# Proposed Change 2318

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| **Code Reference(s):** | **NBC25 Div.A 1.2.1.1. (first printing)**<br>**NBC25 Div.C 2.2.2.1. (first printing)**<br>**NPC25 Div.A 1.2.1.1. (first printing)**<br>**NPC25 Div.C 2.2.2. (first printing)**<br>**NECB25 Div.A 1.2.1.1. (first printing)**<br>**NECB25 Div.C 2.2.3.1. (first printing)** |
| Subject: | Conformity Assessment |
| Title: | Acceptance of CCMC Code Conformity Assessments |
| Description: | This proposed change introduces provisions in Divisions A and C for the acceptance of Code conformity assessments issued by the Canadian Construction Materials Centre. |
| Related Code Change Request(s): | CCR 1223 |

This change could potentially affect the following topic areas:

- [x] Division A
- [x] 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 inconsistent recognition of conformity assessment mechanisms creates barriers to the cross-provincial movement of construction products. To provide authorities having jurisdiction (AHJs) with a clear procedure for the acceptance of recognized conformity assessment mechanisms, explicit recognition is required to be introduced in the National Model Codes and aligned with current provincial approaches in British Columbia, Alberta, Ontario, Québec and Nova Scotia.

## Justification

There is an opportunity to modernize the conformity assessment system by developing consistent conformity assessment mechanisms in Canada. To support this effort, the National Model Codes could explicitly recognize products that have been evaluated to meet Code requirements. This proposed change introduces greater coordination of mutual recognition of conformity assessments across jurisdictions through consistent recognition and coordination of conformity assessments performed by the Canadian Construction Materials Centre (CCMC). See the First Ministers' Announcement: First Ministers' Joint Statement | Prime Minister of Canada.

Following the commitments made by the Canadian Table for Harmonized Construction Codes Policy, this proposed change introduces acceptance of Code conformity assessment mechanisms within the body of the National Model Codes, in addition to where previously mentioned in the preface. This introduction of provisions in Divisions A (for compliance) and C (for administration provisions) would enable AHJs to accept submission of a Code conformity assessment issued by CCMC.

The CCMC is a construction code compliance service on behalf of the provinces and territories, which is provided by the National Research Council. The CCMC follows a comprehensive process aligned with ISO/IEC 17065, which includes building code analysis, consultation, benchmark testing, product testing and ongoing plant inspection and surveillance. CCMC-evaluated products are listed on an online registry and marked with the CCMC official mark and unique number.

This proposed change provides an option for conformity assessment to demonstrate Code compliance. Future proposed changes could include additional options that recognize the certification of products, processes and services by other conformity assessment bodies that are accredited by the Standards Council of Canada.

## PROPOSED CHANGE

**NBC25 Div.A 1.2.1.1. (first printing)**

**[1.2.1.1.] 1.2.1.1. Compliance with this Code**

**[1] 1)** Compliance with this Code shall be achieved by

[a] a) complying with the applicable acceptable solutions in Division B (see Note A-1.2.1.1.(1)(a)), ~~or~~

[b] --) complying with a conformity assessment issued by the Canadian Construction Materials Centre (see Note A-1.2.1.1.(1)(b)-2030), or

[c] b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions (see ~~Note A-1.2.1.1.(1)(b)~~Note A-1.2.1.1.(1)(c)).

**[2] 2)** For the purposes of compliance with this Code as required in

~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c), the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements referred to in Subsection 1.1.2. of Division B.

**Note A-1.2.1.1.(1)(b)-2030 CCMC Conformity Assessments.**

If a building design (e.g. material, component, assembly or system) can be shown to meet all the requirements of a conformity assessment issued by the Canadian Construction Materials Centre (CCMC), that design is deemed to have satisfied the intent of the Code. Demonstration of meeting the CCMC assessment criteria assures the authority having jurisdiction that the building design (e.g. construction product or system) has been evaluated, in accordance with the applicable standard or Code, using performance testing and analysis that also includes the ongoing manufacturing quality management system and surveillance. The corresponding evaluation report should be provided to the authority having jurisdiction, as described in Sentence 2.2.2.1.(4) of Division C.

**Note A-1.2.1.1.(1)(~~b~~c) Code Compliance via Alternative Solutions.**

Where a design differs from the acceptable solutions in Division B, then it should be treated as an "alternative solution." A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objectives and functional statements. However, because the objectives and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions—certainly far less precisely than would be the case with a true performance code, which would have quantitative performance targets and prescribed methods of performance measurement for all aspects of building performance. Nevertheless, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not "well enough" but "as well as."

In this sense, it is Division B that defines the boundaries between acceptable risks and the "unacceptable" risks referred to in the statements of the Code's objectives, i.e. the risk remaining once the applicable acceptable solutions in Division B have been implemented represents the residual level of risk deemed to be acceptable by the broad base of Canadians who have taken part in the consensus process used to develop the Code.

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**NBC25 Div.C 2.2.2.1. (first printing)**

**[2.2.2.1.] 2.2.2.1. General Information Required**

**[1] 1)** Sufficient information shall be provided to show that the proposed work will conform to this Code and whether or not it may affect adjacent

property.

**[2] 2)** Plans shall be drawn to scale and shall indicate the nature and extent of the work or proposed *occupancy* in sufficient detail to establish that, when completed, the work and the proposed *occupancy* will conform to this Code.

**[3] 3)** When proposed work is changed during construction, information on the changes shall comply with the requirements of this Section for proposed work.

**[4] --)** When compliance with this Code is based on an evaluation report issued by the Canadian Construction Materials Centre, the report shall be provided to demonstrate compliance in accordance with Clause 1.2.1.1.(1)(b)-2030 of Division A.

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**NPC25 Div.A 1.2.1.1. (first printing)**

**[1.2.1.1.] 1.2.1.1. Compliance with this Code**

**[1] 1)** Compliance with this Code shall be achieved by

[a] a) complying with the applicable acceptable solutions in Division B (see Note A-1.2.1.1.(1)(a)), ~~or~~

[b] --) complying with a conformity assessment issued by the Canadian Construction Materials Centre (see Note A-1.2.1.1.(1)(b)-2030), or

[c] b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions (see ~~Note A-1.2.1.1.(1)(b)~~Note A-1.2.1.1.(1)(c)).

**[2] 2)** For the purposes of compliance with this Code as required in ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c), the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements referred to in Subsection 1.1.2. of Division B.

**Note A-1.2.1.1.(1)(b)-2030 CCMC Conformity Assessments.**

If a building design (e.g. material, component, assembly or system) can be shown to meet all the requirements of a conformity assessment issued by the Canadian Construction Materials Centre (CCMC), that design is deemed to have satisfied the intent of the Code. Demonstration of meeting the CCMC assessment criteria assures the authority having jurisdiction that the building design (e.g. construction product or system) has been evaluated, in accordance with the applicable standard or Code, using performance testing and analysis that also includes the ongoing manufacturing quality management system and surveillance. The corresponding evaluation report should be provided to the authority having jurisdiction, as described in Sentence 2.2.2.1.(2) of Division C.

**Note A-1.2.1.1.(1)(~~b~~c) Code Compliance via Alternative Solutions.**

Where a design differs from the acceptable solutions in Division B, then it should be treated as an "alternative solution." A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objectives and functional statements. However, because the objectives and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions—certainly far less precisely than would be the case with a true performance code, which would have quantitative performance targets and prescribed methods of performance measurement for all aspects of building performance. Nevertheless, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not "well enough" but "as well as."

In this sense, it is Division B that defines the boundaries between acceptable risks and the "unacceptable" risks referred to in the statements of the Code's objectives, i.e., the risk remaining once the applicable acceptable solutions in Division B have been implemented represents the residual level of risk deemed to be acceptable by the broad base of Canadians who have taken part in the consensus process used to develop the Code.

