stations are installed as required for accessibility purposes.

Designers and builders would need to select and install appropriate designs for manual stations.

Product manufacturers may need to modify their designs for manual stations.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[3.2.4.16.] 3.2.4.16. ([1] 1) [F11-OS1.5]

[3.2.4.16.] 3.2.4.16. ([2] 2) [F02-OS1.2] [F12-OS1.2,OS1.5] [F10-OS1.5]

[3.2.4.16.] 3.2.4.16. ([3] 3) [F02-OS1.2] [F12-OS1.2,OS1.5] [F10-OS1.5]

[3.2.4.16.] 3.2.4.16. ([4] 4) [F11-OS1.5]

[3.2.4.16.] 3.2.4.16. ([5] 5) [F11-OS1.5]

[3.8.2.6.] 3.8.2.6. ([1] 1) no attributions

Submit a comment

Proposed Change 1762

Code Reference(s):	**NBC20 Div.B 3.2.7.1. (first printing)** **NBC20 Div.B 9.34.2.7. (first printing)**
Subject:	Accessibility — Anthropometrics
Title:	Illumination Levels
Description:	This proposed change introduces minimum levels of illumination over escalators and moving walkways, and at controls and signs in public and service areas in Part 9 buildings.

This change could potentially affect the following topic areas:

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

Problem

The current requirements for minimum lighting levels in Part 9 of the National Building Code of Canada (NBC) are not specific to escalators, moving walks, building controls or accessible legible signs, which could lead to inadequate lighting levels at these locations, which could lead to safety issues resulting in:

- trips, slips or falls when approaching, using or disembarking from an escalator or moving walk, which could lead to harm to persons,
- difficulty using a building's controls intended for the operation of building services or safety devices, including electrical switches, thermostats, faucets, door hardware and intercom switches, that are intended to be operated by the occupant, which could lead to delays or impediments when moving throughout the building during an emergency or unacceptably impeding a person with low vision from using a buildings controls, or
- difficulty reading signs that are intended to be accessible and legible, which could lead to delays or impediments when moving throughout the building during an emergency or unacceptably impeding a person with low vision from

using a buildings facilities.

New requirements in Part 3 were introduced in the NBC 2020 for minimum illumination levels at such locations. However, Part 9 requirements for small buildings were not updated in the same way thereby creating different levels of safety and accessibility.

Justification

Adequate lighting levels are essential to facilitate the safe circulation of a building's occupants. While the NBC requires minimum lighting levels for some rooms and spaces used by the public, it does not specifically address the following critical areas that may require an enhanced lighting level above ambient conditions: escalators and moving walks, building controls, or signage intended to be legible.

The reviewed documentation showed that as humans age they tend to require a greater amount of light to complete a given task. For example, a 65-year-old person may require up to four times the amount of light compared to a 20-year-old person. This proposed change would increase lighting levels for these specifics areas by introducing cross-references in Part 9 to revised Sentences 3.2.7.1.(6)-2025 to (9)-2025. The requirements are intended to serve all building occupants including those with low vision.

Escalators and moving walks were identified as being potentially hazardous because of the amount of physical and cognitive effort and coordination required to safely embark on and disembark from them and the significant risk of tripping or falling when using them. In addition, these devices typically have dark treads or walking surfaces that potentially have little contrast with the adjacent walking surfaces. Therefore, minimum lighting levels at escalators and moving walks are being proposed in Part 9 to mitigate some of the tripping and falling risks associated with the use of these devices.

The nature of the task to be completed also plays an important role in determining the required amount of light. For example, controls for the operation of building services or safety devices, including electrical switches, thermostats, faucets, door hardware and intercom switches, that are intended to be operated by the occupant require adequate illumination so people are able to find and use them, particularly where their use might affect health, safety and egress.

Because signage, such as emergency exit plans, room signs, and wayfinding signs, conveys critical information, it should be adequately lit to facilitate circulation and the use of the building and its facilities by everyone. The proposed illumination levels are representative of the requirements in most accessibility standards.

As many of the proposed Part 9 lighting requirements already exist in Part 3, this proposed change adds a cross-reference to Part 3 in Part 9 to avoid duplicating the requirements. Also, since one of the existing Part 3 requirements directs Code users to Part 9, this proposed change moves that Part 9 content into Part 3 (Sentences 3.2.7.1.(3)-2025 and (4)-2025) to facilitate use of the Code.

PROPOSED CHANGE

[3.2.7.1.] 3.2.7.1. Minimum Lighting Requirements

[1] 1) ~~An~~ ~~e~~*Exits*, ~~a~~ *public corridors*, ~~or~~ and corridors providing *access to exit* for the public or serving patients' sleeping rooms or classrooms shall be equipped to provide illumination to an average level not less than 50 lx at the levels of the floor, ~~or~~ treads and~~level~~ handrails and at angles and intersections at changes of level where there are stairs or *ramps*.

[2] 2) The minimum level of the illumination required by Sentence (1) shall be 10 lx.

[3] --) Every public or service area in a *building* shall be equipped with lighting outlets with fixtures to provide illumination to every portion of the area.

[4] --) Except as provided in Sentences (6)-2025 to (9)-2025, the fixtures required by Sentence (3)-2025 shall provide illumination in conformance with Table 3.2.7.1.

Table [3.2.7.1.]
Lighting for Public and Service Areas
Forming Part of Sentence [3.2.7.1.] -- ([4] --)

Public or Service Area	Minimum Illumination, lx
Garages	50
Public washrooms	100
Recreation rooms	100
Service hallways and stairways	50
Service rooms and laundry areas	200
Storage rooms	50

~~**[5] 3)** Rooms and spaces used by the public shall be equipped to provide illumination as described in Sentences (4) to (7) and Article 9.34.2.7.~~

[6] 4) The minimum level of illumination over the entire length of escalators and moving walks shall be not less than 100 lx at the levels of the handrails, treads and walking surfaces.

[7] 5) Except as provided in Sentence (6) and except for light switches and internally illuminated controls, the minimum level of illumination at controls required by Article 3.8.2.6. shall be not less than 100 lx.

[8] 6) Where visual information is provided at controls referred to in Sentence (5), the minimum level of illumination at the controls shall be not less than 200 lx, except where the visual information is internally

illuminated.

[9] 7) Except for internally illuminated signs, the minimum level of illumination at signs displaying visual information required by Clauses 3.4.6.10.(5)(b) and 3.4.6.16.(5)(g), Subclause 3.4.6.16.(5)(l)(ii), Clause 3.4.6.16.(6)(d), Sentence 3.4.6.18.(3), Clause 3.4.6.18.(4)(a) and Articles 3.4.6.19., 3.8.2.10. and 9.9.11.5. shall be not less than 200 lx.

[10] 8) Lighting outlets in a *building* of *residential occupancy* shall be provided in conformance with Subsection 9.34.2.

[9.34.2.7.] 9.34.2.7. Public and Service Areas

[1] 1) Every public or service area in a *building*~~s~~ shall be provided with lighting in conformance with~~outlets with fixtures controlled by a wall switch or panel to illuminate every portion of such areas.~~

[a] --) Sentences 3.2.7.1.(3)-2025 to (9)-2025, and

[b] --) Article 9.9.12.2. for *means of egress*.

~~**[2] 2)** When provided by incandescent lighting, illumination required in Sentence (1) shall conform to Table 9.34.2.7. (See Article 9.9.12.2. for lighting in *means of egress*.)~~

~~**[3] 3)** When other types of lighting are used, illumination equivalent to that shown in Table 9.34.2.7. shall be provided.~~

~~**Table [9.34.2.7.] 9.34.2.7.**~~
~~**Lighting for Public Areas**~~
~~**Forming Part of Sentences [9.34.2.7.] 9.34.2.7.([2] 2) and ([3] 3)**~~

~~Room or Space~~	~~Minimum Illumination, lx~~	~~Minimum Lighting Power Density, W/m^2 of *floor area* (incandescent lighting)~~
~~Storage rooms~~	~~50~~	~~5~~
~~*Service rooms* and laundry areas~~	~~200~~	~~20~~
~~Garages~~	~~50~~	~~5~~
~~Public water-closet rooms~~	~~100~~	~~10~~
~~Service hallways and stairways~~	~~50~~	~~5~~
~~Recreation rooms~~	~~100~~	~~10~~

Impact analysis

The estimated costs required to implement task-specific lighting at the levels required by this proposed change would represent less than 1% of the overall building costs. It should also be noted that the lighting levels being proposed are consistent with lighting levels already required by the NBC for the lighting of certain rooms or spaces in public areas.

The improved lighting requirements would help to reduce the likelihood that occupants with and without low vision might trip, slip or fall while circulating within a building (NBC Objective - Safety in Use). The improved lighting requirements could also help to limit the probability that a person with low vision might be unacceptably impeded from circulating within a building or from using the building's facilities (NBC Objective - Accessibility).

Recognizing that over 5% of Canadians above 15 years old have a disability related to vision that is not addressable with corrective lenses (Statistics Canada, 2017), this proposed change would facilitate circulation within a building and use of its facilities more safely.

Reference

Statistics Canada, "Canadian Survey on Disability Reports: A demographic, employment and income profile of Canadians with disabilities aged 15 years and over, 2017", https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2018002-eng.htm

Enforcement implications

As there are existing requirements requiring minimum lighting levels, it is expected that this proposed change can be enforced using the existing Code enforcement infrastructure.

Who is affected

Building occupants would benefit from additional lighting while circulating within a building

Architects and engineers would need to ensure that the minimum lighting requirements are met in the buildings they design.

Authorities having jurisdiction would need to verify that adequate lighting is provided in buildings.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[3.2.7.1.] 3.2.7.1. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[3.2.7.1.] 3.2.7.1. ([2] 2) [F30-OS3.1] [F10-OS3.7]

[3.2.7.1.] -- ([3] --) [F30-OS3.1]

[3.2.7.1.] -- ([4] --) [F30-OS3.1]

~~[3.2.7.1.] 3.2.7.1. ([5] 3) no attributions~~

[3.2.7.1.] 3.2.7.1. ([6] 4) [F30-OS3.1]

[3.2.7.1.] 3.2.7.1. ([7] 5) [F74-OA2]

[3.2.7.1.] 3.2.7.1. ([8] 6) [F74-OA2]

[3.2.7.1.] 3.2.7.1. ([9] 7) [F10-OS3.7]

[3.2.7.1.] 3.2.7.1. ([9] 7) [F74-OA2]

[3.2.7.1.] 3.2.7.1. ([9] 7) [F30-OS3.1]

[3.2.7.1.] 3.2.7.1. ([10] 8) no attributions

[9.34.2.7.] 9.34.2.7. ([1] 1) [F30-OS3.1]

~~[9.34.2.7.] 9.34.2.7. ([2] 2) [F30-OS3.1]~~

~~[9.34.2.7.] 9.34.2.7. ([3] 3) [F30-OS3.1]~~

Submit a comment

Proposed Change 1878

Code Reference(s):	**NBC20 Div.B 3.3.1.14.(1) (first printing)**
Subject:	Windows, Doors and Skylights
Title:	Nearness of Non-Exit Stairways to Doors
Description:	This proposed change expands Sentence 3.3.1.14.(1) to include a reference to the requirement in Sentence 9.9.6.6.(1) regarding the nearness of non-exit stairways to doors.
Related Code Change Request(s):	CCR 1249, CCR 1251

This change could potentially affect the following topic areas:

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

Problem

The National Building Code of Canada (NBC) 2020 does not require interior stairs in large buildings to be provided with any clearance between the riser edge and the swing of the door, which is inconsistent with the clearance requirements for exit doors in both large and small buildings (i.e., minimum 300 mm) in Sentences 3.4.6.11.(1) and 9.9.6.6.(1) of Division B of the NBC. The lack of a clearance requirement for interior stairs in Part 3 buildings creates a safety issue by

- impeding access to exit doors from interior stairs,
- increasing the risk that a person may be hit by the door when it is opened and subsequently lose balance and fall, and
- increasing the risk that a person may lose balance by accidentally stepping through a doorway and down onto the step of a stairway when expecting a level surface.

This problem is also inconsistent with analogous requirements in Sentence 9.9.6.6.(1), where the minimum requirements for clearance between the swing of the door and the edge of non-exit stairs in small buildings are consistent with those for exit stairs.

Justification

This proposed change would expand Sentence 3.3.1.14.(1), which specifies the requirements for ramps and stairways that do not serve as exits in large buildings, to include a reference to Sentence 9.9.6.6.(1). This would introduce a requirement for a minimum clearance of 300 mm between a stair riser and the leading edge of a door during its swing and would harmonize the minimum requirements for the clearance between non-exit stairs and doors with those in place for exit stairs. Part 3 prescribes a minimum clearance of 300 mm for exit stairs in Sentence 3.4.6.11.(1). However, this proposed change would add a cross-reference to Sentence 9.9.6.6.(1), which includes the same dimensions for minimum clearance but also includes an exemption for dwelling units.

By introducing a minimum requirement for door swing clearance for non-exit stairs in Part 3 buildings, this proposed change would help limit the probability that a person on the stairs near a door would be hit by the door if it were opened, which could lead to harm to the person.

This proposed change would also limit the probability that a person would step through a doorway and unexpectedly arrive at the step of a stairway, which could lead to the person falling and experiencing subsequent harm.

PROPOSED CHANGE

NBC20 Div.B 3.3.1.14.(1) (first printing)

[3.3.1.14.] 3.3.1.14. Ramps and Stairways

[1] 1) Except as permitted by Sentence (2), Article 3.3.4.7. and Subsection 3.3.2., *ramps* and stairways that do not serve as *exits* shall conform to the requirements for *exit ramps* and stairways stated in Sentences 3.4.3.2.(8) and 9.9.6.6.(1), and Articles 3.4.3.4.~~,~~ and 3.4.6.1. to 3.4.6.9.

Impact analysis

Impact on safety: This proposed change is expected to improve the safety of building occupants by ensuring that there is enough clearance between the riser edge of interior stairs and the leading edge of a door during its swing. This would limit the probability that a person on the stairs near the door would be hit by the door if it were opened, which could lead to harm to the person. This proposed change would also limit the

probability that a person would step through the doorway and down onto a step, which could lead to the person falling and experiencing subsequent harm. As a similar change has already been implemented in Part 9 buildings, this proposed change would help to harmonize the level of occupant safety in Part 3 buildings.

Impact on usable floor space in large buildings: This proposed change would introduce an explicit requirement for a minimum clearance of 300 mm between the riser edge of interior stairs and the door during its swing. For a door with a width of 850 mm, this would correspond to a footprint of approximately 2.5 m^2 per interior stairway leading to a door. In relation to the overall floor area of large buildings that would be affected by this proposed change, the impact on spatial demands would be negligible. A similar change can already be found in the NBC for Part 9 buildings (i.e., small buildings), which suggests that the consequences for the use of space in Part 3 buildings (i.e., large buildings) would be limited.

Impact on financial cost: The financial cost associated with this proposed change is expected to be negligible in relation to the overall construction cost of a Part 3 building, recognizing that the proposed change is already in place for Part 9 buildings. Architects may need to re-evaluate certain designs for Part 3 buildings to ensure that enough clearance is provided between the riser edge of interior stairs and the door, similar to required practice for Part 9 buildings. Harmonizing the requirements for Part 3 buildings with Part 9 buildings may simplify the design process for new buildings in the future.

Impact on the provinces and territories: Since this proposed change has not yet been implemented in any provincial or territorial building codes, the regulatory impact would be similar across Canada.

Enforcement implications

Since a similar requirement is already in place for Part 9 buildings and for exit stairs, harmonizing the requirements for interior stairs in Part 3 buildings may simplify future enforcement by authorities having jurisdiction.

This proposed change could be enforced using the existing enforcement infrastructure for Part 9 buildings.

Who is affected

The proposed change would affect

- building occupants, who would be less likely to be hit by a door while descending interior stairs in large buildings
- professional designers, building owners and building developers, who would need to implement the requirement in the design of new large buildings
- authorities having jurisdiction, who would need to enforce the new requirement

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 3.3.1.14.(1) (first printing)

[3.3.1.14.] 3.3.1.14. ([1] 1) no attributions

Submit a comment

Proposed Change 1754

Code Reference(s):	**NBC20 Div.B 5.2.2.2. (first printing)**
Subject:	Vegetated Roof Assemblies
Title:	Requirements for Wind Resistance of Vegetated Roof Assemblies
Description:	This proposed change introduces a requirement for the testing of the dynamic wind uplift resistance and wind flow resistance of vegetated roof assemblies in accordance with the CAN/CSA-A123.24:21 standard.
Related Code Change Request(s):	CCR 1151

This change could potentially affect the following topic areas:

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

Problem

The use of vegetated roof assemblies is becoming more and more common in building design and construction as they provide for more sustainable buildings. The code, as it stands, provides very limited guidance and requirements with regard to the determination of adequate wind loads for vegetated roof assemblies. This situation does not prevent the possibility of under- or over-designed solutions and concepts.

Justification

The addition of a reference to CAN/CSA-A123.24:21, "Standard Test Method For Wind Resistance Of Modular Vegetated Roof Assembly," would rectify the problems described above by providing an acceptable means of establishing the required wind loads for vegetated roof assemblies.

Referencing this standard in the NBC would provide a way for the industry to meet the code's intent through the use of uniform and reproducible testing methods.

PROPOSED CHANGE

[5.2.2.2.] 5.2.2.2. Determination of Wind Load

(See Note A-5.2.2.2.)

[1] 1) This Article applies to the determination of wind load to be used in the design of materials, components and assemblies, including their connections, that separate dissimilar environments or are exposed to the exterior, where these are

[a] a) subject to wind load, and

[b] b) required to be designed to resist wind load.

[2] 2) Except as provided in Sentence (3), the wind load referred to in Sentence (1) shall be 100% of the specified wind load determined in accordance with Article 4.1.7.1.

[3] 3) Where it can be shown by test or analysis that a material, component, assembly or connection referred to in Sentence (1) will be subject to less than 100% of the specified wind load, the wind load referred to in Sentence (1) shall be not less than the load determined by test or analysis.

[4] 4) Except as provided in Sentences (5) and (6), the wind uplift resistance of membrane roofing assemblies shall be determined in accordance with the requirements of CAN/CSA-A123.21, "Standard test method for the dynamic wind uplift resistance of membrane-roofing systems". (See Note A-5.2.2.2.(4).)

[5] 5) Membrane roofing assemblies with proven past performance for the anticipated wind loads need not comply with Sentence (4). (See Note A-5.1.4.1.(5).)

[6] --) The wind resistance of vegetated roof assemblies shall

[a] --) conform to existing provincial or territorial regulations, or

[b] --) in the absence of the regulations referred to in Clause (a), be determined in accordance with the requirements of CAN/CSA-A123.24:21, “Standard test method for wind resistance of vegetated roof assembly” (see Note A-5.2.2.2.(6)(b)).

Note A-5.2.2.2.(6)(b) Vegetated Roof Assemblies.

When a vegetated system is added on the top of a membrane roofing assembly, a vegetated roof assembly (VRA) is formed. The test methods described in CAN/CSA-A123.24:21, "Standard test method for wind resistance of vegetated roof assembly," determine both the wind uplift resistance and the wind flow resistance of the VRA. If the wind uplift resistance of the membrane roofing assembly used in the VRA has already been determined in accordance with the requirements of CAN/CSA-A123.21, "Standard test method for the dynamic wind uplift resistance of membrane-roofing systems," as required by Sentence 5.2.2.2.(4), then this resistance can be used as an acceptable conservative wind uplift resistance of the VRA; in such cases, only the wind flow resistance of the VRA has to be determined in accordance with CAN/CSA-A123.24:21. If, however, any variations in the components or methods of construction of the membrane roofing assembly used in the VRA are made after the wind uplift resistance was determined in accordance with the requirements of CAN/CSA-A123.21, then the wind uplift resistance of the VRA must be determined in accordance with CAN/CSA-A123.24:21.

Impact analysis

As the proposed changes are performance-based and the cost of vegetated roof assemblies is less than 0.5% of the total cost of the construction of a building, a qualitative cost analysis is provided.

The testing of the wind flow resistance of a vegetated roof assembly costs on average between $2500 and $4000 per system, depending on the number of configurations evaluated. The cost of testing is per system and not per project. However, test results can be reused (without retesting) for other systems under similar conditions. The cost of testing would be absorbed by the industry sector that provides the vegetated roof assemblies.

The cost of construction would not be impacted as systems are already being built.

Direct benefits include the reduction of under- or over-designed vegetated roof assemblies and the provision of an appropriate method to determine the wind resistance of vegetated roof assemblies and their compliance with specific building requirements.

Indirect benefits include the reduction of safety issues related to the overturning of roofs in under-designed assemblies and unnecessary roof loading in over-designed assemblies.

Enforcement implications

This proposed change can be enforced by existing means and resources involved in the acceptance and verification of roofing design.

Who is affected

Designers, specification writers, manufacturers, roofing contractors, building owners and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[5.2.2.2.] 5.2.2.2. ([1] 1) no attributions

[5.2.2.2.] 5.2.2.2. ([2] 2) [F20-OS2.1] [F22-OS2.3,OS2.4]

[5.2.2.2.] 5.2.2.2. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]

[5.2.2.2.] 5.2.2.2. ([2] 2) [F20,F22-OH4]

[5.2.2.2.] 5.2.2.2. ([3] 3) [F20-OS2.1] [F22-OS2.3,OS2.4]

[5.2.2.2.] 5.2.2.2. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3]

[5.2.2.2.] 5.2.2.2. ([3] 3) [F20,F22-OH4]

[5.2.2.2.] 5.2.2.2. ([4] 4) [F20,F55,F61-OH1.1,OH1.2,OH1.3]

[5.2.2.2.] 5.2.2.2. ([4] 4) [F20,F55,F61-OS2.1,OS2.3]

[5.2.2.2.] 5.2.2.2. ([5] 5) no attributions

-- (--) [F20,F55,F61-OH1.1,OH1.2,OH1.3]

-- (--) [F20,F55,F61-OS2.1,OS2.3]

Submit a comment

Proposed Change 1973

Code Reference(s):	**NBC20 Div.B 5.9.1.1. (first printing)**
Subject:	Environmental Separation Table 5.9.1.1.
Title:	Replacement of Reference to Outdated CAN/CGSB Standard with a Reference to an ASTM Standard
Description:	This proposed change replaces the reference to CAN/CGSB-37.58-M86, "Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing," with a reference to ASTM C836/C836M-18, "Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course," in Table 5.9.1.1.

This change could potentially affect the following topic areas:

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

Problem

CAN/CGSB-37.58-M86, "Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing," which is currently referenced in Table 5.9.1.1. of Division B of the NBC, had not been updated since 1986 and was withdrawn in 2005.

The withdrawal of the standard over 15 years ago means that industry is no longer using this standard as a reference for minimum performance or material suitability. Therefore, if the standard were to remain in the NBC, it would cause confusion and conflict between designers, manufacturers, authorities having jurisdiction and the legal community. These conflicts would occur when

- authorities having jurisdiction request documentation from manufacturers during permit reviews to prove Code compliance,
- designers require Code compliance for use of their design specifications on a project, or
- lawyers demand proof of Code compliance during possible court cases.

Justification

At the mid-cycle review of updates to the standards currently referenced in Table 5.9.1.1., it was determined that CAN/CGSB-37.58-M86

- was withdrawn in 2005, and
- is no longer used in practice.

Therefore, it was agreed to replace the reference to this withdrawn standard with a reference to ASTM C836/C836M-18, "Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course."

Replacing the reference

- removes the need to prove compliance with a standard that is no longer relevant to the industry
- provides Code users with a relevant and up-to-date standard with which to comply.

This proposed change would eliminate potential conflicts and confusion for designers, manufacturers, authorities having jurisdiction and the legal community, as noted above.

PROPOSED CHANGE

NBC20 Div.B 5.9.1.1. (first printing)

[5.9.1.1.] 5.9.1.1. Compliance with Applicable Standards

[1] 1) Except as provided in Sentence (2) and elsewhere in this Part, materials and components, and their installation, shall conform to the requirements of the applicable standards in Table 5.9.1.1. where those materials or components are

[a] a) incorporated into environmental separators or assemblies exposed to the exterior, and

[b] b) installed to fulfill the requirements of this Part.

(See Note A-5.9.1.1.(1).)

[2] 2) The requirements for *flame-spread ratings* contained in thermal insulation standards shall be applied only as required in Part 3.

Table [5.9.1.1.] 5.9.1.1.
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence [5.9.1.1.] 5.9.1.1.([1] 1)

Issuing Agency	Document Number	Title of Document
ANSI	A135.6	Engineered Wood Siding
ASME	B18.6.1	Wood Screws (Inch Series)
ASTM	A123/A123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM	C4	Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile
ASTM	C73	Standard Specification for Calcium Silicate Brick (Sand-Lime Brick)
ASTM	C126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C212	Standard Specification for Structural Clay Facing Tile

Issuing Agency	Document Number	Title of Document
ASTM	C412M	Standard Specification for Concrete Drain Tile
ASTM	C444M	Standard Specification for Perforated Concrete Pipe
ASTM	C553	Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM	C612	Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM	C700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM	C726	Standard Specification for Mineral Wool Roof Insulation Board
ASTM	C834 (1)	Standard Specification for Latex Sealants
ASTM	C836/836M-18	Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
ASTM	C840	Standard Specification for Application and Finishing of Gypsum Board
ASTM	C920 (1)	Standard Specification for Elastomeric Joint Sealants
ASTM	C991	Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings
ASTM	C1002	Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM	C1177/C1177M	Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM	C1178/C1178M	Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
ASTM	C1184 (1)	Standard Specification for Structural Silicone Sealants
ASTM	C1280	Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
ASTM	C1311 (1)	Standard Specification for Solvent Release Sealants
ASTM	C1330 (1)	Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM	C1396/C1396M (2)	Standard Specification for Gypsum Board
ASTM	C1658/C1658M (3)	Standard Specification for Glass Mat Gypsum Panels
ASTM	D1227/D1227M	Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM	D2178/D2178M	Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM	D3019/D3019M (4)	Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered
ASTM	D4479/D4479M	Standard Specification for Asphalt Roof Coatings – Asbestos-Free

Issuing Agency	Document Number	Title of Document
ASTM	D4637/D4637M	Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane
ASTM	D4811/D4811M	Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
ASTM	D6878/D6878M	Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
ASTM	E2190	Standard Specification for Insulating Glass Unit Performance and Evaluation
BNQ	BNQ 3624-115	Polyethylene (PE) Pipe and Fittings for Soil and Foundation Drainage
CGSB	CAN/CGSB-11.3-M	Hardboard
CGSB	CAN/CGSB-12.1	Safety Glazing
CGSB	CAN/CGSB-12.2-M	Flat, Clear Sheet Glass
CGSB	CAN/CGSB-12.3-M	Flat, Clear Float Glass
CGSB	CAN/CGSB-12.4-M	Heat Absorbing Glass
CGSB	CAN/CGSB-12.8	Insulating glass units
CGSB	CAN/CGSB-12.9	Spandrel glass
CGSB	37-GP-9Ma	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
CGSB	CAN/CGSB-37.50-M	Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing
CGSB	CAN/CGSB-37.54	Polyvinyl Chloride Roofing and Waterproofing Membrane
~~CGSB~~	~~CAN/CGSB-37.58-M~~	~~Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing~~
CGSB	CAN/CGSB-41.24	Rigid Vinyl Siding, Soffits and Fascia
CGSB	CAN/CGSB-51.32-M	Sheathing, Membrane, Breather Type
CGSB	CAN/CGSB-51.33-M	Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction
CGSB	CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction
CGSB	CAN/CGSB-93.1-M	Sheet, Aluminum Alloy, Prefinished, Residential
CGSB	CAN/CGSB-93.2-M	Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use
CSA	A23.1	Concrete materials and methods of concrete construction
CSA	CAN/CSA-A82	Fired masonry brick made from clay or shale
CSA	CAN3-A93-M	Natural Airflow Ventilators for Buildings
CSA	CAN/CSA-A123.2	Asphalt-Coated Roofing Sheets
CSA	A123.3	Asphalt Saturated Organic Roofing Felt
CSA	CAN/CSA-A123.4	Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems

Issuing Agency	Document Number	Title of Document
CSA	A123.5	Asphalt shingles made from glass felt and surfaced with mineral granules
CSA	CAN/CSA-A123.16	Asphalt-coated glass-base sheets
CSA	A123.17	Asphalt Glass Felt Used in Roofing and Waterproofing
CSA	A123.23	Product specification for polymer-modified bitumen sheet, prefabricated and reinforced
CSA	A123.51	Asphalt shingle application on roof slopes 1:6 and steeper
CSA	A165.1	Concrete block masonry units
CSA	A165.2	Concrete brick masonry units
CSA	A165.3	Prefaced concrete masonry units
CSA	CAN/CSA-A179	Mortar and Grout for Unit Masonry
CSA	CAN/CSA-A220 Series	Concrete Roof Tiles
CSA	CAN/CSA-A371	Masonry Construction for Buildings
CSA	A3001	Cementitious Materials for Use in Concrete
CSA	B182.1	Plastic drain and sewer pipe and pipe fittings
CSA	G40.21	Structural quality steel
CSA	CAN/CSA-G401	Corrugated steel pipe products
CSA	CAN/CSA-O80 Series	Wood preservation
CSA	O118.1	Western Red Cedar Shakes and Shingles
CSA	O118.2	Eastern White Cedar Shingles
CSA	O121	Douglas fir plywood
CSA	O141	Softwood Lumber
CSA	O151	Canadian softwood plywood
CSA	O153	Poplar plywood
CSA	O325	Construction sheathing
CSA	O437.0	OSB and Waferboard
HPVA	ANSI/HPVA HP-1	American National Standard for Hardwood and Decorative Plywood
ULC	CAN/ULC-S701.1	Standard for Thermal Insulation, Polystyrene Boards
ULC	CAN/ULC-S702.1	Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification
ULC	CAN/ULC-S703	Standard for Cellulose Fibre Insulation (CFI) for Buildings
ULC	CAN/ULC-S704.1	Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

Issuing Agency	Document Number	Title of Document
ULC	CAN/ULC-S705.1	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
ULC	CAN/ULC-S705.2	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application
ULC	CAN/ULC-S706.1	Standard for Wood Fibre Insulating Boards for Buildings
ULC	CAN/ULC-S710.1	Standard for Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S711.1	Standard for Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S717.1	Standard for Flat Wall Insulating Concrete Form (ICF) Units – Material Properties

Notes to Table [5.9.1.1.] 5.9.1.1.:

(1) See Note A-Table 5.9.1.1.

(2) The *flame-spread rating* of gypsum board shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1396/C1396M.

(3) The *flame-spread rating* of gypsum panels shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1658/C1658M.

(4) For the purpose of compliance with Part 5, ASTM D3019/D3019M shall only apply to the non-fibered and non-asbestos-fibered types of asphalt roll roofing.

Impact analysis

This proposed change is expected to have a positive impact in that it would resolve all potential conflicts created by the Code reference to an outdated standard as a minimum requirement and align the Code with current industry practice.

Enforcement implications

Replacing the reference to the withdrawn and outdated CGSB standard with a reference to an up-to-date ASTM standard as a minimum requirement would eliminate the conflict that could be created if an authority having jurisdiction were to demand proof of compliance to a standard that is not used by industry.

Who is affected

Designers, specifiers, manufacturers, building owners, building officials, lawyers and contractors. These groups would benefit from the elimination of the potential conflicts addressed above.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 5.9.1.1. (first printing)

[5.9.1.1.] 5.9.1.1. ([1] 1)
[F20,F22,F51,F54,F55,F61,F63,F80-OH1.1,OH1.2] [F41,F55-OH1.1] [F55,F61,F80-OH1.3]

[5.9.1.1.] 5.9.1.1. ([1] 1)
[F20,F80-OS2.1] [F20,F22,F51,F61,F63,F80-OS2.3] [F51-OS2.5]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F20-OS2.2] [F80-OS2.3]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F80,F61,F63-OS3.1]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F80,F61,F63-OH4]

[5.9.1.1.] 5.9.1.1. ([1] 1) ([a] a) [F61,F63-OS1.4]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F20,F80-OP2.1,OP2.3] [F22,F80-OP2.4]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F42-OH2.5]

[5.9.1.1.] 5.9.1.1. ([2] 2) no attributions

Submit a comment

Proposed Change 1974

Code Reference(s):	**NBC20 Div.B 5.9.1.1. (first printing)**
Subject:	Environmental Separation Table 5.9.1.1.
Title:	Deletion of Reference to Duplicate Standard
Description:	This proposed change deletes the reference to ASTM D2178/D2178M-13a, "Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing," from Table 5.9.1.1.

This change could potentially affect the following topic areas:

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

Problem

Part 5 of the NBC currently references both ASTM D2178/D2178M-13a, "Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing," and CSA-A123.17-05, "Asphalt Glass Felt Used in Roofing and Waterproofing"; however, ASTM D2178/D2178M was adopted, with Canadian deviations, as CSA-A123.17.

If ASTM D2178/D2178M were to remain in the NBC, it would cause confusion and conflict between designers, manufacturers, authorities having jurisdiction and the legal community. These conflicts would occur when

- authorities having jurisdiction request documentation from manufacturers during permit reviews to prove Code compliance,
- designers require Code compliance for use of their design specifications on a project, or
- lawyers demand proof of Code compliance during possible court cases.

Justification

At the mid-cycle review of updates to the standards currently referenced in Table 5.9.1.1., the Standing Committee on Environmental Separation determined that ASTM D2178/D2178M-13a and CSA-A123.17-05 are currently referenced in Part 5 despite the fact that ASTM D2178/D2178M has been adopted, with Canadian deviations, as CSA-A123.17. Therefore, the Standing Committee agreed to delete the reference to ASTM D2178/D2178M.

Deleting reference to ASTM D2178/D2178M from the NBC eliminates potential conflict and confusion for designers, manufacturers, authorities having jurisdiction and the legal community, as noted above.

PROPOSED CHANGE

NBC20 Div.B 5.9.1.1. (first printing)

[5.9.1.1.] 5.9.1.1. Compliance with Applicable Standards

[1] 1) Except as provided in Sentence (2) and elsewhere in this Part, materials and components, and their installation, shall conform to the requirements of the applicable standards in Table 5.9.1.1. where those materials or components are

[a] a) incorporated into environmental separators or assemblies exposed to the exterior, and

[b] b) installed to fulfill the requirements of this Part.

(See Note A-5.9.1.1.(1).)

[2] 2) The requirements for *flame-spread ratings* contained in thermal insulation standards shall be applied only as required in Part 3.

Table [5.9.1.1.] 5.9.1.1.
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence [5.9.1.1.] 5.9.1.1.([1] 1)

Issuing Agency	Document Number	Title of Document
ANSI	A135.6	Engineered Wood Siding
ASME	B18.6.1	Wood Screws (Inch Series)
ASTM	A123/A123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM	C4	Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile
ASTM	C73	Standard Specification for Calcium Silicate Brick (Sand-Lime Brick)
ASTM	C126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C212	Standard Specification for Structural Clay Facing Tile
ASTM	C412M	Standard Specification for Concrete Drain Tile
ASTM	C444M	Standard Specification for Perforated Concrete Pipe
ASTM	C553	Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM	C612	Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM	C700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM	C726	Standard Specification for Mineral Wool Roof Insulation Board

Issuing Agency	Document Number	Title of Document
ASTM	C834 (1)	Standard Specification for Latex Sealants
ASTM	C840	Standard Specification for Application and Finishing of Gypsum Board
ASTM	C920 (1)	Standard Specification for Elastomeric Joint Sealants
ASTM	C991	Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings
ASTM	C1002	Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM	C1177/C1177M	Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM	C1178/C1178M	Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
ASTM	C1184 (1)	Standard Specification for Structural Silicone Sealants
ASTM	C1280	Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
ASTM	C1311 (1)	Standard Specification for Solvent Release Sealants
ASTM	C1330 (1)	Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM	C1396/C1396M (2)	Standard Specification for Gypsum Board
ASTM	C1658/C1658M (3)	Standard Specification for Glass Mat Gypsum Panels
ASTM	D1227/D1227M	Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
~~ASTM~~	~~D2178/D2178M~~	~~Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing~~
ASTM	D3019/D3019M (4)	Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered
ASTM	D4479/D4479M	Standard Specification for Asphalt Roof Coatings – Asbestos-Free
ASTM	D4637/D4637M	Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane
ASTM	D4811/D4811M	Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
ASTM	D6878/D6878M	Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
ASTM	E2190	Standard Specification for Insulating Glass Unit Performance and Evaluation
BNQ	BNQ 3624-115	Polyethylene (PE) Pipe and Fittings for Soil and Foundation Drainage
CGSB	CAN/CGSB-11.3-M	Hardboard
CGSB	CAN/CGSB-12.1	Safety Glazing

Issuing Agency	Document Number	Title of Document
CGSB	CAN/CGSB-12.2-M	Flat, Clear Sheet Glass
CGSB	CAN/CGSB-12.3-M	Flat, Clear Float Glass
CGSB	CAN/CGSB-12.4-M	Heat Absorbing Glass
CGSB	CAN/CGSB-12.8	Insulating glass units
CGSB	CAN/CGSB-12.9	Spandrel glass
CGSB	37-GP-9Ma	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
CGSB	CAN/CGSB-37.50-M	Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing
CGSB	CAN/CGSB-37.54	Polyvinyl Chloride Roofing and Waterproofing Membrane
CGSB	CAN/CGSB-37.58-M	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing
CGSB	CAN/CGSB-41.24	Rigid Vinyl Siding, Soffits and Fascia
CGSB	CAN/CGSB-51.32-M	Sheathing, Membrane, Breather Type
CGSB	CAN/CGSB-51.33-M	Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction
CGSB	CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction
CGSB	CAN/CGSB-93.1-M	Sheet, Aluminum Alloy, Prefinished, Residential
CGSB	CAN/CGSB-93.2-M	Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use
CSA	A23.1	Concrete materials and methods of concrete construction
CSA	CAN/CSA-A82	Fired masonry brick made from clay or shale
CSA	CAN3-A93-M	Natural Airflow Ventilators for Buildings
CSA	CAN/CSA-A123.2	Asphalt-Coated Roofing Sheets
CSA	A123.3	Asphalt Saturated Organic Roofing Felt
CSA	CAN/CSA-A123.4	Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems
CSA	A123.5	Asphalt shingles made from glass felt and surfaced with mineral granules
CSA	CAN/CSA-A123.16	Asphalt-coated glass-base sheets
CSA	A123.17	Asphalt Glass Felt Used in Roofing and Waterproofing
CSA	A123.23	Product specification for polymer-modified bitumen sheet, prefabricated and reinforced
CSA	A123.51	Asphalt shingle application on roof slopes 1:6 and steeper
CSA	A165.1	Concrete block masonry units
CSA	A165.2	Concrete brick masonry units
CSA	A165.3	Prefaced concrete masonry units

Issuing Agency	Document Number	Title of Document
CSA	CAN/CSA-A179	Mortar and Grout for Unit Masonry
CSA	CAN/CSA-A220 Series	Concrete Roof Tiles
CSA	CAN/CSA-A371	Masonry Construction for Buildings
CSA	A3001	Cementitious Materials for Use in Concrete
CSA	B182.1	Plastic drain and sewer pipe and pipe fittings
CSA	G40.21	Structural quality steel
CSA	CAN/CSA-G401	Corrugated steel pipe products
CSA	CAN/CSA-O80 Series	Wood preservation
CSA	O118.1	Western Red Cedar Shakes and Shingles
CSA	O118.2	Eastern White Cedar Shingles
CSA	O121	Douglas fir plywood
CSA	O141	Softwood Lumber
CSA	O151	Canadian softwood plywood
CSA	O153	Poplar plywood
CSA	O325	Construction sheathing
CSA	O437.0	OSB and Waferboard
HPVA	ANSI/HPVA HP-1	American National Standard for Hardwood and Decorative Plywood
ULC	CAN/ULC-S701.1	Standard for Thermal Insulation, Polystyrene Boards
ULC	CAN/ULC-S702.1	Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification
ULC	CAN/ULC-S703	Standard for Cellulose Fibre Insulation (CFI) for Buildings
ULC	CAN/ULC-S704.1	Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced
ULC	CAN/ULC-S705.1	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
ULC	CAN/ULC-S705.2	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application
ULC	CAN/ULC-S706.1	Standard for Wood Fibre Insulating Boards for Buildings
ULC	CAN/ULC-S710.1	Standard for Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S711.1	Standard for Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S717.1	Standard for Flat Wall Insulating Concrete Form (ICF) Units – Material Properties

Notes to Table [5.9.1.1.] 5.9.1.1.:

(1) See Note A-Table 5.9.1.1.

(2) The *flame-spread rating* of gypsum board shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1396/C1396M.

(3) The *flame-spread rating* of gypsum panels shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1658/C1658M.

(4) For the purpose of compliance with Part 5, ASTM D3019/D3019M shall only apply to the non-fibered and non-asbestos-fibered types of asphalt roll roofing.

Impact analysis

This proposed change is expected to have a positive impact in that it would resolve all potential conflicts created by referencing two duplicate standards for compliance.

Enforcement implications

Removing the reference to ASTM D2178/D2178M-13a from the NBC would also remove the potential confusion and conflict that could be created if an authority having jurisdiction were to demand proof of compliance to both standards.

Who is affected

Designers, specification writers, manufacturers, building owners, building officials, lawyers and contractors. These groups would benefit from the elimination of the potential confusion and conflict addressed above.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 5.9.1.1. (first printing)

[5.9.1.1.] 5.9.1.1. ([1] 1)
[F20,F22,F51,F54,F55,F61,F63,F80-OH1.1,OH1.2] [F41,F55-OH1.1] [F55,F61,F80-OH1.3]

[5.9.1.1.] 5.9.1.1. ([1] 1)
[F20,F80-OS2.1] [F20,F22,F51,F61,F63,F80-OS2.3] [F51-OS2.5]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F20-OS2.2] [F80-OS2.3]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F80,F61,F63-OS3.1]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F80,F61,F63-OH4]

[5.9.1.1.] 5.9.1.1. ([1] 1) ([a] a) [F61,F63-OS1.4]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F20,F80-OP2.1,OP2.3] [F22,F80-OP2.4]

[5.9.1.1.] 5.9.1.1. ([1] 1) [F42-OH2.5]

[5.9.1.1.] 5.9.1.1. ([2] 2) no attributions

Submit a comment

Proposed Change 1332

Code Reference(s):	**NBC20 Div.B Table 5.9.1.1. (first printing)**
Subject:	Environmental Separation Table 5.9.1.1.
Title:	Replacement and Addition of Standards in Table 5.9.1.1.
Description:	This proposed change replaces the standard CAN/CGSB-41.24-95, "Rigid Vinyl Siding, Soffits and Fascia," by ASTM D3679-17, "Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding," and ASTM D4477-16, "Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit," in Table 5.9.1.1., and adds the standards ASTM D7254-17, "Standard Specification for Polypropylene (PP) Siding," and ASTM D7793-17, "Standard Specification for Insulated Vinyl Siding," to the Table.

This change could potentially affect the following topic areas:

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

Problem

The currently referenced standard CAN/CGSB-41.24-95, “Rigid Vinyl Siding, Soffits and Fascia,”

- is outdated and was withdrawn in March 2012, and
- does not reflect the products available on the market and used in construction.

In addition, the NBC does not address polypropylene (PP) siding and insulated vinyl siding (IVS) though they have been used for more than ten years in practice. In the absence of standards, a variety of materials have been used with inconsistent applications and results.

Justification

After reviewing the standards ASTM D3679-17, "Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding," and ASTM D4477-16, "Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit," and comparing them to CAN/CGSB-41.24-95, the following was determined:

- CAN/CGSB-41.24-95
    - was withdrawn in 2012,
    - has not been updated since 1995,
    - refers to materials that are not currently available on the market, and
    - is not currently used by the industry or in practice.
- ASTM D3679-17
    - was developed through consensus,
    - reflects materials that are currently available on the market,
    - has been recognized and used by the industry and in practice, and
    - does not address soffits, necessitating the addition of a reference to ASTM D4477-16.
- Replacing CAN/CGSB-41.24-95 by ASTM D3679-17 and ASTM D4477-16 in Table 5.9.1.1.
    - will reduce the risk of unacceptable performance and the liability of professionals, as it will allow the use of materials that are available on the market and tested for performance, and
    - will lessen the workloads of contractors, manufacturers, designers, specification writers and building officials in determining Code compliance.