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**NPC25 Div.C 2.2.2. (first printing)**

## [2.2.2.] 2.2.2. Plumbing Drawings and Related Documents

### [2.2.2.1.] 2.2.2.1. Information Required on Plumbing Drawings and Related Documents

**[1] 1)** Plumbing drawings and related documents submitted with the application for a plumbing permit shall show

[a] a) the location and *nominal pipe size* of every *building drain* and of every *trap* and *cleanout* fitting that is on a *building drain*,

[b] b) the location and *nominal pipe size* of every *sanitary drainage pipe*, *trap* and *vent pipe*, and

[c] c) a layout of the *potable water distribution system*, including *nominal pipe sizes* and valves.

**[2] --)** When compliance with this Code is based on an evaluation report issued by the Canadian Construction Materials Centre, the report shall be provided to demonstrate compliance in accordance with Clause 1.2.1.1.(1)(b)-2030 of Division A.

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**NECB25 Div.A 1.2.1.1. (first printing)**

### [1.2.1.1.] 1.2.1.1. Compliance with this Code

**[1] 1)** Compliance with this Code shall be achieved by

[a] a) complying with the applicable acceptable solutions in Division B

(see Note A-1.2.1.1.(1)(a)), ~~or~~

[b] --) complying with a conformity assessment issued by the Canadian Construction Materials Centre (see Note A-1.2.1.1.(1)(b)-2030), or

[c] b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions (see ~~Note A-1.2.1.1.(1)(b)~~Note A-1.2.1.1.(1)(c)).

**[2] 2)** For the purposes of compliance with this Code as required in ~~Clause (1)(b)~~Clause (1)(c), the objective and functional statements attributed to the acceptable solutions in Division B shall be the objective and functional statements referred to in Subsection 1.1.3. of Division B.

**Note A-1.2.1.1.(1)(b)-2030 CCMC Conformity Assessments.**

If a building design (e.g. material, component, assembly or system) can be shown to meet all the requirements of a conformity assessment issued by the Canadian Construction Materials Centre (CCMC), that design is deemed to have satisfied the intent of the Code. Demonstration of meeting the CCMC assessment criteria assures the authority having jurisdiction that the building design (e.g. construction product or system) has been evaluated, in accordance with the applicable standard or Code, using performance testing and analysis that also includes the ongoing manufacturing quality management system and surveillance. The corresponding evaluation report should be provided to the authority having jurisdiction, as described in Sentence 2.2.3.1.(3)-2030 of Division C.

**Note A-1.2.1.1.(1)(~~b~~c) Code Compliance via Alternative Solutions.**

Where a design differs from the acceptable solutions in Division B, then it should be treated as an "alternative solution." A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objective and functional statements. However, because the objective and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions—certainly far less precisely than would be the case with a true performance code, which would have quantitative performance targets and prescribed methods of performance measurement for all aspects of building performance. Nevertheless, ~~Clause 1.2.1.1.(1)(b)~~Clause 1.2.1.1.(1)(c) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not "well enough" but "as well as."

In this sense, it is Division B that defines the boundaries between acceptable situations and the "unacceptable" situations referred to in the statements of the Code's objectives, i.e. the consequence remaining once the applicable acceptable solutions in

Division B have been implemented represents the residual consequence deemed to be acceptable by the broad base of Canadians who have taken part in the consensus process used to develop the Code.

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**NECB25 Div.C 2.2.3.1. (first printing)**

**[2.2.3.1.] 2.2.3.1. General Information Required**

**[1] 1)** Sufficient information shall be provided to show that the proposed *alteration* will conform to this Code and whether or not it will affect adjacent property. (See Note A-2.2.2.1.(1).)

**[2] 2)** Plans shall be drawn to scale and shall indicate the nature and scope of the proposed *alteration* and proposed *occupancy* in sufficient detail to establish that, when completed, the proposed *alteration* and the proposed *occupancy* will conform to this Code.

**[3] --)** When compliance with this Code is based on an evaluation report issued by the Canadian Construction Materials Centre, the report shall be provided to demonstrate compliance in accordance with Clause 1.2.1.1.(1)(b)-2030 of Division A.

**[4] 3)** If the proposed *alteration* is changed during construction, information on the changes shall comply with the requirements of this Section for *alteration* work.

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## Impact analysis

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This proposed change introduces a clear path for national acceptance of the conformity assessment mechanisms that were previously only referenced in the preface of the National Model Codes. Manufacturers of products that currently have CCMC assessments would benefit from clarity about compliance and improved market access across Canada. While product assessment would remain an optional compliance pathway for manufactured products with this proposed change, costs for product manufacturers pursuing product certification would be balanced by the reduced effort involved to achieve product acceptance (see "Enforcement implications" below). Costs related to product assessments vary by product category, intended uses and functions, and testing requirements. Assessment costs are available on the CCMC website at: https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-construction-materials-centre.

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## Enforcement implications

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The National Model Codes currently only describe conformity assessment mechanisms in the preface. This proposed change would provide the administrative means for AHJs to consistently accept conformity assessment opinions. Acceptance of conformity assessments would reduce the burden related to alternative solutions on product

manufacturers, builders and AHJs. For AHJs, specifically, this proposed change would reduce the time spent approving the use of construction products, especially when innovative. Relying on assessments performed by the CCMC, a service provided by the National Research Council, would assure AHJs that a construction product demonstrates performance through initial testing, as well as ongoing manufacturing quality management systems.

## Who is affected

In addition to authorities having jurisdiction, product manufacturers, designers and builders, this proposed change may affect a wide range of stakeholders involved in design, specification, manufacture, approval and construction, including specifiers, building owners, contractors and building officials.

For Code users and authorities having jurisdiction, the addition of this new compliance option would accelerate the approval process.

Contractors, inspectors and designers would benefit from clearer direction on product conformance, which would support consistent interpretation and improved compliance efficiency.

# Proposed Change 2221

**Code Reference(s):** **NBC25 Div.B 1.3.1.2. (first printing), NFC25 Div.B 1.3.1.2. (first printing), NPC25 Div.B 1.3.1.2. (first printing), NECB25 Div.B 1.3.1.2. (first printing)**

Subject: Referenced Documents

Title: Updates to Referenced Documents

## PROPOSED CHANGE

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1281 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501-~~05~~24 | Methods of Test for Exterior Walls | NBC A-5.9.3.<br>CNB A-5.9.3. |
| 1282 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501.1-~~05~~17 | Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure | NBC A-5.9.3.<br>CNB A-5.9.3. |
| 1283 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501.2-~~09~~15 | Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls~~,~~ and Sloped Glazing Systems | NBC A-5.9.3.<br>CNB A-5.9.3. |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1284 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501.4-~~09~~18 | Recommended Static Test Method for Evaluating **Window Wall,** Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drifts | NBC A-5.9.3.<br>CNB A-5.9.3. |
| 1286 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501.5-~~07~~23 | Test Method for ~~Thermal Cycling~~**Serviceability** of Exterior ~~Walls~~**Fenestration After Thermal Cycling** | NBC A-5.9.3.<br>CNB A-5.9.3.<br>NECB 3.2.4.3.(3)<br>CNÉB 3.2.4.3. 3) |
| 1285 | AAMA (Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association)) | 501.6-~~09~~18 | Recommended Dynamic Test Method for Determining the Seismic Drift Causing Glass Fallout from ~~a~~**Window Wall, Curtain** Wall ~~System~~**and Storefront Systems** | NBC A-4.1.8.18.(14) and (15)<br>NBC A-5.9.3.<br>CNB A-4.1.8.18. 14) et 15)<br>CNB A-5.9.3. |
| 1324 | ASME (American Society of Mechanical Engineers) | B16.12-~~2019~~2025 | Cast Iron Threaded Drainage Fittings | NPC 2.2.6.3.(1)<br>CNP 2.2.6.3. 1) |
| 1288 | ASME (American Society of Mechanical Engineers) | B16.15-~~2018~~2024 | Cast Copper Alloy Threaded Fittings: Classes 125 and 250 | NPC 2.2.7.3.(1)<br>NPC A-2.2.5. to 2.2.8.<br>CNP 2.2.7.3. 1)<br>CNP A-2.2.5. à 2.2.8. |
| 1318 | ASME (American Society of Mechanical Engineers) | B16.26-~~2018~~2024 | Cast Copper Alloy Fittings for Flared Copper Tubes | NPC 2.2.7.7.(1)<br>NPC 2.2.7.7.(2)<br>CNP 2.2.7.7. 1)<br>CNP 2.2.7.7. 2) |
| 1323 | ASME (American Society of Mechanical Engineers) | B16.5-~~2020~~2025 | Pipe Flanges and Flanged Fittings: NPS ~~½~~ 1/2 through NPS 24~~,~~ Metric/Inch Standard | NFC 4.5.5.3.(1)<br>CNPI 4.5.5.3. 1)<br>NPC 2.2.6.12.(1)<br>CNP 2.2.6.12. 1) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1287 | ASME (American Society of Mechanical Engineers) | B16.9-~~2018~~2024 | Factory-Made Wrought Buttwelding Fittings | NPC 2.2.6.11.(1)<br>NPC 2.2.6.14.(1)<br>CNP 2.2.6.11. 1)<br>CNP 2.2.6.14. 1) |
| 1322 | ASME (American Society of Mechanical Engineers) | B31.3-~~2022~~2024 | Process Piping | NFC 4.5.2.1.(5)<br>CNPI 4.5.2.1. 5) |
| 1329 | ASME (American Society of Mechanical Engineers) | B31.9-~~2020~~2025 | Building Services Piping | NPC 2.3.2.8.(1)<br>CNP 2.3.2.8. 1) |
| 1290 | ASME (American Society of Mechanical Engineers)/CSA (CSA Group) | ASME A112.18.1-~~2018~~2024/CSA B125.1-~~18~~:24 | Plumbing ~~Supply~~supply ~~Fittings~~fittings | NPC 2.2.10.6.(1)<br>NPC 2.2.10.7.(1)<br>CNP 2.2.10.6. 1)<br>CNP 2.2.10.7. 1)<br>NECB 6.2.6.1.(1)<br>NECB 6.2.6.2.(1)<br>CNÉB 6.2.6.1. 1)<br>CNÉB 6.2.6.2. 1) |
| 1289 | ASME (American Society of Mechanical Engineers)/CSA (CSA Group) | ASME A112.19.2-~~2018~~2024/CSA B45.1-~~18~~:24 | Ceramic ~~Plumbing~~plumbing ~~Fixtures~~fixtures | NPC 2.2.2.2.(1)<br>CNP 2.2.2.2. 1) |
| 1349 | ASME (American Society of Mechanical Engineers)/CSA (CSA Group) | ASME A17.1-~~2022~~2025/CSA B44-~~22~~:25 | Safety ~~Code~~code for ~~Elevators~~elevators and ~~Escalators~~escalators | NBC 3.2.6.7.(2)<br>NBC 3.5.2.1.(1)<br>NBC 3.5.2.1.(2)<br>NBC 3.5.2.1.(3)<br>NBC 3.5.4.1.(2)<br>NBC 3.5.4.2.(1)<br>NBC A-3.5.2.1.(1)<br>NBC Table 4.1.5.11.<br>NBC Table 4.1.8.18.<br>NFC 7.2.2.1.(2) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1349 | ASME (American Society of Mechanical Engineers)/CSA (Groupe CSA/CSA Group) | ASME A17.1-~~2022~~2025/CSA B44-~~22~~:25 | ~~Code~~Safety ~~de~~code ~~sécurité~~for ~~sur~~elevators ~~les~~and ~~ascenseurs ou monte-chargos et les escaliers mécaniques~~escalators | CNB 3.2.6.7. 2)<br>CNB 3.5.2.1. 1)<br>CNB 3.5.2.1. 2)<br>CNB 3.5.2.1. 3)<br>CNB 3.5.4.1. 2)<br>CNB 3.5.4.2. 1)<br>CNB A-3.5.2.1. 1)<br>CNB Tableau 4.1.5.11.<br>CNB Tableau 4.1.8.18.<br>CNPI 7.2.2.1. 2) |
| 1301 | ASTM (ASTM International) | A1008/A1008M-~~21a~~24 | Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable | NBC 4.2.3.8.(1)<br>CNB 4.2.3.8. 1) |
| 1302 | ASTM (ASTM International) | A1011/A1011M-~~18a~~23 | Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength | NBC 4.2.3.8.(1)<br>CNB 4.2.3.8. 1) |
| 1303 | ASTM (ASTM International) | A123/A123M-~~17~~24 | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products | NBC Table 5.9.1.1.<br>NBC Table 9.20.16.1.<br>CNB Tableau 5.9.1.1.<br>CNB Tableau 9.20.16.1. |
| 1304 | ASTM (ASTM International) | A153/A153M-~~16a~~23 | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware | NBC 9.23.2.4.(2)<br>NBC Table 5.9.1.1.<br>NBC Table 9.20.16.1.<br>CNB 9.23.2.4. 2)<br>CNB Tableau 5.9.1.1.<br>CNB Tableau 9.20.16.1. |
| 1305 | ASTM (ASTM International) | A182/A182M-~~21~~24c | Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service | NPC 2.2.6.12.(1)<br>NPC 2.2.6.13.(1)<br>CNP 2.2.6.12. 1)<br>CNP 2.2.6.13. 1) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1306 | ASTM (ASTM International) | A193/A193M-~~20~~24a | Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications | NFC 4.5.5.4.(1)<br>CNPI 4.5.5.4. 1) |
| 1352 | CGSB (Canadian General Standards Board) | CAN/CGSB-12.1-~~2022~~2026 | Safety ~~Glazing~~glazing | NBC 3.3.1.20.(3)<br>NBC 3.3.2.17.(1)<br>NBC 3.3.2.17.(2)<br>NBC 3.4.6.15.(1)<br>NBC 3.4.6.15.(3)<br>NBC 3.7.2.4.(1)<br>NBC 9.6.1.2.(1)<br>NBC 9.6.1.4.(1)<br>NBC 9.6.1.4.(6)<br>NBC 9.8.8.7.(1)<br>NBC Table 5.9.1.1. |
| 1352 | ONGC (Office des normes générales du Canada) | CAN/CGSB-12.1-~~2022~~2026 | Vitrage de sécurité | CNB 3.3.1.20. 3)<br>CNB 3.3.2.17. 1)<br>CNB 3.3.2.17. 2)<br>CNB 3.4.6.15. 1)<br>CNB 3.4.6.15. 3)<br>CNB 3.7.2.4. 1)<br>CNB 9.6.1.2. 1)<br>CNB 9.6.1.4. 1)<br>CNB 9.6.1.4. 6)<br>CNB 9.8.8.7. 1)<br>CNB Tableau 5.9.1.1. |
| 1353 | CGSB (Canadian General Standards Board) | CAN/CGSB-12.8-~~2017~~2026 | Insulating glass units | NBC 9.6.1.2.(1)<br>NBC Table 5.9.1.1. |
| 1353 | ONGC (Office des normes générales du Canada) | CAN/CGSB-12.8-~~2017~~2026 | Vitrages isolants | CNB 9.6.1.2. 1)<br>CNB Tableau 5.9.1.1. |
| 1261 | CSA (CSA Group) | A440S1:~~19~~25 | Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440~~-17~~:22, North American Fenestration Standard/Specification for windows, doors, and skylights | NBC 5.9.2.2.(1)<br>NBC 5.9.3.5.(3)<br>NBC 9.36.2.9.(3)<br>NBC 9.7.4.2.(1)<br>NBC A-5.9.2.2.<br>NBC A-5.9.3.5.(3)<br>NBC A-9.7.4.2.(1) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1261 | CSA (Groupe CSA/CSA Group) | A440S1:~~19~~25 | Supplément canadien à AAMA/WDMA/CSA 101/I.S.2/A440~~-17~~:22, Norme nord-américaine sur les fenêtres/Spécification relative aux fenêtres, aux portes et aux lanterneaux | CNB 5.9.2.2. 1)<br>CNB 5.9.3.5. 3)<br>CNB 9.36.2.9. 3)<br>CNB 9.7.4.2. 1)<br>CNB A-5.9.2.2.<br>CNB A-5.9.3.5. 3)<br>CNB A-9.7.4.2. 1) |
| 1312 | CSA (CSA Group) | B149.1:~~20~~25 | Natural gas and propane installation code | NBC 2.4.2.2.(2)<br>NBC 6.2.1.5.(1)<br>NBC 9.10.22.1.(1)<br>NBC 9.31.6.2.(2)<br>NBC 9.33.5.2.(1)<br>NBC A-9.10.22.<br>NFC 3.1.1.4.(2)<br>NFC 3.1.1.4.(3)<br>NFC 4.6.1.1.(2)<br>NFC 5.6.1.9.(1) |
| 1312 | CSA (Groupe CSA/CSA Group) | B149.1:~~20~~25 | Code d'installation du gaz naturel et du propane | CNB 2.4.2.2. 2)<br>CNB 6.2.1.5. 1)<br>CNB 9.10.22.1. 1)<br>CNB 9.31.6.2. 2)<br>CNB 9.33.5.2. 1)<br>CNB A-9.10.22.<br>CNPI 3.1.1.4. 2)<br>CNPI 3.1.1.4. 3)<br>CNPI 4.6.1.1. 2)<br>CNPI 5.6.1.9. 1) |
| 1313 | CSA (CSA Group) | B149.2~~-15~~:25 | Propane storage and handling code | NFC 3.1.1.4.(2)<br>NFC 3.2.8.2.(3)<br>NFC 4.6.1.1.(2) |
| 1313 | CSA (Groupe CSA/CSA Group) | B149.2~~-15~~:25 | Code sur le stockage et la manipulation du propane | CNPI 3.1.1.4. 2)<br>CNPI 3.2.8.2. 3)<br>CNPI 4.6.1.1. 2) |
| 1314 | CSA (CSA Group) | CSA/ANSI B149.6:~~20~~25 | Code for ~~digester gas, landfill gas, and~~ biogas generation and utilization | NBC 2.2.8.1.(3) |
| 1314 | CSA (Groupe CSA/CSA Group) | CSA/ANSI B149.6:~~20~~25 | Code sur la production et l'utilisation des ~~gaz de digestion, des gaz d'enfouissement et des~~ biogaz | CNB 2.2.8.1. 3) |
| 1293 | CSA (CSA Group) | C282:~~19~~24 | Emergency electrical power supply for buildings | NBC 3.2.7.5.(1)<br>NFC 6.5.1.1.(1)<br>NFC 6.5.1.4.(1)<br>NFC A-6.5.1.1.(2) |