Furthermore, a review of ASTM D7254-17, "Standard Specification for Polypropylene (PP) Siding," and ASTM D7793-17, "Standard Specification for Insulated Vinyl Siding," found that these two standards offer acceptable minimum levels of performance, thus making them acceptable for reference in Table 5.9.1.1.

The four ASTM standards (ASTM D3679-17, ASTM D4477-16, ASTM D7254-17 and ASTM D7793-17) that would be added to Table 5.9.1.1 do not specifically include cold-weather testing of the materials they cover. In a review of currently available standards for these materials, none were found to include cold-weather testing. However, the currently available standards do provide other testing requirements that indicate expected performance criteria. Therefore, the Standing Committee on Environmental Separation concluded that referencing current industry standards for these materials would be better than not referencing any standards at all.

PROPOSED CHANGE

Table [5.9.1.1.] 5.9.1.1.
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence 5.9.1.1.(1)

Issuing Agency	Document Number	Title of Document
ANSI	A135.6	Engineered Wood Siding
ASME	B18.6.1	Wood Screws (Inch Series)
ASTM	A123/A123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM	C4	Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile
ASTM	C73	Standard Specification for Calcium Silicate Brick (Sand-Lime Brick)
ASTM	C126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C212	Standard Specification for Structural Clay Facing Tile
ASTM	C412M	Standard Specification for Concrete Drain Tile
ASTM	C444M	Standard Specification for Perforated Concrete Pipe
ASTM	C553	Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM	C612	Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM	C700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM	C726	Standard Specification for Mineral Wool Roof Insulation Board

Issuing Agency	Document Number	Title of Document
ASTM	C834 (1)	Standard Specification for Latex Sealants
ASTM	C840	Standard Specification for Application and Finishing of Gypsum Board
ASTM	C920 (1)	Standard Specification for Elastomeric Joint Sealants
ASTM	C991	Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings
ASTM	C1002	Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM	C1177/C1177M	Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM	C1178/C1178M	Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
ASTM	C1184 (1)	Standard Specification for Structural Silicone Sealants
ASTM	C1280	Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
ASTM	C1311 (1)	Standard Specification for Solvent Release Sealants
ASTM	C1330 (1)	Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM	C1396/C1396M (2)	Standard Specification for Gypsum Board
ASTM	C1658/C1658M (3)	Standard Specification for Glass Mat Gypsum Panels
ASTM	D1227/D1227M	Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM	D2178/D2178M	Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM	D3019/D3019M (4)	Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered
ASTM	D3679 (5)	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding
ASTM	D4477 (6)	Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit
ASTM	D4479/D4479M	Standard Specification for Asphalt Roof Coatings – Asbestos-Free

Issuing Agency	Document Number	Title of Document
ASTM	D4637/D4637M	Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane
ASTM	D4811/D4811M	Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
ASTM	D6878/D6878M	Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
ASTM	D7254 (7)	Standard Specification for Polypropylene (PP) Siding
ASTM	D7793 (8)	Standard Specification for Insulated Vinyl Siding
ASTM	E2190	Standard Specification for Insulating Glass Unit Performance and Evaluation
BNQ	BNQ 3624-115	Polyethylene (PE) Pipe and Fittings for Soil and Foundation Drainage
CGSB	CAN/CGSB-11.3-M	Hardboard
CGSB	CAN/CGSB-12.1	Safety Glazing
CGSB	CAN/CGSB-12.2-M	Flat, Clear Sheet Glass
CGSB	CAN/CGSB-12.3-M	Flat, Clear Float Glass
CGSB	CAN/CGSB-12.4-M	Heat Absorbing Glass
CGSB	CAN/CGSB-12.8	Insulating glass units
CGSB	CAN/CGSB-12.9	Spandrel glass
CGSB	37-GP-9Ma	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
CGSB	CAN/CGSB-37.50-M	Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing
CGSB	CAN/CGSB-37.54	Polyvinyl Chloride Roofing and Waterproofing Membrane
CGSB	CAN/CGSB-37.58-M	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing
~~CGSB~~	~~CAN/CGSB-41.24~~	~~Rigid Vinyl Siding, Soffits and Fascia~~
CGSB	CAN/CGSB-51.32-M	Sheathing, Membrane, Breather Type
CGSB	CAN/CGSB-51.33-M	Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction

Issuing Agency	Document Number	Title of Document
CGSB	CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction
CGSB	CAN/CGSB-93.1-M	Sheet, Aluminum Alloy, Prefinished, Residential
CGSB	CAN/CGSB-93.2-M	Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use
CSA	A23.1	Concrete materials and methods of concrete construction
CSA	CAN/CSA-A82	Fired masonry brick made from clay or shale
CSA	CAN3-A93-M	Natural Airflow Ventilators for Buildings
CSA	CAN/CSA-A123.2	Asphalt-Coated Roofing Sheets
CSA	A123.3	Asphalt Saturated Organic Roofing Felt
CSA	CAN/CSA-A123.4	Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems
CSA	A123.5	Asphalt shingles made from glass felt and surfaced with mineral granules
CSA	CAN/CSA-A123.16	Asphalt-coated glass-base sheets
CSA	A123.17	Asphalt Glass Felt Used in Roofing and Waterproofing
CSA	A123.23	Product specification for polymer-modified bitumen sheet, prefabricated and reinforced
CSA	A123.51	Asphalt shingle application on roof slopes 1:6 and steeper
CSA	A165.1	Concrete block masonry units
CSA	A165.2	Concrete brick masonry units
CSA	A165.3	Prefaced concrete masonry units
CSA	CAN/CSA-A179	Mortar and Grout for Unit Masonry
CSA	CAN/CSA-A220 Series	Concrete Roof Tiles
CSA	CAN/CSA-A371	Masonry Construction for Buildings
CSA	A3001	Cementitious Materials for Use in Concrete
CSA	B182.1	Plastic drain and sewer pipe and pipe fittings
CSA	G40.21	Structural quality steel

Issuing Agency	Document Number	Title of Document
CSA	CAN/CSA-G401	Corrugated steel pipe products
CSA	CAN/CSA-O80 Series	Wood preservation
CSA	O118.1	Western Red Cedar Shakes and Shingles
CSA	O118.2	Eastern White Cedar Shingles
CSA	O121	Douglas fir plywood
CSA	O141	Softwood Lumber
CSA	O151	Canadian softwood plywood
CSA	O153	Poplar plywood
CSA	O325	Construction sheathing
CSA	O437.0	OSB and Waferboard
HPVA	ANSI/HPVA HP-1	American National Standard for Hardwood and Decorative Plywood
ULC	CAN/ULC-S701.1	Standard for Thermal Insulation, Polystyrene Boards
ULC	CAN/ULC-S702.1	Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification
ULC	CAN/ULC-S703	Standard for Cellulose Fibre Insulation (CFI) for Buildings
ULC	CAN/ULC-S704.1	Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced
ULC	CAN/ULC-S705.1	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification
ULC	CAN/ULC-S705.2	Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application
ULC	CAN/ULC-S706.1	Standard for Wood Fibre Insulating Boards for Buildings

Issuing Agency	Document Number	Title of Document
ULC	CAN/ULC-S710.1	Standard for Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S711.1	Standard for Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S717.1	Standard for Flat Wall Insulating Concrete Form (ICF) Units – Material Properties

Notes to Table [5.9.1.1.] 5.9.1.1.:

(1) See Note A-Table 5.9.1.1.

(2) The *flame-spread rating* of gypsum board shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1396/C1396M.

(3) The *flame-spread rating* of gypsum panels shall be determined in accordance with CAN/ULC-S102, in lieu of ASTM E84 as indicated in ASTM C1658/C1658M.

(4) For the purpose of compliance with Part 5, ASTM D3019/D3019M shall only apply to the non-fibered and non-asbestos-fibered types of asphalt roll roofing.

(5) The *flame-spread rating* of rigid polyvinyl chloride siding shall be determined in accordance with CAN/ULC-S102.2, in lieu of ASTM E84 as indicated in ASTM D3679.

(6) The *flame-spread rating* of rigid polyvinyl chloride soffits shall be determined in accordance with CAN/ULC-S102.2, in lieu of ASTM E84 as indicated in ASTM D4477.

(7) The *flame-spread rating* of polypropylene siding shall be determined in accordance with CAN/ULC-S102.2, in lieu of ASTM E84 as indicated in ASTM D7254.

(8) The *flame-spread rating* of insulated vinyl siding shall be determined in accordance with CAN/ULC-S102.2, in lieu of ASTM E84 as indicated in ASTM D7793.

Impact analysis

No additional costs are expected to be incurred as a result of replacing CAN/CGSB-41.24-95 by ASTM D3679-17 and ASTM D4477-16 in Table 5.9.1.1. The benefit of this replacement is that standards referenced are relevant and current, were developed through consensus, and represent today's products.

No additional costs are expected to be incurred as a result of adding ASTM D7254-17 and ASTM D7793-17 to Table 5.9.1.1., as materials covered in the standards have been commonly used in Canada for the last 10 years.

This proposed change would simply add references to ASTM standards that are currently in use within these product categories and would provide more material options.

Enforcement implications

Compliance with the new standards can be enforced without additional resources.

Who is affected

Designers, specifiers, manufacturers, contractors, building owners and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

N/A

Submit a comment

Proposed Change 1765

Code Reference(s):	**NBC20 Div.B 9.5. (first printing)** **NBC20 Div.B 9.9.5.3. (first printing)**
Subject:	Accessibility — Anthropometrics
Title:	Projection of Protruding Building Elements
Description:	This proposed change extends the Part 9 requirements on the projection of protruding building elements to most paths of travel.
Related Code Change Request(s):	CCR 685

This change could potentially affect the following topic areas:

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

Problem

The current requirements in Part 9 of the National Building Code of Canada (NBC) address the risks presented by protruding building elements only in public corridors within a means of egress. However, protruding elements in other locations and paths of travel can also present a safety issue for the 5.4% of Canadians 15 years old or older that are living with low vision that cannot be corrected by corrective lenses[1]. According to a study performed by the Association of Education and Rehabilitation of the Blind and Visually Impaired, over 40% of respondents with low vision indicated they have head-level accidents at least once a year and as often as once per month; 12% indicated they have a head-level accident more than once a month[2]. Requirements in Part 3 restrict the location and geometry of protruding building elements in areas of the building that are beyond public corridors within a means of egress, but these requirements have not yet been introduced in Part 9.

Requirements on obstructions in paths of travel that are inconsistent between Parts 3 and 9 may cause confusion and potential injury to building occupants, especially those with low vision.

Part 9 requirements should be aligned with those of Part 3 so that persons with low vision can maintain the same expectations for protection from protruding building elements along paths of travel. This proposed change would harmonize the level of safety and usability of Part 9 buildings with Part 3 buildings with respect to protruding building elements.

References

1. Statistics Canada, "Canadian Survey on Disability Reports: A demographic, employment and income profile of Canadians with disabilities aged 15 years and over, 2017", https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2018002-eng.htm

2. Manduchi, R. and Kurniawan, S. (2011). Mobility-related accidents experienced by people with visual impairment. *AER Journal: Research and Practice in Visual Impairment and Blindness*, 4(2), 44-54.

Justification

This proposed change limits the location and geometry of protruding building elements in most paths of travel in Part 9 buildings by introducing new Subsection 9.5.6. This proposed change would harmonize the level of safety between Part 3 and Part 9 buildings, and help ensure that persons with low vision can maintain consistent expectations about the presence of protrusions in paths of travel in both types of buildings.

To limit the impact on design flexibility, the proposed requirements permit elements that are detectable by canes and exempts paths in service rooms and dwelling units.

PROPOSED CHANGE

[9.5.] 9.5. Design of Areas and Spaces

[9.5.1.] 9.5.1. General

[9.5.1.1.] 9.5.1.1. Method of Measurement

[9.5.1.2.] 9.5.1.2. Combination Rooms

[9.5.2.] 9.5.2. Barrier-Free Design

[9.5.2.1.] 9.5.2.1. General

[9.5.2.2.] 9.5.2.2. Protection on Floor Areas with a Barrier-Free Path of Travel

[9.5.2.3.] 9.5.2.3. Exception for Apartment Buildings

[9.5.3.] 9.5.3. Ceiling Heights

[9.5.3.1.] 9.5.3.1. Ceiling Heights of Rooms or Spaces

[9.5.3.2.] 9.5.3.2. Mezzanines

[9.5.3.3.] 9.5.3.3. Storage Garages

[9.5.4.] 9.5.4. Hallways

[9.5.4.1.] 9.5.4.1. Hallway Width

[9.5.5.] 9.5.5. Doorway Sizes

[9.5.5.1.] 9.5.5.1. Doorway Opening Sizes

[9.5.5.2.] 9.5.5.2. Doorways to Public Water-Closet Rooms

[9.5.5.3.] 9.5.5.3. Doorways to Rooms with a Bathtub, Shower or Water Closet

[9.5.6.] -- Safety in Paths of Travel

[9.5.6.1.] --- Protruding Building Elements

[1] --) Paths of travel shall comply with Sentences 3.3.1.8.(2) and (3).

~~**[9.9.5.3.] 9.9.5.3. Obstructions in Public Corridors**~~

~~**[1] 1)** Except as permitted in Sentence (2), obstructions located within 1~~

~~980 mm of the floor shall not project horizontally more than 100 mm into *exit* passageways, corridors used by the public or *public corridors* in a manner that would create a hazard for visually impaired persons travelling adjacent to walls.~~

~~[2] 2)~~ ~~The horizontal projection of an obstruction referred to in Sentence (1) is permitted to exceed 100 mm where the obstruction extends to less than 680 mm above the floor. (See Note A-3.3.1.8.(2) and (3).)~~

Impact analysis

While it may take some time for designers to get accustomed to applying the proposed requirements for protruding building elements, this proposed change is not expected to increase the cost of construction.

Statistics Canada reports that 5.4% of Canadians who are 15 years old or older live with low vision that cannot be corrected by corrective lenses[1]. This proposed change is expected to improve building safety and usability for persons with low vision who could benefit from the reduced probability of being impacted by an unnoticed protruding building element as they travel along a path of travel.

Reference

1. Statistics Canada, "Canadian Survey on Disability Reports: A demographic, employment and income profile of Canadians with disabilities aged 15 years and over, 2017", https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2018002-eng.htm

Enforcement implications

This proposed change can be enforced using the infrastructure currently in place to enforce the Code. Protruding building elements can be measured with simple measurement tools.

Who is affected

Occupants would be less likely to collide with protruding building elements and risk injury.

Designers and builders would need to ensure that various building features met these requirements.

Authorities having jurisdiction would need to evaluate if protruding building elements comply with Code requirements.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[9.5.1.1.] 9.5.1.1. ([1] 1) no attributions

[9.5.1.2.] 9.5.1.2. ([1] 1) no attributions

[9.5.1.2.] 9.5.1.2. ([2] 2) [F10-OS3.7]

[9.5.2.1.] 9.5.2.1. ([1] 1) no attributions

[9.5.2.2.] 9.5.2.2. ([1] 1) no attributions

[9.5.2.3.] 9.5.2.3. ([1] 1) no attributions

[9.5.2.3.] 9.5.2.3. ([2] 2) no attributions

[9.5.3.1.] 9.5.3.1. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[9.5.3.1.] 9.5.3.1. ([2] 2) [F30-OS3.1] [F10-OS3.7]

[9.5.3.1.] 9.5.3.1. ([3] 3) [F30-OS3.1] [F10-OS3.7]

[9.5.3.1.] 9.5.3.1. ([4] 4) [F30-OS3.1] [F10-OS3.7]

[9.5.3.2.] 9.5.3.2. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[9.5.3.3.] 9.5.3.3. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[9.5.4.1.] 9.5.4.1. ([1] 1) [F10-OS3.7]

[9.5.5.1.] 9.5.5.1. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[9.5.5.1.] 9.5.5.1. ([2] 2) [F10-OS3.7] [F30-OS3.1]

[9.5.5.2.] 9.5.5.2. ([1] 1) [F30-OS3.1] [F10-OS3.7]

[9.5.5.3.] 9.5.5.3. ([1] 1) no attributions

[9.5.5.3.] 9.5.5.3. ([2] 2) [F74-OA2]

[9.5.6.1.] -- ([1] --) [F30-OS3.1] [F73-OS3.1]

~~[9.9.5.3.] 9.9.5.3. ([1] 1) [F30-OS3.1]~~

~~[9.9.5.3.] 9.9.5.3. ([2] 2) no attributions~~

Submit a comment

Proposed Change 1809

Code Reference(s):	**NBC20 Div.B 9.18.6.2. (first printing)**
Subject:	Radon and Soil Gas Mitigation
Title:	Ballast for Ground Cover in Heated Crawl Spaces
Description:	This proposed change clarifies the requirements for proper ballast to weight down the ground cover in heated crawl spaces.

This change could potentially affect the following topic areas:

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

Problem

The provisions found in Clause 9.18.6.2.(2)(a) of Division B of the National Building Code of Canada (NBC) 2020 do not clearly state what is meant by ground cover being evenly weighted down in a heated crawl space.

Ground cover has been shown to balloon as the result of having ballast of incorrect or inconsistent thickness covering it; for example, this ballooning can occur during common operations like running a clothes dryer in a dwelling. This ballooning can cause the soil gas barrier to fail, which leads to soil gases, such as radon, leaking into the livable space of the building. These gases affect the indoor air quality, and the presence of radon can cause an increase in the probability of the building occupants developing lung cancer.

Justification

This proposed change clarifies the type of ballast material that can be applied over the ground cover in a heated crawl space and the thickness of the ballast material, which can be measured by the authority having jurisdiction during construction. This clarification would reduce the probability of a premature soil gas barrier failure, which would reduce the probability of soil gases, such as radon, leaking into the livable space of the building.

PROPOSED CHANGE

[9.18.6.2.] 9.18.6.2. Ground Cover in Heated Crawl Spaces

[1] 1) Where a crawl space is heated, a ground cover consisting of not less than 0.15 mm polyethylene sheet conforming to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction", shall be installed as part of an *air barrier system* in accordance with Subsection 9.25.3.

[2] 2) The ground cover required in Sentence (1) shall have its joints lapped not less than 300 mm, and

[a] a) be sealed and evenly weighted down with not less than 50 mm of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve, or

[b] b) be covered with concrete not less than 50 mm thick.

[3] 3) The perimeter of the ground cover required in Sentence (1) shall be sealed to the *foundation* wall. (See Notes A-9.13.4., A-9.25.3.4. and 9.25.3.6., and A-9.25.3.6.(2) and (3).)

[4] 4) All penetrations of the ground cover required in Sentence (1) shall be sealed against air leakage. (See Subsection 9.25.3.)

Impact analysis

Currently, it is common practice in construction to use granular material as ballast over ground cover in heated crawl spaces. However, the granular material is not always applied at a thickness of 50 mm. If increasing the thickness of the granular material were required to comply with this proposed change, costs would increase by between $\$0.70/m^2$ and $\$1.03/m^2$ for every 25 mm of thickness.

Where sand has been used as ballast instead of granular material, the cost difference ranges from $\$0.66/m^2$ to $\$0.88/m^2$ less for a 50 mm thickness of sand compared to using the same thickness of granular material. However, because sand does not drain as well as granular material and can cause mould growth in a heated crawl space, it is not a suitable substitute for granular material.

The benefit of applying the ballast is a reduction in the probability of the ground cover ballooning, which can cause the ground cover seams to fail. It costs between $300 and $400 to repair damaged ground cover due to ballooning.

Enforcement implications

The proposed change would reduce confusion during inspection about acceptable ballast materials and thicknesses for weighting down ground cover.

Who is affected

This proposed change would affect building occupants by reducing the risk of soil gases and moisture leaking into the building and causing adverse health effects.

For contractors, this proposed change would clarify the requirements for ballast over ground cover and reduce the amount of remedial work that would have been required previously.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[9.18.6.2.] 9.18.6.2. ([1] 1) [F40,F61-OH1.1] [F61-OH1.2]

[9.18.6.2.] 9.18.6.2. ([1] 1) [F61-OS2.3]

[9.18.6.2.] 9.18.6.2. ([1] 1) no attributions

[9.18.6.2.] 9.18.6.2. ([2] 2) [F40,F61-OH1.1] [F61-OH1.2]

[9.18.6.2.] 9.18.6.2. ([2] 2) [F61-OS2.3]

[9.18.6.2.] 9.18.6.2. ([3] 3) [F40-OH1.1]

[9.18.6.2.] 9.18.6.2. ([4] 4) [F40,F61-OH1.1,OH1.2]

[9.18.6.2.] 9.18.6.2. ([4] 4) [F61-OS2.3]

Submit a comment

Proposed Change 1831

Code Reference(s):	**NBC20 Div.B 9.36.2.5. (first printing)**
Subject:	Building Envelope - General
Title:	Insulation of Masonry Fireplaces
Description:	This proposed change clarifies the requirements for insulation of masonry fireplaces.

This change could potentially affect the following topic areas:

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

Problem

Sentence 9.36.2.5.(3) of Division B of the National Building Code of Canada requires a conventional masonry fireplace to be insulated; however, the requirements are onerous, impractical to apply, and conflict with other applicable requirements for conventional masonry fireplaces.

There exists no authoritative literature (e.g., technical papers, guides or consensus-based standards) that details the design and construction of an insulated conventional masonry fireplace or that offers deemed compliance.

This situation results in difficulties for Code users when demonstrating and enforcement officials when determining compliance.

Justification

The challenges associated with insulating a masonry fireplace include

- the inability to insulate conventional masonry fireplaces to Code without encountering conflicting requirements while still complying with other

construction requirements related to fire safety,
- difficulties for authorities having jurisdiction when verifying the compliance of a prescribed design or construction,
- the absence of a prescriptive consensus standard to reference and the absence of comprehensive prescriptive details and descriptions within authoritative literature pertaining to insulating conventional masonry fireplaces, and
- the objective of Section 9.36. requirements to minimize heat loss through the building envelope.

Given these challenges, it is proposed that:

- masonry fireplaces be uninsulated (as they were in the past and currently are in practice), which would eliminate conflicts between Code requirements, facilitate compliance, and retain a demonstrated history of known performance,
- the current requirements for the minimum RSI value of a masonry fireplace remain unchanged, i.e., not less than 55% of that required by Tables 9.36.2.6.-A and -B except where trade-off options are used,
- the trade-off options be used
    - to reduce the prescribed minimum RSI value of a conventional masonry fireplace to a lower value that is representative of the RSI value of an uninsulated fireplace, and
    - to correspondingly increase the R-value of an adjacent element in the building envelope, thereby ensuring that heat loss through the building envelope remains unchanged from the current (insulated) requirements, and
- a minimum RSI value for a conventional masonry fireplace be introduced, facilitating trade-off options, equivalent to that offered by a triple-wythe clay brick masonry wall (290 mm). By using thermal resistance values from Table A-9.36.2.4.(1)-D, this minimum RSI value would be calculated to be 290 × 0.0007 = 0.203 RSI (R-1.2).

Requiring that masonry fireplaces be uninsulated would avoid conflicts between Code requirements and would ensure that the requirements can be applied in practice without fire hazards. Keeping the current minimum RSI requirements would ensure there is no additional heat loss from the building envelope that would be caused by this proposed change.

PROPOSED CHANGE

NBC20 Div.B 9.36.2.5. (first printing)

[9.36.2.5.] 9.36.2.5. Continuity of Insulation

[1] 1) Except as provided in Sentences (2) to (10) and in Sentence 9.36.2.4.(3) regarding balcony and canopy slabs, and except for clearances around components required for fire safety reasons, interior *building* components that meet *building* envelope components and major structural members that partly penetrate the *building* envelope shall not break the continuity

of the insulation and shall not decrease the effective thermal resistance at their projected area to less than that required in Articles 9.36.2.6. and 9.36.2.8. (See Note A-9.36.2.5.(1).)

[2] 2) Where an interior wall, *foundation* wall, *firewall*, *party wall* or structural element penetrates an exterior wall or insulated roof or ceiling and breaks the continuity of the plane of insulation, the penetrating element shall be insulated

[a] a) on both of its sides, inward or outward from the *building* envelope, for a distance equal to 4 times its uninsulated thickness to an effective thermal resistance not less than that required for exterior walls as stated in Table 9.36.2.6.-A or 9.36.2.6.-B,

[b] b) within the plane of insulation of the penetrated element to an effective thermal resistance not less than 60% of that required for the penetrated element, or

[c] c) within itself to an effective thermal resistance not less than that required for the penetrated element.

(See Note A-9.36.2.5.(2).)

[3] 3) Where a masonry fireplace or flue penetrates an exterior wall and breaks the continuity of the plane of insulation, the fireplace or flue shall ~~it shall be insulated within the plane of insulation of the wall or within itself to an effective thermal resistance not less than 55% of that required for the exterior wall as stated in Table 9.36.2.6.-A or 9.36.2.6.-B (See Note A-9.36.2.5.(3).)~~

[a] --) be uninsulated,

[b] --) be considered as an opaque *building* assembly, and

[c] --) except as provided in Sentence (4), have an effective thermal resistance not less than 55% of that required for the exterior wall as stated in Table 9.36.2.6.-A or 9.36.2.6.-B.

[4] --) For the purpose of demonstrating compliance using the trade-off options described in Article 9.36.2.11.,

[a] --) the effective thermal resistance required by Clause (3)(c) is permitted to be reduced in accordance with Sentence 9.36.2.11.(2), but need not comply with Sentence 9.36.2.11.(6), and

[b] --) the fireplace or flue shall be assigned an RSI value of 0.203 unless a higher effective thermal resistance is determined in accordance with Article 9.36.2.2.

[5] 4) Where an ornamentation or appendage penetrates an exterior wall and breaks the continuity of the plane of insulation, the penetrating element shall be insulated

[a] a) on both of its sides, inward or outward from the *building* envelope, for a distance equal to 4 times the insulated thickness of the exterior wall to an effective thermal resistance not less than that required for the wall as stated in Table 9.36.2.6.-A or 9.36.2.6.-B,

[b] b) within the plane of insulation of the wall to an effective thermal resistance not less than 55% of that required for the exterior wall,

or

[c] c) within the penetrating element to an effective thermal resistance not less than that required for the exterior wall.

[6] 5) Except as provided in Sentences (9) and (10), where two planes of insulation are separated by a *building* envelope assembly and cannot be physically joined, one of the planes of insulation shall be extended for a distance equal to at least 4 times the thickness of the assembly separating the two planes. (See Note A-9.36.2.5.(5).)

[7] 6) Except as provided in Sentence (7) and Article 9.36.2.11., where mechanical, plumbing or electrical system components, such as pipes, ducts, conduits, cabinets, chases, panels or recessed heaters, are placed within and parallel to a wall assembly required to be insulated, the effective thermal resistance of that wall at the projected area of the system component shall be not less than that required by Tables 9.36.2.6.-A, 9.36.2.6.-B, 9.36.2.8.-A and 9.36.2.8.-B (See Note A-9.36.2.5.(6).)

[8] 7) The effective thermal resistance of a wall at the projected areas of plumbing and electrical system components, such as plumbing vent pipes, conduits, and electrical outlet and switch boxes, need not comply with Sentence (6), provided

[a] a) the effective thermal resistance at the projected area of the system component is not less than 60% of that required in Articles 9.36.2.6. and 9.36.2.8., and

[b] b) the insulation is continuous on the cold side behind the system component.

[9] 8) Except as permitted by Article 9.36.2.11., where mechanical ducts, plumbing pipes, conduits for electrical services or communication cables are placed within the insulated portion of a floor or ceiling assembly, the effective thermal resistance of the assembly at the projected area of the ducts, pipes, conduits or cables shall be not less than 2.78 ($m^2 \times K$)/W.

[10] 9) Joints and junctions between walls and other *building* envelope components shall be insulated in a manner that provides an effective thermal resistance that is no less than the lower of the minimum values required for the respective adjoining components. (See Note A-9.36.2.5.(9).)

[11] 10) Sentence (1) does not apply where the continuity of the insulation is interrupted

[a] a) between the insulation in the *foundation* wall and that of the floor slab,

[b] b) by an integral perimeter footing of a slab-on-grade (see Sentences 9.25.2.3.(5) and 9.36.2.8.(8)), or

[c] c) at the horizontal portion of a *foundation* wall that supports masonry veneer and is insulated on the exterior.

Note A-9.36.2.5.(3) Insulation of Masonry Fireplaces.

The two insulation options for masonry fireplaces and flues presented in Sentence 9.36.2.5.(3) are consistent with those presented in Sentences 9.36.2.5.(2) and (4) with the exception of the option to insulate the sides of the penetrating element to 4 times the thickness of the penetrated wall, which would not be an energy-efficient option in cases where the penetration by the fireplace or flue is several feet wide. Figures A-9.36.2.5.(3)-A and A-9.36.2.5.(3)-B illustrate the options for achieving a continuously insulated exterior wall where it is penetrated by a masonry fireplace or flue.

Figure [A-9.36.2.5.(3)-A] A-9.36.2.5.(3)-A
Masonry fireplace insulated within itself

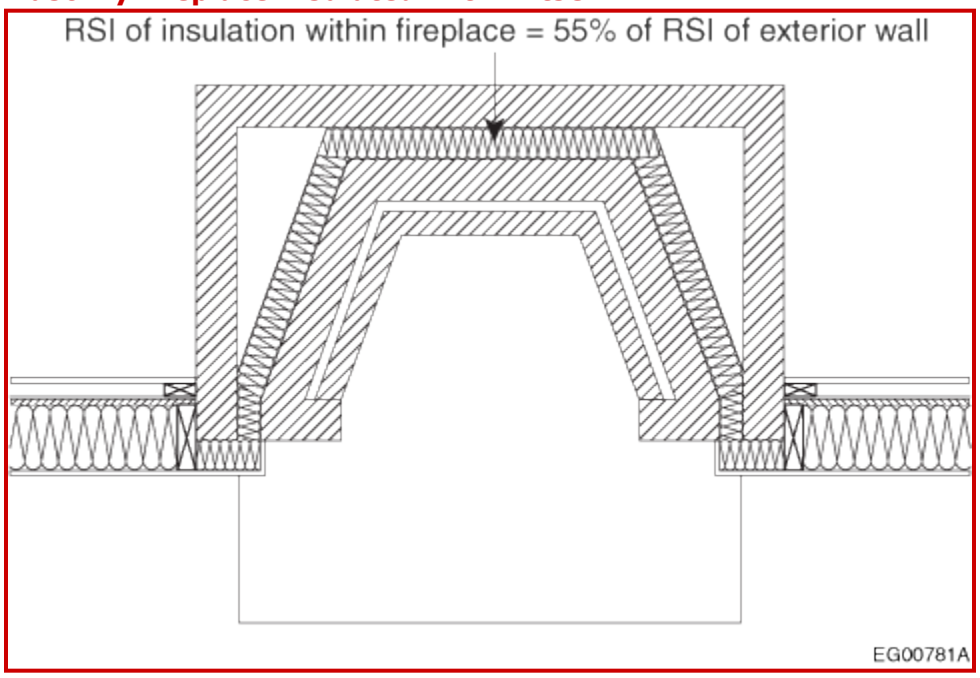
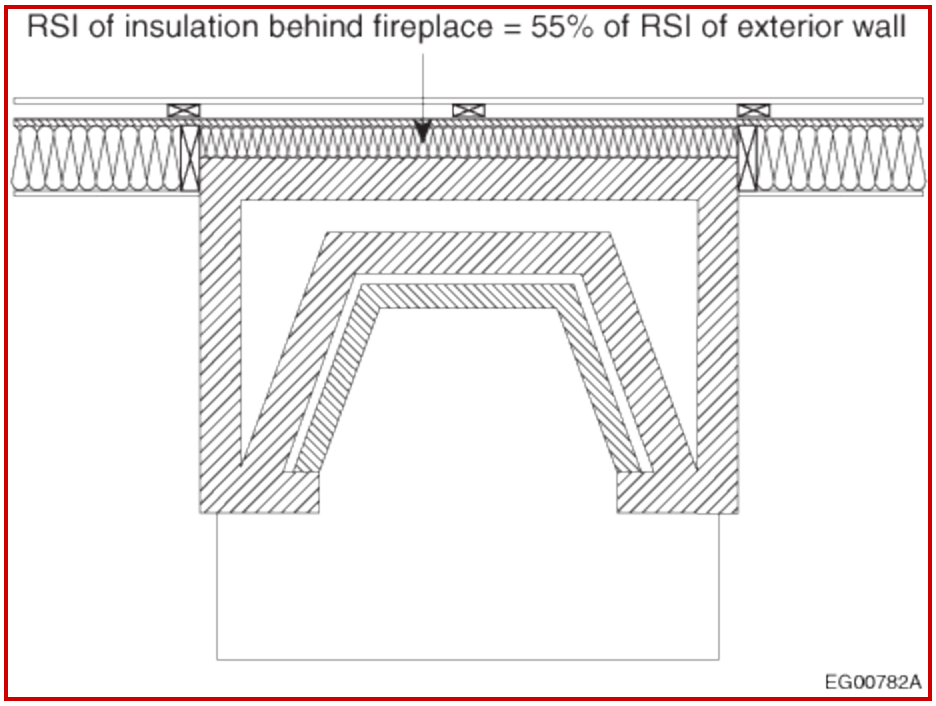


Figure [A-9.36.2.5.(3)-B] A-9.36.2.5.(3)-B
Masonry fireplace insulated within plane of insulation of exterior wall



Impact analysis

This proposed change is not expected to result in any additional costs to Code users. Also, it is not expected to result in increased energy consumption. It addresses potential fire hazards by permitting the construction of a masonry fireplace prescriptively, which is otherwise prohibited.

Enforcement implications

This proposed change could be enforced by the existing Code enforcement infrastructure without requiring additional resources. The current provisions, however, are without authoritative prescribed solutions and means to deem compliance. This proposed change does not have enforcement implications beyond the practices required to enforce the existing Code provisions.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.2.5. (first printing)

[9.36.2.5.] 9.36.2.5. ([1] 1) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([2] 2) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([3] 3) [F92,F93-OE1.1]

[9.36.2.5.] 9.36.2.5. ([5] 4) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([6] 5) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([7] 6) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([8] 7) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([9] 8) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([10] 9) [F92-OE1.1]

[9.36.2.5.] 9.36.2.5. ([11] 10) no attributions

Submit a comment

Proposed Change 1823

Code Reference(s):	**NBC20 Div.B 9.36.2.7. (first printing)** **NBC20 Div.B 9.36.5.3. (first printing)** **NBC20 Div.B 9.36.7.3. (first printing)**
Subject:	Fenestration
Title:	Thermal Characteristics of Fenestration and Doors
Description:	This proposed change places a limit on the maximum solar heat gain coefficient for fenestration and doors based on the fenestration and door area to gross wall area ratio.

This change could potentially affect the following topic areas:

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

Problem

Currently, Article 9.36.2.7. of Division B of the National Building Code of Canada (NBC) 2020 allows Code users to choose either the overall thermal transmittance (U-value) or Energy Rating (ER) path to comply with the Code requirements on the thermal characteristics of fenestration and doors.

The Code does not adequately address the risk of the overheating of buildings due to the relationship between the solar heat gain coefficient (SHGC) of glazing and the fenestration and door area to gross wall area ratio (FDWR). Buildings that have large areas of high solar heat gain from fenestration on orientations with significant solar exposure are the most susceptible to overheating. East-west orientations in particular may cause higher peak cooling loads and overheating potential. In homes using the prescriptive path for compliance that have mechanical cooling, this situation can result in higher energy use; and, in homes that do not have mechanical cooling, this situation can result in overheating, leading to a higher likelihood of homeowners installing mechanical cooling systems in future that are not included in the energy model used at the time of construction. These risks may be further amplified when solar heat gain energy is beneficial to modeling for compliance with energy-efficiency requirements.

Conversely, in the NBC 2020, Sentence 9.36.7.3.(2) requires that peak cooling in the proposed house be lower than that of the reference house. The reference house is always modeled with an SHGC of 0.26 for all fenestration, which is considered a very low solar gain coefficient. Use of this SHGC can cause non-compliance in homes that otherwise appear to meet the intent of the Code and may be overly restrictive to Code users.

Justification

An ongoing concern about the potential overheating of homes and the related impact on energy use was identified. While Sentence 9.36.8.6.(4) in the prescriptive compliance path attempts to address the potential for overheating by restricting ER compliance to orientations with less than 17% FDWR, there are no explicit limitations on high solar heat gain from fenestration, which can allow for the selection of high solar heat gain fenestration that is compliant with the current requirement. This situation can result in homes that use the prescriptive path for compliance having high energy usage for cooling, causing discomfort to occupants, and increasingly causing their owners to install mechanical cooling after occupancy that is not accounted for in the energy compliance models of the Code.

A study completed by NRC titled, "Climate Resilience Buildings: Guideline for management of overheating risk in residential buildings," [1] in 2021 (updated in 2022) in section 10.1 identifies 0.40 SHGC or lower as a notional threshold for low solar gain and shows that the selection of low solar gain fenestration correlates with a reduced risk of overheating in homes.

This proposed change restricts the SHGC to 0.45 in the prescriptive path in cases where the FDWR is not more than 17%, and to 0.40 in cases where the FDWR is between 17% and 22%. In cases where the FDWR exceeds 22% or when homeowners choose fenestration with a higher SHGC than prescribed, homeowners will be required to use the performance path for compliance.

Using the performance path, NBC Sentence 9.36.7.3.(2) requires that the Code user demonstrate compliance in the proposed house by achieving a peak cooling load that is lower than that of the reference house. While this approach is intended to limit the risk of houses overheating, in application it can cause houses that appear to comply with the intent of the Code to fail the compliance metric, causing undue hardship for Code users. This situation is due in part to the use of an SHGC of 0.26 for all fenestration in the reference house (Clause 9.36.5.14.(2)(c)). Combined with the procedure for redistribution of windows in the reference house (Sentence 9.36.5.14.(5)), a peak cooling value that is unduly restrictive can be established.

Examples of types of houses that may be affected include low-load houses with small volumes, houses with overall small cooling loads, and houses with mechanical cooling installed that is already accounted for in the energy model.

It was determined that revising the SHGC used in the reference house to a higher value would trigger substantial changes to the already established tables of prescriptive points (Subsection 9.36.8.), as well as making compliance with the energy performance tiers more difficult by reducing the heating energy required by the reference house. An alternative approach was proposed that introduces an additional 10% allowance when comparing the peak cooling loads of the proposed and reference homes.

The Natural Resources Canada (NRCan)-funded Canadian Home Builders' Association (CHBA) Net Zero Home Labelling Program was considered to assess the impact of the additional 10% allowance. It was determined that a complete solution would require the following three changes to the compliance requirements to prevent overheating in NBC Article 9.36.7.3.:

1. A relaxation of the proposed-to-reference-house comparison, allowing for the proposed house to achieve compliance with a design cooling load of 110% that of the reference house.
2. The introduction of a cooling intensity metric that limits the design cooling intensity of the proposed house to 4.5 W/m^3.
3. The installation of a mechanical cooling system in the proposed house that has the capacity to meet the peak cooling load, and that is included in the energy model calculation for compliance with NBC Article 9.36.7.2.

Taken together, the above-mentioned changes would provide relief to the owners of houses at the margins of compliance with the current requirements that meet the intent of the overheating requirements. The above-mentioned changes would also reduce the risk of overheating in houses that comply with the requirements using the prescriptive path.

The narrow scope of the work related to the above-mentioned changes limits the solutions in this proposed change to addressing concerns about overheating as they relate to energy use in houses. Overheating due to extreme climate events was deemed to be outside of scope and is not directly addressed. While this proposed change may form part of a broader solution to the overheating issue, it should not be construed as having that goal.

PROPOSED CHANGE

NBC20 Div.B 9.36.2.7. (first printing)

[9.36.2.7.] 9.36.2.7. Thermal Characteristics of Fenestration, Doors and Skylights

[1] 1) Except as provided in ~~Sentences (2) to (8)~~Sentences (3)-2025 to (9)-2025 and Article 9.36.2.11., fenestration and doors shall have an overall thermal transmittance (U-value) not greater than, or an Energy Rating not less than, the values listed in Table 9.36.2.7.-A for the applicable heating-degree day category. (See Note A-9.36.2.7.(1) and (3)~~Note A-9.36.2.7.(1) and (2)~~.)

Table [9.36.2.7.-A] 9.36.2.7.-A
Required Thermal Characteristics of Fenestration and Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([1] 1)

Components	Thermal Characteristics (1)	Heating Degree-Days of *Building* Location, (2) in Celsius Degree-Days					
		Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
Fenestration (3) and doors	Max. U-value, W/(m^2×K)	1.84	1.84	1.61	1.61	1.44	1.44
	Min. Energy Rating	21	21	25	25	29	29

Notes to Table [9.36.2.7.-A] 9.36.2.7.-A:

(1) See Note A-Table 9.36.2.7.-A.

(2) See Article 1.1.3.1.

(3) Except skylights (see Sentence (3)-2025~~Sentence (2)~~) and glass block assemblies (see Sentence (5)-2025~~Sentence (4)~~).

[2] --) The solar heat gain coefficient of fenestration and doors in a given orientation shall not be greater than the value listed in Table 9.36.2.7.-B-2025 for the fenestration and door area to gross wall area ratio (FDWR) in that orientation.

Table [9.36.2.7.-B]
Solar Heat Gain Coefficient of Fenestration and Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([3] 2)

Fenestration and door area to gross wall area ratio (FDWR)	Maximum solar heat gain coefficient of fenestration and doors
FDWR < 17%	0.45
17% < FDWR < 22%	0.40
FDWR > 22%	0.26

[3] 2) Skylights shall have an overall thermal transmittance not greater than the values listed in ~~Table 9.36.2.7.-B~~Table 9.36.2.7-C-2025 for the applicable heating-degree day category. (See Note A-9.36.2.7.(1) and (3)~~Note A-9.36.2.7.(1) and (2)~~.)

Table [9.36.2.7.-C] 9.36.2.7.-B
Overall Thermal Transmittance of Skylights
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([3] 2)

	Heating Degree-Days of *Building* Location, (1) in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
Component	Maximum Overall Thermal Transmittance, W/(m^2×K)					
Skylights	2.92	2.92	2.75	2.75	2.41	2.41

Note to Table [9.36.2.7.-C] 9.36.2.7.-B:

(1) See Article 1.1.3.1.

[4] 3) Except for site-assembled or site-glazed factory-made fenestration products, curtain wall construction, and site-built windows and glazed doors that are tested in accordance with Sentence 9.36.2.2.(3), site-built windows and glazed doors need not comply with Sentence (1), provided they are constructed in accordance with one of the options presented in ~~Table 9.36.2.7.-C~~Table 9.36.2.7.-D for the applicable climate zone. (See Note A-9.36.2.7.(4)~~Note A-9.36.2.7.(3)~~.)