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| 1293 | CSA (Groupe CSA/CSA Group) | C282:~~19~~24 | Alimentation électrique de secours des bâtiments | CNB 3.2.7.5. 1)<br>CNPI 6.5.1.1. 1)<br>CNPI 6.5.1.4. 1)<br>CNPI A-6.5.1.1. 2) |
| 1278 | CSA (CSA Group) | O141:~~05~~23 | ~~Softwood~~Canadian ~~Lumber~~standard lumber | NBC 9.3.2.6.(1)<br>NBC A-9.3.2.1.(1)<br>NBC D-2.3.6.<br>NBC D-2.4.1.<br>NBC Table 5.9.1.1. |
| 1278 | CSA (Groupe CSA/CSA Group) | O141:~~05~~23 | ~~Softwood~~Bois ~~Lumber~~d'oeuvre normalisé canadien | CNB 9.3.2.6. 1)<br>CNB A-9.3.2.1. 1)<br>CNB D-2.3.6.<br>CNB D-2.4.1.<br>CNB Tableau 5.9.1.1. |
| 1279 | CSA (CSA Group) | O177~~-06~~:23 | Qualification ~~Code~~code for ~~Manufacturers~~manufacturers of ~~Structural~~structural ~~Glued~~glued-~~Laminated~~laminated ~~Timber~~timber | NBC 4.3.1.2.(1)<br>NBC Table 9.23.12.3.-D<br>NBC Table 9.23.4.2.-K |
| 1279 | CSA (Groupe CSA/CSA Group) | O177~~-06~~:23 | Règles de qualification des fabricants de bois de charpente lamellé-collé | CNB 4.3.1.2. 1)<br>CNB Tableau 9.23.12.3.-D<br>CNB Tableau 9.23.4.2.-K |

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| 1348 | HRAI (Heating, Refrigeration and Air Conditioning Institute of Canada) | ~~2017~~2025 Edition | HRAI Digest | NBC 6.2.1.1.(1)<br>NBC 9.32.2.3.(4)<br>NBC 9.32.3.2.(1)<br>NBC 9.33.4.1.(1)<br>NBC A-9.36.3.2.(1)<br>NBC A-9.36.3.2.(2)<br>NBC A-9.36.3.4.(1)<br>CNB 6.2.1.1. 1)<br>CNB 9.32.2.3. 4)<br>CNB 9.32.3.2. 1)<br>CNB 9.33.4.1. 1)<br>CNB A-9.36.3.2. 1)<br>CNB A-9.36.3.2. 2)<br>CNB A-9.36.3.4. 1)<br>NECB 1.1.4.2.(1)<br>NECB A-5.2.1.1.(1)<br>CNÉB 1.1.4.2. 1)<br>CNÉB A-5.2.1.1. 1) |
| 669 | NFPA (National Fire Protection Association) | 14-~~2013~~2019 | Standard for the Installation of Standpipe and Hose Systems | NBC 3.2.5.10.(1)<br>NBC 3.2.5.9.(1)<br>CNB 3.2.5.10. 1)<br>CNB 3.2.5.9. 1) |
| 790 | NFPA (National Fire Protection Association) | 34-~~2018~~2021 | Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids | NBC A-6.9.1.2.(1)<br>CNB A-6.9.1.2. 1)<br>NFC 5.4.6.2.(1)<br>CNPI 5.4.6.2. 1) |
| 735 | NFPA (National Fire Protection Association) | 61-~~2017~~2020 | Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities | NBC A-6.9.1.2.(1)<br>CNB A-6.9.1.2. 1)<br>NFC A-5.3.1.3.(2)<br>CNPI A-5.3.1.3. 2) |
| 736 | NFPA (National Fire Protection Association) | 664-~~2017~~2020 | Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities | NBC A-6.9.1.2.(1)<br>CNB A-6.9.1.2. 1)<br>NFC 5.3.2.1.(1)<br>NFC A-5.3.1.3.(2)<br>CNPI 5.3.2.1. 1)<br>CNPI A-5.3.1.3. 2) |

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| 738 | NFPA (National Fire Protection Association) | 91-~~2015~~2020 | Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids | NBC 6.3.4.3.(1)<br>NBC A-6.9.1.2.(1)<br>CNB 6.3.4.3. 1)<br>CNB A-6.9.1.2. 1)<br>NFC 3.2.2.3.(5)<br>NFC 4.1.7.2.(5)<br>NFC A-5.3.1.3.(2)<br>CNPI 3.2.2.3. 5)<br>CNPI 4.1.7.2. 5)<br>CNPI A-5.3.1.3. 2) |
| 1262 | NFRC (National Fenestration Rating Council) | ANSI/NFRC 100-~~2020~~2023 | Procedure for Determining Fenestration Product U-factors | NBC 9.36.2.2.(3)<br>CNB 9.36.2.2. 3)<br>NECB 3.1.1.5.(3)<br>CNÉB 3.1.1.5. 3) |
| 1263 | NFRC (National Fenestration Rating Council) | ANSI/NFRC 200-~~2020~~2023 | Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence | NBC 9.36.2.2.(3)<br>CNB 9.36.2.2. 3)<br>NECB 3.1.1.5.(3)<br>CNÉB 3.1.1.5. 3) |
| 1311 | UL (UL Standards & Engagement (formerly Underwriters' Laboratories Inc.)) | ANSI/CAN/UL 583:~~2022~~2025 | ~~Standard for~~ Electric-Battery-Powered Industrial Trucks | NFC 3.1.3.1.(3) |
| 1311 | UL (UL Standards & Engagement (formerly Underwriters' Laboratories Inc.)) | ANSI/CAN/UL 583:~~2022~~2025 | Camions industriels électrique à batterie | CNPI 3.1.3.1. 3) |
| 1333 | UL (UL Standards & Engagement (formerly Underwriters' Laboratories Inc.)) | ANSI/CAN/UL/ULC 30:~~2022~~2026 | ~~Standard for~~ Metallic and Nonmetallic Safety Cans for Flammable and Combustible Liquids | NFC 4.1.5.8.(2)<br>NFC 4.2.3.1.(1)<br>NFC 4.2.6.4.(1)<br>NFC 5.5.5.2.(2) |
| 1333 | UL (UL Standards & Engagement (formerly Underwriters' Laboratories Inc.)) | ANSI/CAN/UL/ULC 30:~~2022~~2026 | ~~Standard~~Les ~~for~~bidons ~~Metallic~~de ~~and~~sécurité ~~Nonmetallic~~métalliques ~~Safety~~et ~~Cans~~non ~~for~~métalliques ~~Flammable~~pour ~~and~~liquides ~~Combustible~~inflammables ~~Liquids~~et combustibles | CNPI 4.1.5.8. 2)<br>CNPI 4.2.3.1. 1)<br>CNPI 4.2.6.4. 1)<br>CNPI 5.5.5.2. 2) |

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|---|---|---|---|---|
| 1271 | ULC (UL Standards & Engagement (formerly ULC Standards)) | ANSI/CAN/UL/ULC 1275:~~2021~~2024 | ~~Standard for~~ Flammable Liquid Storage Cabinets | NFC 4.2.10.5.(1) |
| 1271 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | ANSI/CAN/UL/ULC 1275:~~2021~~2024 | Armoires de stockage de liquides inflammables | CNPI 4.2.10.5. 1) |
| 1351 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC 1001:~~2024~~2026 | Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems | NBC 3.2.9.1.(1)<br>NBC 9.10.1.2.(1)<br>NBC A-3.2.9.1.(1)<br>NFC 6.8.1.1.(1)<br>NFC A-6.8.1.1.(1) |
| 1351 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC 1001:~~2024~~2026 | Norme sur les essais intégrés de systèmes de protection incendie et de sécurité des personnes | CNB 3.2.9.1. 1)<br>CNB 9.10.1.2. 1)<br>CNB A-3.2.9.1. 1)<br>CNPI 6.8.1.1. 1)<br>CNPI A-6.8.1.1. 1) |
| 1264 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S102~~ 102.2:~~2018~~18 | Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies | NBC 3.1.12.1.(2)<br>NBC 3.1.13.4.(1)<br>NBC 9.27.12.1.(4)<br>NBC 9.27.13.1.(2)<br>NBC D-1.1.1.<br>NBC D-3.1.1.<br>NBC Table 5.9.1.1. |
| 1264 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S102~~ 102.2:~~2018~~18 | Méthode d'essai normalisée caractéristiques de combustion superficielle des revêtements de sol et des divers matériaux et assemblages | CNB 3.1.12.1. 2)<br>CNB 3.1.13.4. 1)<br>CNB 9.27.12.1. 4)<br>CNB 9.27.13.1. 2)<br>CNB D-1.1.1.<br>CNB D-3.1.1.<br>CNB Tableau 5.9.1.1. |
| 1325 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S104-15~~ 104:2015 | Standard Method for Fire Tests of Door Assemblies | NBC 3.1.8.4.(1)<br>NBC 3.2.6.5.(3) |

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| 1325 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S104-15~~ 104:2015 | Méthode normalisée des essais de résistance au feu des portes | CNB 3.1.8.4. 1)<br>CNB 3.2.6.5. 3) |
| 1326 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S106-15~~ 106:2015 | Standard Method for Fire Tests of Window and Glass Block Assemblies | NBC 3.1.8.4.(1) |
| 1326 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S106-15~~ 106:2015 | Méthode normalisée des essais de comportement au feu des fenêtres et des briques de verre | CNB 3.1.8.4. 1) |
| 1269 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S107~~ 107:2019 | Standard Methods of Fire Tests of Roof Coverings | NBC 3.1.15.1.(1) |
| 1269 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S107~~ 107:2019 | Méthodes normalisées d'essai de résistance au feu des matériaux de couverture | CNB 3.1.15.1. 1) |
| 1330 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S112-10~~ 112:2025 | Standard Method of Fire Test of Fire Damper Assemblies | NBC 3.1.8.4.(1)<br>NBC A-3.2.6.6.(1) |
| 1330 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S112-10~~ 112:2025 | Méthode d'essai normalisée de résistance au feu des registres coupe-feu | CNB 3.1.8.4. 1)<br>CNB A-3.2.6.6. 1) |
| 1331 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S112~~ 112.1-~~10~~:2025 | Standard for Leakage Rated Dampers for Use in Smoke Control Systems | NBC 3.1.8.4.(3)<br>NBC 6.3.2.7.(3) |

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| 1331 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S112~~ 112.1-~~10~~:2025 | Norme sur les registres étanches pour systèmes de désenfumage | CNB 3.1.8.4. 3)<br>CNB 6.3.2.7. 3) |
| 1265 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S126-14~~ 126:2014 | Standard Method of Test for Fire Spread Under Roof-Deck Assemblies | NBC 3.1.14.1.(1)<br>NBC 3.1.14.2.(1) |
| 1265 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S126-14~~ 126:2014 | Méthode normalisée d'essai sur la propagation des flammes sous les platelages de toits | CNB 3.1.14.1. 1)<br>CNB 3.1.14.2. 1) |
| 1319 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S139~~ 139:~~2017~~2025 | Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control-, and Data Cables | NBC 3.2.6.5.(6)<br>NBC 3.2.7.10.(2)<br>NBC 3.2.7.10.(3) |
| 1319 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S139~~ 139:~~2017~~2025 | ~~Normes~~Norme sur l'essai de ~~résistance~~tenue au feu pour l'évaluation de l'intégrité ~~des~~du ~~circuits~~circuit des câbles ignifuges d'alimentation, ~~de l~~d'instrumentation, ~~des~~de ~~contrôles~~commande et de transmission de données | CNB 3.2.6.5. 6)<br>CNB 3.2.7.10. 2)<br>CNB 3.2.7.10. 3) |
| 1266 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S143-14~~ 143:2014 | Standard Method of Fire Tests for Non-Metallic Electrical and Optical Fibre Cable Raceway Systems | NBC 3.1.5.23.(1) |
| 1266 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S143-14~~ 143:2014 | Méthode d'essai normalisée de comportement au feu des systèmes de canalisation non métalliques pour câbles électriques et à fibres optiques | CNB 3.1.5.23. 1) |
| 1338 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S503-05~~ 503:2025A | Standard for Carbon-Dioxide Fire Extinguishers | NFC 2.1.5.1.(4) |

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| 1338 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S503-05~~ 503:2025A | Norme sur les extincteurs au dioxyde de carbone | CNPI 2.1.5.1. 4) |
| 1339 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S504-12~~ 504:2025 | Standard for Dry Chemical Fire Extinguishers | NFC 2.1.5.1.(4) |
| 1339 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S504-12~~ 504:2025 | Norme sur les extincteurs à poudres chimiques | CNPI 2.1.5.1. 4) |
| 1350 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S507-05~~ 507:2026 | Standard for Water Fire Extinguishers | NFC 2.1.5.1.(4) |
| 1350 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S507-05~~ 507:2026 | Norme sur les extincteurs à eau | CNPI 2.1.5.1. 4) |
| 1332 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S531~~ 531:~~2019~~2026 | Standard for Smoke Alarms | NBC 3.2.4.20.(2)<br>NBC 9.10.19.1.(1)<br>NFC 2.1.3.3.(1) |
| 1332 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S531~~ 531:~~2019~~2026 | Norme sur les avertisseurs de fumée | CNB 3.2.4.20. 2)<br>CNB 9.10.19.1. 1)<br>CNPI 2.1.3.3. 1) |
| 1268 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S536~~ 536:~~2019~~2024 | Standard for Inspection and Testing of Fire Alarm Systems | NFC 6.3.1.2.(1) |