Table [9.36.2.7.-D] 9.36.2.7.-C
Compliance Options for Site-built Windows and Glazed Portion of Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([4] 3)

Component	Description of Component	Compliance Options							
		Climate Zones 4 and 5			Climate Zones 6 and 7A			Climate Zones 7B and 8	
		≤ 3999 HDD			4000 to 5999 HDD			≥ 6000 HDD	
		1	2	3	1	2	3	1	2
Frame	non-metallic	Ö	Ö	—	Ö	Ö	—	Ö	Ö
	thermally broken metallic	—	—	Ö	—	—	Ö	—	—
Glazing	double	—	Ö	—	—	—	—	—	—
	triple	Ö	—	Ö	Ö	Ö	Ö	Ö	Ö
	argon-filled	—	Ö	—	Ö	—	Ö	—	Ö
Low-e coating	none	Ö	—	—	—	—	—	—	—
	number of panes with ≤ 0.10	—	≥ 1	—	—	—	—	≥ 2	—
	number of panes with ≤ 0.20	—	—	2	≥ 1	2	≥ 2	—	≥ 2
Spacer	size, mm	12.7	—	12.7	≥ 12.7	12.7	≥ 12.7	≥ 12.7	≥ 12.7
	non-metallic	—	Ö	—	—	—	—	—	—

[5] 4) Glass block assemblies separating *conditioned space* from unconditioned space or the exterior shall have

[a] a) an overall thermal transmittance of not more than 2.9 W/(m^2×K), and

[b] b) a total aggregate area of not more than 1.85 m^2.

[6] 5) One door separating a *conditioned space* from an unconditioned space or the exterior is permitted to have an overall thermal transmittance up to 2.6 W/(m^2×K).

[7] 6) Storm windows and doors need not comply with Sentence (1).

[8] 7) Vehicular access doors separating a *conditioned space* from an unconditioned space or the exterior shall have a nominal thermal resistance of not less than 1.1 (m^2×K)/W.

[9] 8) Access hatches separating a *conditioned space* from an unconditioned space shall be insulated to a nominal thermal resistance of not less than 2.6 (m^2×K)/W.

NBC20 Div.B 9.36.5.3. (first printing)

[9.36.5.3.] 9.36.5.3. Compliance

(See Note A-9.36.5.3.)

[1] 1) The performance compliance calculations shall determine the annual energy

consumption of the proposed house and the house energy target of a reference house in accordance with

[a] a) this Subsection, or

[b] b) the EnerGuide Rating System, version 15, and Sentence (2).

(See Note A-9.36.5.3.(1).)

[2] 2) The annual energy consumption of the proposed house shall not exceed the house energy target of the reference house. (See Note A-9.36.5.3.(2).)

[3] 3) In establishing the house energy target, *building* components, systems and assemblies shall be accounted for in accordance with the prescriptive requirements of Subsections 9.36.2. to 9.36.4. for the climate zone under consideration.

[4] 4) In establishing the annual energy consumption, *building* components, systems and assemblies that are addressed in the scope of the prescriptive requirements of Subsections 9.36.2. to 9.36.4. shall be accounted for for the climate zone under consideration.

[5] 5) Where the construction techniques or *building* components, systems or assemblies used are more energy-efficient than those prescribed by the prescriptive requirements, the performance compliance calculations are permitted to take this increased performance level into account in the determination of the annual energy consumption, provided it can be quantified and is not dependent on occupant interaction.

[6] 6) Both the proposed and reference houses shall be modeled using the same climatic data, *soil* conditions, operating schedules in Article 9.36.5.4. and temperature set-points.

[7] --) Where a cooling system is not installed in the proposed house, the peak cooling load shall be modeled for both the proposed and reference houses by using additional models with appropriately sized space-cooling equipment serving all *conditioned spaces*. (See Note A-9.36.5.3.(7).)

[8] --) The proposed house described in Sentence (7) shall have

[a] --) a peak cooling load not greater than 110% of the peak cooling load for the reference house, or

[b] --) a design cooling intensity not greater than 4.5 W/m^3.

Note A-9.36.5.3.(7). Peak Cooling Load.

The term "peak cooling load" refers to the highest hourly-averaged rate of mechanical cooling required to maintain the building or house at the cooling set-point temperature over the course of the year. The peak cooling load must reflect the rate at which heat is extracted from the conditioned space and not the rate of energy consumption of any cooling equipment. Some modeling software only reports peak cooling loads when the building or house model is configured with an air conditioner; in such cases, the model should include air-conditioning for the purpose of computing the peak cooling load. If the modeling software does not report peak hourly loads, the design cooling load may be used instead.

The peak cooling load criterion is intended to reduce the risk that houses will overheat in the summer as a consequence of the energy reduction measures required by the Code. To meet this goal, in houses without cooling systems, the proposed house must achieve a peak cooling load that is no more than 110% that of the reference house or a design cooling intensity of not more than 4.5 W/m^3. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.5. may nevertheless be prone to overheating in some circumstances. This requirement does not prescribe the installation of cooling systems in new construction.

NBC20 Div.B 9.36.7.3. (first printing)

[9.36.7.3.] 9.36.7.3. Energy Performance Improvement Compliance Calculations

[1] 1) Except where otherwise stated in this Article, the proposed and reference houses shall be modeled in accordance with Subsection 9.36.5. to determine

[a] a) the annual energy consumption of the proposed house and the house energy target of the reference house,

[b] b) the annual gross space heat loss of the proposed and reference houses calculated in accordance with Sentence (5), and

[c] c) the peak cooling load of the proposed and reference houses ~~(see Sentence (4))~~.

(See Note A-9.36.7.3.(1).)

~~**[2] 2)** The peak cooling load for the proposed house shall not be greater than the peak cooling load for the reference house. (See Sentence (4).)~~

[3] 3) Except for energy performance tier 1, where space heating is provided by a heat pump in the proposed house, the reference house shall be modeled using

[a] a) equipment of the same type as the secondary or back-up system in the proposed house, but made to comply with the energy efficiency requirements of Article 9.36.3.10., or

[b] b) electric resistance heaters, where no back-up is provided in the proposed house.

~~**[4] 4)** Where cooling systems are not installed in the proposed house, both the proposed and reference houses shall have additional models using appropriately sized space-cooling equipment serving all *conditioned spaces* to determine the peak cooling load. (See Note A-9.36.7.3.(4).)~~

[5] 5) The annual gross space heat loss shall be calculated as the sum of the cumulative heat loss from

[a] a) conduction across opaque and transparent elements of the *building* envelope,

[b] b) air infiltration and exfiltration, and

[c] c) mechanical ventilation.

(See Note A-9.36.7.3.(5).)

[6] 6) The percent heat loss reduction shall be calculated by subtracting the annual gross space heat loss of the proposed house from the annual gross space heat loss of the reference house and dividing the result by the annual gross space heat loss of the reference house.

[7] 7) The percent improvement shall be calculated by subtracting the annual energy consumption of the proposed house from the house energy target of the reference house and dividing the result by the house energy target of the reference house.

[8] 8) The percent house energy target shall be calculated by dividing the annual energy consumption of the proposed house by the house energy target of the reference house.

[9] 9) The airtightness value used in the energy model for the proposed house shall be

[a] a) the airtightness value set out in Clause 9.36.5.10.(9)(a), or

[b] b) where an airtightness test is to be conducted, a design airtightness, until the airtightness has been measured in accordance with Sentence 9.36.6.3.(1) and the appropriate airtightness value set out in Sentence 9.36.5.10.(9) can be selected.

(See Note A-9.36.7.3.(9).)

~~**Note A-9.36.7.3.(4) Peak Cooling Load.**~~

~~The term "peak cooling load" refers to the highest hourly-averaged rate of mechanical cooling required to maintain the building or house at the cooling set-point temperature over the course of the year. The peak cooling load must reflect the rate at which heat is extracted from the conditioned space, and not the rate of energy consumption of any cooling equipment.~~

~~Some modeling software only report peak cooling loads when the building or house model is configured with an air conditioner; in such cases, the model should include air-conditioning for the purpose of computing the peak cooling load. If the modeling software does not report peak hourly loads, the design cooling load may be used instead.~~

~~The peak cooling load criteria is intended to reduce the risk that houses built under the tiered energy performance compliance path will overheat in the summer. To meet this goal, the proposed house must achieve a peak cooling load that is no more than that of the reference house. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.5. may nevertheless be prone to overheating in some circumstances. Instead, houses complying with this modeling requirement should be no more prone to overheating than houses constructed under other energy efficiency compliance paths in the Code. This requirement does not prescribe the installation of cooling systems in new construction nor can the installation of air-conditioning be used as an alternative compliance path for houses not meeting this requirement.~~

Impact analysis

This proposed change would restrict the use of windows with a high solar heat gain coefficient (SHGC), which may initially result in higher construction costs for some builders. High solar heat gain windows (under the Energy Rating path) generally cost less than the equivalent low SHGC windows. However, it is noted that mid- and low-SHGC glazing options are becoming increasingly available and cost-competitive as demand for this product type increases. As of June 2023, the difference in manufacturer's suggested retail unit price is $100 between low- and high-SHGC windows that are 48 in. × 48 in. in a double pane vinyl casement.

This proposed change would result in a lower operational cost to homeowners by reducing the cost of air-conditioning where cooling systems are installed and by limiting the discomfort of overheating where they are not. This proposed change has the additional benefit of reducing the likelihood of low SEER air conditioners being added or retrofitted by homeowners after closing that would not have been considered in the energy calculation at the time of construction. This situation would represent an increase in energy use in the house as a consequence of the requirements related to glazing selection, which are intended to reduce energy use, and would result in the additional energy use being omitted from the calculations. The National Research Council of Canada (NRC), Natural Resources Canada (NRCan) and Canada Mortgage and Housing Corporation (CMHC), with contributions from 37 companies, studied the impact of using glazing systems with high versus low solar heat gain in the webpage titled, "Low-Solar and High-Solar Gain Glazings" [2]. The results compiled throughout North America and the results for 10 Canadian locations indicated the following:

- High solar heat gain glazing systems offered 13% to 17% energy cost savings compared to conventional windows and offered annual energy cost savings of $117 to $354.
- Low solar heat gain glazing systems offered 8% to 10% energy cost savings compared to conventional windows and offered annual energy cost savings from $71 to $203.

Another study conducted by CanmetENERGY-Ottawa (NRCan) observed that, for a typical window-to-wall ratio, low-SHGC windows reduce the peak cooling load by 0.4 ton to 1 ton depending on the orientation. This translates into a savings of $6 to $15 for each heating period of 24 hours.

As a benefit to builders, this proposed change would help reduce customer discomfort and costly retrofits as a result of customer call-backs. Further, the additional compliance options introduced in the performance path in Article 9.36.5.3. would increase flexibility in compliance for builders by providing three options instead of only one. Anecdotal feedback indicated that the use of the performance path for compliance often results in net-cost reductions for builders, where the costs of energy modeling are offset by trade-offs in specifications that may not be available under the prescriptive path method.

References

[1] Laouadi A., Bartko M., Gaur A., Lacasse M.A., "Climate Resilience Buildings: Guideline for management of overheating risk in residential buildings," National Research Council, CRBCPI-Y4-10, April 1, 2021, including revisions released on January 10, 2022 and February 16, 2022: nrc-publications.canada.ca/eng/view/ft/?id=9c60dc19-ca18-4f4c-871f-2633f002b95c&dp=2&dsl=en

[2] Natural Resources Canada, Low-Solar and High-Solar Gain Glazings, website: https://natural-resources.canada.ca/energy/efficiency/data-research-and-insights-energy-efficiency/housing-innovation/low-solar-and-high-solar-gain-glazings/5139

Enforcement implications

This proposed change can be enforced by the existing Code enforcement infrastructure without additional resources. There are no enforcement implications beyond the practices required to enforce the existing Code provisions.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.2.7. (first printing)

[9.36.2.7.] 9.36.2.7. ([1] 1) [F92-OE1.1]

[9.36.2.7.] -- ([2] --) [F95-OE1.1]

[9.36.2.7.] 9.36.2.7. ([3] 2) [F92-OE1.1]

[9.36.2.7.] 9.36.2.7. ([4] 3) no attributions

[9.36.2.7.] 9.36.2.7. ([4] 3) [F92-OE1.1]

[9.36.2.7.] 9.36.2.7. ([5] 4) [F92-OE1.1]

[9.36.2.7.] 9.36.2.7. ([6] 5) [F92-OE1.1]

[9.36.2.7.] 9.36.2.7. ([7] 6) no attributions

[9.36.2.7.] 9.36.2.7. ([8] 7) [F92-OE1.1]

[9.36.2.7.] 9.36.2.7. ([9] 8) [F92-OE1.1]

NBC20 Div.B 9.36.5.3. (first printing)

[9.36.5.3.] 9.36.5.3. ([1] 1) no attributions

[9.36.5.3.] 9.36.5.3. ([2] 2) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([3] 3) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([4] 4) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([5] 5) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([6] 6) [F99-OE1.1]

[9.36.5.3.] -- ([7] --) [F95,F99-OE1.1]

[9.36.5.3.] -- ([8] --) [F95,F99-OE1.1]

NBC20 Div.B 9.36.7.3. (first printing)

[9.36.7.3.] 9.36.7.3. ([1] 1) no attributions

~~**[9.36.7.3.] 9.36.7.3. ([2] 2) [F95-OE1.1]**~~

[9.36.7.3.] 9.36.7.3. ([3] 3) no attributions

[9.36.7.3.] 9.36.7.3. ([3] 3) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]

~~**[9.36.7.3.] 9.36.7.3. ([4] 4) no attributions**~~

[9.36.7.3.] 9.36.7.3. ([5] 5) [F90,F91,F92,F93,F95,F100-OE1.1]

[9.36.7.3.] 9.36.7.3. ([6] 6) no attributions

[9.36.7.3.] 9.36.7.3. ([6] 6) [F99-OE1.1]

[9.36.7.3.] 9.36.7.3. ([7] 7) [F99-OE1.1]

[9.36.7.3.] 9.36.7.3. ([8] 8) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.7.3.] 9.36.7.3. ([9] 9) [F90,F91,F92,F93,F95,F100-OE1.1]

Submit a comment

Proposed Change 1664

Code Reference(s):	**NBC20 Div.B 9.36.2.11. (first printing)**
Subject:	Building Envelope - General
Title:	Option for Insulation Under Ducts (Factory-Constructed Buildings)
Description:	The proposed change updates Sentence 9.36.2.11.(6) to provide an alternative to the existing effective thermal resistance requirement for insulation under trunk ducts installed below insulated floor framing in factory-constructed buildings.
Related Code Change Request(s):	CCR 811

This change could potentially affect the following topic areas:

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

Problem

NBC Sentence 9.36.2.5.(8) requires that the insulation under ducts have an effective thermal resistance (RSI) not less than 2.78 (R15.78). This requirement is problematic for trunk ducts in some factory-constructed buildings due to the dimensional limitations specified in transportation regulations. Sentence 9.36.2.5.(8) refers to Article 9.36.2.11. as an alternative to compliance with the prescriptive RSI value of 2.78 (R15.78).

In developing the trade-off calculations, the limits on the acceptable reduction in effective thermal resistance were not considered. According to Sentence 9.36.2.11.(6), the acceptable reduction in effective thermal resistance of floor assemblies must result

in an RSI value not less than 60% of the RSI value required in Article 9.36.2.6., i.e., RSI 2.80 (R15.9) for Zones 4 to 6 and RSI 3.01 (R17.09) for Zones 7A to 8. Given these limits, the trade-offs provide no relief from the prescriptive requirement.

For the general case, Clause 9.36.3.2.(3)(b) requires that ducts installed outside the plane of insulation in the building envelope be insulated to not less than the level required for exterior walls. Sentence 9.36.3.2.(5) allows the level of insulation under ducts installed under floor framing to be reduced to not less than RSI 2.11, provided that additional insulation is installed on the sides of the duct to maintain the required level of performance.

Justification

The proposed change does not compromise the minimum required level of energy performance.

The change is intended to allow reduced levels of insulation under trunk ducts installed under insulated floor framing and will make the permitted reduction consistent with what is allowed when the duct is installed outside the building envelope.

PROPOSED CHANGE

[9.36.2.11.] 9.36.2.11. Trade-off Options for Above-ground Building Envelope Components and Assemblies

(See Note A-9.36.2.11.)

[1] 1) Subject to the limitations stated in Sentences (6) to (8), the trade-off options described in Sentences (2) to (4) apply only to above-ground *building* envelope components and assemblies, or portions thereof, of a single *building*.

[2] 2) The effective thermal resistance of one or more above-ground opaque *building* envelope assemblies is permitted to be less than that required in Article 9.36.2.6., provided

[a] a) the total areas of all proposed and reference assemblies are equal,

[b] b) the effective thermal resistance of one or more other proposed above-ground opaque *building* envelope assembly areas is increased to more than that required by Article 9.36.2.6., and

[c] c) the sum of the areas of all traded above-ground opaque *building* envelope assemblies divided by their respective effective thermal resistance is less than or equal to what it would be if all assemblies complied with Article 9.36.2.6.

(See Notes A-9.36.2.11.(2) and A-9.36.2.11.(2) and (3).)

[3] 3) The effective thermal resistance of one or more windows, as calculated in accordance with Sentence (5), is permitted to be less than that required

in Article 9.36.2.7., provided

[a] a) the total areas of all traded windows are equal,

[b] b) the traded windows are located in the same orientation,

[c] c) the effective thermal resistance of one or more other windows is increased to more than that required by Article 9.36.2.7., and

[d] d) the sum of the areas of all traded windows divided by their respective effective thermal resistance is less than or equal to what it would be if all windows complied with Article 9.36.2.7.

(See Notes A-9.36.2.11.(3) and A-9.36.2.11.(2) and (3).)

[4] 4) The effective thermal resistance of one or more portions of floor insulation or ceiling insulation in attics under sloped roofs in *buildings* that are one *storey* in *building height* is permitted to be less than that required in Article 9.36.2.6., provided

[a] a) the total area of fenestration, excluding skylights, and doors does not exceed 15% of the above-ground gross wall area as calculated in accordance with Article 9.36.2.3.,

[b] b) the floor-to-ceiling height measured from the top of the subfloor to the underside of the finished ceiling of the *storey* does not exceed 2.34 m,

[c] c) the distance measured from the top of the subfloor to the underside of the bottom chord of the truss or joist of the roof is not more than 2.39 m, and

[d] d) the difference between the sum of the proposed areas of ceilings or floors divided by their respective proposed effective thermal resistance and the sum of the reference areas of ceilings or floors divided by their respective thermal resistance required in Article 9.36.2.6. is not more than the difference between 17% fenestration and door area and the proposed fenestration and door areas divided by the required effective thermal resistance values for windows and doors in Article 9.36.2.7.

(See Notes A-9.36.2.11.(4) and A-9.36.2.11.(2) and (3).)

[5] 5) The effective thermal resistance of windows shall be determined as RSI = 1/U-value.

[6] 6) The reduction in effective thermal resistance of above-ground opaque *building* envelope assemblies permitted by Sentences (2) and (4) shall result in an RSI value that ~~is not less than~~

[a] --) conforms to Sentence 9.36.3.2.(5), or

[b] a) is not less than~~55% of that required in Article 9.36.2.6. for above-ground walls and joist-type roofs (see Note A-9.36.2.11.(6)(a), and~~

[i] --) 55% of that required in Article 9.36.2.6. for above-ground walls and joist-type roofs (see Note A-9.36.2.11.(6)(b)(i)), and

[ii] --) 60% of that required in Article 9.36.2.6. for other opaque assemblies.

[c] b) ~~60% of that required in Article 9.36.2.6. for other opaque~~

~~assemblies.~~

[7] 7) The effective thermal resistances of above-ground opaque assemblies with embedded heating cables, pipes or membranes are not permitted to be traded.

[8] 8) The effective thermal resistances of doors and access hatches described in Sentences 9.36.2.7.(3) to (7) are not permitted to be traded.

Impact analysis

This trade-off option will provide a significant benefit for factory-constructed buildings where transportation regulations impose stringent height limits.

Enforcement implications

This proposed change can be enforced by the existing infrastructure without additional resources.

Who is affected

Designers, engineers, architects, building officials and manufacturers/suppliers.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[9.36.2.11.] 9.36.2.11. ([1] 1) no attributions

[9.36.2.11.] 9.36.2.11. ([2] 2) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([2] 2) no attributions

[9.36.2.11.] 9.36.2.11. ([3] 3) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([3] 3) no attributions

[9.36.2.11.] 9.36.2.11. ([4] 4) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([5] 5) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([6] 6) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([7] 7) [F92-OE1.1]

[9.36.2.11.] 9.36.2.11. ([8] 8) [F92-OE1.1]

Submit a comment

Proposed Change 1833

Code Reference(s):	**NBC20 Div.B 9.36.3.10. (first printing)**
Subject:	HVAC Equipment Efficiency Table
Title:	New Performance Metrics for Small Single-Phase Air Conditioners and Heat Pumps
Description:	This proposed change introduces new energy metrics for small single-phase air conditioners and heat pumps.

This change could potentially affect the following topic areas:

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

Problem

Effective January 1, 2023, the US Department of Energy (DOE) introduced a series of new energy performance metrics (EER2, SEER2 and HSPF2) in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products," that is applicable to small single-phase air-cooled air conditioners and air-source heat pumps. These metrics are similar to the previous ones (EER, SEER and HSPF), but use different test conditions that are considered to be more realistic. Larger units and three-phase models are not affected by this amendment.

With the publication of the Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 17), SOR/2022-265, on December 7, 2022, the Canadian Energy Efficiency Regulations, 2016 (EER), SOR/2016-311, were aligned with DOE 10 CFR, Part 430-2022 by requiring the minimum performance levels to be expressed with the new metrics. As a result, a discrepancy is caused between Section 9.36. of Division B of the NBC and the EER. If manufacturers provided product labels only using the new metrics, the products available on the market could potentially have issues with conformance to the NBC.

This discrepancy will lead to gaps in the Code, and Code users will be unable to evaluate whether HVAC equipment performance complies with the NBC requirements. This, in turn, will lead to difficulties for enforcement officials when determining compliance.

Justification

This proposed change to Section 9.36. updates the reference to the 2022 amendment of DOE 10 CFR, Part 430 and introduces the new energy performance metrics. To facilitate compliance with the NBC, this proposed change maintains the alignment of the NBC with the Energy Efficiency Regulations, 2016 (EER), as amended by SOR/2022-265 (Amendment 17).

Amendment 17 generally presents two sets of performance requirements to the EER: the first that came into force on January 1, 2023, and the second that comes into force on January 1, 2025. Considering that the NBC 2025 will be published and adopted after January 1, 2025, these requirements, where applicable, should be included in the 2025 edition of the NBC.

PROPOSED CHANGE

NBC20 Div.B 9.36.3.10. (first printing)

[9.36.3.10.] 9.36.3.10. Equipment Efficiency

[1] 1) HVAC equipment and components shall comply with the performance requirements stated in Table 9.36.3.10. (See Note A-9.36.3.10.(1).)

Table [9.36.3.10.] 9.36.3.10.
HVAC Equipment Performance Requirements
Forming Part of Sentences 9.36.3.9.(2) and [9.36.3.10.] 9.36.3.10.([1] 1)

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Air-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
Single-phase air conditioners and heat pumps, split-system	< 19	DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1	SEER2 = 14.3 (2)
			HSPF2 V = 6 (2)

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Air conditioners and heat pumps, ~~S~~split-system	< 19	CSA C656	SEER = 14.5
			EER = 11.5
			HSPF V = 7.1
Single-phase air conditioners and heat pumps, single-package system	< 19	DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1	SEER2 = 13.4 (2)
			HSPF V = 6.0 (2)
Air conditioners and heat pumps, ~~S~~single-package system	< 19	CSA C656	SEER = 14
			EER = 11
			HSPF V = 7.0
Heat pumps, split-system and single-package	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Air conditioners, all electrical phases, split-system and single-package	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Single-Package Vertical Air Conditioners (SPVAC) and Heat Pumps (SPVHP)			
SPVAC and SPVHP in cooling mode	< 19	CAN/CSA-C746	EER = 11
SPVAC and SPVHP in heating mode	< 19		$COP_h \geq 3.3$
SPVAC and SPVHP	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Water-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
Ground-source and water-source heat pumps			
open loop	≤ 40	CAN/CSA-C13256-1	$COP_c \geq 4.75$, $COP_h \geq 3.6$
closed loop			$COP_c \geq 3.93$, $COP_h \geq 3.1$

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Water-to-water heat pumps			
open loop	≤ 40	CAN/CSA-C13256-2	$COP_c \geq 5.60$, $COP_h \geq 3.4$
closed loop			$COP_c \geq 4.21$, $COP_h \geq 2.8$
Internal water-loop heat pumps	< 5	CAN/CSA-C13256-1	$COP_c \geq 3.28$, $COP_h \geq 4.2$
	≥ 5 and ≤ 40		$COP_c \geq 3.52$, $COP_h \geq 4.2$
Water-cooled air conditioners – all types	< 19	ANSI/AHRI 210/240	COP = 3.54, ICOP = 3.60
	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Direct-Expansion Ground-Source Heat Pumps – Electrically Operated			
Direct-expansion ground-source heat pumps	≤ 21	CSA C748	EER = 13.0
			COP_h = 3.1
Packaged Terminal Air Conditioners (PTAC) and Heat Pumps (PTHP)			
PTAC – all types and modes	All capacities	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
PTHP – all types and modes			
Room Air Conditioners and Room Air Conditioner Heat Pumps			
Louvered, without reverse cycle	< 2.3	CSA C368.1	CEER ≥ 11.0
	≥ 2.3 and < 4.1		CEER ≥ 10.9
	≥ 4.1 and < 5.9		CEER ≥ 10.7
	≥ 5.9 and < 8.2		CEER ≥ 9.4
	≥ 8.2 and < 10.6		CEER ≥ 9.0
Non-louvered, without reverse cycle	< 2.3		CEER ≥ 10.0

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	≥ 2.3 and < 3.2		CEER ≥ 9.6
	≥ 3.2 and < 4.1		CEER ≥ 9.5
	≥ 4.1 and < 5.9		CEER ≥ 9.3
	≥ 5.9 and < 10.6		CEER ≥ 9.4
Louvered, with reverse cycle	< 5.9		CEER ≥ 9.8
	≥ 5.9 and < 10.6		CEER ≥ 9.3
Non-louvered, with reverse cycle	< 4.1		CEER ≥ 9.3
	≥ 4.1 and < 10.6		CEER ≥ 8.7
Room air conditioner, casement only	All capacities		CEER ≥ 9.5
Room air conditioner, casement slider	All capacities		CEER ≥ 10.4
Boilers			
Electric *boilers*	< 88	—	Must be equipped with automatic water temperature control (3)
Gas-fired *boilers* (4)	< 88	CAN/CSA-P.2	AFUE ≥ 90%
	≥ 88 and < 733	ANSI/AHRI 1500 or DOE 10 CFR, Part 431, Subpart E, Appendix A	E_t ≥ 83%
Oil-fired *boilers*	< 88	CAN/CSA-P.2	AFUE ≥ 86%

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	≥ 88 and ≤ 733	ANSI/AHRI 1500 or DOE 10 CFR, Part 431, Subpart E, Appendix A	E_t ≥ 83%
Warm-Air Furnaces, Combination Warm-Air Furnace/Air-conditioning Units, Duct Furnaces and Unit Heaters			
Gas-fired warm-air *furnaces* (4)	≤ 66 using single-phase electric current	CAN/CSA-P.2	AFUE ≥ 95% and must be equipped with a high-efficiency constant torque or constant airflow fan motor
	≤ 66, through-the- wall *furnace*		E_t ≥ 78.5% AFUE ≥ 90%
	≤ 66 using three-phase electric current	ANSI Z21.47/CSA 2.3	AFUE ≥ 78% or E_t ≥ 80%
	> 66 and ≤ 117.23		E_t ≥ 80%
Commercial gas-fired outdoor packaged *furnaces* (rooftop units) (4)	> 66 and ≤ 117.23	CAN/CSA-P.8	E_t ≥ 80%
Gas-fired duct *furnaces* (4)	≤ 117.23	ANSI Z83.8/CSA 2.6	E_t ≥ 81%
Gas-fired *unit heaters* (4)	≤ 117.23	CAN/CSA-P.11	E_t ≥ 82%
Oil-fired warm-air *furnaces*	≤ 66	CAN/CSA-P.2	AFUE ≥ 85%
Oil-fired duct *furnaces* and *unit heaters*	—	CSA B140.4	E_t ≥ 81%

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Combined space- and water-heating systems (combos)	≤ 87.9 if *boiler*-based	CAN/CSA-P.9, (5)	TPF = 0.80
	≤ 73.2 if based on *service water heater*		
Integrated mechanical systems	All capacities	CSA P.10	OTPF = 0.85
Electric *furnaces*	≤ 66	No energy performance test required	Must be equipped with a high-efficiency constant torque or constant airflow fan motor
Other			
Gas-fired fireplaces and *stoves* (4) heating	—	CAN/CSA-P.4.1	FE ≥ 50%, see Sentence (2)
decorative (6) (7)			See Sentence (2)
Solid-fuel-burning space-heating equipment (8)	< 500 kW output capacity	EPA 40 CFR, Part 60, Subpart AAA, and Subpart QQQQ, CSA B415.1, or EN 303-5,	(9)
Dehumidifiers	≤ 16.6 L/day	CAN/CSA-C749	EF ≥ 1.35
	> 16.6 and ≤ 21.3 L/day		EF ≥ 1.50
	> 21.3 and ≤ 25.5 L/day		EF ≥ 1.60

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	> 25.5 and ≤ 35.5 L/day		EF ≥ 1.70
	> 35.5 and ≤ 87.5 L/day		EF ≥ 2.50
Unitary electric resistance space heaters (10)	All capacities	No energy performance test required	—

Notes to Table [9.36.3.10.] 9.36.3.10.:

(1) The symbols and abbreviations that appear in this column have the following meanings:

AFUE = annual fuel utilization efficiency
CEER = combined energy-efficiency ratio, in (Btu/h)/W
COP_c = coefficient of performance in cooling mode, in W/W
COP_h = coefficient of performance in heating mode, in W/W
EER = energy-efficiency ratio, in (Btu/h)/W
EF = energy factor, in %/h
E_t = thermal efficiency
FE = fireplace efficiency
HSPF V = heating seasonal performance factor for region V (see map in CSA C656), in (Btu/h)/W
HSPF2 V = heating seasonal performance factor 2 for region V (see map in DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1), in (Btu/h)/W
ICOP = integrated coefficient of performance, in W/W
OTPF = overall thermal performance factor
SEER = seasonal energy-efficiency ratio, in (Btu/h)/W
SEER2 = seasonal energy-efficiency ratio 2, in (Btu/h)/W
TPF = thermal performance factor

(2) The SEER2 and HSPF2 V metrics are similar to the SEER and HSPF V metrics, respectively, but use different test conditions, as specified in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products." For the purpose of compliance with the Code, either pair of performance metrics may be used.

(3) An automatic water temperature control device adjusts the temperature of the water in the *boiler* so that the heat supplied corresponds more closely to the heat demanded under varying outdoor temperatures.

(4) Includes propane.

(5) See Sentence (3).

(6) Decorative gas-fired fireplaces and *stoves* are vented decorative gas *appliances* that are marked as such on their rating plate and that comply with ANSI Z21.50/CSA 2.22, "Vented decorative gas appliances".

(7) Decorative gas-fired fireplaces and *stoves* shall not be used to satisfy heating requirements or as part of the heating system required by Section 9.33.

(8) Does not include *stoves* with an oven whose volume is greater than 0.028 m^3.

(9) Minimum performance values are omitted from the Table in cases where the referenced standard itself contains such requirements. Equipment tested to the referenced standards provides an acceptable level of energy performance.

(10) See Sentence 9.36.3.6.(3).

[2] 2) Natural gas and propane fireplaces shall be

[a] a) direct-vent (sealed), and

[b] b) pilot-on-demand, interrupted or intermittent ignition systems without a standing pilot light.

[3] 3) The heat source component of combined space- and service water heating systems that are not within the scope of CAN/CSA-P.9, "Test method for determining the performance of combined space and water heating systems (combos)", shall meet the performance requirements stated in Table 9.36.3.10. for the applicable equipment type. (See Note A-9.36.3.10.(3).)

Impact analysis

This proposed change would help Code users and authorities having jurisdiction to assess whether equipment conforms to the Code.

This proposed change is expected to be cost neutral because it simply aligns the NBC requirements with the Canadian Energy Efficiency Regulations, 2016.

Enforcement implications

This proposed change would facilitate enforcement since the metrics used in the NBC would align with those of the Canadian Energy Efficiency Regulations, 2016 and the US Department of Energy, Energy Conservation Program for Consumer Products.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.3.10. (first printing)

[9.36.3.10.] 9.36.3.10. ([1] 1) [F95,F98,F99-OE1.1]

[9.36.3.10.] 9.36.3.10. ([2] 2) [F95,F98,F99-OE1.1]

[9.36.3.10.] 9.36.3.10. ([3] 3) no attributions

Submit a comment

Proposed Change 1814

Code Reference(s):	**NBC20 Div.B 9.36.6.2. (first printing)** **NBC20 Div.B 9.36.6.3. (first printing)** **NBC20 Div.B 9.36.6.4. (first printing)**
Subject:	Airtightness
Title:	Removing the NLA Airtightness Metric
Description:	This proposed change removes the normalized leakage area (NLA) metric for airtightness level determination.

This change could potentially affect the following topic areas:

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

Problem

The National Building Code of Canada (NBC) provides both the normalized leakage area at a reference pressure of 10 Pa (NLA_{10}) and the normalized leakage rate at a reference pressure of 50 Pa (NLR_{50}) as airtightness metrics. These metrics are provided with the intent to be used as a size-neutral option for small attached dwelling units.

Differing calculation methodologies for these two metrics have effectively limited the usefulness of NLA_{10}; Code users are finding NLR_{50} more useful and more applicable for compliance and comparison. Because there is no true equivalency between the values provided for the three air leakage metrics (i.e., air changes per hour at a reference pressure of 50 Pa (ACH_{50}), NLR_{50} and NLA_{10}) in the requirements of the National Model Codes or other codes (e.g., NBC, Ontario Building Code) or various energy efficiency programs (e.g., ENERGY STAR for new homes), this difference in calculation methods has caused confusion for Code users in the application of calculated data. Effectively, this situation has resulted in the use of the NLA_{10} in the NBC being redundant.

Justification

NLA_{10} was introduced in the National Model Codes as one of the airtightness metrics to determine the airtightness level of building envelopes, because it visualizes the leakage area, which could be helpful from a communication perspective for an energy-efficiency requirement.

However, the NLA_{10} metric does not differentiate the hole's size or shape and is not frequently used as it is not helpful to demonstrate compliance.

NLA_{10} may be considered redundant when the other two airtightness metrics (i.e., ACH_{50} and NLR_{50}) are available. Therefore, this proposed change would remove the technically redundant NLA_{10} metric from the NBC to avoid confusion about the interpretation of calculated data and to avoid unnecessary calculations for Code users.

PROPOSED CHANGE

NBC20 Div.B 9.36.6.2. (first printing)

[9.36.6.2.] 9.36.6.2. Definitions

[1] 1) For the purposes of this Subsection, the following terms shall have the meanings stated herein:

[a] a) "zone" means a *conditioned space* or part thereof having a sufficiently large opening onto the location where the airtightness testing equipment is installed to provide enough airflow such that the entire zone is at the same pressure (see Note A-9.36.6.2.(1)(a)),

[b] b) "attached zone" means a zone whose boundary area is fully or partially in contact with an adjacent zone or zones (see Note A-9.36.6.2.(1)(b)),

[c] c) "ACH_{50}" refers to the air changes per hour at a reference pressure of 50 Pa, and

[d] d) ~~"NLA_{10}" refers to the normalized leakage area at a reference pressure of 10 Pa, and~~

[e] e) "NLR_{50}" refers to the normalized leakage rate at a reference pressure of 50 Pa.

NBC20 Div.B 9.36.6.3. (first printing)

[9.36.6.3.] 9.36.6.3. Determination of Airtightness

[1] 1) Where airtightness is to be used as input to the energy model calculations, it shall be determined through a multi-point depressurization test carried out in accordance with CAN/CGSB-149.10, "Determination of the airtightness of building envelopes by the fan depressurization method", using the following parameters described therein:

[a] a) as-operated, and

[b] b) guarded or unguarded.

[2] 2) ~~Except as provided in Sentence (3), w~~Where airtightness is to be used to demonstrate compliance with an Airtightness Level listed in Table 9.36.6.4.-A or 9.36.6.4.-B, it shall be determined through a single-point, two-point or multi-point depressurization test carried out in accordance with CAN/CGSB-149.10, "Determination of the airtightness of building envelopes by the fan depressurization method", using the following parameters described therein:

[a] a) as-operated, and

[b] b) guarded or unguarded, as applicable.

~~**[3] 3)** Determining NLA_{10} using a single-point test is not permitted.~~

NBC20 Div.B 9.36.6.4. (first printing)

[9.36.6.4.] 9.36.6.4. Determination of Airtightness Level

[1] 1) Compliance with an Airtightness Level listed in Table 9.36.6.4.-A or 9.36.6.4.-B shall be determined in accordance with this Article using the value of ACH_{50}~~, NLA_{10}~~ or NLR_{50} determined in accordance with Sentence 9.36.6.3.(2).

[2] 2) For the purposes of Sentences (3) and (4), the Airtightness Level for *buildings* or *dwelling units* containing more than one zone shall be the lowest Airtightness Level achieved for the zones therein. (See Note A-9.36.6.4.(2).)

[3] 3) Except as provided in Sentence (4), the Airtightness Level for single zones and attached zones shall be determined by complying with one of the corresponding airtightness values stipulated in Table 9.36.6.4.-A.

Table [9.36.6.4.-A] 9.36.6.4.-A
Airtightness Levels for Single Zones and Attached Zones Determined Using the Guarded Method
Forming Part of Sentences 9.36.6.3.(2), [9.36.6.4.] 9.36.6.4.([1] 1) and ([3] 3), and 9.36.8.8.(1)

Airtightness Levels	Airtightness Metrics		
	ACH_{50}	~~NLA_{10}, cm^2/m^2~~	NLR_{50}, $L/s \times m^2$
	Maximum Airtightness Values		
AL-1A	2.5	~~1.20~~	0.89
AL-2A	2.0	~~0.96~~	0.71
AL-3A	1.5	~~0.72~~	0.53
AL-4A	1.0	~~0.48~~	0.35
AL-5A	0.6	~~0.29~~	0.21

[4] 4) Where the unguarded method is used to determine the airtightness of an attached zone, the Airtightness Level shall be determined by complying with one of the corresponding airtightness values stipulated in Table 9.36.6.4.-B, provided the zone is tested independently.

Table [9.36.6.4.-B] 9.36.6.4.-B
Airtightness Levels for Attached Zones Determined Using the Unguarded Method
Forming Part of Sentences 9.36.6.3.(2), [9.36.6.4.] 9.36.6.4.([1] 1) and ([4] 4), and 9.36.8.8.(1)

Airtightness Levels	Airtightness Metrics		
	ACH_{50}	~~NLA_{10}, cm^2/m^2~~	NLR_{50}, $L/s \times m^2$
	Maximum Airtightness Values		
AL-1B	3.0	~~1.92~~	1.17
AL-2B	2.5	~~1.6~~	0.98
AL-3B	2.0	~~1.28~~	0.78
AL-4B	1.5	~~0.96~~	0.59
AL-5B	1.0	~~0.64~~	0.39
AL-6B	0.6	~~0.38~~	0.23

Impact analysis

As the NLA_{10} metric is not frequently used, this proposed change that removes it from the NBC would resolve the confusion caused by inconsistent calculations between differing airtightness metrics, as well as save the time and effort of calculating the NLA_{10} value based on airtightness testing results.

Enforcement implications

This proposed change could be enforced using existing Code enforcement infrastructure.

Who is affected

Contractors, building owners, building officials and fire officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.6.2. (first printing)

[9.36.6.2.] 9.36.6.2. ([1] 1) no attributions

NBC20 Div.B 9.36.6.3. (first printing)

[9.36.6.3.] 9.36.6.3. ([1] 1) no attributions

[9.36.6.3.] 9.36.6.3. ([1] 1) [F90-OE1.1]

[9.36.6.3.] 9.36.6.3. ([2] 2) no attributions

~~**[9.36.6.3.] 9.36.6.3. ([3] 3) no attributions**~~

NBC20 Div.B 9.36.6.4. (first printing)

[9.36.6.4.] 9.36.6.4. ([1] 1) no attributions

[9.36.6.4.] 9.36.6.4. ([1] 1) [F90,F91,F92,F93,F95,F100-OE1.1]

[9.36.6.4.] 9.36.6.4. ([2] 2) [F90,F91,F92,F93,F95,F100-OE1.1]

[9.36.6.4.] 9.36.6.4. ([3] 3) [F90,F91,F92,F93,F95,F100-OE1.1]

[9.36.6.4.] 9.36.6.4. ([4] 4) [F90,F91,F92,F93,F95,F100-OE1.1]

Submit a comment

Proposed Change 1834

Code Reference(s):	**NBC20 Div.B 9.36.8. (first printing)**
Subject:	Prescriptive Trade-off Path
Title:	Interpolation of Energy Conservation Points
Description:	This proposed change permits interpolation of energy conservation points for energy conservation measures with values that fall between those listed in NBC Tables 9.36.8.5. to 9.36.8.7.

This change could potentially affect the following topic areas:

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

Problem

There is insufficient granularity for energy conservation points provided in tabulated form for above-ground opaque building assemblies, below-ground opaque building assemblies, and fenestration and doors. In the absence of interpolation, when the energy conservation measure falls between two listed values in NBC Tables 9.36.8.5. to 9.36.8.7., Code users receive the lower number of points.

Crediting the Code user with a lower number of points requires the Code user to compensate by selecting an additional energy conservation measure to comply with the target tier, thereby incurring additional cost.

Justification

The linear interpolation of energy conservation points provides granularity by assigning points to values that fall between those listed in the relevant NBC tables. Therefore, Code users are credited with energy conservation points that better reflect the energy savings of their chosen energy conservation measure.

By accumulating the accurate number of energy conservation points through interpolation, Code users can more easily demonstrate compliance with the target tier.

PROPOSED CHANGE

NBC20 Div.B 9.36.8. (first printing)

[9.36.8.] 9.36.8. Tiered Energy Performance Compliance: Prescriptive Path

[9.36.8.1.] 9.36.8.1. Scope

[9.36.8.2.] 9.36.8.2. Compliance

[9.36.8.3.] 9.36.8.3. Definitions

[9.36.8.4.] 9.36.8.4. Building Envelope – General

[9.36.8.5.] 9.36.8.5. Energy Conservation Measures for Above-Ground Opaque Building Assemblies

[1] 1) Except as permitted by Articles 9.36.2.5. and 9.36.2.11., and Sentence 9.36.2.6.(3), the effective thermal resistance of above-ground opaque *building* assemblies or portions thereof shall be not less than that shown for the applicable heating degree-days of the *building* location in Table 9.36.2.6.-B.

[2] 2) Above-ground walls that comply with one of the energy conservation measures prescribed in Table 9.36.8.5. shall be credited with the corresponding energy conservation points stipulated therein.

[3] 3) The effective thermal resistance of *rim joists* shall be not less than that of the above-ground walls.

[4] 4) Where the top of a section of *foundation* wall is on average greater than or equal to 600 mm above the adjoining ground level, the effective thermal resistance of the above-ground portion of that section of wall shall be not less than that of the above-ground walls.

[5] 5) Except for tubular daylighting devices, the effective thermal resistance of skylight shafts shall be not less than that of the above-ground walls.

[6] 6) Except as provided in Sentence (7), where above-ground walls are

constructed using two or more wall assemblies with different calculated effective thermal resistance values, the above-ground wall assembly with the lowest effective thermal resistance value shall be used to determine the applicable energy conservation points from Table 9.36.8.5.

[7] 7) The effective thermal resistance of one or more of the above-ground wall assemblies referred to in Sentence (6) is permitted to be less than that required to meet an energy conservation measure target listed in Table 9.36.8.5. for the wall or walls to be credited with the energy conservation points listed for that target, provided

[a] a) the effective thermal resistance of one or more of the other above-ground wall assemblies is increased to more than the energy conservation measure target listed in Table 9.36.8.5. to account for the wall assemblies that do not meet the target, and

[b] b) the sum of the results of each individual above-ground wall assembly area divided by its respective effective thermal resistance is less than or equal to the total area of all above-ground wall assemblies divided by the effective thermal resistance target listed in Table 9.36.8.5. that is to be credited.