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| 1268 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S536~~ 536:~~2019~~2024 | Norme sur l'inspection et la mise à l'essai des systèmes d'alarme incendie | CNPI 6.3.1.2. 1) |
| 1343 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S554~~ 554:~~2016~~2026 | Standard for Water Based Agent Fire Extinguishers | NFC 2.1.5.1.(4) |
| 1343 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S554~~ 554:~~2016~~2026 | Norme sur les extincteurs à agent à base d'eau | CNPI 2.1.5.1. 4) |
| 1267 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S561~~ 561:~~2022~~2024 | Standard for Installation and Services for Fire Signal Receiving Centres and Systems | NBC 3.2.4.7.(4) NBC A-3.2.4.7.(4) NFC 6.3.1.3.(1) NFC A-6.3.1.3.(1) |
| 1267 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S561~~ 561:~~2022~~2024 | Norme sur l'installation et les services – Systèmes et centrales de réception d'alarme incendie | CNB 3.2.4.7. 4) CNB A-3.2.4.7. 4) CNPI 6.3.1.3. 1) CNPI A-6.3.1.3. 1) |
| 1344 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S566~~ 566:~~2017~~2025A | Standard for Halocarbon Clean Agent Fire Extinguishers | NFC 2.1.5.1.(4) |
| 1344 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S566~~ 566:~~2017~~2025A | Norme sur les extincteurs aux agents propres à l'halocarbure | CNPI 2.1.5.1. 4) |
| 1270 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S610~~ 610:~~2018~~2019 | Standard for Factory-Built Fireplace Systems | NBC 9.22.8.1.(1) |

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| 1270 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S610~~ 610:~~2018~~2019 | Norme sur les systèmes foyers à feu ouvert préfabriqué | CNB 9.22.8.1. 1) |
| 1334 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S642~~ 642:2021 | Standard for Compounds and Tapes for Threaded Pipe Joints | NFC 4.5.5.1.(1) |
| 1334 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S642~~ 642:2021 | Norme sur les composés et rubans pour joints de tuyau filetés | CNPI 4.5.5.1. 1) |
| 839 | ULC (UL Standards & Engagement (formerly ULC Standards)) | ANSI/CAN/UL/ULC-~~S644~~ 567:~~2016~~2021 | ~~Standard for~~ Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for ~~Flammable~~Petroleum Products and ~~Combustible Liquids~~LP-Gas | NFC 4.6.5.2.(4) |
| 839 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | ANSI/CAN/UL/ULC-~~S644~~ 567:~~2016~~2021 | ~~Norme~~Raccords ~~sur~~à rupture d'urgence, les raccords pivotants et les raccords ~~frangibles~~de ~~d'urgence~~tuyau pour ~~liquides~~les ~~inflammables~~produits pétroliers et ~~combustibles~~le propane | CNPI 4.6.5.2. 4) |
| 1310 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S701~~ 701.1:~~2022~~2025 | Standard for Thermal Insulation, Polystyrene Boards | NBC 9.25.2.2.(1) NBC Table 5.9.1.1. NBC Table 9.23.17.2.A NBC Table A-9.36.2.4.(1)D |
| 1310 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S701~~ 701.1:~~2022~~2025 | Norme sur l'isolant thermique en polystyrène, panneaux | CNB 9.25.2.2. 1) CNB Tableau 5.9.1.1. CNB Tableau 9.23.17.2.A CNB Tableau A-9.36.2.4. 1)D |

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|---|---|---|---|---|
| 1320 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S703-09~~ 703:2025 | Standard for Cellulose Fibre Insulation-~~(CFI)~~ for Buildings | NBC 9.25.2.2.(1)<br>NBC D-2.3.4.<br>NBC Table 5.9.1.1.<br>NBC Table A-9.36.2.4.(1)D |
| 1320 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S703-09~~ 703:2025 | Norme sur l'isolant en fibre cellulosique-~~(IFC)~~ pour les bâtiments | CNB 9.25.2.2. 1)<br>CNB D-2.3.4.<br>CNB Tableau 5.9.1.1.<br>CNB Tableau A-9.36.2.4. 1)D |
| 1345 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S706~~ 706.1:2020 | Standard for Insulating Wood Fibre Boards for Buildings | NBC 9.23.16.7.(3)<br>NBC 9.25.2.2.(1)<br>NBC 9.29.8.1.(1)<br>NBC D-3.1.1.<br>NBC Table 5.9.1.1.<br>NBC Table 9.23.17.2.A |
| 1345 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S706~~ 706.1:2020 | Norme sur les panneaux isolants en fibre de bois pour bâtiments | CNB 9.23.16.7. 3)<br>CNB 9.25.2.2. 1)<br>CNB 9.29.8.1. 1)<br>CNB D-3.1.1.<br>CNB Tableau 5.9.1.1.<br>CNB Tableau 9.23.17.2.A |
| 1273 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S716~~ 716.1:~~2019~~2024 | Standard for Exterior Insulation and Finish Systems (EIFS~~) —~~ ) - Materials and Systems | NBC 5.9.4.1.(1)<br>NBC 9.27.14.1.(1)<br>NBC 9.27.14.2.(1)<br>NBC A-5.9.4.1.(1)<br>NBC A-9.27.14.2.(2)(a) |
| 1273 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S716~~ 716.1:~~2019~~2024 | Norme pour les systèmes d'isolation et de finition extérieurs (~~systèmes~~Systèmes SIFE) – ~~matériaux~~Matériaux et systèmes | CNB 5.9.4.1. 1)<br>CNB 9.27.14.1. 1)<br>CNB 9.27.14.2. 1)<br>CNB A-5.9.4.1. 1)<br>CNB A-9.27.14.2. 2)a) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1274 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S716~~ 716.2:~~2019~~2024 | Standard for Exterior Insulation and Finish Systems (EIFS~~) – ~~) - Installation of EIFS Components and Water Resistive Barrier | NBC 5.9.4.1.(1) NBC 9.27.14.3.(1) NBC A-5.9.4.1.(1) |
| 1274 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S716~~ 716.2:~~2019~~2024 | Norme pour les systèmes d'isolation et de finition extérieurs (~~systèmes~~Systèmes SIFE) – Installation des composants des systèmes SIFE et de la barrière résistant à l'eau | CNB 5.9.4.1. 1) CNB 9.27.14.3. 1) CNB A-5.9.4.1. 1) |
| 1276 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S716~~ 716.3:~~2019~~2024 | Standard for Exterior Insulation and Finish Systems (EIFS~~) – ~~) - Design Application | NBC 9.27.14.3.(1) NBC A-5.9.4.1.(1) |
| 1276 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S716~~ 716.3:~~2019~~2024 | Norme pour les systèmes d'isolation et de finition extérieurs (~~systèmes~~Systèmes SIFE) – Application de la conception | CNB 9.27.14.3. 1) CNB A-5.9.4.1. 1) |
| 1346 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S741-08~~ 741:2008 | Standard for Air Barrier Materials – Specification | NBC 5.4.1.2.(2) NBC 9.36.2.10.(1) NECB 3.2.4.3.(2) |
| 1346 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S741-08~~ 741:2008 | Norme sur les matériaux d'étanchéité à l'air – Spécification | CNB 5.4.1.2. 2) CNB 9.36.2.10. 1) CNÉB 3.2.4.3. 2) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1347 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S742~~ 742:2020 | Standard for Air Barrier Assemblies – Specification | NBC 5.4.1.2.(1)<br>NBC 5.4.1.2.(2)<br>NBC 9.36.2.9.(1)<br>NBC A-5.4.1.1.(3)<br>NBC A-5.4.1.2.(1)<br>NBC A-5.4.1.2.(2)<br>NBC A-5.4.1.2.(4)<br>NBC A-9.36.2.10.(5)(b)<br>NBC A-9.36.2.9.(1)<br>NECB 3.2.4.3.(2)<br>NECB A-3.2.4.3.(1) and (2) |
| 1347 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S742~~ 742:2020 | Norme sur les ensembles d'étanchéité à l'air – ~~spécifications~~Spécifications | CNB 5.4.1.2. 1)<br>CNB 5.4.1.2. 2)<br>CNB 9.36.2.9. 1)<br>CNB A-5.4.1.1. 3)<br>CNB A-5.4.1.2. 2)<br>CNB A-5.4.1.2. 4)<br>CNB A-5.4.1.2. 1)<br>CNB A-9.36.2.10. 5)b)<br>CNB A-9.36.2.9. 1)<br>CNÉB 3.2.4.3. 2)<br>CNÉB A-3.2.4.3. 1) et 2) |
| 1309 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~S770-15~~ 770:2025 | Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams | NBC Table A-9.36.2.4.(1)D |
| 1309 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC-~~S770-15~~ 770:2025 | Méthode d'essai normalisée pour la détermination de la résistance thermique à long terme des mousses isolantes thermiques à alvéoles fermés | CNB Tableau A-9.36.2.4. 1)D |
| 1009 | ULC (UL Standards & Engagement (formerly ULC Standards)) | CAN/ULC-~~ORD-C107~~S675.~~12-92~~2:14 | ~~Line~~Standard for Nonvolumetric Precision Leak Detection Devices for Underground and Aboveground Storage Tanks and Piping for Flammable ~~Liquid~~and ~~Piping~~Combustible Liquids | NFC 4.4.2.1.(11)<br>NFC 4.4.3.4.(2)<br>NFC 4.4.4.2.(1) |