(See also Note A-9.36.2.11.(2).)

Table [9.36.8.5.] 9.36.8.5.
Energy Conservation Measures and Points for Above-Ground Walls (1)
Forming Part of Sentences [9.36.8.5.] 9.36.8.5.([2] 2), ([6] 6) and ([7] 7)

Energy Conservation Measures for Above-Ground Walls – Minimum Effective RSI Values, $(m^2 \times K)/W$ (2)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
2.97	2.0	–	–	–	–	–
3.08	3.2	1.4	1.6	2.1	–	–
3.69	7.4	5.4	6.2	6.7	5.4	5.2
3.85	8.2	6.0	6.9	7.4	6.2	6.0
3.96	8.9	6.8	7.7	8.2	7.0	6.8
4.29	10.2	8.1	9.2	9.7	8.6	8.4
4.40	10.8	8.7	9.9	10.3	9.3	9.1

Energy Conservation Measures for Above-Ground Walls – Minimum Effective RSI Values, $(m^2 \times K)/W$ (2)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
4.57	11.4	9.3	10.6	11.1	10.1	9.9
4.73	11.9	9.7	11.1	11.5	10.6	10.4
4.84	12.3	10.2	11.6	12.1	11.2	10.9
5.01	12.9	10.7	12.2	12.7	11.8	11.6
5.45	14.0	11.9	13.6	14.0	13.3	13.1

Notes to Table [9.36.8.5.] 9.36.8.5.:

(1) See also Subsection 9.25.5.

(2) For intermediate values of minimum effective RSI, linear interpolation of energy conservation points is permitted.

[9.36.8.6.] 9.36.8.6. Energy Conservation Measures for Fenestration and Doors

[1] 1) Except as provided in Sentences (2) to (4), fenestration and doors that comply with one of the energy conservation measures prescribed in Table 9.36.8.6. shall be credited with the corresponding energy conservation points stipulated therein, provided all fenestration and doors comply with that energy conservation measure.

[2] 2) Where the individual doors or windows have more than one overall thermal transmittance value (U-value), an average U-value is permitted to be used to determine the applicable energy conservation points from Table 9.36.8.6., provided the requirements of Sentence (3) are met.

[3] 3) The U-value of one or more doors or fenestration is permitted to be greater than that required in Table 9.36.8.6., provided

[a] a) the traded doors and fenestration are located in the same orientation,

[b] b) the U-value of one or more of the other doors and fenestration is decreased to less than the energy conservation measure target in Table 9.36.8.6. to account for the doors and windows that do not meet the target, and

[c] c) the sum of each individual door or fenestration area multiplied by its respective U-value is less than or equal to the total area of all fenestration and doors multiplied by the U-value target in Table 9.36.8.6. that is to be credited.

(See also Note A-9.36.2.11.(3).)

[4] 4) Where the fenestration and doors make up not more than 17% of the total above-ground wall area, including openings, in a given orientation, the fenestration and doors in that orientation need not comply with Sentence (1) and are not subject to the provisions of Sentences (2) and (3), provided they meet or exceed the minimum Energy Rating stated in Table 9.36.8.6. that is to be credited. (See Note A-9.36.8.6.(4).)

Table [9.36.8.6.] 9.36.8.6.
Energy Conservation Measures and Points for Fenestration and Doors Forming Part of Article 9.36.8.6.

Energy Conservation Measures for Fenestration and Doors (1)		**Heating Degree-Days of *Building* Location, in Celsius Degree-Days**					
Maximum U-values, W/(m^2×K) (2)	Minimum Energy Ratings (3)	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
		Energy Conservation Points					
1.61	25	1.9	1.8	–	–	–	–
1.44	29	3.8	3.6	1.6	1.8	–	–
1.22	34	6.9	7.0	4.6	5.5	3.2	3.4

Notes to Table [9.36.8.6.] 9.36.8.6.:

(1) Except skylights and glass block assemblies.

(2) For intermediate values of maximum U-value, linear interpolation of energy conservation points is permitted.

(3) See Sentence (4). Energy Ratings shall be determined in accordance with CSA A440.2, "Fenestration energy performance".

[9.36.8.7.] 9.36.8.7. Energy Conservation Measures for Opaque Building Assemblies Below-Grade or in Contact with the Ground

[1] 1) Opaque *building* assemblies below-grade or in contact with the ground shall be designed and constructed in accordance with Sentences 9.36.2.8.(2) to (10) and this Article.

[2] 2) Except as permitted by Article 9.36.2.5., the effective thermal resistance of *foundation* walls shall be not less than that shown for the applicable heating degree-days of the *building* location in Table 9.36.2.8.-B.

[3] 3) *Foundation* walls that comply with one of the energy conservation measures prescribed in Table 9.36.8.7. shall be credited with the corresponding energy conservation points stipulated therein.

[4] 4) Where *foundation* walls are constructed with more than one effective thermal resistance (RSI) value, the lowest effective RSI value of any of these walls shall be used to determine the applicable energy conservation points from Table 9.36.8.7.

Table [9.36.8.7.] 9.36.8.7.
Energy Conservation Measures and Points for Opaque Building Assemblies Below-Grade or In Contact with Ground
Forming Part of Sentences [9.36.8.7.] 9.36.8.7.([3] 3) and ([4] 4)

Energy Conservation Measures for *Foundation* Walls – Minimum Effective RSI Values, $(m^2 \times K)/W$ (1)	**Heating Degree-Days of *Building* Location, in Celsius Degree-Days**					
	Zone 4 < 3000	**Zone 5 3000 to 3999**	**Zone 6 4000 to 4999**	**Zone 7A 5000 to 5999**	**Zone 7B 6000 to 6999**	**Zone 8 ≥ 7000**
	Energy Conservation Points					
2.98	1.7	–	–	–	–	–
3.09	1.8	0.2	0.2	0.2	0.2	–
3.46	2.2	0.6	0.8	0.6	0.7	–
3.90	2.6	1.2	1.4	1.1	1.3	–

Note to Table [9.36.8.7.] 9.36.8.7.:

(1) For intermediate values of minimum effective RSI, linear interpolation of energy conservation points is permitted.

[9.36.8.8.] 9.36.8.8. Energy Conservation Measures Relating to Airtightness

[9.36.8.9.] 9.36.8.9. Energy Conservation Measures for HVAC Systems

[9.36.8.10.] 9.36.8.10. Energy Conservation Measures for Service Water Heating Equipment

[9.36.8.11.] 9.36.8.11. Energy Conservation Points for Building Volume

Impact analysis

This proposed change would permit Code users to use linear interpolation to be credited for the appropriate number of energy conservation points for an energy conservation measure with a value between two targets listed in NBC Tables 9.36.8.5. to 9.36.8.7. This proposed change would facilitate compliance with the target energy tier by allowing the Code user to accumulate more energy conservation points through interpolation.

The cost of each percentage of energy savings based on other energy conservation measures varies between $170 and $470, approximately. It is expected that allowing interpolation will result in relative cost savings.

Enforcement implications

This proposed change could be enforced using the existing Code enforcement infrastructure.

Who is affected

Designers, engineers, architects, builders and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.8. (first printing)

[9.36.8.1.] 9.36.8.1. ([1] 1) no attributions

[9.36.8.2.] 9.36.8.2. ([1] 1) no attributions

[9.36.8.2.] 9.36.8.2. ([1] 1) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.8.4.] 9.36.8.4. ([1] 1) no attributions

[9.36.8.5.] 9.36.8.5. ([1] 1) no attributions

[9.36.8.5.] 9.36.8.5. ([2] 2) [F92-OE1.1]

[9.36.8.5.] 9.36.8.5. ([3] 3) [F92-OE1.1]

[9.36.8.5.] 9.36.8.5. ([4] 4) no attributions

[9.36.8.5.] 9.36.8.5. ([4] 4) [F92-OE1.1]

[9.36.8.5.] 9.36.8.5. ([5] 5) no attributions

[9.36.8.5.] 9.36.8.5. ([5] 5) [F92-OE1.1]

[9.36.8.5.] 9.36.8.5. ([6] 6) [F92-OE1.1]

[9.36.8.5.] 9.36.8.5. ([7] 7) [F92-OE1.1]

[9.36.8.6.] 9.36.8.6. ([1] 1) [F92-OE1.1]

[9.36.8.6.] 9.36.8.6. ([2] 2) no attributions

[9.36.8.6.] 9.36.8.6. ([3] 3) no attributions

[9.36.8.6.] 9.36.8.6. ([3] 3) [F92-OE1.1]

[9.36.8.6.] 9.36.8.6. ([4] 4) [F92-OE1.1]

[9.36.8.7.] 9.36.8.7. ([1] 1) no attributions

[9.36.8.7.] 9.36.8.7. ([2] 2) [F92-OE1.1]

[9.36.8.7.] 9.36.8.7. ([3] 3) [F92-OE1.1]

[9.36.8.7.] 9.36.8.7. ([4] 4) no attributions

[9.36.8.8.] 9.36.8.8. ([1] 1) no attributions

[9.36.8.8.] 9.36.8.8. ([2] 2) [F90-OE1.1]

[9.36.8.9.] 9.36.8.9. ([1] 1) no attributions

[9.36.8.9.] 9.36.8.9. ([2] 2) no attributions

[9.36.8.9.] 9.36.8.9. ([3] 3) no attributions

[9.36.8.9.] 9.36.8.9. ([3] 3) [F95,F100-OE1.1]

[9.36.8.9.] 9.36.8.9. ([4] 4) [F95-OE1.1]

[9.36.8.10.] 9.36.8.10. ([1] 1) no attributions

[9.36.8.10.] 9.36.8.10. ([2] 2) no attributions

[9.36.8.10.] 9.36.8.10. ([3] 3) [F96-OE1.1]

[9.36.8.11.] 9.36.8.11. ([1] 1) [F95-OE1.1]

[9.36.8.11.] 9.36.8.11. ([2] 2) [F95-OE1.1]

Submit a comment

Proposed Change 1889

Code Reference(s):	**NBC20 Div.B 9.36.8.6. (first printing)**
Subject:	Prescriptive Trade-off Path
Title:	Energy Conservation Points for Fenestration and Doors
Description:	This proposed change assigns additional energy conservation points for higher-performing fenestration and doors.

This change could potentially affect the following topic areas:

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

Problem

For the purposes of demonstrating compliance with the prescriptive trade-off path, the National Building Code of Canada (NBC) 2020 does not currently assign energy conservation points for fenestration and doors available on the market that have overall thermal transmittance values (U-values) lower than 1.22 W/(m^2×K). Since the energy savings associated with these more efficient products are credited in the performance path, this creates an inconsistency between the prescriptive and performance compliance paths.

Failure to assign energy conservation points to these higher-performing components would prevent the Code users who choose to install more efficient fenestration and doors from claiming points for the associated energy savings when complying with the prescriptive trade-off path.

In order to meet the energy conservation points for higher tiers, more options in terms of lower U-values are required than the Code currently provides.

Justification

This proposed change assigns energy conservation points to higher-performing fenestration and doors that are available on the market. With this proposed change, Code users who choose to install more efficient fenestration and doors would benefit from an equivalent credit in the prescriptive trade-off path for compliance as in the performance path.

This proposed change also increases the number of trade-off options available to Code users for compliance with higher tiers.

Additionally, this proposed change adds granularity for energy conservation points provided in tabulated form for fenestration and doors by allowing interpolation. If this proposed change did not permit interpolation, Code users would only be able to claim the lower of two point values when the energy conservation measure falls between two values listed in proposed Table 9.36.8.6.

Failure to add additional energy conservation measures to the Code could prevent Code users from accumulating sufficient points to comply with higher tiers, as required by their respective jurisdictions.

PROPOSED CHANGE

NBC20 Div.B 9.36.8.6. (first printing)

[9.36.8.6.] 9.36.8.6. Energy Conservation Measures for Fenestration and Doors

[1] 1) Except as provided in Sentences (2) to (4), fenestration and doors that comply with one of the energy conservation measures prescribed in Table 9.36.8.6. shall be credited with the corresponding energy conservation points stipulated therein, provided all fenestration and doors comply with that energy conservation measure.

[2] 2) Where the individual doors or windows have more than one overall thermal transmittance value (U-value), an average U-value is permitted to be used to determine the applicable energy conservation points from Table 9.36.8.6., provided the requirements of Sentence (3) are met.

[3] 3) The U-value of one or more doors or fenestration is permitted to be greater than that required in Table 9.36.8.6., provided

[a] a) the traded doors and fenestration are located in the same orientation,

[b] b) the U-value of one or more of the other doors and fenestration is decreased to less than the energy conservation measure target in Table 9.36.8.6. to account for the doors and windows that do not meet the target, and

[c] c) the sum of each individual door or fenestration area multiplied by its respective U-value is less than or equal to the total area of all fenestration and doors multiplied by the U-value target in Table 9.36.8.6. that is to be credited.

(See also Note A-9.36.2.11.(3).)

[4] 4) Where the fenestration and doors make up not more than 17% of the total above-ground wall area, including openings, in a given orientation, the

fenestration and doors in that orientation need not comply with Sentence (1) and are not subject to the provisions of Sentences (2) and (3), provided they meet or exceed the minimum Energy Rating stated in Table 9.36.8.6. that is to be credited. (See Note A-9.36.8.6.(4).)

Table [9.36.8.6.] 9.36.8.6.
Energy Conservation Measures and Points for Fenestration and Doors
Forming Part of Article 9.36.8.6.

Energy Conservation Measures for Fenestration and Doors (1)		**Heating Degree-Days of *Building* Location, in Celsius Degree-Days**					
Maximum U-values, W/(m²×K) (2)	**Minimum Energy Ratings (3)**	**Zone 4 < 3000**	**Zone 5 3000 to 3999**	**Zone 6 4000 to 4999**	**Zone 7A 5000 to 5999**	**Zone 7B 6000 to 6999**	**Zone 8 ≥ 7000**
		Energy Conservation Points					
1.61	25	1.9	1.8	–	–	–	–
1.44	29	3.8	3.6	1.6	1.8	–	–
1.22	34	6.9	7.0	4.6	5.5	3.2	3.4
1.05	40	10.8	11.7	8.8	8.9	6.1	5.9
0.94	42	12.3	13.4	10.5	10.7	8.0	7.8
0.82	44	14.0	15.2	12.4	12.6	10.1	9.8

Notes to Table [9.36.8.6.] 9.36.8.6.:

(1) Except skylights and glass block assemblies.

(2) For intermediate values of maximum U-values, linear interpolation of energy conservation points is permitted.

(3) ~~See Sentence (4).~~ Energy Ratings shall be determined in accordance with CSA A440.2, "Fenestration energy performance".

Impact analysis

This proposed change would make complying with the energy performance tiers more affordable by providing additional options to accumulate sufficient energy conservation points.

It should be noted that the costs listed in Table 1 are estimates that depend on various factors. One major assumption made during analysis was the cost data, which was obtained for a specific region and adjusted for other regions using the location factors provided by RSMeans. The following location factors were used for the cost estimation based on 2023 values.

Table 1: Location Factors by Region

Region	Location Factor
BC	0.98–1.05
AB	1.02–1.09
SK and MB	0.88–1.07
ON	1.01–1.15
QC	1.06–1.17
Atlantic Canada	0.88–1.05
Northern Canada	1.03–1.12

Table 2 provides an estimate of the incremental cost of fenestration for different U-values in different regions.

Table 2: Incremental Costs and Corresponding Energy Savings of Fenestration by Region

U-Values	Min. Energy Rating	Energy Savings (%)	Incremental Cost of Fenestration ($/m^2)						
			BC	AB	SK and MB	ON	QC	Atlantic Canada	Northern Canada
1.05	40	5.9–11.7	70–75	73–78	63–76	72–82	76–84	63–75	74–80
0.94	42	7.8–13.4	83–89	86–92	74–90	85–97	90–99	74–89	87–95
0.82	44	9.8–15.2	95–104	101–108	87–106	100–114	105–116	87–104	102–111

The incremental costs were calculated using a reference fenestration U-value of 1.61 W/(m^2×K) for Winnipeg, Manitoba, which was obtained from the Task Group on Prescriptive Trade-off Path in Section 9.36. The source of the costing data was CanmetENERGY's Housing Technology Assessment Platform for 2019. The costing data were adjusted for 2023 using the Bank of Canada's Inflation Calculator. The incremental costs for other regions were based on the costing data for Manitoba and adjusted using the residential location factors provided by RSMeans.

With this proposed change, the Code users who choose to install higher-efficiency fenestration would be credited between 5.9 and 15.2 energy conservation points, which represents the percentage energy savings, and would incur an additional cost of between $63 and $116 per m^2 of fenestration compared to the cost of fenestration required to meet the Code minimum.

Enforcement implications

This proposed change could be enforced using the existing Code enforcement infrastructure.

Who is affected

Designers, engineers, architects, builders and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.8.6. (first printing)

[9.36.8.6.] 9.36.8.6. ([1] 1) [F92-OE1.1]

[9.36.8.6.] 9.36.8.6. ([2] 2) no attributions

[9.36.8.6.] 9.36.8.6. ([3] 3) no attributions

[9.36.8.6.] 9.36.8.6. ([3] 3) [F92-OE1.1]

[9.36.8.6.] 9.36.8.6. ([4] 4) [F92-OE1.1]

Submit a comment

Proposed Change 1888

Code Reference(s):	**NBC20 Div.B 9.36.8.8. (first printing)**
Subject:	Prescriptive Trade-off Path
Title:	Updates to Energy Conservation Points for Airtightness Levels
Description:	This proposed change updates energy conservation points for airtightness levels in Subsection 9.36.8.

This change could potentially affect the following topic areas:

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

Problem

A review of the assigned energy conservation points for airtightness levels in the prescriptive trade-off path of the 2020 edition of the National Building Code of Canada (NBC) revealed an error. The energy conservation points in Table 9.36.8.8. were exchanged, meaning incorrect points were assigned for airtightness requirements using the guarded and unguarded methods.

Furthermore, the modeling approach used to calculate the points for different energy conservation measures was updated. The new approach models 240 archetypes in all climate zones to determine the appropriate energy conservation points and does not model a heat-recovery ventilator in the reference house (in accordance with Sentence 9.36.5.15.(3)). As a result, the existing energy conservation points for airtightness levels in Table 9.36.8.8. need to be updated.

Failure to update the existing energy conservation points would not only retain the erroneous assignment of energy conservation points for airtightness, but it would also create a discrepancy since the modeling rules used to determine the existing points differ from the rules used to assign points to new energy conservation measures.

This would prevent Code users from benefitting from obtaining the appropriate energy conservation points for the purpose of demonstrating compliance with the prescriptive trade-off path. In order to accumulate the energy conservation points needed to comply with higher tiers, more options in terms of energy conservation measures are required than are currently provided in the Code.

Justification

This proposed change updates the energy conservation points for airtightness levels in Table 9.36.8.8., which corrects the erroneous assignment of energy conservation points for airtightness levels in the current edition of the Code. This proposed change also updates points by modeling a greater number of archetypes in all climate zones and aligns the modeling rules with the energy performance path in Subsection 9.36.5.

Code users who achieve better airtightness testing results than the minimum performance required to comply with Energy Performance Tier 1 would benefit from using updated energy conservation points to demonstrate compliance with a higher energy performance tier of the prescriptive trade-off path.

Failure to add additional energy conservation measures to the Code may prevent Code users from accumulating sufficient points to comply with higher tiers, as required by their respective jurisdictions.

PROPOSED CHANGE

NBC20 Div.B 9.36.8.8. (first printing)

[9.36.8.8.] 9.36.8.8. Energy Conservation Measures Relating to Airtightness

[1] 1) *Buildings* to which this Subsection applies shall be designed and constructed in accordance with

[a] a) Articles 9.36.2.9. and 9.36.2.10., or

[b] b) Article 9.36.2.9. and Sentences 9.36.2.10.(1) to (7) and shall, where airtightness testing is carried out in accordance with Subsection 9.36.6., comply with an Airtightness Level listed in Table 9.36.6.4.-A or 9.36.6.4.-B.

[2] 2) *Buildings* that comply with an Airtightness Level determined in accordance with Clause (1)(b) shall be credited with the corresponding energy conservation points stipulated in Table 9.36.8.8.

Table [9.36.8.8.] 9.36.8.8.
Energy Conservation Measures and Points for Airtightness
Forming Part of Sentence [9.36.8.8.] 9.36.8.8.([2] 2)

Energy Conservation Measures for Airtightness – Airtightness Levels (1)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
Airtightness Levels from Table 9.36.6.4.-A						
AL-1A	–	–	–	–	–	–
AL-2A	~~2.0~~2.2	~~3.4~~3.2	~~3.5~~3.5	~~4.6~~3.8	~~6.1~~4.3	~~6.1~~4.8
AL-3A	~~4.0~~4.3	~~6.7~~6.3	~~7.0~~6.9	~~9.3~~7.6	~~12.1~~8.5	~~12.11~~9.7
AL-4A	~~5.9~~6.5	~~10.1~~9.6	~~10.5~~10.5	~~13.9~~11.4	~~18.0~~12.9	~~18.0~~14.7
AL-5A	~~7.6~~8.3	~~13.0~~12.3	~~13.4~~13.4	~~17.8~~14.7	~~22.7~~16.5	~~22.7~~18.8
Airtightness Levels from Table 9.36.6.4.-B						
AL-1B	–	–	–	–	–	–
AL-2B	~~–~~2.1	~~–~~3.2	~~–~~3.5	~~–~~3.8	~~–~~4.3	~~–~~4.8
AL-3B	~~2.2~~4.3	~~3.0~~6.4	~~3.5~~6.9	~~4.6~~7.6	~~4.1~~8.5	~~4.6~~9.6
AL-4B	~~4.0~~6.4	~~6.0~~9.6	~~6.9~~10.4	~~9.1~~11.5	~~8.2~~12.8	~~9.3~~14.5
AL-5B	~~6.0~~8.6	~~9.1~~12.8	~~10.4~~14.0	~~13.6~~15.4	~~12.3~~17.2	~~14.2~~19.6
AL-6B	~~7.7~~10.4	~~11.6~~15.6	~~13.3~~17.0	~~17.4~~18.7	~~15.6~~20.9	~~18.2~~23.8

Note to Table [9.36.8.8.] 9.36.8.8.:

(1) All *dwelling units* and common spaces in a *building*, or the whole *building*, must meet the Airtightness Level for which energy conservation points are being credited.

Impact analysis

This proposed change is not expected to impose additional costs because the option to use airtightness energy conservation measures to demonstrate compliance with the prescriptive trade-off path is already provided by the Code. The costs associated with using energy conservation measures are generally comprised of the cost of conducting an airtightness test. This proposed change would revise the energy conservation points assigned to an airtightness level in the current edition of the Code.

It should be noted that the costs listed for the building envelope measures are estimates that depend on various factors. One major assumption made when conducting the analysis was the cost data, which was obtained for a specific region and adjusted for other regions using the location factors provided by RSMeans. The following location factors were used for the cost estimation based on 2023 values.

Table 1: Location Factors by Region

Region	Location Factor
BC	0.98–1.05
AB	1.02–1.09
SK and MB	0.88–1.07
ON	1.01–1.15
QC	1.06–1.17
Atlantic Canada	0.88–1.05
Northern Canada	1.03–1.12

Table 2 provides an estimate of the incremental costs of achieving different airtightness performance levels for different regions.

Table 2: Incremental Costs of Airtightness Performance Levels by Region

Airtightness Levels	Energy Savings (%)	Incremental Costs of Airtightness ($/m^2)						
		BC	AB	SK and MB	ON	QC	Atlantic Canada	Northern Canada
AL-1A	0	0	0	0	0	0	0	0
AL-2A	2.2–4.8	485–520	505–540	435–530	500–570	525–579	435–520	510–555
AL-3A	4.3–9.7	945–1,012	983–1,051	848–1,031	973–1,108	1,022–1,128	848–1,012	993–1,079
AL-4A	6.5–14.7	1,803–1,932	1,877–1,969	1,619–1,969	1,858–2,116	1,950–2,153	1,619–1,932	1,895–2,061
AL-5A	8.3–18.8	3,521–3,772	3,664–3,916	3,161–3,844	3,628–4,131	3,808–4,203	3,161–3,772	3,700–4,023

To generate the cost estimates of achieving higher levels of airtightness performance, Housing Technology Assessment Platform costing was run for all 240 new construction archetypes at a pressure difference of 50 Pa. The incremental costs were then adjusted using a 15% inflation rate. The incremental costs are reported as the average incremental cost per building in the city of Vancouver, where the average was taken across all 240 archetypes. The incremental costs for other regions were generated by adjusting the incremental cost data from the city of Vancouver using the residential location factors provided by RSMeans.

The energy conservation points assigned to the airtightness levels in Climate Zones 4 and 6 generally remain the same or increase. In Climate Zone 5, the energy conservation points are 0.2 to 0.7 points lower for each airtightness level. In Climate Zones 7A, 7B and 8, the energy conservation points are 0.8 to 6.2 points lower for each airtightness level.

This decrease in points means that a Code user would need to select another energy conservation measure to compensate for the decrease and still comply with a tier of the prescriptive trade-off path. It should be noted that this proposed change would increase the number of energy conservation measures when the prescriptive trade-off path is used. This would give Code users the opportunity to obtain more points to compensate for the decrease in points for airtightness in the Climate Zones mentioned above.

With this proposed change, Code users who choose to perform airtightness testing at higher levels would be credited between 2.2 and 18.8 energy conservation points, which represents an energy savings and would cost between $435 and $4,203.

Enforcement implications

This proposed change could be enforced using the existing Code enforcement infrastructure.

Who is affected

Designers, engineers, architects, builders and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.8.8. (first printing)

[9.36.8.8.] 9.36.8.8. ([1] 1) no attributions

[9.36.8.8.] 9.36.8.8. ([2] 2) [F90-OE1.1]

Submit a comment

Proposed Change 1836

Code Reference(s):	**NBC20 Div.B 9.36.8.9. (first printing)**
Subject:	Prescriptive Trade-off Path
Title:	Gas-Fired Furnaces
Description:	This proposed change introduces Sentence 9.36.8.9.(5) and Table 9.36.8.9.-B to assign energy conservation points to gas-fired furnaces.

This change could potentially affect the following topic areas:

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

Problem

The National Building Code of Canada (NBC) does not currently assign energy conservation points to gas-fired furnaces in the prescriptive trade-off path in Section 9.36. This proposed change would establish the number of energy conservation points assigned to gas-fired furnaces with performance levels that exceed the minimum performance required by Energy Performance Tier 1.

Failure to assign energy conservation points to gas-fired furnaces as specified would prevent Code users from accumulating the energy conservation points associated with the energy savings gained from installing a high-efficiency gas-fired furnace, unless the performance compliance path is used.

In order to accumulate energy conservation points for higher performance tiers, more options in terms of energy conservation measures are required than are currently provided in the Code.

Justification

The choice of gas-fired furnace contributes to a building's energy savings. Code users who choose to install high-efficiency gas-fired furnaces will benefit from the additional energy savings provided by the equipment when complying with the prescriptive trade-off path in Section 9.36.

By assigning energy conservation points to gas-fired furnaces exceeding the minimum performance required for Tier 1, Code users would benefit from this additional option for demonstrating compliance with a higher energy performance tier in the prescriptive trade-off path.

Additionally, this proposed change adds granularity for energy conservation points provided in tabulated form for gas-fired furnaces by allowing interpolation. If this proposed change did not permit interpolation, Code users would only be able to claim the lower of two point values when the minimum performance of the chosen gas-fired furnace falls between two values listed in proposed NBC Table 9.36.8.9.

Failure to add additional energy conservation measures to the Code could prevent Code users from accumulating sufficient points to comply with higher tiers, as required by their respective jurisdictions.

PROPOSED CHANGE

NBC20 Div.B 9.36.8.9. (first printing)

[9.36.8.9.] 9.36.8.9. Energy Conservation Measures for HVAC Systems

[1] 1) HVAC systems, equipment and installations shall be designed and constructed in accordance with Articles 9.36.3.2. to 9.36.3.8. and this Article.

[2] 2) Where HVAC systems, equipment or techniques other than those described in Articles 9.36.3.2. to 9.36.3.8. and this Article are used, the *building* shall be designed and constructed in accordance with the NECB.

[3] 3) Ventilation systems serving *buildings* to which this Subsection applies shall be equipped with a heat-recovery ventilator conforming to Article 9.36.3.9.

[4] 4) Heat-recovery ventilators that comply with one of the energy conservation measures prescribed in Table 9.36.8.9. shall be credited with the corresponding energy conservation points stipulated therein.

Table [9.36.8.9.-A] 9.36.8.9.
Energy Conservation Measures and Points for Ventilation Systems
Forming Part of Sentence [9.36.8.9.] 9.36.8.9.([4] 4)

Energy Conservation Measures for Ventilation Systems – Sensible Heat-Recovery Efficiency, SRE (1)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
60% ≤ SRE < 65%	0.7	0.7	0.7	0.6	0.8	0.4
65% ≤ SRE < 75%	2.1	2.1	2.2	1.7	2.3	1.2
75% ≤ SRE < 84%	3.4	3.2	3.5	2.7	3.7	1.8

Note to Table [9.36.8.9.-A] 9.36.8.9.:

(1) SRE = sensible recovery efficiency measured at an outside air test temperature of 0°C

[5] --) Gas-fired furnaces that comply with one of the energy conservation measures prescribed in Table 9.36.8.9.-B shall be credited with the corresponding energy conservation points stipulated therein.

Table [9.36.8.9.-B]
Energy Conservation Measures and Points for Gas-fired Furnaces (1)
Forming Part of Sentence [9.36.8.9.] 9.36.8.9.([4] 4)

Energy Conservation Measures for Space Heating Equipment (2) (3)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
Annual Fuel Utilization Efficiency (AFUE)	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
96%	0.4	0.4	0.4	0.5	0.5	0.5
98%	1.1	1.3	1.3	1.4	1.5	1.6

Notes to Table [9.36.8.9.-B] :

(1) Includes both natural gas and propane.

(2) For intermediate values of minimum AFUE, linear interpolation of energy conservation points is permitted.

(3) Gas-fired furnaces must be equipped with a high-efficiency constant torque or constant airflow fan motor.

Impact analysis

This proposed change would improve the affordability of complying with the energy performance tiers through the prescriptive path by increasing the number of measures eligible for points and allowing Code users to obtain credit for the energy savings associated with installing a high-efficiency gas-fired furnace.

Upgrading to higher efficiency gas-fired furnace does not result in substantial increase in energy savings relative to the increase in incremental cost of equipment. When choosing to install a higher efficiency gas-fired furnace, Code users would benefit from receiving the assigned energy conservation points for that equipment to contribute to demonstrating compliance with a higher energy tier of the prescriptive trade-off path.

As demonstrated by Table 1., Code users who choose to install higher efficiency gas furnaces would be credited with between 0.4 and 1.6 energy conservation points, which represents the percentage energy savings, and would incur a cost of between $1,124 and $2,120.

Table 1. Comparison of Costs and Energy Savings of Gas-Fired Furnaces by Region

AFUE	Energy Savings (%)	Incremental cost compared to a 95% AFUE(1) furnace(2) ($)						
		BC	AB	SK and MB	ON	QC	Atlantic Canada	Northern Canada
96%	0.4–0.5	1,179	1,179	1,194	1,174	1,231	1,142	1,124
98%	1.1–1.6	2,069	2,069	2,084	2,063	2,120	2,031	2,014

Source: furnacestore.ca; prices listed include retail markup and Canada-wide free shipping.

Notes to Table 1.:

(1) AFUE = annual fuel utilization efficiency

(2) Equipment used was the Goodman Gas Furnace – Upflow, Modulating Variable Speed and 60,000 BTU / 3 Ton Blower.

Enforcement implications

This proposed change could be enforced by the existing Code enforcement infrastructure.

Who is affected

Designers, engineers, architects, builders and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.8.9. (first printing)

[9.36.8.9.] 9.36.8.9. ([1] 1) no attributions

[9.36.8.9.] 9.36.8.9. ([2] 2) no attributions

[9.36.8.9.] 9.36.8.9. ([3] 3) no attributions

[9.36.8.9.] 9.36.8.9. ([3] 3) [F95,F100-OE1.1]

[9.36.8.9.] 9.36.8.9. ([4] 4) [F95-OE1.1]

[9.36.8.9.] -- ([5] --) [F95-OE1.1]

Submit a comment

Proposed Change 1835

Code Reference(s):	**NBC20 Div.B 9.36.8.10. (first printing)**
Subject:	Prescriptive Trade-off Path
Title:	Drain-Water Heat Recovery
Description:	This proposed change introduces Sentences 9.36.8.10.(4) and (5), and Table 9.36.8.10.-B to assign energy conservation points to drain-water heat-recovery units.

This change could potentially affect the following topic areas:

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

Problem

Drain-water heat-recovery (DWHR) units capture lost heat from hot water as it drains. The energy performance path in Section 9.36. of Division B of the NBC permits Code users to account for the contribution of DWHR units to overall energy performance. However, the Code does not currently assign energy conservation points to DWHR units for compliance with the prescriptive trade-off path.

DWHR units are popular due to their ability to save energy and are mandatory in some jurisdictions.

Failure to assign energy conservation points to DWHR units would prevent the Code users who choose to install them from accumulating the associated energy savings when complying with the prescriptive trade-off path. In order to accumulate energy conservation points for higher performance tiers, more options in terms of energy conservation measures are required than are currently provided in the Code.

Justification

This proposed change assigns energy conservation to DWHR units. Code users would benefit from additional options for achieving the minimum energy conservation points for compliance with the energy performance tiers if DWHR units were added to the list of eligible energy conservation measures in Subsection 9.36.8.

Additionally, this proposed change adds granularity for energy conservation points provided in tabulated form for DWHR units by allowing interpolation. If this proposed change did not permit interpolation, Code users would only be able to claim the lower of two point values when the minimum performance of the chosen DWHR unit falls between two values listed in proposed Table 9.6.8.10.-B.

Failure to add additional energy conservation measures to the Code could prevent Code users from accumulating sufficient points to comply with higher tiers, as required by their respective jurisdictions.

PROPOSED CHANGE

NBC20 Div.B 9.36.8.10. (first printing)

[9.36.8.10.] 9.36.8.10. Energy Conservation Measures for Service Water Heating Equipment

[1] 1) Service water heating equipment and components shall be designed and constructed in accordance with Subsection 9.36.4. and this Article.

[2] 2) Where service water heating equipment or techniques other than those described in Subsection 9.36.4. and this Article are used, the *building* shall be designed and constructed in accordance with the NECB.

[3] 3) Service water heating equipment that complies with one of the energy conservation measures prescribed in Table 9.36.8.10. shall be credited with the corresponding energy conservation points stipulated therein.

Table [9.36.8.10.-A] 9.36.8.10.
Energy Conservation Measures and Points for Service Water Heating Equipment
Forming Part of Sentence [9.36.8.10.] 9.36.8.10.([3] 3)

Type of Equipment	Energy Conservation Measures for Service Water Heating Equipment – Energy Efficiency, EF or UEF (1) (2)	Performance Testing Standard	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
			Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
			Energy Conservation Points					
Gas- or oil-fired tankless condensing water heater	EF ≥ 0.95 or UEF ≥ 0.92	CAN/CSA-P.3	8.9	5.4	4.9	3.1	3.1	3.1
Gas- or oil-fired residential *storage-type service water heater*	EF ≥ 0.80 or UEF ≥ 0.83		8.9	5.4	4.9	3.1	3.1	3.1
Gas- or oil-fired residential-duty commercial *storage-type service water heater*	UEF ≥ 0.79		4.6	2.7	2.4	1.5	1.5	1.5
	UEF ≥ 0.85		6.0	3.6	3.2	2.0	2.0	2.0
Heat pump water heater	EF ≥ 2.35	CAN/CSA-C745	6.4	3.9	3.8	3.0	3.0	3.0

Notes to Table [9.36.8.10.-A] 9.36.8.10.:

(1) EF = energy factor
UEF = uniform energy factor

(2) Applies to *storage-type service water heaters* that heat potable water, including *storage-type service water heaters* used to generate heat in combined space- and water-heating systems.

[4] --) Where a drain-water heat-recovery unit is used, it shall
[a] --) be installed in accordance with the manufacturer's instructions, and
[b] --) recover heat from
[i] --) all above-ground showers, where there are one or two such showers, or
[ii] --) at least two above-ground showers, where there are more than two such showers.

[5] --) Drain-water heat-recovery units that comply with one of the energy conservation measures prescribed in Table 9.36.8.10.-B shall be credited with the corresponding energy conservation points stipulated therein.

Table [9.36.8.10.-B]
Energy Conservation Measures and Points for Drain-Water Heat-Recovery Units
Forming Part of Sentence [9.36.8.10.] -- ([5] --)

Energy Conservation Measures for Drain-Water Heat-Recovery Units – Heat-Recovery Efficiency (1) (2)	Heating Degree-Days of *Building* Location, in Celsius Degree-Days					
	Zone 4 ≤ 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
	Energy Conservation Points					
30%	2.4	1.9	1.9	1.9	1.9	1.5
40%	3.1	2.4	2.4	2.4	2.4	2.0
50%	3.7	2.9	3.0	2.9	2.9	2.4
60%	4.4	3.4	3.5	3.5	3.4	2.8
70%	5.0	3.9	4.0	4.0	3.9	3.2
75%	5.4	4.1	4.3	4.2	4.2	3.4

Notes to Table [9.36.8.10.-B] :

(1) Heat-recovery efficiency shall be determined in accordance with CSA B55.1, "Test method for measuring efficiency and pressure loss of drain water heat recovery units."

(2) For intermediate values of minimum heat-recovery efficiency, linear interpolation of energy conservation points is permitted.

Impact analysis

This proposed change would improve the affordability of complying with the energy performance tiers through the prescriptive trade-off path. By assigning energy conservation points to drain-water heat-recovery (DWHR) units, Code users can get credit for the energy savings associated with these units. DWHR may be less costly than other energy conservation measures. In some jurisdictions, DWHR is mandatory.

In Table 1., the DWHR units with a heat-recovery efficiency of 70% and 75% have a 4 in. drain compared to a 3 in. drain for other efficiencies, resulting in a higher cost. The costs listed in Table 1. were valid on May 11, 2023.

Code users who choose to install a DWHR unit would be credited with between 1.5 and 5.4 energy conservation points, which represents the percentage energy savings, and would incur a cost of between $402 and $1,674.

Table 1. Comparison of Costs and Energy Savings of Various DWHR Units by Region

Heat-Recovery Efficiency	Energy Savings (%)	Cost of DWHR Unit ($)						
		BC	AB	SK and MB	ON	QC	Atlantic Canada	Northern Canada
30%*	1.5–2.4	402	402	402	402	402	402	402
40%**	2.0–3.1	499	499	499	499	499	499	499
50%**	2.4–3.7	539	539	539	539	539	539	539
60%**	2.8–4.4	699	699	699	699	699	699	699
70%***	3.2–5.0	1410	1410	1410	1410	1410	1410	1410
75%***	3.4–5.4	1674	1674	1674	1674	1674	1674	1674

Source: homedepot.ca and renewability.com; prices include retail markup and Canada-wide free shipping.

Notes to Table 1.:

* Powerpipe DWHR unit, 3 in. drain (for unit with 30% efficiency).

** ThermoDrain DWHR unit, 3 in. drain with PEX (for units with 40% to 60% efficiency).

*** Powerpipe DWHR unit, 4 in. drain (for units with 70% and 75% efficiency).

Enforcement implications

This proposed change could be easily enforced by the existing Code enforcement infrastructure because the percentage efficiency of the DWHR unit appears on the product sticker.

Who is affected

Designers, engineers, architects, builders and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.8.10. (first printing)

[9.36.8.10.] 9.36.8.10. ([1] 1) no attributions

[9.36.8.10.] 9.36.8.10. ([2] 2) no attributions

[9.36.8.10.] 9.36.8.10. ([3] 3) [F96-OE1.1]

[9.36.8.10.] -- ([4] --) [F96-OE1.1]

[9.36.8.10.] -- ([5] --) [F96-OE1.1]

Submit a comment

Proposed Change 1824

Code Reference(s):	**NBC20 Div.B 10 (first printing)**
Subject:	Alteration of Existing Buildings
Title:	Scope and Application of NBC Part 10
Description:	This proposed change introduces NBC Part 10 and states the scope and application of this proposed Part to the alteration of existing buildings.
Related Proposed Change(s):	PCF 1812, PCF 1813, PCF 1839

This change could potentially affect the following topic areas:

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

General information

See the summary for subject Alteration of Existing Buildings.

Problem

Scope and Application of Part 10

The National Building Code of Canada (NBC) applies to the alteration of existing buildings, but relaxations to Code requirements may be granted by authorities having jurisdiction. The different relaxations between jurisdictions leads to inconsistencies in the level of performance of buildings with alterations and creates confusion about the degree of work necessary for the alteration to meet the Code requirements. The requirements applying to the alteration of existing buildings should be clearly stated in a new Part 10 in the NBC.

The scope of the initial version of Part 10 is limited to requirements applying to the alteration of existing buildings that improve the energy performance of the building. Energy performance requirements applying to the alteration of Part 9 buildings (to which Section 9.36. applies) are located in Part 10. Energy performance requirements applying to the alteration of Part 3 buildings will be located in Part 11 of the National Energy Code of Canada for Buildings. The proposed NBC Part 10 must clearly direct Code users where to find the requirements applying to the alteration of the existing building in question.

Application of the Requirements of Part 10 to Extensions

Extensions to buildings (including additions) create a combination of an existing portion of the building and a newly constructed portion. New construction should meet the requirements of the Code, but additional consideration may be necessary for the existing portion of the extended building as a result of the extension. The requirements that apply to the existing building must be clearly stated to avoid confusion in the case of an extension.

Justification

The voluntary alteration of an existing building represents an opportunity to upgrade the building’s safety, accessibility, durability or energy performance. When significant repairs or alterations need to be made is the ideal time to consider upgrading the building’s performance where it is cost-effective to do so, thereby minimizing the incremental cost of the upgrade.

To address the alteration of existing buildings, a guiding principle of the development of provisions is that the provisions should be reasonable, pragmatic and avoid placing an undue burden on building owners. Providing exemptions from or relaxations of the Code requirements that are not practical to apply to an existing building, and that do not lead to a decrease in building performance, allows the flexibility to continue using existing functional materials or equipment by extending their service life and deferring replacement costs.

Code users would benefit from a clarification of the requirements that apply to extensions (including additions) and the alteration of existing buildings, as well as a clarification of the applicable permitted relaxations to Code requirements.

PROPOSED CHANGE

NBC20 Div.B 10 (first printing)

[10.] 10 Alteration of Existing Buildings

[10.1.] -- General

[10.1.1.] -- Application and Definitions

[10.1.1.1.] --- Scope

[1] --) This Part is concerned with the energy performance of *existing buildings* or parts thereof subjected to *alteration*. (See Note A-10.1.1.1.(1).)

[10.1.1.2.] --- Application

[1] --) The application of this Part shall be as described in Article 1.3.3.4.-2025 of Division A.

[10.1.1.3.] --- Compliance

[1] --) Except as provided in Sentence (2), the *alteration* of *existing buildings* or parts thereof shall comply with Part 11-2025 of Division B of the NECB.

[2] --) Except as provided in Sentence (3), the *alteration* of *existing buildings* or parts thereof shall comply with Section 10.9. for

[a] --) *buildings* of *residential occupancy* to which Part 9 applies,

[b] --) *buildings* containing *business and personal services*, *mercantile* or *low-hazard industrial occupancies* to which Part 9 applies whose combined total *floor area* does not exceed 300 m^2, excluding parking garages that serve *residential occupancies*, and

[c] --) *buildings* containing a mix of the *residential* and *non-residential occupancies* described in Clauses (a) and (b).

[3] --) For the purpose of determining whether Section 10.9. applies in Sentence (2), the *existing buildings* shall be considered together with the *alteration*.

[10.1.1.4.] --- Defined Words

[1] --) Words that appear in italics are defined in Article 1.4.1.2.-2025 of Division A.

[10.1.1.5.] --- Performance

[1] --) An *alteration* to an *existing building* shall not adversely affect any aspect of *building* performance.

[10.1.1.6.] --- Extensions

[1] --) Where an extension, including an addition, is being added to an *existing building*,

[a] --) the *existing building* shall comply with this Part, and

[b] --) the extension shall comply with all other Parts of the Code.

Note A-10.1.1.1.(1) Extent of the Alteration.

Unless they state otherwise, the provisions of Part 10 are not intended to require building owners to undertake work beyond the planned extent of an alteration. Certain provisions do, however, expand the extent of an alteration where it is reasonable and cost effective to do so. Some examples of such an expansion of extent are the following:

- sealing ducts that are accessible,
- insulating piping that is being replaced,
- installing automatic temperature controls on service water heating systems with storage tanks,
- improving impacted or exposed portions of an air barrier system, and
- improving the thermal resistance of exposed wall framing, ceilings or floors.

The overarching principles for the application of the provisions of Part 10 to an alteration are the following:

- to maintain or increase the overall building performance level,
- to avoid negative or unintended consequences and unrealistic expectations,
- to ensure that the building is left in a safe state during the alteration, and
- to encourage alterations without placing an undue burden on building owners.

[10.2.] -- Reserved

[10.3.] -- Reserved

[10.4.] -- Reserved

[10.5.] -- Reserved

[10.6.] -- Reserved

[10.7.] -- Reserved

[10.8.] -- Reserved

[10.9.] -- Energy Efficiency of Housing and Small Buildings

[10.9.1.] -- General

[10.9.1.1.] --- Reserved

[10.9.2.] -- Energy Efficiency

[10.9.2.1.] --- Definitions

[1] --) The definitions provided in Article 9.36.1.2. shall apply to this Subsection.

[10.9.2.2.] --- Replacement Work

[1] --) Where a component is being replaced, the energy performance level of that component shall not be decreased, unless it can be shown that the *building*'s overall energy performance level will not be decreased as a result of the replacement.

General information

See the summary for subject Alteration of Existing Buildings.

Impact analysis

It is expected that the proposed Part 10 requirements which apply to the alteration of existing buildings would provide a benefit to both the industry and authorities having jurisdiction by providing a consistent set of provisions to ensure an acceptable level of safety and building performance, and to remove ambiguity with respect to the degree of work required to improve performance in the unaltered portion of the building.

Providing exemptions for maintenance, repair or replacement with a similar component where appropriate would permit extension of the service life of materials and equipment, defer system replacement costs and improve building performance without creating an undue burden on building owners.

This proposed change would help reduce the administrative and enforcement costs 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.

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.

The proposed changes would aid enforcement by identifying the work necessary to improve energy performance in the unaltered portion of the building.

Who is affected

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

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 10 (first printing)

[10.1.1.1.] -- ([1] --) no attributions

[10.1.1.2.] -- ([1] --) no attributions

[10.1.1.3.] -- ([1] --) no attributions

[10.1.1.3.] -- ([2] --) no attributions

[10.1.1.3.] -- ([3] --) no attributions

[10.1.1.4.] -- ([1] --) no attributions

[10.1.1.5.] -- ([1] --) [F02-OS1.2]

[10.1.1.5.] -- ([1] --) [F55,F61,F63-OH1.1,OH1.2,OH1.3]

[10.1.1.6.] -- ([1] --) no attributions

[10.9.2.1.] -- ([1] --) no attributions

[10.9.2.2.] -- ([1] --) [F91,F93,F95,F96-OE1.1]

Submit a comment

Proposed Change 1839

Code Reference(s):	**NECB20 Div.A 1.1.1.1. (first printing)** **NECB20 Div.A 1.3.3. (first printing)**
Subject:	Alteration of Existing Buildings
Title:	Application of the NECB to the Alteration of Existing Buildings
Description:	This proposed change modifies the application of the NECB generally, and Parts 3 to 8 and 10 and proposed Part 11 specifically, to include the alteration of existing buildings.
Related Proposed Change(s):	PCF 1812, PCF 1813, PCF 1824

This change could potentially affect the following topic areas:

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

General information

See the summary for subject Alteration of Existing Buildings.

Problem

Regulatory authorities and the industry have expressed the desire for a consistent set of provisions that apply to the alteration of existing buildings to ensure an acceptable level of safety and building performance, and to remove ambiguity with respect to the degree to which the unaltered portion of the building must meet the Code requirements. A consistent process for applying these requirements would help to reduce unnecessary variation in enforcement levels in different jurisdictions.

The National Energy Code of Canada for Buildings (NECB) applies to new buildings, to additions, and to the subsequent alteration of buildings constructed to meet the requirements of the 2020 National Model Codes. The NECB does not currently apply to the alteration of existing buildings that are constructed to meet the requirements of previous editions of the National Model Codes. For consistent application across jurisdictions and improved energy efficiency in the existing portion of the building, the application of the NECB must be expanded to include the alteration of existing buildings.

A new Part 11 of the NECB is being proposed to contain the technical requirements that apply to the alteration of existing buildings. Division A of the NECB would also need to be revised to state the application of the proposed Part 11 to existing buildings.

Failure to state the application of a set of requirements that apply to the alteration of existing buildings may lead to an incorrect set of requirements being applied to an existing building or a missed opportunity for upgrading the energy performance of an existing building when it is cost-effective to do so.

Justification

The voluntary alteration of an existing building represents an opportunity to upgrade the energy performance of the building. When significant repairs or alterations need to be made, the energy performance of the building should also be improved at the same time where it is cost-effective to do so, thereby minimizing the incremental cost of the upgrade.

In order to provide the minimum requirements for the alteration of existing buildings, the scope of the NECB must be expanded. The Code requirements that apply to alterations must be identified, with any permitted relaxations provided where applicable.

Providing a set of consistent, harmonized and cost-effective requirements that apply to the alteration of an existing building would provide Code users, the industry and authorities having jurisdiction with a clear expectation of the degree of work required to improve the energy performance of an existing building.

PROPOSED CHANGE

NECB20 Div.A 1.1.1.1. (first printing)

[1.1.1.1.] 1.1.1.1. Application of this Code

[1] 1) Except as provided in ~~Sentence (3)~~Sentence (2)-2025, this Code applies to

[a] --) the design and construction of

[i] --) all new *buildings* described in Sentence 1.3.3.2.(1) of Division A of the NBC, and

[ii] --) ~~to~~ *additions*, and

[b] --) the alteration of all *existing buildings* described in Sentence 1.3.3.2.(1) of Division A of the NBC.

(See Note A-1.1.1.1.(1).)

~~[2] 2)~~ ~~This Code applies to subsequent alterations to and within *buildings* originally constructed in accordance with this Code. (See Note A-1.1.1.1.(2).)~~

[3] **3)** This Code does not apply to *farm buildings*.

Note A-1.1.1.1.(1) Additions~~pplication of this Code~~.

~~This Code applies to buildings and their systems, components and assemblies at the time of their construction.~~

For the purpose of understanding the scope of this Code, an addition can be thought of as a new building that happens to be built contiguous to an existing building or as a new portion of an existing building.

~~**Note A-1.1.1.1.(2) Application of this Code.**~~

~~This Code is intended to apply to alterations to and within buildings constructed in compliance with the NECB to ensure that future alterations and improvements to building assemblies, systems, equipment and components regulated by this Code, such as tenant improvements and renovations, continue to meet the requirements of this Code.~~

~~Designers should pay particular attention to situations where the Part 8 Performance Compliance Path is used. The assumptions used in the original energy model may need to be reviewed, and a new energy model may need to be prepared.~~

NECB20 Div.A 1.3.3. (first printing)

[1.3.3.] 1.3.3. Application of Division B

[1.3.3.1.] 1.3.3.1. Application of Part~~s~~ 1~~, 3 to 8 and 10~~

[1] **1)** Part~~s~~ 1~~, 3 to 8 and 10~~ of Division B appli~~es~~y to all *buildings* covered in this Code. (See Article 1.1.1.1.)

[1.3.3.2.] --- Application of Parts 3 to 8 and 10

[1] --) Parts 3 to 8 and 10 of Division B apply to all new *buildings* covered in this Code and to *additions*.

[1.3.3.3.] --- Application of Part 11

[1] --) Except as provided in Sentences (2) and (3), Part 11 of Division B applies to the alteration of *existing buildings*.

[2] --) Part 11 of Division B does not apply to

[a] --) tents,

[b] --) *air-supported structures*,

[c] --) relocatable *buildings*,

[d] --) open-air *storage garages*,

[e] --) garages or carports described in Sentence 9.35.1.1.(1) of the NBC, or

[f] --) construction camps.

[3] --) Part 11 of Division B does not apply to *heritage buildings* or to parts of a *building* that have been formally recognized by a federal, provincial, territorial or municipal authority as having heritage value.

General information

See the summary for subject Alteration of Existing Buildings.

Impact analysis

The proposed changes to Division B that apply to the alteration of existing buildings provide the impact analysis for each technical requirement.

It is expected that the proposed Code requirements that apply to the alteration of existing buildings would provide a benefit to both the industry and authorities having jurisdiction by providing a consistent set of provisions to ensure an acceptable level of safety and building performance, and to remove ambiguity with respect to the degree of work required to improve energy performance in the unaltered portion of the building.

This proposed change would help reduce the administrative and enforcement costs 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.

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. The proposed changes would aid enforcement by identifying the work necessary to improve energy performance in the unaltered portion of the building.

Who is affected

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

Submit a comment

Proposed Change 1820

Code Reference(s):	**NECB20 Div.A 2.2.1.1.(1) (first printing)** **NECB20 Div.A 3.2.1.1.(1) (first printing)**
Subject:	Greenhouse Gas Emissions
Title:	New Greenhouse Gas Emissions Objective and Functional Statement in the NECB
Description:	This proposed change adds a greenhouse gas emissions objective and functional statement to the NECB.
Related Code Change Request(s):	CCR 1805
Related Proposed Change(s):	PCF 1843, PCF 1989, PCF 2003, PCF 2004, PCF 2016

This change could potentially affect the following topic areas:

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

Problem

In 2011 and 2012, an energy efficiency objective (OE1.1, Excessive Use of Energy) and related design and construction requirements were introduced into the National Energy Code of Canada for Buildings (NECB) and the National Building Code of Canada (NBC).

At the time of the development of the energy efficiency objective, and when setting the Long-Term Strategy for Developing and Implementing More Ambitious Energy Codes in 2016, there was no consensus among provincial and territorial governments on an approach for addressing greenhouse gas (GHG) emissions. In addition, technical committees were directed to focus only on energy efficiency when proposing

performance requirements for future editions of the Codes. Thus, the National Model Codes do not presently address the type or quality of the energy source used by buildings and houses, nor do they address embodied GHG emissions.

In 2022, on advice from the provinces and territories, the Canadian Commission on Building and Fire Codes (CCBFC) decided that an objective related to limiting GHG emissions and requirements meeting this objective were needed in the National Model Codes to enable provincial and territorial regulation, and to further support provincial, territorial and federal GHG emissions reduction targets and climate action plans. The advice indicated that operational GHG emissions should be addressed in the 2025 editions of the Codes and that embodied GHG emissions should be addressed in the 2030 editions of the Codes. This direction was adopted by the newly formed Canadian Board for Harmonized Construction Codes (CBHCC) in November 2022.

"GHG" means any substance included in Canada’s GHG inventory in the National Inventory Report.

Justification

In order to meet provincial, territorial and federal GHG emissions reduction targets and climate action plans, including the goals to reduce Canada's total GHG emissions to 40–45% below the 2005 levels by 2030 and to reach net-zero GHG emissions by 2050, Code requirements need an objective and functional statement that pertain to limiting GHG emissions of new buildings and houses.

In the 2020 editions of the NECB and NBC, energy efficiency tiers were introduced with measures that progressively increase energy efficiency in new buildings and houses. While these requirements go a long way towards reducing the amount of energy used to operate a building or house, operational and embodied GHG emissions have not yet been addressed.

Excessive GHG emissions result in increased concentrations of GHGs in the atmosphere, which in turn can lead to climate change and a risk to the environment. This is the basis for the proposed change to add a new objective under the existing objective, OE Environment.

This proposed change would add an objective (OE2.1) and functional statement (F101) related to limiting GHG emissions to the NECB. A similar proposed change (PCF 1843) would add the GHG emissions objective and functional statement to the NBC.

The proposed objective and functional statement are needed for the introduction of objective-based technical requirements addressing GHG emissions. The objective and functional statement are not standalone and are not technical requirements of the NECB. Technical requirements that address this objective in the design and construction of buildings and houses are under development.

PROPOSED CHANGE

NECB20 Div.A 2.2.1.1.(1) (first printing)

[2.2.1.1.] 2.2.1.1. Objectives

[1] 1) The objectives of this Code are as follows (see Note A-2.2.1.1.(1)):

OE Environment

An objective of this Code is to limit the probability that, as a result of the design or construction of the *building*, the environment will be affected in an unacceptable manner.

OE2 Greenhouse Gas Emissions

An objective of this Code is to limit the probability that, as a result of the design or construction of the *building*, greenhouse gas emissions will have an unacceptable effect on the environment. The risks of unacceptable effect on the environment due to greenhouse gas emissions addressed in this Code are those caused by—

OE2.1 - excessive emissions of greenhouse gases

NECB20 Div.A 3.2.1.1.(1) (first printing)

[3.2.1.1.] 3.2.1.1. Functional Statements

[1] 1) The objectives of this Code are achieved by measures, such as those described in the acceptable solutions in Division B, that are intended to allow the *building* or its elements to perform the following functions (see Note A-3.2.1.1.(1)):

F90 To limit the amount of uncontrolled air leakage through the *building envelope*.

F91 To limit the amount of uncontrolled air leakage through system components.

F92 To limit the amount of uncontrolled thermal transfer through the *building envelope*.

F93 To limit the amount of uncontrolled thermal transfer through system components.

F94 To limit the unnecessary demand and/or consumption of energy for lighting.

F95 To limit the unnecessary demand and/or consumption of energy for heating and cooling.

F96 To limit the unnecessary demand and/or consumption of energy for *service water* heating.

F97 To limit the unnecessary demand and/or consumption of energy for electrical equipment and devices.

F98 To limit the inefficiency of equipment.

F99 To limit the inefficiency of systems.

F100 To limit the unnecessary rejection of reusable waste energy.

F101 To limit operational greenhouse gas emissions.

Impact analysis

The impact analysis for proposed measures to limit GHG emissions will be provided in each of the respective proposed change forms that address the specific technical changes proposed for the NECB.

Enforcement implications

The addition of an objective and functional statement would provide important information to assist with the assessment of alternative solutions.

Who is affected

Owners, designers, manufacturers, building officials, builders and specification writers.

Submit a comment

Proposed Change 1821

Code Reference(s):	**NECB20 Div.B 3.1.1. (first printing)** **NECB20 Div.B 3.2.1.2.(2) (first printing)**
Subject:	Building Envelope - General
Title:	Thermal Bridging Requirements in the NECB
Description:	This proposed change updates the thermal bridging requirements in the NECB to reflect new modeling and standards.

This change could potentially affect the following topic areas:

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

Problem

The performance of the building envelope is a key contributor to the energy performance of the building. A thermal bridge occurs when a component of the building envelope conducts heat from the exterior to the interior of the building or vice-versa. Moisture condensation, thermal discomfort and excessive energy use can result.

Sentence 3.1.1.5.(5) of Division B of the National Energy Code of Canada for Buildings (NECB) does not currently include a referenced standard for two- or three-dimensional thermal simulation. Clear direction for Code users should be provided to perform this modeling.

Sentence 3.1.1.7.(3) excludes the thermal bridging effects due to fasteners from the calculation of thermal transmittance through the building envelope. This is problematic as the effects of thermal bridging result in excessive energy use.

There are misalignments between the NECB and National Building Code of Canada (NBC) Section 9.36. in regard to the calculation of thermal resistance, which could make demonstrating compliance more difficult for Part 9 buildings where the option is given of complying with either Code. If NBC Section 9.36. and the NECB have different requirements, this causes confusion for Code users.

The absence of appropriate and accurate methods of calculation for thermal bridging will result in energy loss not being accounted for, which in turn leads to Code users not achieving the expected energy savings and also leads to excess energy use, which would have an unacceptable effect on the environment.

Justification

This proposed change accounts for the energy lost due to thermal bridging and requires that the loss be compensated for by another component of the building envelope.

This proposed change also updates the referenced standards in the Code to include CSA Z5010:21, "Thermal bridging calculation methodology," as a method of modeling thermal bridging using two- or three-dimensional thermal simulation. This calculation method allows for a more accurate determination of heat loss at junctions. And, ASTM C1199-22, "Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods," is also introduced as an acceptable method to determine the thermal properties of fenestration.

Review of both standards determined that:

- there are no issues in the standards falling outside the scope and application of the NBC and the NECB,
- there are no inconsistencies between the definitions used in the standards and those used in the NBC and the NECB,
- there are no new or revised definitions that would need to be added to the NBC and the NECB,
- the standards address minimum acceptable practice,
- CSA Z5010 addresses issues that need to be regulated by providing a calculation guideline for thermal bridging,
- ASTM C1199 addresses issues that need to be regulated by providing a test method for the energy performance of fenestrations and is equivalent to ASTM C1363 but it is specifically for fenestration and will provide a more accurate result,
- referencing the standards does not necessitate the creation of a new objective or functional statement,
- referencing the standards causes no additional cost implications, and
- the standards should be referenced without limitations/qualifications.

This proposed change also harmonizes the requirements between the NECB and NBC Section 9.36. If NBC Section 9.36. and the NECB were to have different requirements, confusion would be caused for Code users, as compliance with the NECB is an option for NBC Part 9 buildings. Harmonizing the NECB and NBC Section 9.36. facilitates compliance for Code users.

Using appropriate and accurate methods for the calculation of thermal bridging will result in accurate energy loss accounting. As a result, Code users would achieve the expected energy savings, and excess energy use would also be prevented.

PROPOSED CHANGE

NECB20 Div.B 3.1.1. (first printing)

[3.1.1.] 3.1.1. General

[3.1.1.1.] 3.1.1.1. Scope

[3.1.1.2.] 3.1.1.2. Application

[3.1.1.3.] 3.1.1.3. Compliance

[3.1.1.4.] 3.1.1.4. Definitions

[1] 1) Words that appear in italics are defined in Article 1.4.1.2. of Division A.

[2] --) For the purposes of this Part, the term "thermal bridge" shall mean a point, linear area or surface area of a *building envelope* that has a thermal transmittance higher than the nominal thermal resistance of an adjacent *building envelope* assembly, which results in a higher energy flow through the point, linear area or surface area and increases the risk of condensation. (See Note A-3.1.1.4.(2).)

[3.1.1.5.] 3.1.1.5. Thermal Characteristics of Building Assemblies (See Note A-3.1.1.5.)

[1] 1) The thermal characteristics of *building envelope* materials shall be determined in accordance with the applicable product standards listed in the NBC or, in the absence of such standards or where such standards do not address the determination of thermal characteristics, in accordance with

[a] a) ASTM C177, "Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus",~~or~~

[b] b) ASTM C518-21,"Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus", or

[c] --) ASTM C1363-19, "Standard Test Method for Thermal Performance

of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus."

[2] 2) Calculations and tests performed in accordance with Sentence (1) shall be carried out at an average temperature of 24±2°C and under a temperature difference of 22±2°C.

[3] 3) Except as provided in Sentence (4), the *overall thermal transmittance* of *fenestration* and doors shall be determined for the reference sizes listed in accordance with

[a] a) CSA A440.2:22/CSA A440.3:22, "Fenestration energy performance/User guide to CSA A440.2:22, Fenestration energy performance,"~~CSA A440.2/A440.3, "Fenestration energy performance/User guide to CSA A440.2:19, Fenestration energy performance",~~ or

[b] b) ANSI/NFRC 100-2020, "Procedure for Determining Fenestration Product U-factors", and ANSI/NFRC 200-2020 "Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence."

[4] 4) The *overall thermal transmittance* of *fenestration* and doors that are not within the scope of the standards listed in Sentence (3) shall be determined from

[a] a) calculations carried out using the procedures described in the 2021 "ASHRAE Handbook – Fundamentals", or

[b] b) ASTM C1199-22, "Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods."~~laboratory tests performed in accordance with ASTM C1363, "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus", using an indoor air temperature of 21±1°C and an outdoor air temperature of –18±1°C measured at the mid-height of the *fenestration* or door.~~

[5] 5) The thermal characteristics of *building* assemblies other than *fenestration* and doors shall be determined from

[a] a) calculations carried out using the procedures described in

[i] i) the 2021 "ASHRAE Handbook – Fundamentals", ~~or~~

[ii] ii) ISO 14683:2017, "Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values", or

[iii] --) CSA Z5010:21, "Thermal bridging calculation methodology," (see Note A-3.1.1.5.(5)(a)), or

[b] b) ~~two- or three-dimensional thermal modeling, or~~

[c] c) laboratory tests performed in accordance with ASTM C1363-19, "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus", using an indoor air temperature of 21±1°C and an outdoor air temperature of –18±1°C.

[6] --) The thermal characteristics of log walls shall be determined by calculation in accordance with Section 305 of ICC 400-2017, "Standard on the Design and Construction of Log Structures." (See Note A-3.1.1.5.(6).)

[3.1.1.6.] 3.1.1.6. Calculation of Fenestration and Door Areas

[1] --) The gross ceiling or roof area shall be calculated as the sum of the interior surface areas of insulated ceiling and/or roof assemblies and of *skylight* openings.

[2] --) The gross wall area shall be calculated as the sum of the interior surface areas of all exterior *building envelope* assemblies above the finished ground level, including

[a] --) rim joists,

[b] --) *fenestration* and doors,

[c] --) insulated walls extending from finished ground level to the interior side of the insulated ceiling and/or roof assembly, and

[d] --) the exposed areas of below-ground *building envelope* assemblies, where *fenestration* or doors are located below the plane of the adjacent finished ground.

(See Note A-3.1.1.6.(2)-2025.)

[3] **1)** *Fenestration* and door areas shall be calculated to the ~~rough opening in the wall~~ actual size of the *fenestration* and doors, and shall include all related *frame* and *sash* members. ~~(See Note A-3.1.1.6.(1).)~~

[4] **2)** The *fenestration* area made of flat panes that are not all in the same plane or curved panes shall be measured along the surface of the glass. (See Note A-3.1.1.6.(4~~2~~)~~Note A-3.1.1.6.(2)~~.)

~~[5] 3) Except as provided in Sentence (4), in the calculation of allowable *fenestration* and door area, the gross wall area shall be calculated as the sum of the areas of all above-ground wall assemblies including *fenestration* and doors, but not including parapets, projected fins, ornamentation and appendages.~~

[6] **4)** The calculation of allowable *fenestration* and door area in *additions* shall be based upon

[a] a) the *addition* being considered by itself, or

[b] b) the *addition* being considered together with the existing *building*, provided that the combined *overall thermal transmittance* of the *addition* and existing *building* meets the prescriptive or trade-off requirements.

~~[7] 5) In the calculation of allowable *skylight* area, the gross roof area shall be calculated as the sum of the areas of insulated roof including *skylights*.~~

[3.1.1.7.] 3.1.1.7. Calculation of Overall Thermal Transmittance

[1] **1)** ~~In calculating the~~For the purpose of compliance with this Part, the calculated *overall thermal transmittance* of opaque assemblies ~~for purposes of comparison with the provisions in Section 3.2.,~~shall include

the effect of thermal bridging ~~shall be considered~~ for all elements of the assembly, including

[a] a) point thermal bridges,~~closely spaced repetitive structural members, such as studs and joists, and ancillary members, such as lintels, sills and plates,~~

[b] b) linear thermal bridges, and~~major structural elements that penetrate or intersect the *building envelope* (see Note A-3.1.1.7.(1)(b)),~~

[c] c) thermal bridges at junctions between ~~the following~~ *building envelope* materials, components and assemblies.~~:~~ (See Note A-3.1.1.7.(1).).

[i] i) ~~glazing assemblies,~~

[ii] ii) ~~spandrels,~~

[iii] iii) ~~parapets,~~

[iv] iv) ~~roof-to-wall junctions,~~

[v] v) ~~corners, and~~

[vi] vi) ~~edges of walls or floors, and~~

[d] d) ~~secondary structural members (see Note A-3.1.1.7.(1)(d)).~~

[2] 2) In calculating the *overall thermal transmittance* of the assemblies in Sentence (1) for purposes of ~~comparison~~ compliance with the provisions in this Part~~Section 3.2.~~, ~~pipes, ducts, equipment with through-the-wall venting, packaged terminal air conditioners or heat pumps~~ penetrations through the assemblies by components of the *building*'s mechanical, electrical and plumbing systems need not be taken into account. (See Note A-3.1.1.7.(2).)

~~**[3] 3)** In calculating the *overall thermal transmittance* of assemblies for purposes of comparison with the provisions in Section 3.2., fasteners need not be taken into account.~~

[4] 4) Where a component of the *building envelope* is protected by an enclosed unconditioned space, such as a sun porch, enclosed veranda or vestibule, the unconditioned enclosure may be considered to have an *overall thermal transmittance* of 6.25 W/(m^2×K). (See Note A-3.1.1.7.(4).)

~~**[5] 5)** For the purposes of this Article, roof assemblies shall be considered to include all related structural framing.~~

[6] 6) For the purposes of this Article, wall assemblies inclined less than 60° from the horizontal shall be considered as roof assemblies, and roof assemblies inclined 60° or more from the horizontal shall be considered as wall assemblies.

~~**[7] 7)** For the purposes of this Article, wall assemblies shall be considered to include all related structural framing and perimeter areas of intersecting interior walls.~~

~~**[8] 8)** For the purposes of this Article, floor assemblies shall be considered to include all related structural framing.~~

Note A-3.1.1.4.(2) Condensation Risk for Thermal Bridges.

The inner surface temperature of the point, linear area or surface area that acts as a thermal bridge in an assembly can be significantly colder than the surrounding area. This difference in temperature can lead to condensation on the thermal bridge if its surface temperature is colder than the dew point of the surrounding air. Such condensation can, in turn, lead to the degradation of materials, components and assemblies, and to the growth of mould.

Note A-3.1.1.5. Thermal Characteristics of Building Assemblies.

Thermal characteristics of building assemblies can also be determined through the use of computer simulation models. Examples of software tools include THERM, WINDOW, COMSOL and Siemens NX.

Note A-3.1.1.5.(5)(a) Thermal Bridging Calculations.

Methods for calculating the effect of thermal bridging for common scenarios are available, as are databases and catalogues of pre-calculated or measured results. For instance,~~Acceptable sources of information for calculating the effect of thermal bridging are~~ the "Building Envelope Thermal Bridging Guide", which is available through BC Hydro or the Licensing and Consumer Services branch of BC Housing~~, and ASHRAE Research Project Report RP-1365, "Thermal Performance of Building Envelope Details for Mid- and High-Rise Buildings".~~. Also, an online energy calculator for roofs, Energy-RCI, is available at: https://nrc.canada.ca/en/research-development/products-services/software-applications/energy-rci.

Note A-3.1.1.5.(6) Calculating Effective Thermal Resistance of Log Walls.

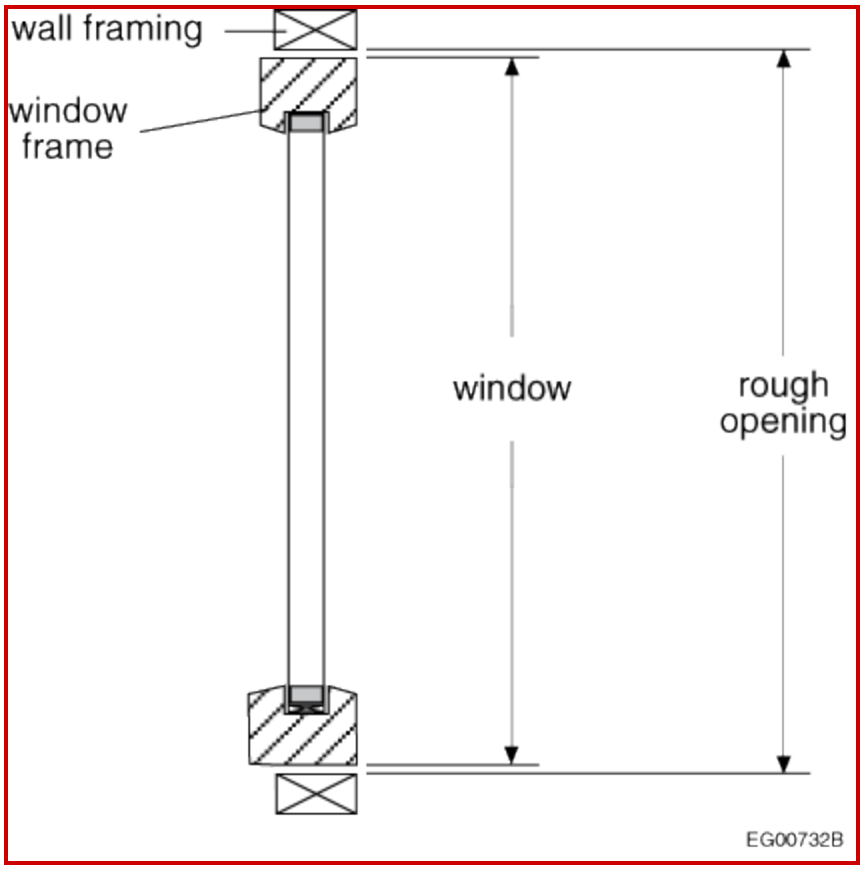
ICC 400, "Standard on the Design and Construction of Log Structures," defines log wall thickness as the "average cross-sectional area divided by the stack height." This approach equalizes all log profiles regardless of their size or shape by eliminating the need to vary, average or round out log thickness measurements, which would otherwise be necessary to determine applicable profile factors for different log shapes. ICC 400 lists R-values for log walls, including the exterior and interior air film coefficients, based on wall thickness and wood species' specific gravity.

~~**Note A-3.1.1.6.(1) Fenestration and Door Areas.**~~

~~The method of calculation of fenestration and door areas is slightly different in Sentence 3.1.1.6.(1) from the one used in CSA A440.2/A440.3, "Fenestration energy performance/User guide to CSA A440.2:19, Fenestration energy performance", for windows and doors. For calculating the fenestration area of a building, this Code uses the dimensions of rough openings to facilitate determination of compliance.~~

~~Figure A-3.1.1.6.(1) illustrates the requirements of Sentence 3.1.1.6.(1).~~

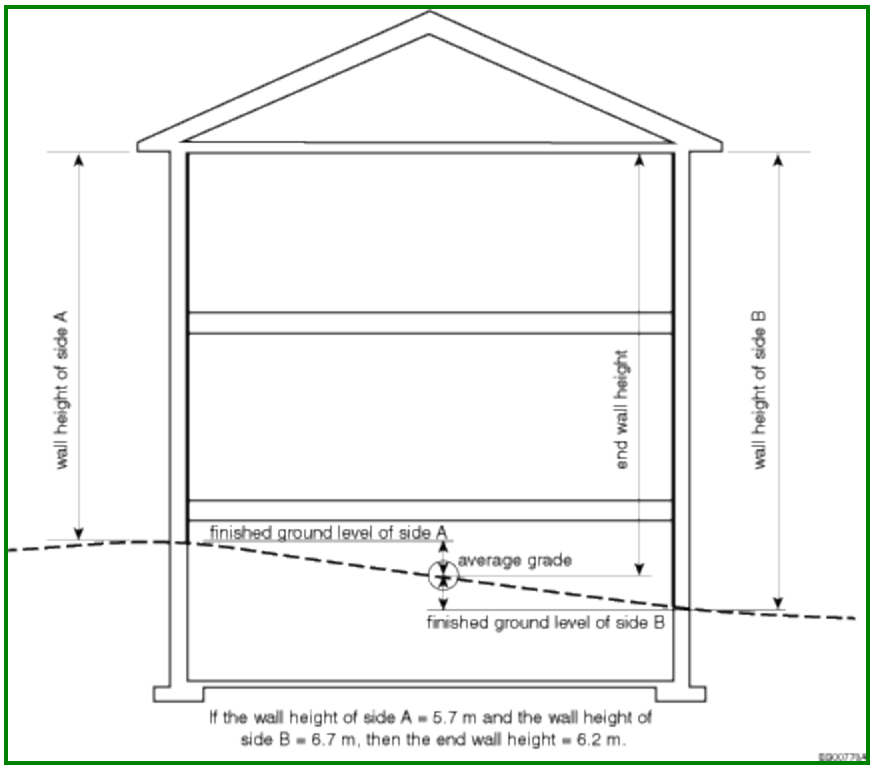
~~**Figure [A-3.1.1.6.(1)] A-3.1.1.6.(1)**~~
~~**Measuring fenestration and door areas**~~



Note A-3.1.1.6.(2)-2025 Calculating Gross Wall Area.

Where the structure of the lowest floor and rim joist assembly is above the finished ground level or where the above-grade portion of foundation walls separates conditioned space from unconditioned space, they should be included in the calculation of gross wall area. Figure A-3.1.1.6.(2) shows the intended measurements for the most common type of housing construction.

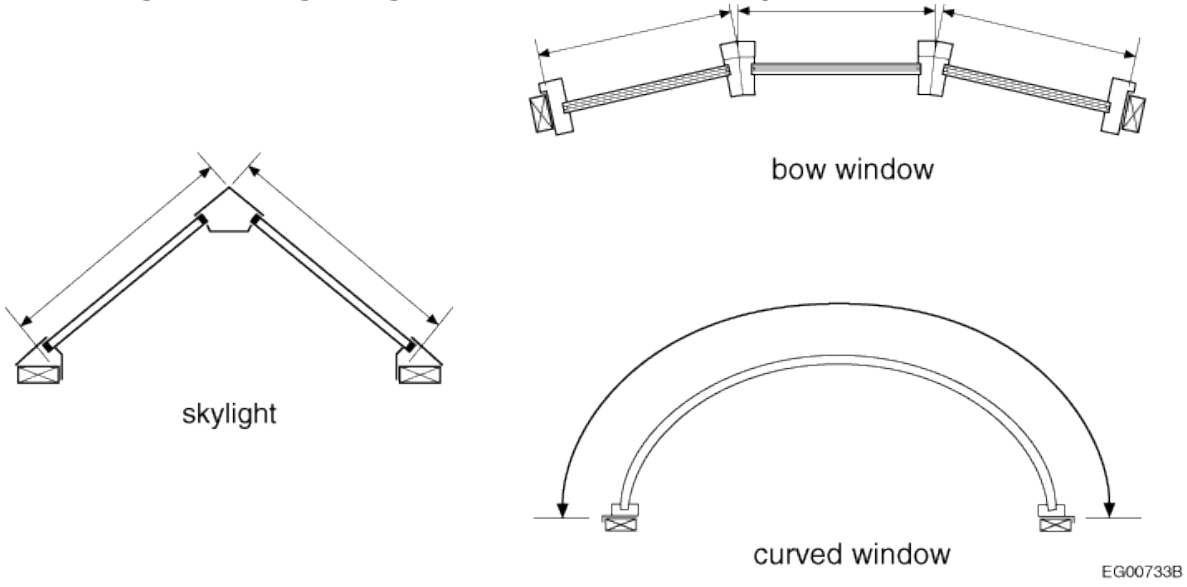
Figure [A-3.1.1.6.(2)-2025]
Example of interior wall height to be used in the calculation of gross wall area



Note A-3.1.1.6.(4~~2~~) Areas of Other Fenestration.

Figure A-3.1.1.6.(2) illustrates how to measure the area of glass panes as described in Sentence 3.1.1.6.(2).

Figure [A-3.1.1.6.(42)] A-3.1.1.6.(2)
Measuring areas of glazing that is not in the same plane



Note A-3.1.1.7.(1)-2025 Linear Elements, Point Elements and Junctions.

Point elements include fasteners (however, fasteners that do not penetrate the insulation layer do not need to be accounted for in the calculation), ties, anchors,

attachments and connectors.

Linear elements include studs, joists, ancillary members, lintels, plates, sills, flashings, angles, shelf angles, purlins, girts, sub-girts, hat channels, U-channels and furring.

Junctions between building envelope materials, components and assemblies occur at balconies, canopies, slab edges, fenestration perimeters (including the installation design details between the rough opening and the fenestration), spandrels, parapets, roof-to-wall junctions, corners, and edges of walls or floors. Junctions also occur at the intersection of interior walls with exterior walls, roofs or ceilings.

~~**Note A-3.1.1.7.(1)(b) Major Structural Elements.**~~

~~Examples of major structural elements that could penetrate the building envelope are walls, floors, roofs, balconies, joists, beams, girders, columns, and curbs.~~

~~**Note A-3.1.1.7.(1)(d) Secondary Structural Members.**~~

~~Secondary structural members typically attach cladding elements to primary structural members. Examples of secondary structural members are girts, purlins, sub-girts, hat-channels, U-channels, and shelf angles.~~

Note A-3.1.1.7.(2) Penetrations through the Building Envelope.

Examples of the penetrations described in Sentence 3.1.1.7.(2) include pipes, ducts, equipment with through-the-wall venting, and packaged terminal air conditioners or heat pumps. The impact of such penetrations ~~described in Sentence 3.1.1.7.(2)~~ on the overall thermal transmittance is difficult to assess but is considered to be negligible if the insulation is installed tight to the penetration.

NECB20 Div.B 3.2.1.2.(2) (first printing)

[3.2.1.2.] 3.2.1.2. Continuity of Insulation

[1] 2) Joints between components of the *building envelope*, such as expansion or construction joints or joints between walls and doors or *fenestration*, shall be insulated in a manner that provides continuity across such joints. (See Note A-3.2.1.2.(2).)

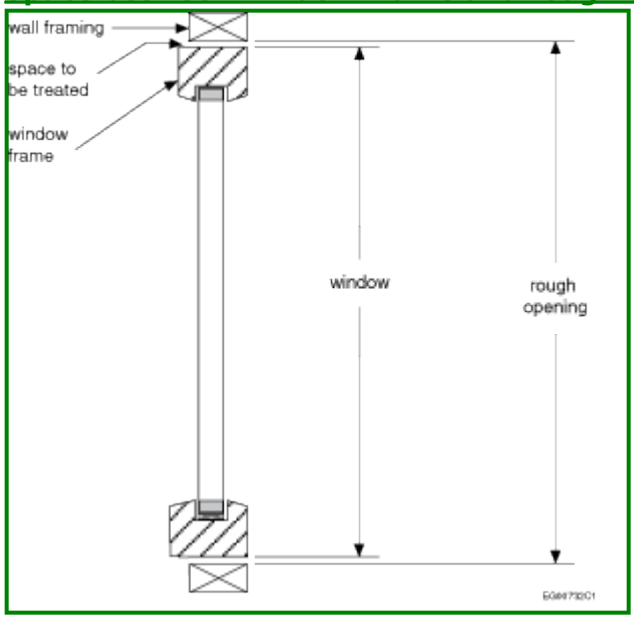
Note A-3.2.1.2.(2) Continuity of Insulation Where Components Meet.

Sentence 3.2.1.2.(2) calls for continuity of the insulation at the intersection of two components of the building envelope, such as a wall with another wall or a roof, or a wall with a window. This means that there should be no gap in the insulation between the two components. An obvious application is insulating the space between a window or door frame and the rough framing members. For example, to reduce thermal bridging, the space between the window frame and the rough opening in the wall framing (shown in Figure A-3.2.1.2.(2)), may be treated with low-expansion sealant foam product complying with CAN/ULC S710.1:2019, "Standard for Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification," or CAN/ULC S711.1:2019, "Standard for Bead-

Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification."

Figure [A-3.2.1.2.(2)]

Space between window frame and rough opening in wall framing



Impact analysis

Roofing Analysis

Using the highest density of roofing fasteners the thermal transmittance of the assembly was calculated and is shown in Table 1. The highest density was selected as a worst-case scenario.

Table 1. Thermal Transmittance of the Roofing Assembly

Climate Zone	NECB 2020 Transmittance (W/m^2K)	Current R	Fastener Factor %	Transmittance with Fasteners (W/m^2K)
4	0.164	34.6	15.5	0.189
5	0.156	36.4	16.2	0.181
6	0.138	41.1	18.1	0.163
7a	0.121	46.9	20.3	0.146
7b	0.117	48.5	21	0.142
8	0.11	51.6	22.2	0.134

The updated thermal transmittance values were applied to three archetypes in six locations. The difference in overall building energy use intensity (EUI) is shown in Table 2.

Table 2. Difference in Overall Building EUI

Building	Location	EUI with Fasteners	EUI without Fasteners	% diff
Retail Standalone	Edmonton, AB	165.5	162.3	2.0
	Victoria, BC	149.2	147.2	1.4
	Yellowknife, NT	239.3	234.2	2.2
	Windsor, ON	172.3	170	1.4
	Montréal, QC	177.2	174.6	1.5
	Whitehorse, YT	189.5	185.6	2.1
Secondary School	Edmonton, AB	172.5	170.7	1.1
	Victoria, BC	137.6	136.6	0.7
	Yellowknife, NT	275.5	272.7	1.0
	Windsor, ON	166.5	165.3	0.7
	Montréal, QC	178.6	177.1	0.8
	Whitehorse, YT	210.3	208.1	1.1
Warehouse	Edmonton, AB	120.6	117.6	2.6
	Victoria, BC	94.44	92.77	1.8
	Yellowknife, NT	178.4	173.9	2.6
	Windsor, ON	135.6	133.6	1.5
	Montréal, QC	141	138.6	1.7
	Whitehorse, YT	142.7	139.2	2.5

As can be seen, the effect of including the thermal bridging of roofing fasteners in the thermal transmittance calculation increases the overall building EUI by up to 2.6%. A lesser difference is expected in buildings with smaller roof areas (compared to their volume). For this reason, the impact of roofing fasteners that penetrate the insulation layers should be included in the calculation of effective thermal transmittance.

Wall Fasteners

The effect of including wall fasteners in the thermal transmittance calculation was examined for both the NECB and the NBC with respect to changes in the overall thermal transmittance of the envelope. For wood-framed walls with cavity insulation the change in thermal transmittance was less than 1.2%; where no cavity insulation was included, the change increased to 3.3% maximum.

For steel-framed walls, transmittance increased by up to 2.3% for walls with cavity insulation and up to 2.5% for walls without cavity insulation.

An increase in transmittance of 2.5% would result in an incremental cost of approximately $0.30/ft.^{2} in all regions in Canada. Cost data is sourced from RSMeans (accessed in June 2023).

Overall Effect

These are relatively minor changes in thermal transmittance so it is expected that the overall effect at the building level would be minor, with an increase in EUI of less than 5% when accounting for both roof and wall fasteners.

For simplicity in the Codes, this proposed change includes the effect of wall fasteners that penetrate insulation (without distinguishing between a wall and a roof) despite the effect being small; the analysis may have overlooked cases where the fastener is important (110 wall scenarios were examined).

For the analysis method and data source used, see "Wall U-Values" and "Roofing R-Values" attached as supporting documents.

Enforcement implications

This proposed change would require no changes to Code enforcement as no change to design is being proposed.

Who is affected

Designers, engineers, architects and builders.