| Update | Issuing Agency | Document Number | Title of Document | Code Reference |
|---|---|---|---|---|
| 1009 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | CAN/ULC/~~ORD-C107~~S675~~-12-92~~2:14 | ~~Line~~Norme ~~Leak~~sur ~~Detection~~les ~~Devices~~dispositifs ~~for~~de ~~Flammable~~détection ~~Liquid~~des ~~Piping~~fuites de précision non volumétriques pour les réservoirs de stockage et les tuyauteries, souterrains et hors sol, de liquides inflammables et combustibles | CNPI 4.4.2.1. 11)<br>CNPI 4.4.3.4. 2)<br>CNPI 4.4.4.2. 1) |
| 841 | ULC (UL Standards & Engagement (formerly ULC Standards)) | ~~ULC~~ANSI/~~ORD-C536-98~~CAN/UL 536:2021 | Flexible Metallic Hose | NFC 4.5.6.14.(2)<br>CNPI 4.5.6.14. 2) |
| 1316 | ULC (UL Standards & Engagement (formerly ULC Standards)) | ~~ULC~~ANSI/~~ORD-C558-75~~CAN/UL 558:2025 | ~~Guide~~Industrial ~~for the Investigation of~~ Trucks, Internal Combustion Engine-Powered ~~Industrial Trucks~~ | NFC 3.1.3.1.(2) |
| 1316 | ULC (UL Standards & Engagement (anciennement Normes ULC/ULC Standards)) | ~~ULC~~ANSI/~~ORD-C558-75~~CAN/UL 558:2025 | ~~Guide~~Chariots ~~for~~de ~~the~~manutention ~~Investigation~~à ~~of~~moteur ~~Internal~~à ~~Combustion~~combustion ~~Engine-Powered Industrial Trucks~~interne | CNPI 3.1.3.1. 2) |
| 1299 | ULC (UL Standards & Engagement (formerly ULC Standards)) | ULC~~-S135-2022~~ 135:2025 | Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter) | NBC 3.1.5.1.(2)<br>CNB 3.1.5.1. 2) |

## RATIONALE

### Impact Analysis

To ensure that the Codes directly reflect modern technological and industrial progress, this proposed change updates the edition years of certain referenced documents in the National Model Codes. By doing so, this proposed change allows the Codes to actively keep pace with advancements and enable innovation without delaying the deployment of these advancements. Furthermore, this proposed change harmonizes compliance and minimizes confusion for Code users.

The supporting document attached below includes information submitted by the Standards Development Organizations ("Issuing Agencies") regarding the proposed updates to individual referenced documents in the National Model Codes. The supporting document also includes the

expected impact of the proposed updates. This information was reviewed by members of the National Model Codes Committees and the Standing Codes Coordination Committee, and no further impacts were identified.

## Supporting Document(s)

Combined Updates from Standards Development Organizations
(combined_updates_updated_2026-06-30-attached_to_pcf_final.pdf)

# Proposed Change 2192

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 3.3.1.19.(1) (first printing)**<br>**NBC25 Div.B 3.8.2.10. (first printing)**<br>**NBC25 Div.B 3.8.3.1. (first printing)**<br>**NBC25 Div.B 3.8.3.3. (first printing)**<br>**NBC25 Div.B 3.8.3.9. (first printing)** |
| Subject: | Accessibility |
| Title: | Updating References to CSA B651 to the 2023 Edition and Simplifying the Framework in NBC Subsection 3.8.3. on the Design Requirements for Accessibility in Buildings Intended for Public Use |
| Description: | This proposed change updates references to CSA B651 in the NBC to the 2023 edition and simplifies the framework in NBC Subsection 3.8.3. to provide one set of minimum requirements for the design of Part 3 and Part 9 public 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

In the context of public buildings, there is a desire to update the edition of the CSA B651 standard, "Accessible design of the built environment” (CSA B651-18), referenced in the National Building Code of Canada (NBC) from 2018 to 2023, as well as to update the minimum requirements in the NBC in Subsection 3.8.3.

A barrier to processing these updates is founded in the current structure of NBC Subsection 3.8.3., which gives designers the option to comply with either the requirements in the NBC or certain requirements in CSA B651-18. This “dual pathway”

structure was introduced to NBC 2015 and focuses mostly on buildings intended for use by the general public. In its current form (NBC 2025), both pathways are essentially equivalent in performance level, with some minor differences.

However, the introduction of the dual pathway has presented unintended consequences for updating the minimum requirements in Subsection 3.8.3., especially as the overall landscape of accessibility standards for the built environment in Canada has grown more complex in recent years. Amid this increasingly complex and rapidly evolving accessibility landscape, challenges related to the dual pathway that have recently arisen include:

- **Aligning the NBC with updates to this standard in a targeted and expedient way.** CSA Group has requested that the edition of this referenced standard in the NBC be updated from 2018 to 2023. When the edition of a referenced standard is updated in the NBC, the update applies in its entirety (i.e., the NBC will not usually reference different editions of a standard). However, some updated provisions in CSA/ASC B651:23 could more easily be considered to be referenced as NBC requirements than others (e.g., updates to the luminance contrast of tactile walking surface indicators, which already align with industry practice, are simpler to evaluate for reference in the NBC than updates to minimum space requirements, which require further analysis for their feasibility in small buildings and their defensibility as "minimum" requirements). At present, there is a delay in proposing that the NBC reference the more straightforward updates to CSA/ASC B651:23 because further evaluation is required for the more complex requirements in this standard.
- **Maintaining consistent minimum requirements in each pathway, as the NBC and this standard are updated.** Since both pathways are intended to be minimum requirements in the NBC, it is important for their performance level and scope to be consistent; challenges arise related to compliance and enforcement when the pathways diverge. For example, since Codes technical committees are developing new requirements on topics where the performance in certain areas may exceed that in CSA B651-18 or CSA/ASC B651:23 (e.g., installation requirements for menstrual product dispensers), a mismatch in performance between the two pathways is being created and is likely to cause confusion about the minimum requirements in the NBC. Similar issues may arise with the update from CSA B651-18 to CSA/ASC B651:23 (discussed above).
- **Addressing other relevant accessibility standards.** The volume and breadth of relevant accessibility standards is growing rapidly, especially considering the standards being developed by Accessibility Standards Canada (ASC) and other organizations. The dual pathway framework complicates the consideration, and possible introduction, of emerging standards, such as CAN-ASC 2.4., "Wayfinding and Signage".

To address these challenges and facilitate targeted updates to the NBC related to the accessible design of public buildings, this proposed change updates the edition of CSA B651 referenced in the NBC and simplifies the framework of Subsection 3.8.3.