Supporting Document(s)

Wall U-Values (wall_fasteners_u-values.xlsx)
Roofing R-Values (roofing_r_value.xlsx)

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NECB20 Div.B 3.1.1. (first printing)

[3.1.1.1.] 3.1.1.1. ([1] 1) no attributions

[3.1.1.2.] 3.1.1.2. ([1] 1) no attributions

[3.1.1.3.] 3.1.1.3. ([1] 1) no attributions

[3.1.1.4.] 3.1.1.4. ([1] 1) no attributions

[3.1.1.4.] -- ([2] --) no attributions

[3.1.1.5.] 3.1.1.5. ([1] 1) [F92-OE1.1]

[3.1.1.5.] 3.1.1.5. ([2] 2) [F92-OE1.1]

[3.1.1.5.] 3.1.1.5. ([3] 3) [F92-OE1.1]

[3.1.1.5.] 3.1.1.5. ([4] 4) [F92-OE1.1]

[3.1.1.5.] 3.1.1.5. ([5] 5) [F92-OE1.1]

[3.1.1.5.] -- ([6] --) [F92-OE1.1]

[3.1.1.6.] -- ([1] --) no attributions

[3.1.1.6.] -- ([2] --) no attributions

[3.1.1.6.] 3.1.1.6. ([3] 1) no attributions

[3.1.1.6.] 3.1.1.6. ([4] 2) no attributions

~~[3.1.1.6.] 3.1.1.6. ([5] 3) no attributions~~

[3.1.1.6.] 3.1.1.6. ([6] 4) no attributions

~~[3.1.1.6.] 3.1.1.6. ([7] 5) no attributions~~

[3.1.1.7.] 3.1.1.7. ([1] 1) [F92-OE1.1]

[3.1.1.7.] 3.1.1.7. ([2] 2) no attributions

~~[3.1.1.7.] 3.1.1.7. ([3] 3) no attributions~~

[3.1.1.7.] 3.1.1.7. ([4] 4) no attributions

~~[3.1.1.7.] 3.1.1.7. ([5] 5) [F92-OE1.1]~~

[3.1.1.7.] 3.1.1.7. ([6] 6) [F92-OE1.1]

~~[3.1.1.7.] 3.1.1.7. ([7] 7) [F92-OE1.1]~~

~~[3.1.1.7.] 3.1.1.7. ([8] 8) [F92-OE1.1]~~

NECB20 Div.B 3.2.1.2.(2) (first printing)

[3.2.1.2.] 3.2.1.2. ([1] 2) [F92-OE1.1]

Submit a comment

Proposed Change 1724

Code Reference(s):	**NECB20 Div.B 4.1.1.2. (first printing)**
Subject:	Lighting
Title:	Application of Lighting Requirements
Description:	This proposed change extends the application of NECB Part 4 to lighting that is located on the building site, irrespective of whether or not the lighting is connected to the building's electrical service.
Related Code Change Request(s):	CCR 841

This change could potentially affect the following topic areas:

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

Problem

Sentence 4.1.1.2.(1) of the National Energy Code of Canada for Buildings (NECB) states that Part 4 of the Code applies to lighting components and systems, other than those listed in Sentence (2), that are connected to the building's electrical service. This provision inadvertently creates a loophole because a separate electrical service that is installed for lighting the building site, and not connected to the building's electrical service, could be interpreted by a Code user as being beyond the scope of the Code requirements for lighting power density and control.

Although existing explanatory Note A-4.1.1.2.(1) clarifies that the provision is intended to apply to all lighting components and systems in the building or on the building site, this application clarification is required to appear in the Code provision itself to be enforceable.

Justification

Section 4.2.3., Exterior Lighting Power, contains requirements for site lighting that apply to parking areas, building grounds and outdoor sales areas (including vehicle sales lots). Many office and retail complexes (e.g., shopping centres) are designed to have an electrical service that is metered separately from that of the building(s) so usage costs can be charged individually to tenants. As currently worded, the provision exempts these outside areas from the requirements simply because they are not connected to the building's electrical service. The current wording also creates a compliance loophole that could be exploited by simply installing a separate electrical service for site lighting.

The new explanatory Note clarifies that no compliance loophole exists by addressing the intended application of the lighting requirements for the energy-efficiency compliance of both internal and external lighting, specifically, based on the occupancy of the building. This specific application does not expand the scope of the Codes beyond the building environment and is similar to other Code requirements (e.g., those for barrier-free parking, egress paths, guards for sidewalks).

While there may not be full consensus by municipalities on the wording of Article 4.1.1.2., the intent statement for Sentence 4.1.1.2.(2) does allow any authority having jurisdiction to exempt "applications where, due to the nature of the occupancy, it is impractical to apply these requirements."

PROPOSED CHANGE

[4.1.1.2.] 4.1.1.2. Application

[1] 1) Except as provided in Sentence (2), this Part applies to lighting components and systems that are in the *building,* connected to the *building*'s electrical service, or located on the *building* site. (See Note A-4.1.1.2.(1).)

[2] 2) This Part does not apply to the following lighting systems:

[a] a) emergency lighting that is automatically off during normal hours of *building* operation,

[b] b) lighting within *dwelling units*, and

[c] c) lighting in *buildings* or parts of *buildings* and in certain exterior spaces associated with the *building* where it can be shown that the nature of the *occupancy* makes it impractical to apply these requirements (see Note A-4.1.1.2.(2)(c)).

Note A-4.1.1.2.(1) ~~Application~~Building Site.

In Sentence 4.1.1.2.(1), "building site" is intended to include all areas in which subsidiary uses of the building occur. These areas may be located outside of the main building area, but support the building's use. The following are examples of such

areas:~~Part 4 is intended to apply to all lighting components and systems in or on the building or building site that are connected to the building's electrical service.~~

- areas contiguous with the building that share the same use (e.g., courtyards)
- automated teller machines (ATMs) and night depositories
- building facades
- dining areas
- drive-up windows and doors
- entrances and gatehouse inspection stations at guarded facilities
- parking areas and drives
- parking areas near 24-hour retail entrances
- paths that provide access to an exit and similar egress paths
- pedestrian and vehicular entrances and exits
- pedestrian tunnels
- plaza areas
- roof terraces
- staffed areas related to the building's occupancy (e.g., loading docks, outdoor sales areas, including vehicle sales lots, and sales canopies and overhangs)
- uncovered loading areas for law enforcement and emergency service vehicles
- walkways and ramps
- other areas as approved by the authority having jurisdiction

Impact analysis

This proposed change has no additional cost implications as it closes a loophole in the existing provision. Discussions with building owners have confirmed that providing external lighting in compliance with the NECB does not create a net negative cost impact as market products are competitive and energy savings further incentivize adopting energy-efficient infrastructure.

Enforcement implications

The proposed change can be enforced by the infrastructure currently in place to enforce the Code. The proposed change will also provide greater clarity to authorities having jurisdiction.

Currently the jurisdictions of Vancouver, Calgary and Winnipeg apply Sentence 4.1.1.2.(1) to building site lighting components. Provinces such as Ontario and Quebec have empowered their municipalities to enforce this scope as indicated in proposed Note A-4.1.1.2.(1) without having adopted the specific Code language.

While there may not be full consensus by municipalities on the wording of Article 4.1.1.2., the intent statement for Sentence 4.1.1.2.(2) does allow any authority having jurisdiction to exempt: "applications where, due to the nature of the occupancy, it is impractical to apply these requirements."

Who is affected

Designers, specification writers, manufacturers, builders, building owners and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[4.1.1.2.] 4.1.1.2. ([1] 1) no attributions

[4.1.1.2.] 4.1.1.2. ([2] 2) no attributions

Submit a comment

Proposed Change 1832

Code Reference(s):	**NECB20 Div.B 5.2.12.1. (first printing)**
Subject:	HVAC Equipment Efficiency Table
Title:	New Performance Metrics for Small Single-Phase Air Conditioners and Heat Pumps
Description:	This proposed change introduces new energy metrics for small single-phase air conditioners and heat pumps.

This change could potentially affect the following topic areas:

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

Problem

Effective January 1, 2023, the US Department of Energy (DOE) introduced a series of new energy performance metrics (EER2, SEER2 and HSPF2) in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products," that is applicable to small single-phase air-cooled air conditioners and air-source heat pumps. These metrics are similar to the previous ones (EER, SEER and HSPF), but use different test conditions that are considered to be more realistic. Larger units and three-phase models are not affected by this amendment.

With the publication of the Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 17), SOR/2022-265, on December 7, 2022, the Canadian Energy Efficiency Regulations, 2016 (EER), SOR/2016-311, were aligned with DOE 10 CFR, Part 430-2022 by requiring the minimum performance levels to be expressed with the new metrics. As a result, a discrepancy is caused between the NECB and the EER. If manufacturers provided product labels only using the new metrics, the products available on the market could potentially have issues with their conformance to the NECB.

Moreover, it is anticipated that single-phase variable refrigerant flow systems will also be tested to the new test conditions.

This discrepancy will lead to gaps in the Code, and Code users will be unable to evaluate whether HVAC equipment performance complies with the NECB requirements. This, in turn, will lead to difficulties for enforcement officials when determining compliance.

Justification

This proposed change to the NECB updates the reference to the 2022 amendment to DOE 10 CFR, Part 430 and introduces the new energy performance metrics. To facilitate compliance with the NECB, this proposed change maintains the alignment of the NECB with the Energy Efficiency Regulations, 2016 (EER), as amended by SOR/2022-265 (Amendment 17), and ASHRAE 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings," as well as industry practice by US manufacturers.

Amendment 17 generally presents two sets of performance requirements to the EER: the first came into force on January 1, 2023, and the second comes into force on January 1, 2025.

Considering that the NECB 2025 will be published and adopted after January 1, 2025, these requirements, where applicable, should be included in the 2025 edition of the NECB. Amendment 17 also updates the required minimum performance levels for small variable refrigerant flow systems using the same test conditions.

Furthermore, where the NECB has requirements that were and remain more stringent than the EER, the performance levels of the NECB have been retained and converted to the new metrics using the following references:

- Understanding SEER2: Minimum SEER Rating In 2023 State-By-State (learnmetrics.com)
- Understanding HSPF2 Rating For Heat Pumps (New 2023 Metric) (learnmetrics.com)

PROPOSED CHANGE

NECB20 Div.B 5.2.12.1. (first printing)

[5.2.12.1.] 5.2.12.1. Unitary and Packaged HVAC Equipment

[1] 1) Unitary and packaged HVAC equipment and components with the capacities listed in Tables 5.2.12.1.-A to 5.2.12.1.-P shall comply with the performance requirements stated therein. (See Notes A-5.2.12.1.(1) and A-5.2.12.1.(1) and 6.2.2.1.(1).) (See also Article 6.2.2.4.)

Table [5.2.12.1.-A] 5.2.12.1.-A
Performance Requirements for Air-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated (1)
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
Single-phase air conditioners and heat pumps, single-package, space-constrained	< 19	DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1	See standard	SEER2 = 12.4 / HSPF2 V = 5.4 (3) (4)
Single-phase air conditioners and heat pumps, single-package, others				SEER2 = 14.3 / HSPF2 V = 6.3 (3) (4)
Single-phase air conditioners and heat pumps, split-system, others				SEER2 = 12.4 / HSPF2 V = 5.4 (3) (4)
Single-phase air conditioners and heat pumps, split-system, space-constrained				SEER2 = 14.3 / HSPF2 V = 6.6 (4)
Single-phase air conditioners and heat pumps, split-system, small-duct and high-velocity				SEER2 = 12.4 / HSPF2 V = 5.0 (3) (4)
Air conditioners and heat pumps, ~~S~~single-package, space-constrained	< 19	CSA C656	See standard	SEER = 13 / HSPF V = 6.4 (4)
Air conditioners and heat pumps, ~~S~~single-package, others				SEER = 15 / HSPF V = 7.4 (4)
Air conditioners and heat pumps, ~~S~~split-system, space-constrained				SEER = 13 / HSPF V = 6.4 (4)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
Air conditioners and heat pumps, ~~S~~split-system, others				SEER = 15 / HSPF V = ~~7.4~~7.8 (4)
Air conditioners and heat pumps, split-system, ~~S~~small-duct~~,~~ and high-velocity				SEER = 13 / HSPF V = 5.9 (4)
Large air conditioners and heat pumps, split-system and single-package, all electrical phases, in cooling mode	≥ 19 and < 40	CAN/CSA-C746	Electric resistance heating section or no heating section	EER = 11.2 IEER = 12.9
			Other types of heating sections	EER = 11.0 IEER = 12.7
	≥ 40 and < 70		Electric resistance heating section or no heating section	EER = 11.0 IEER = 12.4
			Other types of heating sections	EER = 10.8 IEER = 12.2
	≥ 70 and < 223		Electric resistance heating section or no heating section	EER = 10.0 IEER = 11.6
			Other types of heating sections	EER = 9.8 IEER = 11.4

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
	≥ 223	ANSI/AHRI 340/360	Electric resistance heating section or no heating section	EER = 9.7 IEER = 11.2
			Other types of heating sections	EER = 9.5 IEER = 11.0
Large heat pumps, split-system and single-package, all electrical phases, in heating mode	≥ 19 and < 40	CAN/CSA-C746	at 8.3ºC	COP_h = 3.30
			at –8.3ºC	COP_h = 2.25
	≥ 40 and < 70		at 8.3ºC	COP_h = 3.20
			at –8.3ºC	COP_h = 2.05
	≥ 70 and < 223		at 8.3ºC	COP_h = 3.20
			at –8.3ºC	COP_h = 2.05
	≥ 223	ANSI/AHRI 340/360	at 8.3ºC	COP_h = 3.20
			at –8.3ºC	COP_h = 2.05

Notes to Table [5.2.12.1.-A] 5.2.12.1.-A:

(1) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(2) ~~(4)~~The symbols and abbreviations that appear in this column have the following meanings:

COP_h	= *coefficient of performance* in heating mode, in W/W
EER	= *energy-efficiency ratio*, in (Btu/h)/W
HSPF V	= heating seasonal performance factor for region V (see map in CSA C656), in (Btu/h)/W
HSPF2 V	= heating seasonal performance factor 2 for region V (see map in DOE 10 CFR Part 430-2022, Subpart B, Appendix M1), in (Btu/h)/W
IEER	= *integrated energy-efficiency ratio*, in (Btu/h)/W
SEER	= *seasonal energy-efficiency ratio*, in (Btu/h)/W
SEER2	= *seasonal energy-efficiency ratio* 2, in (Btu/h)/W

(3) The SEER2 and HSPF2 V metrics are similar to the SEER and HSPF V metrics, respectively, but use different test conditions, as specified in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products." For the purpose of compliance with the Code, either pair of performance metrics may be used.

(4) SEER and SEER2 apply~~ies~~ to air conditioners;~~, and both~~ SEER, SEER2,~~and~~ HSPF V and HSPF2 V apply to heat pumps.

Table [5.2.12.1.-B] 5.2.12.1.-B
Performance Requirements for Single-Package Vertical Air Conditioners (SPVAC) and Heat Pumps (SPVHP) (1)
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
SPVAC and SPVHP in cooling mode	< 70	CAN/CSA-C746	< 19 kW	EER = 11
			≥ 19 kW and < 40 kW	EER = 10
			≥ 40 kW and < 70 kW	EER = 10

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
SPVHP in heating mode			< 19 kW	COP_h = 3.3
			≥ 19 kW and < 40 kW	COP_h = 3.0
			≥ 40 kW and < 70 kW	COP_h = 3.0

Notes to Table [5.2.12.1.-B] 5.2.12.1.-B:

(1) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(2) The symbols and abbreviations that appear in this column have the following meanings:

COP_h = *coefficient of performance* in heating mode, in W/W
EER = *energy-efficiency ratio*, in (Btu/h)/W

Table [5.2.12.1.-C] 5.2.12.1.-C
Performance Requirements for Water-Cooled and Evaporatively Cooled Unitary Air Conditioners – Electrically Operated
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Water-cooled and evaporatively cooled, split-system and single-package	< 19	ANSI/AHRI 210/240	< 19 kW	EER = 12.1 IEER = 12.3
Water-cooled, split-system and single-package (2)	≥ 19 and < 40	CAN/CSA-C746	Electric resistance heating section or no heating section	EER = 12.1 IEER = 13.9
			Other types of heating sections	EER = 11.9 IEER = 13.7
	≥ 40 and < 70		Electric resistance heating section or no heating section	EER = 12.5 IEER = 13.9
			Other types of heating sections	EER = 12.3 IEER = 13.7
	≥ 70 and < 223		Electric resistance heating section or no heating section	EER = 12.4 IEER = 13.6
			Other types of heating sections	EER = 12.2 IEER = 13.4
Evaporatively cooled, split and single-package (2)	≥ 19 and < 40	CAN/CSA-C746	Electric resistance heating section or no heating section	EER = 12.1 IEER = 12.3

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
			Other types of heating sections	EER = 11.9 IEER = 12.1
	≥ 40 and < 70		Electric resistance heating section or no heating section	EER = 12.0 IEER = 12.2
			Other types of heating sections	EER = 11.8 IEER = 12.0
	≥ 70 and < 223		Electric resistance heating section or no heating section	EER = 11.9 IEER = 12.1
			Other types of heating sections	EER = 11.7 IEER = 11.9
Water-cooled, split and single-package	≥ 223	ANSI/AHRI 340/360	Electric resistance heating section or no heating section	EER = 12.2 IEER = 13.5
			Other types of heating sections	EER = 12.0 IEER = 13.3
Evaporatively cooled, split and single-package			Electric resistance heating section or no heating section	EER = 11.7 IEER = 11.9
			Other types of heating sections	EER = 11.5 IEER = 11.7

Notes to Table [5.2.12.1.-C] 5.2.12.1.-C:

(1) The symbols and abbreviations that appear in this column have the following meanings:

EER = *energy-efficiency ratio*, in (Btu/h)/W
IEER = *integrated energy-efficiency ratio*, in (Btu/h)/W

(2) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A.).

Table [5.2.12.1.-D] 5.2.12.1.-D
Performance Requirements for Condensing Units
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Air-cooled (2)	≥ 40 and < 70	CAN/CSA-C746	See standard	EER = 11.2
Water-cooled and evaporatively cooled (2)				EER = 13.1
Air-cooled	≥ 70	ANSI/AHRI 366 (SI)	≥ 70 kW	EER = 10.5 IEER = 11.8
Water-cooled and evaporatively cooled				EER = 13.5 IEER = 14.0

Notes to Table [5.2.12.1.-D] 5.2.12.1.-D:

(1) The symbols and abbreviations that appear in this column have the following meanings:

EER = *energy-efficiency ratio*, in (Btu/h)/W
IEER = *integrated energy-efficiency ratio*, in (Btu/h)/W

(2) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

Table [5.2.12.1.-E] 5.2.12.1.-E
Performance Requirements for Water-Source Unitary Heat Pumps
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Water-to-air (2)	< 5	CAN/CSA-C13256-1	Water loop	COP_c = 3.58 COP_h = 4.3
	≥ 5 and < 40			COP_c = 3.81 COP_h = 4.3
	< 40		Groundwater	COP_c = 5.28 COP_h = 3.7
			Ground loop	COP_c = 4.13 COP_h = 3.2
Water-to-water	< 40	CAN/CSA-C13256-2	Water loop	COP_c = 3.11 COP_h = 3.7
			Groundwater	COP_c = 5.60 COP_h = 3.4
			Ground loop	COP_c = 4.21 COP_h = 2.8

Notes to Table [5.2.12.1.-E] 5.2.12.1.-E:

(1) The symbols and abbreviations that appear in this column have the following meanings:

COP_c = *coefficient of performance* in cooling mode, in W/W
COP_h = *coefficient of performance* in heating mode, in W/W

(2) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

Table [5.2.12.1.-F] 5.2.12.1.-F
Performance Requirements for Direct-Expansion Ground-Source Heat Pumps – Electrically Operated
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Direct-expansion ground-source heat pumps	≤ 21	CSA C748	See standard	COP_c = 3.81 COP_h = 3.1
	> 21			No requirements

Note to Table [5.2.12.1.-F] 5.2.12.1.-F:

(1) The symbols and abbreviations that appear in this column have the following meanings:

COP_c = *coefficient of performance* in cooling mode, in W/W
COP_h = *coefficient of performance* in heating mode, in W/W

Table [5.2.12.1.-G] 5.2.12.1.-G
Performance Requirements for Packaged Terminal Air Conditioners (PTAC) and Heat Pumps (PTHP), and Room Air Conditioners and Heat Pumps (1)
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
PTAC and PTHP in cooling mode, standard and non-standard sizes	< 2.1	AHRI 310/380/CSA C744	See standard	EER = 11.9
	≥ 2.1 and < 4.4			EER = 14.1 – (1.0435 × Cap_{kW})

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)
	≥ 4.4			EER = 9.5
PTHP in heating mode, standard and non-standard sizes	< 2.1			COP_h = 3.3
	≥ 2.1 and < 4.4			COP_h = 3.67 – (0.1739 × Cap_{kW})
	≥ 4.4			COP_h = 2.9
Louvered, without reverse cycle	< 5.9	CSA C368.1	See standard	CEER = 10.7
	≥ 5.9 and ≤ 10.6			CEER = 9.0
Louvered, with reverse cycle	< 5.9			CEER = 9.8
	≥ 5.9 and ≤ 10.6			CEER = 9.3
Non-louvered, without reverse cycle	< 4.1			CEER = 9.6
	≥ 4.1 and ≤ 10.6			CEER = 9.4
Non-louvered, with reverse cycle	< 4.1			CEER = 9.3
	≥ 4.1 and ≤ 10.6			CEER = 8.7
Room air conditioners, casement only	All capacities			CEER = 9.5
Room air conditioners, casement slider				CEER = 10.4

Notes to Table [5.2.12.1.-G] 5.2.12.1.-G:

(1) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(2) The symbols and abbreviations that appear in this column have the following meanings:

CEER = combined *energy-efficiency ratio*, in (Btu/h)/W
COP_h = *coefficient of performance* in heating mode, in W/W
EER = *energy-efficiency ratio*, in (Btu/h)/W

Table [5.2.12.1.-H] 5.2.12.1.-H
Performance Requirements for Computer Room Air Conditioners
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Air-cooled, floor-mounted, with or without fluid economizer	< 23	AHRI 1361 (SI)	Downflow or upflow, ducted	SCOP = 2.67
	≥ 23 and < 86			SCOP = 2.55
	≥ 86			SCOP = 2.33
	< 23		Upflow, non-ducted	SCOP = 2.09
			Horizontal	SCOP = 2.65
	≥ 23 and < 70		Upflow, non-ducted	SCOP = 1.99
			Horizontal	SCOP = 2.55
	≥ 70		Upflow, non-ducted	SCOP = 1.81
			Horizontal	SCOP = 2.47
Water-cooled, floor-mounted, with or without fluid economizer	< 23		Downflow or upflow, ducted	SCOP = 2.74
	≥ 23 and < 86			SCOP = 2.65
	≥ 86			SCOP = 2.61
	< 23		Upflow, non-ducted	SCOP = 2.44

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
			Horizontal	SCOP = 2.71
	≥ 23 and < 70		Upflow, non-ducted	SCOP = 2.34
			Horizontal	SCOP = 2.60
	≥ 70		Upflow, non-ducted	SCOP = 2.24
			Horizontal	SCOP = 2.54
Glycol-cooled, floor-mounted, with or without fluid economizer	< 23		Downflow or upflow, ducted	SCOP = 2.48
	≥ 23 and < 86			SCOP = 2.16
	≥ 86			SCOP = 2.12
	< 23		Upflow, non-ducted	SCOP = 2.34
			Horizontal	SCOP = 2.44
	≥ 23 and < 70		Upflow, non-ducted	SCOP = 1.99
			Horizontal	SCOP = 2.10
	≥ 70		Upflow, non-ducted	SCOP = 1.94
			Horizontal	SCOP = 2.10
Air-cooled, ceiling-mounted, free air discharge condenser, with or without fluid economizer	< 8.5		Ducted	SCOP = 2.01
			Non-ducted	SCOP = 2.04
	≥ 8.5 and < 19		Ducted	SCOP = 1.97
			Non-ducted	SCOP = 2.00
	≥ 19		Ducted	SCOP = 1.87
			Non-ducted	SCOP = 1.89
Air-cooled, ceiling-mounted, ducted condenser, with or without fluid economizer	< 8.5		Ducted	SCOP = 1.82
			Non-ducted	SCOP = 1.68

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
	≥ 8.5 and < 19		Ducted	SCOP = 1.78
			Non-ducted	SCOP = 1.81
	≥ 19		Ducted	SCOP = 1.68
			Non-ducted	SCOP = 1.70
Water-cooled, ceiling-mounted, with or without fluid economizer	< 8.5		Ducted	SCOP = 2.33
			Non-ducted	SCOP = 2.36
	≥ 8.5 and < 19		Ducted	SCOP = 2.23
			Non-ducted	SCOP = 2.26
	≥ 19		Ducted	SCOP = 2.13
			Non-ducted	SCOP = 2.16
Glycol-cooled, ceiling-mounted, with or without fluid economizer	< 8.5		Ducted	SCOP = 1.92
			Non-ducted	SCOP = 1.95
	≥ 8.5 and < 19		Ducted	SCOP = 1.88
			Non-ducted	SCOP = 1.93
	≥ 19		Ducted	SCOP = 1.73
			Non-ducted	SCOP = 1.76

Note to Table [5.2.12.1.-H] 5.2.12.1.-H:

(1) The symbols and abbreviations that appear in this column have the following meanings:

SCOP = sensible *coefficient of performance*. The SCOP is a ratio that is calculated by dividing the net sensible cooling capacity, in W, by the total power input, in W (excluding re-heaters and humidifiers).

Table [5.2.12.1.-I] 5.2.12.1.-I
Performance Requirements for Variable Refrigerant Flow Systems
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Single-phase air-cooled air conditioners and heat pumps, with or without heat recovery (2)	< 19	DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1	See standard	SEER2 = 14.3 / HSPF2 V = 6.6 (3) (4)
Air-cooled air conditioners and heat pumps, with or without heat recovery (2)	< 19	CSA C656	See standard	SEER = 15 / HSPF V = 7.8 (3)
Air-cooled air conditioners	≥ 19 and < 40	AHRI 1230	See standard	EER = 11.2 IEER = 15.5
	≥ 40 and < 70			EER = 11.0 IEER = 14.9
	≥ 70			EER = 10.0 IEER = 13.9
Air-source heat pumps, with or without heat recovery	≥ 19 and < 40			EER = 10.8 IEER = 14.4 COP_h = 3.30 evaluated at 8.3ºC db / 6.1ºC wb COP_h = 2.25 evaluated at –8.3ºC db / –9.4ºC wb

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
	≥ 40 and < 70			EER = 10.4 IEER = 13.7 COP_h = 3.20 evaluated at 8.3ºC db / 6.1ºC wb COP_h = 2.05 evaluated at –8.3ºC db / –9.4ºC wb
	≥ 70			EER = 9.3 IEER = 12.5 COP_h = 3.20 evaluated at 8.3ºC db / 6.1ºC wb COP_h = 2.05 evaluated at –8.3ºC db / –9.4ºC wb
Water-source heat pumps, with or without heat recovery	< 40			EER = 11.8 IEER = 15.8 COP_h = 4.3
	≥ 40			EER = 9.8 IEER = 12.0 COP_h = 4.0
Groundwater source heat pumps, with or without heat recovery	< 40			EER = 16.2 COP_h = 3.6
	≥ 40			EER = 13.8 COP_h = 3.3
Ground-source heat pumps, with or without heat recovery	< 40			EER = 13.2 COP_h = 3.1
	≥ 40			EER = 10.8 COP_h = 2.8

Notes to Table [5.2.12.1.-I] 5.2.12.1.-I:

(1) The symbols and abbreviations that appear in this column have the following meanings:

COP_h	= *coefficient of performance* in heating mode, in W/W
db	= dry-bulb outdoor air temperature
EER	= *energy-efficiency ratio*, in (Btu/h)/W
HSPF V	= heating seasonal performance factor for region V (see map in CSA C656), in (Btu/h)/W
HSPF2 V	= heating seasonal performance factor 2 for region V (see map in DOE 10 CFR Part 430-2022, Subpart B, Appendix M1), in (Btu/h)/W
IEER	= *integrated energy-efficiency ratio*, in (Btu/h)/W
SEER	= *seasonal energy-efficiency ratio*, in (Btu/h)/W
SEER2	= *seasonal energy-efficiency ratio* 2, in (Btu/h)/W
wb	= wet-bulb outdoor air temperature

(2) Components or equipment regulated in "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(3) SEER applies to air conditioners, and both SEER and HSPF V apply to heat pumps.

(4) The SEER2 and HSPF2 V metrics are similar to the SEER, EER and HSPF V metrics, respectively, but use different test conditions, as specified in DOE 10 CFR, Part 430-2022, “Energy, Energy Conservation Program for Consumer Products.” For the purpose of compliance with the Code, either group of performance metrics may be used.

Table [5.2.12.1.-J] 5.2.12.1.-J
Performance Requirements for Direct-Expansion Dedicated Outdoor Air Systems
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Air-cooled	All capacities	ANSI/AHRI 921 (SI)	See standard	ISMRE = 1.8
Air-source heat pumps			See standard	ISMRE = 1.8 ISCOP = 1.2
Water-cooled			Cooling tower / condenser water	ISMRE = 2.2
			Chilled water	ISMRE = 2.7
Water-source heat pumps			Water source	ISMRE = 1.8 ISCOP = 3.5
			Groundwater source	ISMRE = 2.3 ISCOP = 3.2
			Ground-source, closed loop	ISMRE = 2.2 ISCOP = 2.0
Air-cooled, with energy recovery			See standard	ISMRE = 2.4
Air-source heat pumps, with energy recovery			See standard	ISMRE = 2.4 ISCOP = 3.3
Water-cooled, with energy recovery			Cooling tower / condenser water	ISMRE = 2.4
			Chilled water	ISMRE = 3.0

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Water-source heat pumps, with energy recovery			Water source	ISMRE = 2.2 ISCOP = 4.8
			Groundwater source	ISMRE = 2.6 ISCOP = 4.0
			Ground-source, closed loop	ISMRE = 2.4 ISCOP = 3.8

Note to Table [5.2.12.1.-J] 5.2.12.1.-J:

(1) The symbols and abbreviations that appear in this column have the following meanings:

ISCOP = integrated seasonal *coefficient of performance*
ISMRE = integrated seasonal moisture removal efficiency, in kg of moisture/kWh

Table [5.2.12.1.-K] 5.2.12.1.-K
Performance Requirements for Packaged Water Chillers (1)
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)	
				Path A (3)	Path B (3)
Air-cooled, with or without remote condensers, all types of compressors	< 528	CAN/CSA-C743	See standard	COP_C = 2.985 IPLV = 4.048	COP_C = 2.866 IPLV = 4.669

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)	
				Path A (3)	Path B (3)
	≥ 528			COP_c = 2.985 IPLV = 4.137	COP_c = 2.866 IPLV = 4.758
Water-cooled, rotary screw, scroll, or reciprocating compressor	< 264			COP_c = 4.694 IPLV = 5.867	COP_c = 4.513 IPLV = 7.041
	≥ 264 and < 528			COP_c = 4.889 IPLV = 6.286	COP_c = 4.694 IPLV = 7.184
	≥ 528 and < 1 055			COP_c = 5.334 IPLV = 6.519	COP_c = 5.177 IPLV = 8.001
	≥ 1 055 and < 2 110			COP_c = 5.771 IPLV = 6.770	COP_c = 5.633 IPLV = 8.586
	≥ 2 110			COP_c = 6.286 IPLV = 7.041	COP_c = 6.018 IPLV = 9.264

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (2)	
				Path A (3)	Path B (3)
Water-cooled, centrifugal compressor	< 528			COP_c = 5.771 IPLV = 6.401	COP_c = 5.065 IPLV = 8.001
	≥ 528 and < 1 055			COP_c = 5.771 IPLV = 6.401	COP_c = 5.544 IPLV = 8.801
	≥ 1 055 and < 1 407			COP_c = 6.286 IPLV = 6.770	COP_c = 5.917 IPLV = 9.027
	≥ 1 407			COP_c = 6.286 IPLV = 7.041	COP_c = 6.018 IPLV = 9.264
Single-effect absorption, air-cooled	All capacities			COP_c = 0.600	
Single-effect absorption, water-cooled				COP_c = 0.700	
Double-effect absorption, indirect fire				COP_c = 1.000 IPLV = 1.050	
Double-effect absorption, direct fire				COP_c = 1.000 IPLV = 1.000	

Notes to Table [5.2.12.1.-K] 5.2.12.1.-K:

(1) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(2) The symbols and abbreviations that appear in this column have the following meanings:

COP_C = *coefficient of performance* in cooling mode, in W/W
IPLV = *integrated part-load value* (no units)

(3) Chillers are permitted to comply with either Path A or Path B of CAN/CSA-C743. Path A is generally better suited to full-load applications (i.e., where chillers operate a significant amount of the time at full load), while Path B is generally better suited to part-load applications.

Table [5.2.12.1.-L] 5.2.12.1.-L
Performance Requirements for Heat Pumps and Heat Recovery Chiller Packages
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)	
				Path A (2)	Path B (2)
Air-source heat pumps, in cooling mode	< 528	ANSI/AHRI 551/591 (SI)	See standard	COP_C = 2.836 IPLV = 3.846	COP_C = 2.723 IPLV = 4.436
	≥ 528			COP_C = 2.836 IPLV = 3.930	COP_C = 2.723 IPLV = 4.520

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)	
				Path A (2)	Path B (2)
Water-source heat pumps and heat recovery chillers, rotary screw, scroll, or reciprocating compressor, in cooling mode	< 264			COP_c = 4.659 IPLV = 5.574	COP_c = 4.287 IPLV = 6.689
	≥ 264 and < 528			COP_c = 4.645 IPLV = 5.972	COP_c = 4.459 IPLV = 6.825
	≥ 528 and < 1 055			COP_c = 5.067 IPLV = 6.193	COP_c = 4.918 IPLV = 7.601
	≥ 1 055 and < 2 110			COP_c = 5.482 IPLV = 6.432	COP_c = 5.351 IPLV = 8.157
	≥ 2 110			COP_c = 5.072 IPLV = 6.689	COP_c = 5.717 IPLV = 8.801
Water-source heat pumps and heat recovery chillers, centrifugal compressor, in cooling mode	< 264			COP_c = 5.482 IPLV = 6.081	COP_c = 4.812 IPLV = 7.601

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)	
				Path A (2)	Path B (2)
	≥ 264 and < 528			COP_C = 5.482 IPLV = 6.081	COP_C = 5.267 IPLV = 6.361
	≥ 528 and < 1 055			COP_C = 5.972 IPLV = 6.432	COP_C = 5.621 IPLV = 8.567
	≥ 1 055			COP_C = 5.972 IPLV = 6.689	COP_C = 5.717 IPLV = 8.801

Notes to Table [5.2.12.1.-L] 5.2.12.1.-L:

(1) The symbols and abbreviations that appear in this column have the following meanings:

COP_C = *coefficient of performance* in cooling mode, in W/W
IPLV = *integrated part-load value* (no units)

(2) Chillers are permitted to comply with either Path A or Path B of CAN/CSA-C743. Path A is generally better suited to full-load applications (i.e., where chillers operate a significant amount of the time at full load), while Path B is generally better suited to part-load applications.

Table [5.2.12.1.-M] 5.2.12.1.-M
Performance Requirements for Heat Pumps and Heat-Recovery Chiller Packages Based on Leaving Water Temperature
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions (1)	Minimum Performance (2)		
				If LWT = 40°C	If LWT = 50°C	If LWT = 60°C
Air-source heat pumps, in heating mode	All capacities	ANSI/AHRI 551/591 (SI)	EAT = 8°C db / 6°C wb	COP_h = 3.350	COP_h = 2.720	COP_h = 2.330
			EAT = –8°C db / –9°C wb	COP_h = 2.250	COP_h = 1.920	COP_h = 1.640
Water-source heat pumps, rotary screw, scroll, reciprocating or centrifugal compressor, in heating mode	< 1 055		EST / LST = 12°C / 7°C	COP_h = 4.760	COP_h = 3.610	COP_h = 2.660
			EST / LST = 24°C / 19°C	—	—	COP_h = 3.530
	≥ 1 055		EST / LST = 12°C / 7°C	COP_h = 5.060	COP_h = 3.880	COP_h = 2.950
			EST / LST = 24°C / 19°C	—	—	COP_h = 3.870
Heat-recovery chillers, rotary screw, scroll, reciprocating or centrifugal compressor, simultaneous heating and cooling modes	< 1 055		EST / LST = 12°C / 7°C	COP_{hr} = 8.550	COP_{hr} = 6.290	COP_{hr} = 4.390

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions (1)	Minimum Performance (2)		
				If LWT = 40°C	If LWT = 50°C	If LWT = 60°C
			EST / LST = 24°C / 19°C	—	—	COP_{hr} = 6.100
	≥ 1 055		EST / LST = 12°C / 7°C	COP_{hr} = 9.140	COP_{hr} = 6.850	COP_{hr} = 4.960
			EST / LST = 24°C / 19°C	—	—	COP_{hr} = 6.800

Notes to Table [5.2.12.1.-M] 5.2.12.1.-M:

(1) The symbols and abbreviations that appear in this column have the following meanings:

db = dry-bulb outdoor air temperature
EAT = entering air temperature
EST = entering source temperature
LST = leaving source temperature
wb = wet-bulb outdoor air temperature

(2) The symbols and abbreviations that appear in this column have the following meanings:

COP_h = *coefficient of performance* in heating mode, in W/W
COP_{hr} = *coefficient of performance* in heat-recovery mode, in W/W
LWT = leaving water temperature

Table [5.2.12.1.-N] 5.2.12.1.-N
Performance Requirements for Boilers
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Electric	< 88	(2)	—	Must be equipped with automatic water temperature control (3)
	≥ 88		—	—
Gas-fired (4)	< 88	CAN/CSA-P.2	See standard	AFUE = 90% (water) (3) AFUE = 82% (steam) (3)
	≥ 88 and < 733	DOE 10 CFR, Part 431, Subpart E, Appendix A	See standard	E_t ≥ 90% (water) E_t ≥ 81% (steam)
	≥ 733 and < 2 930		See standard	E_c ≥ 90% (water) E_t ≥ 82% (steam)
Oil-fired	< 88	CAN/CSA-P.2	See standard	AFUE = 86% (water) AFUE = 85% (steam)
	≥ 88 and < 733	DOE 10 CFR, Part 431, Subpart E, Appendix A	See standard	E_t = 87% (water) E_t = 84% (steam)
	≥ 733 and < 2 930		See standard	E_c = 88% (water) E_t = 85% (steam)

Notes to Table [5.2.12.1.-N] 5.2.12.1.-N:

(1) The symbols and abbreviations that appear in this column have the following meanings:

AFUE = annual fuel utilization efficiency
E_c = *combustion efficiency*
E_t = *thermal efficiency*

(2) No standards address the heating performance efficiency of electric *boilers*; however, their *thermal efficiency* is typically normalized at 97% in the testing standards.

(3) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(4) Includes propane.

Table [5.2.12.1.-O] 5.2.12.1.-O
Performance Requirements for Warm-Air Furnaces, Combination Warm-Air Furnace/Air-conditioning Units, Duct Furnaces and Unit Heaters
Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Electric *furnaces*	< 66	DOE 10 CFR, Part 430, Subpart B, Appendix Aa (2)	—	FER = 0.044 × Q_{max} + 165 (3) (4)
	≥ 66	(2)		—
Gas-fired warm-air *furnaces* (5) (6)	≤ 66	CAN/CSA-P.2 and DOE 10 CFR, Part 430, Subpart B, Appendix Aa	Without integrated cooling	AFUE = 95% (3) FER = 0.044 × Q_{max} + 195
			Outdoor *furnaces* with integrated cooling	AFUE = 78% (3) FER = 0.044 × Q_{max} + 199
			Through-the-wall, with integrated cooling	AFUE = 90% (3) FER = 0.044 × Q_{max} + 195
		ANSI Z21.47/CSA 2.3	Three-phase electric supply	AFUE = 78% or E_t = 80%
	> 66 and ≤ 117		See standard	E_t = 81%
Gas-fired packaged *furnaces* (5)	≤ 2 931	CAN/CSA-P.8, Annex C	See standard	E_t = 80%

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Gas-fired duct *furnaces* (5) (6)	≤ 2 931	ANSI Z83.8/CSA 2.6	See standard	E_t = 81%
Gas-fired *unit heaters* (3) (5)	≤ 2 931	CAN/CSA-P.11	See standard	E_t = 82%
Oil-fired warm-air *furnaces*	≤ 66	CAN/CSA-P.2	See standard	E_t = 84.5% AFUE = 85% (3)
	> 66	CSA B140.4	See standard	E_t = 82%
Oil-fired duct *furnaces* and *unit heaters*	All capacities	CSA B140.4	See standard	E_t = 81%

Notes to Table [5.2.12.1.-O] 5.2.12.1.-O:

(1) The symbols and abbreviations that appear in this column have the following meanings:

AFUE = annual fuel utilization efficiency
E_t = *thermal efficiency*
FER = fan energy rating, in W per 472 L/s
Q_{max} = maximum airflow provided by the *furnace* at test conditions, in cfm

(2) No standards address the heating performance efficiency of electric *furnaces*; however, their *thermal efficiency* is typically normalized at 97% in the testing standard, which addresses fan efficiency rating only.

(3) Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).

(4) Must be equipped with a high-efficiency constant torque or constant airflow fan motor.

(5) Includes propane.

(6) Excludes gas-fired outdoor packaged units.

Table [5.2.12.1.-P] 5.2.12.1.-P
Performance Requirements for Other Fuel-Burning Equipment and Appliances Forming Part of Sentences [5.2.12.1.] 5.2.12.1.([1] 1), 6.2.2.4.(2), 6.2.2.5.(1) and 8.4.4.18.(6)

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance (1)
Gas-fired fireplaces and stoves, non-decorative	All capacities	CAN/CSA-P.4.1	See standard	FE = 50%, with direct vent and without standing pilot light
Solid-fuel-burning stoves	All capacities	EPA 40 CFR, Part 60, Subpart AAA and Subpart QQQQ, and CSA B415.1	See standard	—
Solid-fuel-burning *boilers*	< 2 000	DIN EN 303-5	See standard	—
Gas-fired infrared heaters, high-intensity (2) (3)	≤ 117 per burner	DIN EN 419	See standard	NRE ≥ 55%
Gas-fired infrared heaters, tubular and low-intensity (2) (3)		DIN EN 416	See standard	NRE ≥ 45%

Notes to Table [5.2.12.1.-P] 5.2.12.1.-P:

(1) The symbols and abbreviations that appear in this column have the following meanings:

E_o	= overall efficiency
FE	= fireplace efficiency
NRE	= net radiant efficiency. NRE corresponds to the ratio of useful (dry) radiant output to the heat input. CAN/ANSI/AHRI 1330, "Performance Rating for Radiant Output of Gas Fired Infrared Heaters", uses the same test methods as DIN EN 416 and DIN EN 419. However, CAN/ANSI/AHRI 1330 reports test results as gross radiant efficiency (GRE), which is the ratio between the corrected radiant output to the heat input and is about 6%–9% lower than NRE, or as infrared factor (IF), which relates to GRE.

(2) Excludes gas-fired outdoor packaged units.

(3) Includes gas-fired patio heaters, high- or low-intensity, as applicable.

Impact analysis

This proposed change would help Code users and authorities having jurisdiction to assess whether equipment conforms to the Code.

This proposed change is expected to be cost neutral because it simply aligns the NECB requirements with the Canadian Energy Efficiency Regulations, 2016.

Enforcement implications

This proposed change would facilitate enforcement since the metrics used in the NECB would align with those of the Canadian Energy Efficiency Regulations, 2016 and the US Department of Energy, Energy Conservation Program for Consumer Products.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NECB20 Div.B 5.2.12.1. (first printing)

[5.2.12.1.] 5.2.12.1. ([1] 1) [F95,F98,F99-OE1.1]

Submit a comment

Proposed Change 1732

Code Reference(s):	**NECB20 Div.B Appendix C (first printing)**
Subject:	Climatic Loads
Title:	Missing Degree-Days Below 15°C Values
Description:	This proposed change adds values that are missing from Table C-1 under "Degree-Days Below 15°C."

This change could potentially affect the following topic areas:

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

Problem

Degree-Days Below 15°C values are missing from Table C-1 for the following locations: Kitchenuhmaykoosib / Big Trout Lake, Mississauga (Lester B. Pearson Int'l Airport), Newcastle (Bowmanville) and Boiestown. These missing values could result in difficulties for Code users and the use of inconsistent values for these locations.

Justification

This proposed change would update Table C-1 by adding missing values for degree-days below 15°C for Kitchenuhmaykoosib / Big Trout Lake, Mississauga (Lester B. Pearson Int'l Airport), Newcastle (Bowmanville) and Boiestown. The addition of this data would prevent Code users from using inconsistent values for these locations.

PROPOSED CHANGE

Climatic Information for Building Design in Canada

Table C-1, which is referenced in Sentence 1.1.4.1.(1), represents a partial reproduction of

Table C-2 of Division B of the NBC (see the section on Climatic and Seismic Information for Building Design in Canada in the NBC for further information on these climatic data categories). The additional data for "Degree-Days Below 15°C" was developed by Environment and Climate Change Canada for inclusion in the NECB.

Table [C-1] C-1
Design Data for Selected Locations in Canada

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
British Columbia									
100 Mile House	1040	-30	-32	29	17	5030	4040	0.27	0.35
Abbotsford	70	-8	-10	29	20	2860	2000	0.33	0.44
Agassiz	15	-9	-11	31	21	2750	1900	0.35	0.47
Alberni	12	-5	-8	31	19	3100	2220	0.24	0.32
Ashcroft	305	-24	-27	34	20	3700	2790	0.29	0.38
Bamfield	20	-2	-4	23	17	3080	2060	0.38	0.50
Beatton River	840	-37	-39	26	18	6300	5230	0.23	0.30
Bella Bella	25	-5	-7	23	18	3180	2150	0.40	0.50
Bella Coola	40	-14	-18	27	19	3560	2660	0.29	0.39
Burns Lake	755	-31	-34	26	17	5450	4430	0.29	0.39
Cache Creek	455	-24	-27	34	20	3700	2790	0.29	0.39
Campbell River	20	-5	-7	26	18	3000	2130	0.41	0.48
Carmi	845	-24	-26	31	19	4750	3770	0.29	0.38
Castlegar	430	-18	-20	32	20	3580	2680	0.26	0.34
Chetwynd	605	-35	-38	27	18	5500	4480	0.30	0.40
Chilliwack	10	-9	-11	30	20	2780	1920	0.35	0.47
Comox	15	-7	-9	27	18	2930	2220	0.41	0.48
Courtenay	10	-7	-9	28	18	2930	2220	0.41	0.48
Cranbrook	910	-26	-28	32	18	4400	3450	0.25	0.33
Crescent Valley	585	-18	-20	31	20	3650	2740	0.25	0.33

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Crofton	5	-4	-6	28	19	2880	2020	0.32	0.40
Dawson Creek	665	-38	-40	27	18	5900	4860	0.30	0.40
Dease Lake	800	-37	-40	24	15	6730	5630	0.23	0.30
Dog Creek	450	-28	-30	29	17	4800	3820	0.27	0.35
Duncan	10	-6	-8	28	19	2980	2110	0.31	0.39
Elko	1065	-28	-31	30	19	4600	3630	0.30	0.40
Fernie	1010	-27	-30	30	19	4750	3770	0.30	0.40
Fort Nelson	465	-39	-42	28	18	6710	5740	0.23	0.30
Fort St. John	685	-35	-37	26	18	5750	4710	0.29	0.39
Glacier	1145	-27	-30	27	17	5800	4760	0.24	0.32
Gold River	120	-8	-11	31	18	3230	2350	0.24	0.32
Golden	790	-27	-30	30	17	4750	3770	0.26	0.35
Grand Forks	565	-19	-22	34	20	3820	2900	0.30	0.40
Greenwood	745	-20	-23	34	20	4100	3160	0.30	0.40
Hope	40	-13	-15	31	20	2820	2130	0.47	0.63
Jordan River	20	-1	-3	22	17	2900	1900	0.44	0.55
Kamloops	355	-23	-25	34	20	3450	2670	0.30	0.40
Kaslo	545	-17	-20	30	19	3830	2910	0.23	0.31
Kelowna	350	-17	-20	33	20	3400	2510	0.30	0.40
Kimberley	1090	-25	-27	31	18	4650	3680	0.25	0.33
Kitimat Plant	15	-16	-18	25	16	3750	2830	0.36	0.48
Kitimat Townsite	130	-16	-18	24	16	3900	2980	0.36	0.48
Ladysmith	80	-7	-9	27	19	2920	2130	0.32	0.40
Langford	80	-4	-6	27	19	2750	1770	0.32	0.40
Lillooet	245	-21	-23	34	20	3400	2610	0.33	0.44
Lytton	325	-17	-20	35	20	3300	2410	0.32	0.43
Mackenzie	765	-34	-38	27	17	5550	4530	0.25	0.32

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Masset	10	-5	-7	17	15	3700	2600	0.50	0.61
McBride	730	-29	-32	29	18	4980	3990	0.27	0.35
McLeod Lake	695	-35	-37	27	17	5450	4430	0.25	0.32
Merritt	570	-24	-27	34	20	3900	2980	0.33	0.44
Mission City	45	-9	-11	30	20	2850	1990	0.32	0.43
Montrose	615	-16	-18	32	20	3600	2690	0.26	0.35
Nakusp	445	-20	-22	31	20	3560	2660	0.25	0.33
Nanaimo	15	-6	-8	27	19	2920	2130	0.38	0.48
Nelson	600	-18	-20	31	20	3500	2600	0.25	0.33
Ocean Falls	10	-10	-12	23	17	3400	2510	0.44	0.59
Osoyoos	285	-14	-17	35	21	3100	2220	0.30	0.40
Parksville	40	-6	-8	26	19	2990	2320	0.40	0.48
Penticton	350	-15	-17	33	20	3350	2460	0.30	0.40
Port Alberni	15	-5	-8	31	19	3100	2220	0.24	0.32
Port Alice	25	-3	-6	26	17	3010	2000	0.24	0.32
Port Hardy	5	-5	-7	20	16	3440	2370	0.36	0.48
Port McNeill	5	-5	-7	22	17	3410	2350	0.36	0.48
Port Renfrew	20	-3	-5	24	17	2900	1900	0.42	0.52
Powell River	10	-7	-9	26	18	3100	2220	0.39	0.48
Prince George	580	-32	-36	28	18	4720	3750	0.28	0.37
Prince Rupert	20	-13	-15	19	15	3900	2770	0.43	0.54
Princeton	655	-24	-29	33	19	4250	3300	0.27	0.36
Qualicum Beach	10	-7	-9	27	19	2990	2320	0.41	0.48
Queen Charlotte City	35	-6	-8	21	16	3520	2440	0.50	0.61
Quesnel	475	-31	-33	30	17	4650	3680	0.24	0.31
Revelstoke	440	-20	-23	31	19	4000	3070	0.24	0.32

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Salmon Arm	425	-19	-24	33	21	3650	2740	0.29	0.39
Sandspit	5	-4	-6	18	15	3450	2380	0.59	0.72
Sechelt	25	-6	-8	27	20	2680	1830	0.38	0.48
Sidney	10	-4	-6	26	18	2850	1860	0.34	0.42
Smith River	660	-45	-47	26	17	7100	5980	0.24	0.30
Smithers	500	-29	-31	26	17	5040	4050	0.30	0.40
Sooke	20	-1	-3	21	16	2900	1900	0.38	0.48
Squamish	5	-9	-11	29	20	2950	2080	0.38	0.50
Stewart	10	-17	-20	25	16	4350	3400	0.27	0.36
Tahsis	25	-4	-6	26	18	3150	2120	0.26	0.34
Taylor	515	-35	-37	26	18	5720	4690	0.30	0.40
Terrace	60	-19	-21	27	17	4150	3210	0.27	0.36
Tofino	10	-2	-4	20	16	3150	2120	0.51	0.68
Trail	440	-14	-17	33	20	3600	2690	0.26	0.35
Ucluelet	5	-2	-4	18	16	3120	2100	0.51	0.68
Vancouver Region									
Burnaby (Simon Fraser Univ.)	330	-7	-9	25	17	3100	2220	0.35	0.47
Cloverdale	10	-8	-10	29	20	2700	1850	0.33	0.44
Haney	10	-9	-11	30	20	2840	1980	0.33	0.44
Ladner	3	-6	-8	27	19	2600	1750	0.37	0.46
Langley	15	-8	-10	29	20	2700	1850	0.33	0.44
New Westminster	10	-8	-10	29	19	2800	1940	0.33	0.44
North Vancouver	135	-7	-9	26	19	2910	2050	0.34	0.45
Richmond	5	-7	-9	27	19	2800	1940	0.36	0.45
Surrey (88 Ave & 156 St.)	90	-8	-10	29	20	2750	1900	0.33	0.44

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Vancouver (City Hall)	40	-7	-9	28	20	2825	1970	0.34	0.45
Vancouver (Granville St. & 41st Ave)	120	-6	-8	28	20	2925	2060	0.36	0.45
West Vancouver	45	-7	-9	28	19	2950	2080	0.36	0.48
Vernon	405	-20	-23	33	20	3600	2690	0.30	0.40
Victoria Region									
Victoria	10	-4	-6	24	17	2650	1730	0.46	0.57
Victoria (Gonzales Hts)	65	-4	-6	24	17	2700	1690	0.46	0.57
Victoria (Mt Tolmie)	125	-6	-8	24	16	2700	1730	0.46	0.57
Whistler	665	-17	-20	30	20	4180	3240	0.24	0.32
White Rock	30	-5	-7	25	20	2620	1770	0.33	0.44
Williams Lake	615	-30	-33	29	17	4400	3450	0.27	0.35
Youbou	200	-5	-8	31	19	3050	2180	0.26	0.32
Alberta									
Athabasca	515	-35	-38	27	19	6000	5000	0.27	0.36
Banff	1400	-31	-33	27	16	5500	4520	0.26	0.32
Barrhead	645	-33	-36	27	19	5740	4750	0.35	0.44
Beaverlodge	730	-36	-39	28	18	5700	4710	0.27	0.36
Brooks	760	-32	-34	32	20	4880	3940	0.35	0.44
Calgary	1045	-30	-32	28	17	5000	4050	0.38	0.48
Campsie	660	-33	-36	27	19	5750	4760	0.33	0.44
Camrose	740	-33	-35	29	19	5500	4520	0.31	0.39
Canmore	1320	-31	-33	28	17	5400	4430	0.30	0.37
Cardston	1130	-29	-32	30	19	4700	3770	0.58	0.72

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Claresholm	1030	-30	-32	30	18	4680	3750	0.46	0.58
Cold Lake	540	-35	-38	28	19	5860	4860	0.29	0.38
Coleman	1320	-31	-34	29	18	5210	4250	0.50	0.63
Coronation	790	-32	-34	30	19	5640	4660	0.30	0.37
Cowley	1175	-29	-32	29	18	4810	3870	0.81	1.01
Drumheller	685	-32	-34	30	18	5050	4100	0.35	0.44
Edmonton	645	-30	-33	28	19	5120	4160	0.36	0.45
Edson	920	-34	-37	27	18	5750	4760	0.37	0.46
Embarras Portage	220	-41	-43	28	19	7100	6040	0.28	0.37
Fairview	670	-37	-40	27	18	5840	4850	0.26	0.35
Fort MacLeod	945	-30	-32	31	19	4600	3670	0.54	0.68
Fort McMurray	255	-38	-40	28	19	6250	5230	0.28	0.35
Fort Saskatchewan	610	-32	-35	28	19	5420	4450	0.34	0.43
Fort Vermilion	270	-41	-43	28	18	6700	5660	0.23	0.30
Grande Prairie	650	-36	-39	27	18	5790	4800	0.32	0.43
Habay	335	-41	-43	28	18	6750	5710	0.23	0.30
Hardisty	615	-33	-36	30	19	5640	4660	0.29	0.36
High River	1040	-31	-32	28	17	4900	3960	0.52	0.65
Hinton	990	-34	-38	27	17	5500	4520	0.37	0.46
Jasper	1060	-31	-34	28	17	5300	4330	0.26	0.32
Keg River	420	-40	-42	28	18	6520	5490	0.23	0.30
Lac La Biche	560	-35	-38	28	19	6100	5090	0.27	0.36
Lacombe	855	-33	-36	28	19	5500	4520	0.32	0.40
Lethbridge	910	-30	-32	31	19	4500	3580	0.53	0.66
Manning	465	-39	-41	27	18	6300	5280	0.23	0.30
Medicine Hat	705	-31	-34	32	19	4540	3610	0.38	0.48
Peace River	330	-37	-40	27	18	6050	5040	0.24	0.32

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Pincher Creek	1130	-29	-32	29	18	4740	3800	0.77	0.96
Ranfurly	670	-34	-37	29	19	5700	4710	0.29	0.36
Red Deer	855	-32	-35	28	19	5550	4570	0.32	0.40
Rocky Mountain House	985	-32	-34	27	18	5640	4660	0.29	0.36
Slave Lake	590	-35	-38	26	19	5850	4850	0.28	0.37
Stettler	820	-32	-34	30	19	5300	4330	0.29	0.36
Stony Plain	710	-32	-35	28	19	5300	4330	0.36	0.45
Suffield	755	-31	-34	32	20	4770	3830	0.39	0.49
Taber	815	-31	-33	31	19	4580	3650	0.50	0.63
Turner Valley	1215	-31	-32	28	17	5220	4260	0.52	0.65
Valleyview	700	-37	-40	27	18	5600	4620	0.34	0.42
Vegreville	635	-34	-37	29	19	5780	4790	0.29	0.36
Vermilion	580	-35	-38	29	19	5740	4750	0.29	0.36
Wagner	585	-35	-38	26	19	5850	4850	0.28	0.37
Wainwright	675	-33	-36	29	19	5700	4710	0.29	0.36
Wetaskiwin	760	-33	-35	29	19	5500	4520	0.31	0.39
Whitecourt	690	-33	-36	27	19	5650	4670	0.28	0.37
Wimborne	975	-31	-34	29	18	5310	4340	0.32	0.40
Saskatchewan									
Assiniboia	740	-32	-34	31	21	5180	4300	0.39	0.49
Battrum	700	-32	-34	32	20	5080	4210	0.43	0.54
Biggar	645	-34	-36	30	20	5720	4820	0.36	0.45
Broadview	600	-34	-35	30	21	5760	4850	0.36	0.46
Dafoe	530	-35	-37	29	21	5860	4950	0.29	0.37
Dundurn	525	-35	-37	30	21	5600	4700	0.36	0.46
Estevan	565	-32	-34	32	22	5340	4450	0.41	0.52

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Hudson Bay	370	-36	-38	29	21	6280	5350	0.29	0.37
Humboldt	565	-36	-38	28	21	6000	5080	0.31	0.39
Island Falls	305	-39	-41	27	20	7100	6130	0.26	0.35
Kamsack	455	-34	-37	29	22	6040	5120	0.32	0.40
Kindersley	685	-33	-35	31	20	5550	4650	0.36	0.46
Lloydminster	645	-34	-37	28	20	5880	4970	0.32	0.40
Maple Creek	765	-31	-34	31	20	4780	3920	0.36	0.45
Meadow Lake	480	-38	-40	28	20	6280	5350	0.30	0.40
Melfort	455	-36	-38	28	21	6050	5130	0.28	0.36
Melville	550	-34	-36	29	21	5880	4970	0.32	0.40
Moose Jaw	545	-32	-34	31	21	5270	4390	0.41	0.52
Nipawin	365	-37	-39	28	21	6300	5370	0.30	0.38
North Battleford	545	-34	-36	29	20	5900	4990	0.36	0.46
Prince Albert	435	-37	-40	28	21	6100	5180	0.30	0.38
Qu'Appelle	645	-34	-36	30	22	5620	4720	0.33	0.42
Regina	575	-34	-36	31	21	5600	4700	0.39	0.49
Rosetown	595	-34	-36	31	20	5620	4720	0.39	0.49
Saskatoon	500	-35	-37	30	21	5700	4800	0.36	0.46
Scott	645	-34	-36	30	20	5960	5040	0.36	0.45
Strasbourg	545	-34	-36	30	22	5600	4700	0.33	0.42
Swift Current	750	-31	-34	31	20	5150	4270	0.43	0.54
Uranium City	265	-42	-44	26	19	7500	6510	0.27	0.36
Weyburn	575	-33	-35	31	23	5400	4510	0.38	0.48
Yorkton	510	-34	-37	29	21	6000	5080	0.32	0.40
Manitoba									
Beausejour	245	-33	-35	29	23	5680	4780	0.32	0.41
Boissevain	510	-32	-34	30	23	5500	4610	0.41	0.52

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Brandon	395	-33	-35	30	22	5760	4850	0.39	0.49
Churchill	10	-38	-40	25	18	8950	7890	0.43	0.55
Dauphin	295	-33	-35	30	22	5900	4990	0.32	0.40
Flin Flon	300	-38	-40	27	20	6440	5500	0.28	0.35
Gimli	220	-34	-36	29	23	5800	4890	0.32	0.40
Island Lake	240	-36	-38	27	20	6900	5940	0.29	0.37
Lac du Bonnet	260	-34	-36	29	23	5730	4830	0.29	0.37
Lynn Lake	350	-40	-42	27	19	7770	6770	0.29	0.37
Morden	300	-31	-33	30	24	5400	4510	0.41	0.52
Neepawa	365	-32	-34	29	23	5760	4850	0.35	0.44
Pine Falls	220	-34	-36	28	23	5900	4990	0.31	0.39
Portage la Prairie	260	-31	-33	30	23	5600	4700	0.36	0.46
Rivers	465	-34	-36	29	23	5840	4930	0.36	0.46
Sandilands	365	-32	-34	29	23	5650	4750	0.32	0.40
Selkirk	225	-33	-35	29	23	5700	4800	0.32	0.41
Split Lake	175	-38	-40	27	19	7900	6890	0.31	0.39
Steinbach	270	-33	-35	29	23	5700	4800	0.32	0.40
Swan River	335	-34	-37	29	22	6100	5180	0.28	0.35
The Pas	270	-36	-38	28	21	6480	5540	0.29	0.37
Thompson	205	-40	-43	27	19	7600	6600	0.28	0.36
Virden	435	-33	-35	30	23	5620	4720	0.36	0.46
Winnipeg	235	-33	-35	30	23	5670	4770	0.36	0.45
Ontario									
Ailsa Craig	230	-17	-19	30	23	3840	3050	0.37	0.48
Ajax	95	-20	-22	30	23	3820	3030	0.37	0.48
Alexandria	80	-24	-26	30	23	4600	3740	0.31	0.40
Alliston	220	-23	-25	29	23	4200	3380	0.28	0.36

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Almonte	120	-26	-28	30	23	4620	3760	0.32	0.41
Armstrong	340	-37	-40	28	21	6500	5530	0.22	0.30
Arnprior	85	-27	-29	30	23	4680	3820	0.29	0.37
Atikokan	400	-33	-35	29	22	5750	4810	0.22	0.30
Attawapiskat	10	-37	-39	28	21	7100	6120	0.30	0.41
Aurora	270	-21	-23	30	23	4210	3390	0.34	0.44
Bancroft	365	-28	-31	29	23	4740	3870	0.25	0.32
Barrie	245	-24	-26	29	23	4380	3540	0.28	0.36
Barriefield	100	-22	-24	28	23	3990	3190	0.37	0.47
Beaverton	240	-24	-26	30	23	4300	3470	0.28	0.36
Belleville	90	-22	-24	29	23	3910	3110	0.34	0.43
Belmont	260	-17	-19	30	24	3840	3050	0.37	0.47
Borden (CFB)	225	-23	-25	29	23	4300	3470	0.28	0.36
Bracebridge	310	-26	-28	29	23	4800	3920	0.27	0.35
Bradford	240	-23	-25	30	23	4280	3450	0.28	0.36
Brampton	215	-19	-21	30	23	4100	3290	0.34	0.44
Brantford	205	-18	-20	30	23	3900	3110	0.33	0.42
Brighton	95	-21	-23	29	23	4000	3200	0.37	0.48
Brockville	85	-23	-25	29	23	4060	3250	0.34	0.44
Burk's Falls	305	-26	-28	29	22	5020	4120	0.27	0.35
Burlington	80	-17	-19	31	23	3740	2960	0.36	0.46
Cambridge	295	-18	-20	29	23	4100	3290	0.28	0.36
Campbellford	150	-23	-26	30	23	4280	3450	0.32	0.41
Cannington	255	-24	-26	30	23	4310	3480	0.28	0.36
Carleton Place	135	-25	-27	30	23	4600	3740	0.32	0.41
Cavan	200	-23	-25	30	23	4400	3560	0.34	0.44
Centralia	260	-17	-19	30	23	3800	3010	0.37	0.48

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Chapleau	425	-35	-38	27	21	5900	4950	0.23	0.30
Chatham	180	-16	-18	31	24	3470	2710	0.34	0.43
Chesley	275	-19	-21	29	22	4320	3490	0.35	0.45
Clinton	280	-17	-19	29	23	4150	3330	0.36	0.46
Coboconk	270	-25	-27	30	23	4500	3650	0.27	0.35
Cobourg	90	-21	-23	29	23	3980	3180	0.38	0.49
Cochrane	245	-34	-36	29	21	6200	5240	0.27	0.35
Colborne	105	-21	-23	29	23	3980	3180	0.38	0.49
Collingwood	190	-21	-23	29	23	4180	3360	0.30	0.39
Cornwall	35	-23	-25	30	23	4250	3420	0.32	0.41
Corunna	185	-16	-18	31	24	3600	2830	0.37	0.47
Deep River	145	-29	-32	30	22	4900	3980	0.27	0.35
Deseronto	85	-22	-24	29	23	4070	3260	0.34	0.43
Dorchester	260	-18	-20	30	24	3900	3110	0.37	0.47
Dorion	200	-33	-35	28	21	5950	5000	0.29	0.39
Dresden	185	-16	-18	31	24	3750	2970	0.34	0.43
Dryden	370	-34	-36	28	22	5850	4940	0.22	0.30
Dundalk	525	-22	-24	29	22	4700	3830	0.33	0.42
Dunnville	175	-15	-17	30	24	3660	2890	0.36	0.46
Durham	340	-20	-22	29	22	4340	3510	0.34	0.44
Dutton	225	-16	-18	31	24	3700	2920	0.37	0.47
Earlton	245	-33	-36	29	22	5730	4790	0.35	0.45
Edison	365	-34	-36	28	22	5740	4840	0.23	0.31
Elliot Lake	380	-26	-28	29	21	4950	4030	0.30	0.38
Elmvale	220	-24	-26	29	23	4200	3380	0.28	0.36
Embro	310	-19	-21	30	23	3950	3150	0.37	0.48
Englehart	205	-33	-36	29	22	5800	4860	0.32	0.41

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Espanola	220	-25	-27	29	21	4920	4000	0.33	0.42
Exeter	265	-17	-19	30	23	3900	3110	0.37	0.48
Fenelon Falls	260	-25	-27	30	23	4440	3600	0.28	0.36
Fergus	400	-20	-22	29	23	4300	3470	0.28	0.36
Forest	215	-16	-18	31	23	3740	2960	0.37	0.48
Fort Erie	180	-15	-17	30	24	3650	2880	0.36	0.46
Fort Erie (Ridgeway)	190	-15	-17	30	24	3600	2830	0.36	0.46
Fort Frances	340	-33	-35	29	22	5440	4550	0.23	0.31
Gananoque	80	-22	-24	28	23	4010	3210	0.37	0.47
Geraldton	345	-36	-39	28	21	6450	5490	0.22	0.30
Glencoe	215	-16	-18	31	24	3680	2900	0.34	0.43
Goderich	185	-16	-18	29	23	4000	3200	0.37	0.48
Gore Bay	205	-24	-26	28	22	4700	3830	0.34	0.44
Graham	495	-35	-37	29	22	5940	4990	0.22	0.30
Gravenhurst (Muskoka Airport)	255	-26	-28	29	23	4760	3890	0.28	0.36
Grimsby	85	-16	-18	30	23	3520	2760	0.36	0.46
Guelph	340	-19	-21	29	23	4270	3440	0.28	0.36
Guthrie	280	-24	-26	29	23	4300	3470	0.28	0.36
Haileybury	210	-32	-35	30	22	5600	4660	0.34	0.44
Haldimand (Caledonia)	190	-18	-20	30	23	3750	2970	0.34	0.44
Haldimand (Hagersville)	215	-17	-19	30	23	3760	2980	0.36	0.46
Haliburton	335	-27	-29	29	23	4840	3960	0.27	0.35
Halton Hills (Georgetown)	255	-19	-21	30	23	4200	3380	0.29	0.37
Hamilton	90	-17	-19	31	23	3460	2700	0.36	0.46

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Hanover	270	-19	-21	29	22	4300	3470	0.34	0.44
Hastings	200	-24	-26	30	23	4280	3450	0.32	0.41
Hawkesbury	50	-25	-27	30	23	4610	3750	0.32	0.41
Hearst	245	-35	-37	29	21	6450	5490	0.23	0.30
Honey Harbour	180	-24	-26	29	23	4300	3470	0.30	0.39
Hornepayne	360	-37	-40	28	21	6340	5380	0.22	0.30
Huntsville	335	-26	-29	29	22	4850	3970	0.27	0.35
Ingersoll	280	-18	-20	30	23	3920	3120	0.37	0.48
Iroquois Falls	275	-33	-36	29	21	6100	5150	0.29	0.37
Jellicoe	330	-36	-39	28	21	6400	5440	0.22	0.30
Kapuskasing	245	-34	-36	29	21	6250	5290	0.24	0.31
Kemptville	90	-25	-27	30	23	4540	3690	0.32	0.41
Kenora	370	-33	-35	28	22	5630	4730	0.23	0.31
Killaloe	185	-28	-31	30	22	4960	4070	0.27	0.35
Kincardine	190	-17	-19	28	22	3890	3100	0.37	0.48
Kingston	80	-22	-24	28	23	4000	3200	0.37	0.47
Kinmount	295	-26	-28	29	23	4600	3740	0.27	0.35
Kirkland Lake	325	-33	-36	29	22	6000	5050	0.30	0.39
Kitchener	335	-19	-21	29	23	4200	3380	0.29	0.37
Kitchenuhmaykoosib / Big Trout Lake	215	-38	-40	26	20	7450	–6460	0.31	0.42
Lakefield	240	-24	-26	30	23	4330	3500	0.30	0.38
Lansdowne House	240	-38	-40	28	21	7150	6160	0.24	0.32
Leamington	190	-15	-17	31	24	3400	2650	0.37	0.47
Lindsay	265	-24	-26	30	23	4320	3490	0.30	0.38
Lion's Head	185	-19	-21	27	22	4300	3470	0.37	0.48

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Listowel	380	-19	-21	29	23	4300	3470	0.34	0.43
London	245	-18	-20	30	24	3900	3110	0.37	0.47
Lucan	300	-17	-19	30	23	3900	3110	0.37	0.48
Maitland	85	-23	-25	29	23	4080	3270	0.34	0.44
Markdale	425	-20	-22	29	22	4500	3650	0.32	0.41
Markham	175	-21	-23	31	24	4000	3200	0.34	0.44
Martin	485	-35	-37	29	22	5900	4950	0.22	0.30
Matheson	265	-33	-36	29	21	6080	5130	0.30	0.39
Mattawa	165	-29	-31	30	22	5050	4130	0.25	0.32
Midland	190	-24	-26	29	23	4200	3380	0.30	0.39
Milton	200	-18	-20	30	23	3920	3120	0.34	0.43
Milverton	370	-19	-21	29	23	4200	3380	0.34	0.43
Minden	270	-27	-29	29	23	4640	3780	0.27	0.35
Mississauga	160	-18	-20	30	23	3880	3090	0.34	0.44
Mississauga (Lester B. Pearson Int'l Airport)	170	-20	-22	31	24	3890	–3100	0.34	0.44
Mississauga (Port Credit)	75	-18	-20	29	23	3780	3000	0.37	0.48
Mitchell	335	-18	-20	29	23	4100	3290	0.35	0.45
Moosonee	10	-36	-38	28	22	6800	5820	0.26	0.35
Morrisburg	75	-23	-25	30	23	4370	3530	0.32	0.41
Mount Forest	420	-21	-24	28	22	4700	3830	0.32	0.41
Nakina	325	-36	-38	28	21	6500	5530	0.22	0.30
Nanticoke (Jarvis)	205	-17	-18	30	23	3700	2920	0.37	0.48
Nanticoke (Port Dover)	180	-15	-17	30	24	3600	2830	0.37	0.48

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Napanee	90	-22	-24	29	23	4140	3320	0.34	0.43
New Liskeard	180	-32	-35	30	22	5570	4630	0.34	0.43
Newcastle	115	-20	-22	30	23	3990	3190	0.37	0.48
Newcastle (Bowmanville)	95	-20	-22	30	23	4000	-3170	0.37	0.48
Newmarket	185	-22	-24	30	23	4260	3430	0.30	0.38
Niagara Falls	210	-16	-18	30	23	3600	2830	0.34	0.43
North Bay	210	-28	-30	28	22	5150	4230	0.27	0.34
Norwood	225	-24	-26	30	23	4320	3490	0.32	0.41
Oakville	90	-18	-20	30	23	3760	2980	0.37	0.47
Orangeville	430	-21	-23	29	23	4450	3610	0.28	0.36
Orillia	230	-25	-27	29	23	4260	3430	0.28	0.36
Oshawa	110	-19	-21	30	23	3860	3070	0.37	0.48
Ottawa (Metropolitan)									
Ottawa (City Hall)	70	-25	-27	30	23	4440	3600	0.32	0.41
Ottawa (Barrhaven)	98	-25	-27	30	23	4500	3650	0.32	0.41
Ottawa (Kanata)	98	-25	-27	30	23	4520	3670	0.32	0.41
Ottawa (M-C Int'l Airport)	125	-25	-27	30	23	4500	3650	0.32	0.41
Ottawa (Orléans)	70	-26	-28	30	23	4500	3650	0.32	0.41
Owen Sound	215	-19	-21	29	22	4030	3220	0.34	0.44
Pagwa River	185	-35	-37	28	21	6500	5530	0.22	0.30
Paris	245	-18	-20	30	23	4000	3200	0.33	0.42
Parkhill	205	-16	-18	31	23	3800	3010	0.37	0.48
Parry Sound	215	-24	-26	28	22	4640	3780	0.30	0.39
Pelham (Fonthill)	230	-15	-17	30	23	3690	2910	0.33	0.42

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Pembroke	125	-28	-31	30	23	4980	4090	0.27	0.35
Penetanguishene	220	-24	-26	29	23	4200	3380	0.30	0.39
Perth	130	-25	-27	30	23	4540	3690	0.32	0.41
Petawawa	135	-29	-31	30	23	4980	4090	0.27	0.35
Peterborough	200	-23	-25	30	23	4400	3560	0.32	0.41
Petrolia	195	-16	-18	31	24	3640	2870	0.37	0.47
Pickering (Dunbarton)	85	-19	-21	30	23	3800	3010	0.37	0.48
Picton	95	-21	-23	29	23	3980	3180	0.38	0.49
Plattsville	300	-19	-21	29	23	4150	3330	0.33	0.42
Point Alexander	150	-29	-32	30	22	4960	4040	0.27	0.35
Port Burwell	195	-15	-17	30	24	3800	3010	0.37	0.47
Port Colborne	180	-15	-17	30	24	3600	2830	0.36	0.46
Port Elgin	205	-17	-19	28	22	4100	3290	0.37	0.48
Port Hope	100	-21	-23	29	23	3970	3170	0.37	0.48
Port Perry	270	-22	-24	30	23	4260	3430	0.34	0.44
Port Stanley	180	-15	-17	31	24	3850	3060	0.37	0.47
Prescott	90	-23	-25	29	23	4120	3310	0.34	0.44
Princeton	280	-18	-20	30	23	4000	3200	0.33	0.42
Raith	475	-34	-37	28	22	5900	4950	0.22	0.30
Rayside-Balfour (Chelmsford)	270	-28	-30	29	21	5200	4280	0.35	0.45
Red Lake	360	-35	-37	28	21	6220	5290	0.22	0.30
Renfrew	115	-27	-30	30	23	4900	4020	0.27	0.35
Richmond Hill	230	-21	-23	31	24	4000	3200	0.34	0.44
Rockland	50	-26	-28	30	23	4600	3740	0.31	0.40
Sarnia	190	-16	-18	31	24	3750	2970	0.37	0.47

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Sault Ste. Marie	190	-25	-28	29	22	4960	4040	0.33	0.44
Schreiber	310	-34	-36	27	21	5960	5010	0.29	0.39
Seaforth	310	-17	-19	30	23	4100	3290	0.35	0.45
Shelburne	495	-22	-24	29	23	4700	3830	0.31	0.40
Simcoe	210	-17	-19	30	24	3700	2920	0.35	0.45
Sioux Lookout	375	-34	-36	28	22	5950	5030	0.22	0.30
Smiths Falls	130	-25	-27	30	23	4540	3690	0.32	0.41
Smithville	185	-16	-18	30	23	3650	2880	0.33	0.42
Smooth Rock Falls	235	-34	-36	29	21	6250	5290	0.25	0.32
South River	355	-27	-29	29	22	5090	4190	0.27	0.35
Southampton	180	-17	-19	28	22	4100	3290	0.37	0.48
St. Catharines	105	-16	-18	30	23	3540	2780	0.36	0.46
St. Marys	310	-18	-20	30	23	4000	3200	0.37	0.47
St. Thomas	225	-16	-18	31	24	3780	3000	0.37	0.47
Stirling	120	-23	-25	30	23	4220	3400	0.31	0.40
Stratford	360	-18	-20	29	23	4050	3240	0.35	0.45
Strathroy	225	-17	-19	31	24	3780	3000	0.37	0.47
Sturgeon Falls	205	-28	-30	29	21	5200	4280	0.27	0.35
Sudbury	275	-28	-30	29	21	5180	4260	0.36	0.46
Sundridge	340	-27	-29	29	22	5080	4180	0.27	0.35
Tavistock	340	-19	-21	29	23	4100	3290	0.35	0.45
Temagami	300	-30	-33	30	22	5420	4490	0.29	0.37
Thamesford	280	-19	-21	30	23	3950	3150	0.37	0.48
Thedford	205	-16	-18	31	23	3710	2930	0.37	0.48
Thunder Bay	210	-31	-33	29	21	5650	4710	0.29	0.39
Tillsonburg	215	-17	-19	30	24	3840	3050	0.34	0.44
Timmins	300	-34	-36	29	21	5940	4990	0.27	0.35

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Timmins (Porcupine)	295	-34	-36	29	21	6000	5050	0.29	0.37
Toronto Metropolitan Region									
Etobicoke	160	-20	-22	31	24	3800	3010	0.34	0.44
North York	175	-20	-22	31	24	3760	2980	0.34	0.44
Scarborough	180	-20	-22	31	24	3800	3010	0.37	0.47
Toronto (City Hall)	90	-18	-20	31	23	3520	2760	0.34	0.44
Trenton	80	-22	-24	29	23	4110	3300	0.37	0.47
Trout Creek	330	-27	-29	29	22	5100	4200	0.27	0.35
Uxbridge	275	-22	-24	30	23	4240	3410	0.33	0.42
Vaughan (Woodbridge)	165	-20	-22	31	24	4100	3290	0.34	0.44
Vittoria	215	-15	-17	30	24	3680	2900	0.37	0.47
Walkerton	275	-18	-20	30	22	4300	3470	0.36	0.46
Wallaceburg	180	-16	-18	31	24	3600	2830	0.35	0.45
Waterloo	330	-19	-21	29	23	4200	3380	0.29	0.37
Watford	240	-17	-19	31	24	3740	2960	0.37	0.47
Wawa	290	-34	-36	26	21	5840	4900	0.30	0.39
Welland	180	-15	-17	30	23	3670	2900	0.34	0.43
West Lorne	215	-16	-18	31	24	3700	2920	0.37	0.47
Whitby	85	-20	-22	30	23	3820	3030	0.37	0.48
Whitby (Brooklin)	160	-20	-22	30	23	4010	3210	0.35	0.45
White River	375	-39	-42	28	21	6150	5200	0.22	0.30
Wiarton	185	-19	-21	29	22	4300	3470	0.34	0.44
Windsor	185	-16	-18	32	24	3400	2650	0.37	0.47
Wingham	310	-18	-20	30	23	4220	3400	0.36	0.46
Woodstock	300	-19	-21	30	23	3910	3110	0.34	0.44

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Wyoming	215	-16	-18	31	24	3700	2920	0.37	0.47
Quebec									
Acton Vale	95	-24	-27	30	23	4620	3790	0.27	0.35
Alma	110	-31	-33	28	22	5800	4860	0.27	0.35
Amos	295	-34	-36	28	21	6160	5210	0.25	0.32
Asbestos	245	-26	-28	29	22	4800	3890	0.27	0.35
Aylmer	90	-25	-28	30	23	4520	3620	0.32	0.41
Baie-Comeau	60	-27	-29	25	19	6020	5070	0.39	0.50
Baie-Saint-Paul	20	-27	-29	28	21	5280	4350	0.37	0.48
Beauport	45	-26	-29	28	22	5100	4180	0.33	0.42
Bedford	55	-24	-26	29	23	4420	3610	0.29	0.37
Beloeil	25	-24	-26	30	23	4500	3680	0.29	0.37
Brome	210	-25	-27	29	23	4730	3880	0.29	0.37
Brossard	15	-24	-26	30	23	4420	3610	0.34	0.44
Buckingham	130	-26	-28	30	23	4880	3970	0.31	0.40
Campbell's Bay	115	-28	-30	30	23	4900	3980	0.25	0.32
Chambly	20	-24	-26	30	23	4450	3630	0.31	0.40
Coaticook	295	-25	-27	28	22	4750	3840	0.27	0.35
Contrecoeur	10	-25	-27	30	23	4500	3680	0.34	0.43
Cowansville	120	-25	-27	29	23	4540	3710	0.29	0.37
Deux-Montagnes	25	-25	-27	29	23	4440	3630	0.29	0.37
Dolbeau	120	-32	-34	28	22	6250	5290	0.27	0.35
Drummondville	85	-26	-28	30	23	4700	3860	0.27	0.35
Farnham	60	-24	-26	29	23	4500	3680	0.29	0.37
Fort-Coulonge	110	-28	-30	30	23	4950	4030	0.25	0.32
Gagnon	545	-34	-36	24	19	7600	6600	0.30	0.39
Gaspé	55	-25	-26	26	20	5500	4570	0.37	0.48

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Gatineau	95	-25	-28	30	23	4600	3690	0.32	0.41
Gracefield	175	-28	-31	30	23	5080	4160	0.25	0.32
Granby	120	-25	-27	29	23	4500	3680	0.27	0.35
Harrington Harbour	30	-27	-29	19	16	6150	5200	0.56	0.72
Havre-Saint-Pierre	5	-27	-29	22	18	6100	5150	0.49	0.63
Hemmingford	75	-24	-26	30	23	4380	3570	0.31	0.40
Hull	65	-25	-28	30	23	4550	3650	0.32	0.41
Iberville	35	-24	-26	29	23	4450	3630	0.32	0.41
Inukjuak	5	-36	-38	21	15	9150	8100	0.37	0.48
Joliette	45	-26	-28	29	23	4720	3870	0.28	0.36
Kuujjuaq	25	-37	-39	24	17	8550	7520	0.47	0.60
Kuujjuarapik	20	-36	-38	25	17	7990	6980	0.37	0.48
Lachute	65	-26	-28	29	23	4640	4570	0.31	0.40
Lac-Mégantic	420	-27	-29	27	22	5180	4470	0.27	0.35
La Malbaie	25	-26	-28	28	21	5400	3800	0.37	0.48
La Pocatière	55	-24	-26	28	22	5160	4240	0.39	0.50
La Tuque	165	-30	-32	29	22	5500	4260	0.27	0.35
Lennoxville	155	-28	-30	29	22	4700	3790	0.25	0.32
Léry	30	-24	-26	29	23	4420	3610	0.33	0.42
Loretteville	100	-26	-29	28	22	5200	4280	0.32	0.41
Louiseville	15	-25	-28	29	23	4900	4030	0.34	0.43
Magog	215	-26	-28	29	23	4730	3880	0.27	0.35
Malartic	325	-33	-36	29	21	6200	5240	0.25	0.32
Maniwaki	180	-30	-32	29	22	5280	4350	0.24	0.31
Masson	50	-26	-28	30	23	4610	3700	0.31	0.40
Matane	5	-24	-26	24	20	5510	4580	0.43	0.55
Mont-Joli	90	-24	-26	26	21	5370	4440	0.41	0.52

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Mont-Laurier	225	-29	-32	29	22	5320	4390	0.23	0.30
Montmagny	10	-25	-28	28	22	5090	4170	0.37	0.47
Montréal Region									
Beaconsfield	25	-24	-26	30	23	4440	3630	0.33	0.42
Dorval	25	-24	-26	30	23	4400	3590	0.34	0.44
Laval	35	-24	-26	29	23	4500	3680	0.33	0.42
Montréal (City Hall)	20	-23	-26	30	23	4200	3410	0.34	0.44
Montréal-Est	25	-23	-26	30	23	4470	3650	0.34	0.44
Montréal-Nord	20	-24	-26	30	23	4470	3650	0.33	0.42
Outremont	105	-23	-26	30	23	4300	3500	0.34	0.44
Pierrefonds	25	-24	-26	30	23	4430	3620	0.33	0.42
Sainte-Anne-de-Bellevue	35	-24	-26	29	23	4460	3640	0.33	0.42
Saint-Lambert	15	-23	-26	30	23	4400	3590	0.34	0.44
Saint-Laurent	45	-23	-26	30	23	4270	3470	0.34	0.44
Verdun	20	-23	-26	30	23	4200	3410	0.34	0.44
Nicolet (Gentilly)	15	-25	-28	29	23	4900	3980	0.33	0.42
Nitchequon	545	-39	-41	23	19	8100	7080	0.29	0.37
Noranda	305	-33	-36	29	21	6050	5100	0.27	0.35
Percé	5	-21	-24	25	19	5400	4470	0.49	0.63
Pincourt	25	-24	-26	29	23	4480	3660	0.33	0.42
Plessisville	145	-26	-28	29	23	5100	4180	0.27	0.35
Port-Cartier	20	-28	-30	25	19	6060	5110	0.42	0.54
Puvirnituq	5	-36	-38	23	16	9200	8150	0.47	0.60
Québec City Region									
Ancienne-Lorette	35	-25	-28	28	23	5130	4210	0.32	0.41

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Lévis	50	-25	-28	28	22	5050	4130	0.32	0.41
Québec	120	-25	-28	28	22	5080	4160	0.32	0.41
Sainte-Foy	115	-25	-28	28	23	5100	4180	0.32	0.41
Sillery	10	-25	-28	28	23	5070	4150	0.32	0.41
Richmond	150	-25	-27	29	22	4700	3860	0.25	0.32
Rimouski	30	-25	-27	26	20	5300	4370	0.41	0.52
Rivière-du-Loup	55	-25	-27	26	21	5380	4450	0.39	0.50
Roberval	100	-31	-33	28	21	5750	4810	0.27	0.35
Rock Island	160	-25	-27	29	23	4850	3990	0.27	0.35
Rosemère	25	-24	-26	29	23	4550	3720	0.31	0.40
Rouyn	300	-33	-36	29	21	6050	5100	0.27	0.35
Saguenay	10	-30	-32	28	22	5700	4760	0.28	0.36
Saguenay (Bagotville)	5	-31	-33	28	21	5700	4760	0.30	0.38
Saguenay (Jonquière)	135	-30	-32	28	22	5650	4710	0.27	0.35
Saguenay (Kénogami)	140	-30	-32	28	22	5650	4710	0.27	0.35
Sainte-Agathe-des-Monts	360	-28	-30	28	22	5390	4470	0.27	0.35
Saint-Eustache	35	-25	-27	29	23	4500	3680	0.29	0.37
Saint-Félicien	105	-32	-34	28	22	5850	4900	0.27	0.35
Saint-Georges-de-Cacouna	35	-25	-27	26	21	5400	4470	0.39	0.50
Saint-Hubert	25	-24	-26	30	23	4490	3670	0.34	0.44
Saint-Hubert-de-Rivière-du-Loup	310	-26	-28	26	21	5520	4590	0.31	0.40
Saint-Hyacinthe	35	-24	-27	30	23	4500	3680	0.27	0.35

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Saint-Jean-sur-Richelieu	35	-24	-26	29	23	4450	3630	0.32	0.41
Saint-Jérôme	95	-26	-28	29	23	4820	3960	0.29	0.37
Saint-Jovite	230	-29	-31	28	22	5250	4340	0.26	0.33
Saint-Lazare / Hudson	60	-24	-26	30	23	4520	3700	0.33	0.42
Saint-Nicolas	65	-25	-28	28	22	4990	4070	0.33	0.42
Salaberry-de-Valleyfield	50	-23	-25	29	23	4400	3590	0.33	0.42
Schefferville	550	-37	-39	24	16	8550	7520	0.33	0.42
Senneterre	310	-34	-36	29	21	6180	5220	0.25	0.32
Sept-Îles	5	-29	-31	24	18	6200	5240	0.42	0.54
Shawinigan	60	-26	-29	29	23	5050	4130	0.27	0.35
Shawville	170	-27	-30	30	23	4880	3970	0.27	0.35
Sherbrooke	185	-28	-30	29	23	4700	3790	0.25	0.32
Sorel	10	-25	-27	29	23	4550	3720	0.34	0.43
Sutton	185	-25	-27	29	23	4600	3770	0.29	0.37
Tadoussac	65	-26	-28	27	21	5450	4520	0.41	0.52
Témiscaming	240	-30	-32	30	22	5020	4100	0.25	0.32
Terrebonne	20	-25	-27	29	23	4500	3680	0.31	0.40
Thetford Mines	330	-26	-28	28	22	5120	4200	0.27	0.35
Thurso	50	-26	-28	30	23	4820	3910	0.31	0.40
Trois-Rivières	25	-25	-28	29	23	4900	3980	0.34	0.43
Val-d'Or	310	-33	-36	29	21	6180	5220	0.25	0.32
Varennes	15	-24	-26	30	23	4500	3680	0.31	0.40
Verchères	15	-24	-26	30	23	4450	3630	0.34	0.43
Victoriaville	125	-26	-28	29	23	4900	3980	0.27	0.35
Ville-Marie	200	-31	-34	30	22	5550	4610	0.31	0.40

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Wakefield	120	-27	-30	30	23	4820	3910	0.27	0.34
Waterloo	205	-25	-27	29	23	4650	3810	0.27	0.35
Windsor	150	-25	-27	29	23	4700	3860	0.25	0.32
New Brunswick									
Alma	5	-21	-23	26	20	4500	3600	0.37	0.48
Bathurst	10	-23	-26	30	22	5020	4100	0.37	0.48
Boiestown	65	-25	-28	29	21	4900	-4010	0.30	0.39
Campbellton	30	-26	-28	29	22	5500	4570	0.35	0.45
Edmundston	160	-27	-29	28	22	5320	4500	0.30	0.38
Fredericton	15	-24	-27	29	22	4670	3760	0.30	0.38
Gagetown	20	-24	-26	29	22	4460	3560	0.31	0.40
Grand Falls	115	-27	-30	28	22	5300	4450	0.30	0.38
Miramichi	5	-24	-26	30	22	4950	4030	0.32	0.41
Moncton	20	-23	-25	28	21	4680	3770	0.39	0.50
Oromocto	20	-24	-26	29	22	4650	3740	0.30	0.39
Sackville	15	-22	-24	27	21	4590	3680	0.38	0.49
Saint Andrews	35	-22	-24	25	20	4680	3770	0.35	0.45
Saint John	5	-22	-24	25	20	4570	3670	0.41	0.53
Shippagan	5	-22	-24	28	21	4930	4010	0.49	0.63
St. George	35	-21	-23	25	20	4680	3770	0.35	0.45
St. Stephen	20	-24	-26	28	22	4700	3790	0.33	0.42
Woodstock	60	-26	-29	30	22	4910	3990	0.29	0.37
Nova Scotia									
Amherst	25	-21	-24	27	21	4500	3600	0.37	0.48
Antigonish	10	-17	-20	27	21	4510	3610	0.42	0.54
Bridgewater	10	-15	-17	27	20	4140	3250	0.43	0.55
Canso	5	-13	-15	25	20	4400	3500	0.48	0.61

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Debert	45	-21	-24	27	21	4500	3600	0.37	0.48
Digby	35	-15	-17	25	20	4020	3130	0.43	0.55
Greenwood (CFB)	28	-18	-20	29	22	4140	3250	0.42	0.54
Halifax Region									
Dartmouth	10	-16	-18	26	20	4100	3210	0.45	0.58
Halifax	55	-16	-18	26	20	4000	3110	0.45	0.58
Kentville	25	-18	-20	28	21	4130	3240	0.42	0.54
Liverpool	20	-16	-18	27	20	3990	3100	0.48	0.61
Lockeport	5	-14	-16	25	20	4000	3110	0.47	0.60
Louisbourg	5	-15	-17	26	20	4530	3630	0.51	0.65
Lunenburg	25	-15	-17	26	20	4140	3250	0.48	0.61
New Glasgow	30	-19	-21	27	21	4320	3420	0.43	0.55
North Sydney	20	-16	-19	27	21	4500	3600	0.46	0.59
Pictou	25	-19	-21	27	21	4310	3410	0.43	0.55
Port Hawkesbury	40	-17	-19	27	21	4500	3600	0.48	0.61
Springhill	185	-20	-23	27	21	4540	3640	0.37	0.48
Stewiacke	25	-20	-22	27	21	4400	3500	0.39	0.50
Sydney	5	-16	-19	27	21	4530	3630	0.46	0.59
Tatamagouche	25	-20	-23	27	21	4380	3480	0.43	0.55
Truro	25	-20	-22	27	21	4500	3600	0.37	0.48
Wolfville	35	-19	-21	28	21	4140	3250	0.42	0.54
Yarmouth	10	-14	-16	22	19	3990	3100	0.44	0.56
Prince Edward Island									
Charlottetown	5	-20	-22	26	21	4460	3650	0.44	0.56
Souris	5	-19	-21	27	21	4550	3650	0.45	0.58
Summerside	10	-20	-22	27	21	4600	3690	0.47	0.60

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Tignish	10	-20	-22	27	21	4770	3860	0.51	0.66
Newfoundland and Labrador									
Argentia	15	-12	-14	21	18	4600	3620	0.59	0.75
Bonavista	15	-14	-16	24	19	5000	4000	0.66	0.84
Buchans	255	-24	-27	27	20	5250	4240	0.47	0.60
Cape Harrison	5	-29	-31	26	16	6900	5920	0.47	0.60
Cape Race	5	-11	-13	19	18	4900	3900	0.82	1.05
Channel-Port aux Basques	5	-13	-15	19	18	5000	4000	0.61	0.78
Corner Brook	35	-16	-18	26	20	4760	3770	0.43	0.55
Gander	125	-18	-20	27	20	5110	4110	0.47	0.60
Grand Bank	5	-14	-15	20	18	4550	3570	0.58	0.74
Grand Falls	60	-26	-29	27	20	5020	4020	0.47	0.60
Happy Valley-Goose Bay	15	-31	-32	27	19	6670	5700	0.33	0.42
Labrador City	550	-36	-38	24	17	7710	6710	0.31	0.40
St. Anthony	10	-25	-27	22	18	6440	5380	0.68	0.87
Stephenville	25	-16	-18	24	19	4850	3860	0.45	0.58
St. John's	65	-15	-16	24	20	4800	3810	0.61	0.78
Twin Falls	425	-35	-37	24	17	7790	6880	0.31	0.40
Wabana	75	-15	-17	24	20	4750	3760	0.59	0.75
Wabush	550	-36	-38	24	17	7710	6710	0.31	0.40
Yukon									
Aishihik	920	-44	-46	23	15	7500	6500	0.27	0.38
Dawson	330	-50	-51	26	16	8120	7100	0.22	0.31
Destruction Bay	815	-43	-45	23	14	7800	6790	0.42	0.60
Faro	670	-46	-47	25	16	7300	6310	0.26	0.35

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Haines Junction	600	-45	-47	24	14	7100	6120	0.24	0.34
Snag	595	-51	-53	23	16	8300	7280	0.22	0.31
Teslin	690	-42	-44	24	15	6770	5800	0.26	0.34
Watson Lake	685	-46	-48	26	16	7470	6470	0.26	0.35
Whitehorse	655	-41	-43	25	15	6580	5610	0.29	0.38
Northwest Territories									
Aklavik	5	-42	-44	26	17	9600	8540	0.31	0.40
Behchokǫ̀ / Rae-Edzo	160	-42	-44	25	17	8300	7480	0.31	0.40
Echo Bay / Port Radium	195	-42	-44	22	16	9300	8250	0.41	0.53
Fort Good Hope	100	-43	-45	28	18	8700	7660	0.34	0.44
Fort McPherson	25	-44	-46	26	17	9150	8100	0.31	0.40
Fort Providence	150	-40	-43	28	18	7620	6620	0.27	0.35
Fort Resolution	160	-40	-42	26	18	7750	6740	0.30	0.39
Fort Simpson	120	-42	-44	28	19	7660	6660	0.30	0.39
Fort Smith	205	-41	-43	28	19	7300	6310	0.30	0.39
Hay River	45	-38	-41	27	18	7550	6550	0.27	0.35
Inuvik	45	-43	-45	26	17	9600	9600	0.31	0.40
Mould Bay	5	-44	-46	11	8	12900	8540	0.45	0.58
Norman Wells	65	-43	-45	28	18	8510	11730	0.34	0.44
Tungsten	1340	-49	-51	26	16	7700	7280	0.34	0.44
Ulukhaktok / Holman	10	-39	-41	18	12	10700	6700	0.67	0.86
Wrigley	80	-42	-44	28	18	8050	7040	0.30	0.39
Yellowknife	160	-41	-44	25	17	8170	7150	0.31	0.40
Nunavut									

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	Degree-Days Below 15°C	Hourly Wind Pressures, kPa (1)	
		January		July 2.5%					
		2.5% °C	1% °C	Dry °C	Wet °C			1/10	1/50
Alert	5	-43	-44	13	8	13030	11860	0.59	0.75
Arctic Bay	15	-42	-44	14	10	11900	10760	0.43	0.55
Arviat	5	-40	-41	22	16	9850	8780	0.45	0.58
Baker Lake	5	-42	-44	23	15	10700	9600	0.42	0.54
Eureka	5	-47	-48	12	8	13500	10540	0.43	0.55
Igluligaarjuk / Chesterfield Inlet	10	-40	-41	20	14	10500	10180	0.44	0.56
Iqaluit	45	-40	-41	17	12	9980	9210	0.51	0.65
Iqaluktuuttiaq / Cambridge Bay	15	-41	-44	18	13	11670	9410	0.39	0.50
Isachsen	10	-46	-48	12	9	13600	9620	0.47	0.60
Kangiqiniq / Rankin Inlet	10	-41	-42	21	15	10500	12310	0.47	0.60
Kanngiqtugaapik / Clyde River	5	-40	-42	14	10	11300	8900	0.43	0.55
Kugluktuk / Coppermine	10	-41	-43	23	16	10300	12410	0.36	0.46
Nottingham Island	30	-37	-39	16	13	10000	8920	0.61	0.78
Resolute	25	-42	-43	11	9	12360	9410	0.46	0.59
Resolution Island	5	-32	-34	12	10	9000	11210	0.96	1.23
Salliq / Coral Harbour	15	-41	-42	20	14	10720	7960	0.45	0.58

Note to Table [C-1] C-1:

(1) The hourly wind pressure data are used in Subclause 3.2.4.3.(2)(b)(ii).

Impact analysis

This proposed change will fill the gaps in the current Code and will not result in any additional cost beyond the current Code requirements.

Enforcement implications

This proposed change can be enforced by the existing infrastructure without additional resources. There would be no enforcement implications beyond the practices required to enforce existing provisions.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

N/A

Submit a comment

Proposed Change 1797

Code Reference(s):	**NFC20 Div.B 5.6.1. (first printing)**
Subject:	Other — Hazardous Materials and Activities
Title:	Protection of Adjacent Buildings
Description:	This proposed change expands explanatory Note A-5.6.1.2.(1) to clarify the intent of the related provision.

This change could potentially affect the following topic areas:

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

Problem

Following the revision of Section 5.6. of the National Fire Code of Canada (NFC) during the 2005–2010 Code cycle, a new Article 5.6.1.2. was introduced in the NFC 2010 for the protection of adjacent buildings in areas undergoing construction, alteration or demolition operations. Explanatory Note A-5.6.1.2.(1) was also introduced to clarify the intended level of the protection required by the new Article, which allowed various options to protect adjacent buildings during demolition, alteration or construction (e.g. water curtains, fire tarpaulin, spatial separation, gypsum sheathing).

Stakeholders have raised a concern as to the degree of application inferred by the wording of Article 5.6.1.2. for the protection of adjacent buildings. Sentence 5.6.1.1.(2)-2005 was removed from the NFC 2010, and clarification of the intent of the application statement for Section 5.6. as stated in Article 5.6.1.1.-2010 was provided in new explanatory Note A-5.6.1.1.-2010. As a result, the normative aspect of the degree of application as set out in Sentence 5.6.1.1.(2)-2005 was removed.

Some jurisdictions now require specific fire protection features (e.g. gypsum sheathing or intumescent oriented strandboard) to mitigate fire spread to adjacent properties in accordance with Article 5.6.1.2., without fully considering the degree of application of Section 5.6. as clarified in explanatory Note A-5.6.1.1.

The intent of the revisions to Section 5.6. made in the NFC 2010 was to allow for more flexibility in the degree of application for the protection of adjacent buildings. Further revisions were made in the NFC 2020 to clarify the measures to be taken in the protection of adjacent buildings. The current wording does not limit a construction or demolition site to specific active or passive fire protection features. Sentence 5.6.1.2.(1)-2020 allows for more options than active or passive fire protection measures, provided a risk assessment is performed and agreed upon by the authority having jurisdiction, as described in explanatory Note A-5.6.1.2.(1)-2020.

The provision and Note were never intended to limit any jurisdiction to specific fire protection features, such as gypsum sheathing, during construction to protect adjacent properties. Construction sites may not require additional fire protection measures, as described in explanatory Note A-5.6.1.2.(1)-2020, if no risk of exposure to adjacent buildings exists. The Note mentions a risk assessment to determine the appropriate application of these fire protection measures.

The relationship between Sentence 5.6.1.2.(1)-2020 and the associated explanatory Note is such that the protection of adjacent properties is always required, but compliance is achieved objectively rather than prescriptively so that jurisdictions have more options and flexibility. A risk assessment is a valid tool to identify the hazards and potential risks to adjacent properties in the event of a fire and to identify the proper measures to mitigate those risks. In some cases, spatial separation is all that is required to achieve compliance with Sentence 5.6.1.2.(1)-2020 based on a risk assessment and fire safety plan.

However, in applying the requirement for the mitigation of fire spread to adjacent buildings, as stated in Article 5.6.1.2.-2020, some jurisdictions understand that the protection required needs to be permanent and, as such, become part of the building. This would result in excessive measures being taken for low-risk situations and additional project costs, which is contrary to the intent of Sentence 5.6.1.2.(1)-2020 to offer more options and flexibility to achieve compliance.

Justification

This proposed change would revise explanatory Note A-5.6.1.2.(1) to

- state that the fire safety plan should include a risk assessment to inform the degree of application for the protection of adjacent buildings, and
- further clarify options for active or passive fire protection measures, which can be determined following a risk assessment and agreed upon by the authority having jurisdiction.

In addition, the revised explanatory Note would clarify that construction sites may not require any additional fire protection measures if there is no risk of exposure to adjacent properties.

PROPOSED CHANGE

[5.6.1.] 5.6.1. General

[5.6.1.1.] 5.6.1.1. Application

[5.6.1.2.] 5.6.1.2. Measures to ~~Mitigate~~Reduce the Risk of Fire Spread to Adjacent Buildings

[1] 1) Measures shall be taken to ~~mitigate~~reduce the risk of fire spread to adjacent *buildings* and facilities that would be exposed to fire originating from *buildings*, parts of *buildings*, facilities and associated areas undergoing construction, alteration or demolition operations. (See Note A-5.6.1.2.(1))

~~[5.6.1.3.] 5.6.1.3. Fire Safety Plan~~

~~[1] 1) A fire safety plan conforming to Section 2.8. shall be prepared.~~

[5.6.1.4.] 5.6.1.4. Access for Firefighting

[5.6.1.5.] 5.6.1.5. Portable Extinguishers

[5.6.1.6.] 5.6.1.6. Standpipe Systems

[5.6.1.7.] 5.6.1.7. Hot Surface Applications

[5.6.1.8.] 5.6.1.8. Ignition Sources

[5.6.1.9.] 5.6.1.9. Building Services at Demolition Sites

[5.6.1.10.] 5.6.1.10. Fuel Supply Installation

[5.6.1.11.] 5.6.1.11. Tank, Piping and Machinery Reservoir Safety at Demolition Sites

[5.6.1.12.] 5.6.1.12. Fire Separations in Partly Occupied Buildings

[5.6.1.13.] 5.6.1.13. Protection during Shutdown

[5.6.1.14.] 5.6.1.14. Watch

[5.6.1.15.] 5.6.1.15. Smoking Restrictions

[5.6.1.16.] 5.6.1.16. Provision for Egress

[5.6.1.17.] 5.6.1.17. Fire Warning

[5.6.1.18.] 5.6.1.18. Storage and Use of Dangerous Goods

[5.6.1.19.] 5.6.1.19. Temporary Enclosures

[5.6.1.20.] 5.6.1.20. Disposal of Combustible Refuse

Note A-5.6.1.2.(1)

As part of fire safety planning, various ~~M~~methods, procedures and materials, if deemed necessary following a risk assessment, can be used to ~~mitigate~~reduce the risk of fire spread from a construction or demolition site to adjacent buildings and facilities. ~~that are deemed necessary following a risk assessment~~These measures can ~~range from active to~~include the presence of trained supervisory staff on site and the monitoring and control of fire hazards. They can also include active or passive ~~systems~~ solutions such as spatial separation, erecting a temporary fire barrier (e.g. fire tarpaulin), using construction methods and materials (e.g. gypsum sheathing), or installing water curtains~~, using construction methods and materials that include gypsum sheathing, or~~

~~erecting a temporary fire barrier such as a fire tarpaulin~~. Materials that may become part of the finished building must conform to the NBC.

Impact analysis

There is no cost associated with this proposed change as it is editorial and clarifies the intent of the original Code requirement.

The benefits would include harmonization of the interpretation and application of the provision, as well as the elimination of potential confusion about the intent of the provision.

Enforcement implications

This proposed change would ease the application of Section 5.6. of Division B of the NFC to construction and demolition sites by the authority having jurisdiction. This proposed change would also facilitate the enforcement of Code provision for regulators.

Who is affected

Regulators, builders, owners, contractors and consultants.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[5.6.1.1.] 5.6.1.1. ([1] 1) no attributions

[5.6.1.2.] 5.6.1.2. ([1] 1) [F02,F03-OP3.1]

~~**[5.6.1.3.] 5.6.1.3. ([1] 1) no attributions**~~

[5.6.1.4.] 5.6.1.4. ([1] 1) [F12-OS1.2]

[5.6.1.4.] 5.6.1.4. ([1] 1) [F12-OP1.2]

[5.6.1.4.] 5.6.1.4. ([2] 2) [F12-OS1.2,OS1.5]

[5.6.1.4.] 5.6.1.4. ([2] 2) [F12-OP1.2]

[5.6.1.4.] 5.6.1.4. ([3] 3) [F12-OS1.2,OS1.5]

[5.6.1.4.] 5.6.1.4. ([3] 3) [F12-OP1.2]

[5.6.1.4.] 5.6.1.4. ([4] 4) [F12-OS1.2,OS1.5]

[5.6.1.4.] 5.6.1.4. ([4] 4) [F12-OP1.2]

[5.6.1.4.] 5.6.1.4. ([5] 5) [F12-OS1.2,OS1.5]

[5.6.1.4.] 5.6.1.4. ([5] 5) [F12-OP1.2]

[5.6.1.5.] 5.6.1.5. ([1] 1) [F12-OS1.2]

[5.6.1.5.] 5.6.1.5. ([1] 1) [F12-OP1.2]

[5.6.1.5.] 5.6.1.5. ([2] 2) [F02-OS1.2]

[5.6.1.5.] 5.6.1.5. ([2] 2) [F02-OP1.2]

[5.6.1.6.] 5.6.1.6. ([1] 1) [F02,F12-OS1.2]

[5.6.1.6.] 5.6.1.6. ([1] 1) [F02,F12-OP1.2]

[5.6.1.6.] 5.6.1.6. ([2] 2) [F02,F12-OS1.2]

[5.6.1.6.] 5.6.1.6. ([2] 2) [F02,F12-OP1.2]

[5.6.1.6.] 5.6.1.6. ([2] 2) ([c] c)

[5.6.1.6.] 5.6.1.6. ([3] 3) [F12,F82-OS1.2]

[5.6.1.6.] 5.6.1.6. ([3] 3) [F12,F82-OP1.2]

[5.6.1.7.] 5.6.1.7. ([1] 1) no attributions

[5.6.1.7.] 5.6.1.7. ([2] 2) [F01-OS1.1]

[5.6.1.7.] 5.6.1.7. ([2] 2) [F01-OP1.1]

[5.6.1.7.] 5.6.1.7. ([3] 3) [F01-OS1.2]

[5.6.1.7.] 5.6.1.7. ([3] 3) [F01-OP1.2]

[5.6.1.8.] 5.6.1.8. ([1] 1) [F01-OS1.1]

[5.6.1.8.] 5.6.1.8. ([1] 1) [F01-OP1.1]

[5.6.1.8.] 5.6.1.8. ([2] 2) [F01-OS1.1,OS1.2]

[5.6.1.8.] 5.6.1.8. ([2] 2) [F01-OP1.1]

[5.6.1.9.] 5.6.1.9. ([1] 1) [F01,F43-OS1.1]

[5.6.1.9.] 5.6.1.9. ([1] 1) [F01,F43-OP1.1]

[5.6.1.9.] 5.6.1.9. ([1] 1) [F32-OS3.3]

[5.6.1.9.] 5.6.1.9. ([2] 2) [F81-OS1.1,OS1.2]

[5.6.1.9.] 5.6.1.9. ([2] 2) [F81-OP1.1,OP1.2]

[5.6.1.9.] 5.6.1.9. ([3] 3) [F32-OS3.4]

[5.6.1.9.] 5.6.1.9. ([3] 3) [F01-OS1.1,OS1.2]

[5.6.1.10.] 5.6.1.10. ([1] 1) [F81,F43-OS1.1]

[5.6.1.11.] 5.6.1.11. ([1] 1) no attributions

[5.6.1.11.] 5.6.1.11. ([2] 2) [F01,F43-OS1.1] [F01-OS1.1]

[5.6.1.11.] 5.6.1.11. ([3] 3) [F01,F81-OS1.1]

[5.6.1.11.] 5.6.1.11. ([4] 4) [F01,F43-OS1.1]

[5.6.1.12.] 5.6.1.12. ([1] 1) [F03-OS1.2]

[5.6.1.12.] 5.6.1.12. ([1] 1) [F03-OP1.2]

[5.6.1.13.] 5.6.1.13. ([1] 1) [F12,F82-OS1.2]

[5.6.1.13.] 5.6.1.13. ([1] 1) [F12,F82-OP1.2]

[5.6.1.13.] 5.6.1.13. ([1] 1) [F02-OP3.1]

[5.6.1.13.] 5.6.1.13. ([2] 2) [F02-OP1.2]

[5.6.1.13.] 5.6.1.13. ([2] 2) [F02-OP3.1]

[5.6.1.13.] 5.6.1.13. ([2] 2) [F02-OS1.2,OS1.5]

[5.6.1.13.] 5.6.1.13. ([2] 2) no attributions

[5.6.1.14.] 5.6.1.14. ([1] 1) [F02-OS1.2,OS1.5]

[5.6.1.14.] 5.6.1.14. ([2] 2) [F02-OS1.5,OS1.2]

[5.6.1.14.] 5.6.1.14. ([3] 3) [F13-OS1.5,OS1.2]

[5.6.1.15.] 5.6.1.15. ([1] 1) [F01-OS1.1]

[5.6.1.16.] 5.6.1.16. ([1] 1) [F10,F82-OS3.7]

[5.6.1.16.] 5.6.1.16. ([2] 2) [F10,F82-OS3.7]

[5.6.1.17.] 5.6.1.17. ([1] 1) [F11-OS1.5]

[5.6.1.18.] 5.6.1.18. ([1] 1) no attributions

[5.6.1.18.] 5.6.1.18. ([2] 2) no attributions

[5.6.1.18.] 5.6.1.18. ([3] 3) no attributions

[5.6.1.19.] 5.6.1.19. ([1] 1) [F01-OS1.1,OS1.2]

[5.6.1.20.] 5.6.1.20. ([1] 1) [F02-OS1.1,OS1.2]

[5.6.1.20.] 5.6.1.20. ([1] 1) [F02-OP1.2]

Submit a comment

Proposed Change 1872

Code Reference(s):	**NFC20 Div.B 5.6.4.3. (first printing)**
Subject:	Encapsulated Mass Timber Construction
Title:	Revisions to Protection Requirements for EMTC During Construction
Description:	This proposed change revises the minimum requirements for and exceptions to the encapsulation of mass timber elements.
Related Code Change Request(s):	CCR 1381
Related Proposed Change(s):	PCF 1870, PCF 1963

This change could potentially affect the following topic areas:

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

Problem

Article 5.6.4.3. of Division B of the 2020 edition of the National Fire Code of Canada (NFC) provides requirements related to the type and degree of encapsulation protection of mass timber elements necessary in encapsulated mass timber construction (EMTC) while the building is under construction. This proposed change is related to PCFs 1870 and 1963, which describe proposed changes to Articles 3.1.6.4. and 3.1.6.6., respectively, of Division B of the National Building Code of Canada (NBC) 2020. PCFs 1870 and 1963 address the requirements for and exceptions to the encapsulation of mass timber elements in finished buildings of EMTC.

PCFs 1870 and 1963 include proposed changes, based on the most recent fire research, to allow 100% of the underside of each mass timber floor assembly to be exposed within a suite. Consequently, there is a need to propose the alignment of the

requirements for mass timber protection for ceilings during construction in NFC Article 5.6.4.3. to avoid the waste of time and resources encapsulating mass timber construction where no such encapsulation is required in the finished building.

Further, during current EMTC projects, difficulties have been encountered when reconciling the requirements of NFC Article 5.6.4.3. during construction with measures to control moisture and mould affecting the wood that is being encapsulated.

Justification

PCFs 1870 and 1963 include proposed changes, based on the most recent fire research, to allow 100% of the underside of each mass timber floor assembly within a suite to be left exposed in the finished building, expanding the NBC provisions related to encapsulation of mass timber elements within buildings permitted to be of EMTC.

The rationales supporting both PCFs 1870 and 1963 explain how recent fire research was performed that supports the proposed changes to the permitted percentage exposure of mass timber elements. With that, this proposed change revises the degree of protection of mass timber ceiling elements in EMTC while a building is under construction. This proposed change would harmonize the NFC requirements with those of the NBC for finished buildings of EMTC.

The proposed new Sentence 5.6.4.3.(2)-2025 introduces an exception to the requirements described in Clause 5.6.4.3.(1)(a) for encapsulating the underside of each mass timber floor assembly and introduces new fire protection measures to address safety during construction. These new measures include:

- the protection of openings through floor assemblies to limit the potential for fire spread through the openings to upper storeys,
- the protection of perimeter joints between the edge of floor assemblies and exterior walls to limit the potential for fire spread through the joint to upper storeys,
- the installation of hose stations with hose lines on standpipe systems for occupant use in extinguishing or controlling any fires that may occur, and
- the need for a fire watch on all storeys at certain times during the workday and afterwards to ensure the fire safety plan is followed.

The proposed new Sentence 5.6.4.3.(3)-2025 introduces an exception to the requirements described in Clauses 5.6.4.3.(1)(a), (c) and (d), and in Sentence 5.6.4.3.(2)-2025. New Sentence (3)-2025 introduces an alternative approach to the passive fire protection requirements by providing for an operational automatic sprinkler system that is installed progressively during construction in buildings of EMTC.

A minor editorial revision is also proposed to clarify the intent of the existing requirement regarding the four uppermost storeys in Sentence 5.6.4.3.(4)-2025.

Because this proposed change to NFC requirements aligns with the proposed changes to the NBC in PCFs 1870 and 1963, builders would not need to encapsulate the underside of floors during construction, only to remove the encapsulation when the building is finished, as would be permitted in the NBC as a result of PCFs 1870 and 1963.

PROPOSED CHANGE

NFC20 Div.B 5.6.4.3. (first printing)

[5.6.4.3.] 5.6.4.3. Protective Encapsulation and Fire Protection

[1] 1) Except as provided in ~~Sentences (2) and (3)~~Sentences (2) to (4) and (6)-2025, to address safety during construction, a protective encapsulation material or an assembly of materials providing an *encapsulation rating* of not less than 25 min, as determined in accordance with Sentence 3.1.6.5.(1) of Division B of the NBC, shall be installed

[a] a) such that not more than 20% of the area of the underside of each mass timber floor assembly on each *storey* is exposed during construction,

[b] b) on the interior side of stairways required by Sentence 5.6.3.7.(3) and of *vertical service spaces* where the enclosures are constructed of mass timber elements,

[c] c) on each face of solid lumber or mass timber *partitions* not less than 38 mm thick and on each face of *partitions* containing wood framing as permitted by Article 3.1.6.15. of Division B of the NBC, and

[d] d) such that not more than 35% of the total area of structural mass timber walls within the *storey* is exposed during construction.

(See Note A-5.6.4.3.(1).)

[2] --) Except as provided in Sentence (5)-2025, a protective encapsulation material or assembly of materials need not be installed as described in Clause (1)(a), provided

[a] --) penetrations or openings through the floor assembly on any *storey* are

[i] --) protected with a firestop conforming to Sentence 3.1.9.1.(1) of Division B of the NBC,

[ii] --) filled with noncombustible insulation that is supported in place, or

[iii] --) protected, from the top of the floor assembly, with a single layer of not less than 12.7 mm thick Type X gypsum board mechanically fastened to not less than 12.7 mm thick plywood or OSB with the gypsum board facing the penetration

(see Note A-5.6.4.3.(2)(a)-2025),

[b] --) joints located in a horizontal plane between the floor and an exterior wall on any *storey* are

[i] --) protected with a firestop conforming to Sentence 3.1.8.3.(4)

of Division B of the NBC, or

[ii] -- filled with noncombustible insulation that is supported in place,

[c] -- a standpipe system is installed in accordance with Articles 5.6.1.6. and 5.6.4.2., and is provided with hose stations for occupant use that are equipped with a hose line having

[i] -- a diameter of either 25 mm or 38 mm, and

[ii] -- a length sufficient to cover all parts of the storey with a hose stream of not less than 5 m

(see Note A-5.6.4.3.(2)(c)-2025), and

[d] -- a fire watch is conducted on all *storeys*

[i] -- at intervals of not more than 1 h when workers are present in the *building*, and

[ii] -- not less than 1 h after workers leave the *building*

(see Note A-5.6.4.3.(2)(d)-2025).

[3] --) Except as provided in Sentence (4)-2025, a protective encapsulation material or assembly of materials need not be installed as described in Clauses (1)(a), (c) and (d), provided an automatic sprinkler system

[a] -- is progressively installed during construction in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems" (see Note A-5.6.4.3.(3)(a)), and

[b] -- is in an operable condition at all times on any *storey* where it is not actively being worked on, until the automatic sprinkler system is completed.

[4] 2) ~~Not more than t~~The four uppermost ~~contiguous~~ *storeys* ~~are permitted to be unprotected as required by~~ need not conform to the requirements of Sentence (1) or the conditions of Sentence (3)-2025 during construction.

[5] --) The first four *storeys* need not conform to the conditions of Sentence (2)-2025 during construction, until the ceiling assembly of the fifth *storey* is installed. (See Note A-5.6.4.3.(5)-2025.)

[6] 3) The encapsulation material or assembly of materials used to meet the requirements of Sentence (1) is permitted to consist of a single layer of Type X gypsum board not less than 12.7 mm thick conforming to Clauses 3.1.6.6.(4)(a) and (c)-2025 of Division B of the NBC (PCF 1963).~~Clauses 3.1.6.6.(2)(a), (c) and (d) of Division B of the NBC.~~

Note A-5.6.4.3.(2)(a)-2025

Until permanent protection is provided, the fire protection of any penetrations or openings through the floor assembly can be temporary. Beyond those described in Clause 5.6.4.3.(2)(a)-2025, other forms of protection should have a noncombustible or other protective layer that will resist fire for a minimum of 30 min. Furthermore, any such protective layer should be structurally adequate over the penetrations or openings for the safety of occupants.

The fire protection of large penetrations or openings through floor assemblies, such as

openings associated with convenience stairs, elevators or interconnected floor spaces, should address additional fire protection considerations, including structural support.

Note A-5.6.4.3.(2)(c)-2025

The length of hose should be sufficient to allow for adequate nozzle pressure and will depend on the chosen hose diameter. Typically, 38 mm diameter hose should have a length of not more than 30.5 m.

If construction reaches a height at which the public waterworks system can no longer provide the required flow and pressure, a temporary or permanent fire pump must be installed to adequately protect the uppermost storey of the building, unless the fire safety plan specifies an alternative approach that is permitted by the authority having jurisdiction.

Note A-5.6.4.3.(2)(d)-2025

The person conducting the fire watch should be familiar with all fire safety features of the building, including the fire safety plan, as provided in conformance with Section 2.8.

Note A-5.6.4.3.(3)(a)-2025

Even though NFPA 13, "Standard for the Installation of Sprinkler Systems", does not include specific provisions for installation of sprinklers during construction, it is expected that the requirements of NFPA 13 will be fully implemented as appropriate for the conditions that exist in the building under construction.

Note A-5.6.4.3.(5)-2025

It is intended that all storeys meet the conditions of Sentence 5.6.4.3.(2)-2025 once the ceiling assembly of the fifth storey has been installed.

Impact analysis

This proposed change provides additional options for fire protection during building construction, which may reduce costs. As the existing compliance options would remain in the NFC, this proposed change would not entail any additional costs.

By aligning the NFC requirements for the protection of mass timber elements during construction with those proposed for the NBC 2025 for the finished building, the expectation is that costs would either remain the same or be reduced due to the harmonization of requirements.

As the installation of encapsulation materials during the construction process can be challenging in terms of managing moisture and related mould, having the option not to install encapsulation materials could help avoid this potential issue and the costs of fixing any moisture-related damage.

Enforcement implications

There are no anticipated enforcement implications as this proposed change could be enforced by the existing Code enforcement infrastructure.

Who is affected

Architects, designers, developers, owners, and engineers would benefit from the increased flexibility provided by this proposed change.

Authorities having jurisdiction, including fire departments, would need to continue to evaluate their operating procedures in response to the requirements for EMTC.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NFC20 Div.B 5.6.4.3. (first printing)

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OS1.2]

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OP1.2]

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OP3.1]

[5.6.4.3.] -- ([2] --) no attributions

[5.6.4.3.] -- ([3] --) no attributions

[5.6.4.3.] 5.6.4.3. ([4] 2) no attributions

[5.6.4.3.] -- ([5] --) no attributions

[5.6.4.3.] 5.6.4.3. ([6] 3) no attributions

Submit a comment

Proposed Change 1879

Code Reference(s):	**NFC20 Div.B 5.6.4.3.(1) (first printing)**
Subject:	Encapsulated Mass Timber Construction
Title:	Revisions to Protection Requirements for EMTC During Construction
Description:	This proposed change clarifies the requirement for the maximum exposed surface area of structural mass timber walls during building construction in Clause 5.6.4.3.(1)(d) and introduces explanatory Note A-5.6.4.3.(1)(d).

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

Problem

Article 5.6.4.3. of Division B of the National Fire Code of Canada (NFC) 2020 provides requirements for the encapsulation protection needed for mass timber elements in EMTC while the building is under construction. In particular, Clause 5.6.4.3.(1)(d) describes the requirement for the maximum exposed area of structural mass timber walls, which is linked to the requirements in Sentences 3.1.6.4.(4) and (5) of Division B of the National Building Code of Canada (NBC) 2020.

The current wording in the NFC is unclear as to how to apply the 35% area limit that is referenced, which could result in overly restrictive interpretation. In the NFC, the 35% area limit is linked to the total area of structural mass timber walls within a storey, while in the NBC the 35% limit is linked to the total wall area of the perimeter of the suite.

Therefore, the wording of NFC Clause 5.6.4.3.(1)(d) needs to be aligned with the intent of the NBC to clarify how the perimeter dimensions (for either suites or entire storeys) are to be calculated and applied to meet the maximum limits for exposed mass timber walls during construction.

Justification

The NBC 2020 provisions for EMTC allow structural mass timber walls to be left exposed within a suite. The 35% upper limit on the actual surface area of mass timber walls that can be left exposed within the suite is linked to the total surface area of the perimeter walls enclosing the suite.

This limit is also applied as a fire safety measure that is required during construction. During the construction of EMTC, protective encapsulation materials providing an encapsulation rating of not less than 25 min are required on structural mass timber walls such that the total surface area of structural mass timber walls that are exposed is not more than 35% of the area of the perimeter walls.

For the calculation of the actual amount of surface area permitted to be left exposed, this proposed change would revise the NFC wording to clarify the intent and allow Code users to apply a consistent approach to calculating the area of the perimeter walls, which is consistent with the requirements in the NBC.

The revised wording would also more clearly link the 35% maximum value to either the perimeter walls of any suite on the storey or, when the entire storey is a single suite, to the perimeter walls of the entire storey.

The addition of proposed Note A-5.6.4.3.(1)(d) would also clarify that the area of openings (doors or windows) within any perimeter wall is to be included in the area calculations.

PROPOSED CHANGE

NFC20 Div.B 5.6.4.3.(1) (first printing)

[5.6.4.3.] 5.6.4.3. Protective Encapsulation

[1] 1) Except as provided in Sentences (2) and (3), to address safety during construction, a protective encapsulation material or an assembly of materials providing an *encapsulation rating* of not less than 25 min, as determined in accordance with Sentence 3.1.6.5.(1) of Division B of the NBC, shall be installed

[a] a) such that not more than 20% of the area of the underside of each mass timber floor assembly on each *storey* is exposed during construction,

[b] b) on the interior side of stairways required by Sentence 5.6.3.7.(3) and of *vertical service spaces* where the enclosures are constructed

of mass timber elements,

[c] c) on each face of solid lumber or mass timber *partitions* not less than 38 mm thick and on each face of *partitions* containing wood framing as permitted by Article 3.1.6.15. of Division B of the NBC, and

[d] d) such that ~~not more than35% of the total~~the exposed surface area of structural mass timber walls within the *storey* ~~is exposed during construction~~does not exceed~~.~~

[i] --) the aggregate exposed surface area of the *suite* stated in Sentence 3.1.6.4.(5) of Division B of the NBC, or

[ii] --) 35% of the total wall area of the perimeter of the *storey* (see Note A-5.6.4.3.(1)(d)).

(See Note A-5.6.4.3.(1).)

Note A-5.6.4.3.(1)(d)

The intent of Clause 5.6.4.3.(1)(d) is that the maximum area of mass timber walls that is permitted to be exposed in the finished building also be permitted to be exposed during construction. In the calculation of the total wall area of the perimeter of a suite or storey, the area of any wall openings, such as doors or windows, are included.

Impact analysis

This proposed change is not expected to entail costs not otherwise intended by the current Code provisions as it would clarify the intent and application of Clause 5.6.4.3.(1)(d).

By aligning the NFC requirements for calculating the permitted area of exposed mass timber walls during construction with those of the NBC for the completed building, the expectation is that costs would either remain the same or be reduced due to the harmonization of the two sets of requirements.

Enforcement implications

There are no anticipated enforcement implications as the proposed change can be enforced by the existing Code enforcement infrastructure. The clarification in this proposed change is also expected to facilitate the enforcement of the Code requirements.

Who is affected

Architects, designers, developers, owners and engineers would benefit from the increased clarity provided by this proposed change.

Authorities having jurisdiction, including fire departments, would need to continue to evaluate their operating procedures in accordance with the Code requirements for EMTC.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NFC20 Div.B 5.6.4.3.(1) (first printing)

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OS1.2]

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OP1.2]

[5.6.4.3.] 5.6.4.3. ([1] 1) [F02-OP3.1]

Submit a comment

Proposed Change 1377

Code Reference(s):	**NPC20 Div.B 2.2.3.2. (first printing)**
Subject:	Materials and Equipment
Title:	Introduction of Requirements for Oil Separators
Description:	This proposed change adds requirements for oil separators to the NPC by introducing a reference to CAN/ULC-S656-14, "Standard for Oil-Water Separators."
Related Code Change Request(s):	CCR 955

This change could potentially affect the following topic areas:

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

Problem

Currently, there are no provisions in the NPC for oil separators (also referred to as oil interceptors) intended for the collection and separation of non-soluble, non-emulsified petroleum and allied petroleum products.

The lack of performance requirements for oil separators could create enforcement issues that could lead to failure or an inability to prevent the aforementioned products from being discharged into drainage systems, which could lead to the release of hazardous substances or to explosions or fires, which could lead to harm to persons.

Justification

Introducing a reference to CAN/ULC-S656-14, "Standard for Oil-Water Separators," into the NPC would provide stakeholders with performance requirements for oil separators and would allow authorities having jurisdiction to ensure that products and their installation conform to these requirements.

This proposed change would limit the risk of fire or explosion and help protect downstream water supplies and systems from free oils, which can create issues for water treatment operations.

PROPOSED CHANGE

[2.2.3.2.] 2.2.3.2. Interceptors

[1] 1) *Interceptors* shall be designed so that they can be readily cleaned.

[2] 2) Grease *interceptors* shall

[a] a) be designed so that they do not become air bound, and

[b] b) not have a water jacket.

[3] 3) Grease *interceptors* shall be selected and installed in conformance with

[a] a) CSA B481.0, "Material, design, and construction requirements for grease interceptors", and

[b] b) CSA B481.3, "Sizing, selection, location, and installation of grease interceptors".

(See Note A-2.2.3.2.(3).)

[4] --) Oil *interceptors* intended for the collection and separation of non-soluble, non-emulsified petroleum and allied petroleum products shall conform to CAN/ULC-S656-14, “Standard for Oil-Water Separators.”

Impact analysis

The proposed change would allow authorities having jurisdiction to enforce minimum requirements for oil separators and would improve life safety and protection of the environment.

The proposed change would require that officials work to enforce this new requirement. However, the extra work would benefit building users and provide a safer environment for all.

Enforcement implications

The proposed change can be enforced, and its enforcement would not require an increase in resources.

Who is affected

Engineers, plumbers, designers, building owners, contractors and regulators.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[2.2.3.2.] 2.2.3.2. ([1] 1) [F81-OH2.1,OH2.3,OH2.4]

[2.2.3.2.] 2.2.3.2. ([2] 2) [F81-OH2.1,OH2.3,OH2.4] [F46-OH2.2]

[2.2.3.2.] 2.2.3.2. ([3] 3) [F81-OH2.1]

[2.2.3.2.] 2.2.3.2. ([3] 3) [F81-OP5]

[2.2.3.2.] -- ([4] --) [F43-OH5]

[2.2.3.2.] -- ([4] --) [F81-OS1.1]