## Justification

The proposed change:

1. simplifies the NBC Subsection 3.8.3. framework by removing the CSA B651 pathway option in Article 3.8.3.1. (while preserving the existing NBC pathway option), and
2. updates the remaining references in the NBC from CSA B651-18 to CSA/ASC B651:23.

**Simplification of the NBC Subsection 3.8.3. framework**

Simplifying the NBC Subsection 3.8.3. framework by removing the CSA B651 pathway creates a single list of minimum technical requirements (i.e., the NBC pathway). This proposed change would make it easier to:

- Add or update requirements in Subsection 3.8.3. (e.g., regarding accessible change spaces for adults) without creating a mismatch in minimum requirements between dual pathways.
- Directly reference CSA/ASC B651:23 in specific NBC provisions where justified and update references to future editions of the standard in a targeted manner.
- Simplify the consideration and possible future introduction of other relevant standards.

Designers could continue to follow the requirements in CSA/ASC B651:23 if they choose to or if required for their projects, while meeting the legislated minimum NBC requirements. A building designed in accordance with CSA/ASC B651:23 will generally meet or surpass the NBC minima.

The Ontario Building Code and the Alberta Building Code have not adopted the "dual pathway" structure, but do contain the requirements of the "NBC pathway". As harmonization efforts increase between the provinces and territories, it is expected that a simpler NBC framework will make it easier to achieve and maintain harmony in minimum requirements across Canada by allowing for targeted discussions of individual requirements and their implications for each of the provinces and territories before they are introduced in the NBC.

**Updating the remaining references from CSA B651-18 to CSA/ASC B651:23**

The NBC currently references specific clauses of CSA B651 for requirements for exterior walks, signage and, where provided, tactile direction indicators, outside of the dual pathway. By removing the dual pathway, updates to these references can be given due consideration.

This proposed change specifically:

- **Exterior walks** (NBC Clause 3.8.3.3.(1)(d)): updates general surface requirements, changes in level, gratings, and headroom and protrusions. The 2023 edition of the standard provides more explanatory material and images, and renumbers certain clause numbers. The only apparent change to technical requirements is related to texture- and luminance-contrasted surfaces, which are required in "large open plazas" (2023 edition) instead of "high pedestrian areas" (2018 edition).

- **Signage** (NBC Article 3.8.3.9.): simplifies requirements for visual information signs, where the 2023 edition of the standard removes a requirement that signs be "of uniform design" (but retains a requirement that signs used to convey the same information in the same facility be consistently shaped, coloured and positioned, thereby achieving the same goal via consistency in the delivery of information). The updates also address the provision of Braille on tactile signs by maintaining the requirement for Braille underneath text, but relaxing the requirement for Braille that is specific to raised pictograms (and instead providing guidance in an image and a note on how to address signs with both text and pictograms).
- **Tactile walking surface indicators** (NBC Sentence 3.3.1.19.(1)): applies to the geometry and colour of these indicators; the 2023 edition of the standard largely adds explanatory material. The only apparent change to technical requirements is the removal of the relaxation on luminance contrast with the adjacent surface for these indicators when yellow. Luminance contrast was 40% in the 2018 edition and increases to 50% in the 2023 edition to align with other colours of these indicators. Optional guidance on the optimal colour of yellow to use in these indicators is also provided in the 2023 edition.

As well, the term "luminance (colour) contrast" is used consistently in CSA/ASC B651:23, as opposed to "colour contrast" in CSA B651-18.

Several Code change requests have been received recommending the alignment of the NBC with the 2023 edition of CSA B651. These updates are not yet part of the current proposed change, but can be given greater and more timely consideration with the simplification of the NBC framework.

## PROPOSED CHANGE

**[3.3.1.19.] 3.3.1.19. Tactile Attention Indicators**

**[1] 1)** Except as provided in Sentence (2), tactile attention indicators complying with Clauses 4.4~~3~~.5.3.1, 4.4~~3~~.5.3.3 and 4.4~~3~~.5.3.4 of CSA/ASC B651:23, "Accessible design for the built environment", shall be installed

[a] a) at the top of *flights* of stairs that are unenclosed, and

[b] b) at drop-off edges with a change in elevation greater than 300 mm that are unprotected by a *guard*.

(See Note A-3.3.1.19.(1).)

**[3.8.2.10.] 3.8.2.10. Signs and Indicators**

**Note A-3.8.2.10.(5) Location of Tactile Direction Indicators.**

Designers are encouraged to refer to CSA/ASC B651:23, "Accessible design for the built environment", for recommended locations for tactile direction indicators.

**[3.8.3.1.] 3.8.3.1. Design ~~Standards~~**

**[1] 1)** *Buildings* or parts thereof and facilities that are required to be *barrier-free* shall be designed in accordance with this Subsection. (See Note A-3.8.3.1.(1)-2030.)

[a] a) ~~this Subsection, or~~

[b] b) ~~the provisions of CSA B651, "Accessible design for the built environment", listed in Table 3.8.3.1., in their entirety.~~

~~(See Note A-3.8.3.1.(1).)~~

**~~Table [3.8.3.1.] 3.8.3.1.~~**
**~~Barrier-free Design Provisions~~**
**~~Forming Part of Sentence [3.8.3.1.] 3.8.3.1.([1] 1)~~**

| ~~*Barrier-free* Application (Code References)~~ | ~~Applicable CSA B651 Provisions~~ |
|---|---|
| ~~Interior accessible routes (3.8.3.2.)~~ | ~~4.3 and 5.1~~ |
| ~~Exterior accessible routes (3.8.3.3.)~~ | ~~8.2.1 to 8.2.5 and 8.2.7~~ |
| ~~Passenger pickup areas (3.8.3.4.)~~ | ~~9.3~~ |
| ~~*Ramps* (3.8.3.5.)~~ | ~~5.3 and 5.5~~ |
| ~~Doors and doorways (3.8.3.6.)~~ | ~~5.2~~ |
| ~~Passenger-elevating devices (3.8.3.7.)~~ | ~~5.6.2~~ |
| ~~Operating controls (3.8.3.8.)~~ | ~~4.2~~ |
| ~~Signage (3.8.3.9.)~~ | ~~4.5 and 9.4.4~~ |
| ~~Drinking fountains (3.8.3.10.)~~ | ~~6.1~~ |
| ~~Washroom facilities (3.8.3.12. to 3.8.3.16.)~~ | ~~6.2 and 6.3~~ |
| ~~Bathing facilities (3.8.3.17. and 3.8.3.18.)~~ | ~~6.5~~ |
| ~~Communication (3.8.3.19. and 3.8.3.21.)~~ | ~~6.6~~ |
| ~~Counters (3.8.3.20. and 3.8.3.21.)~~ | ~~6.7.1~~ |
| ~~Spaces in seating areas (3.8.3.22.)~~ | ~~6.7.3~~ |

**Note A-3.8.3.1.(1)-2030 Barrier-free Design ~~Standards~~.**

The NBC provisions in Subsection 3.8.3. are minimum requirements. Designers may

wish to consider higher-performance provisions in accessibility standards or guidelines intended for public buildings.~~Code users who opt to apply the provisions of CSA B651, "Accessible design for the built environment", listed in Table 3.8.3.1. must do so without exception: they cannot randomly select and apply a mix of provisions from the NBC and that standard.~~

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**[3.8.3.3.] 3.8.3.3. Exterior Walks**

**[1] 1)** Exterior walks that form part of a *barrier-free* path of travel shall

[a] a) have a slip-resistant, continuous and even surface,

[b] b) be not less than 1 600 mm wide,

[c] c) have a level area conforming to Clause 3.8.3.5.(1)(c) adjacent to an entrance doorway, and

[d] d) be designed in accordance with Clause 8.2.1 of CSA/ASC B651:23, "Accessible design for the built environment",

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**[3.8.3.9.] 3.8.3.9. Accessible Signs**

**[1] 1)** Visual information signs required by Subsections 3.4.5., 3.4.6. and 9.9.11., and 3.8.2.10. shall comply with Clauses 4.6~~5~~.2, 4.6~~5~~.3 and 4.6~~5~~.4 of CSA/ASC B651:23, "Accessible design for the built environment". (See Note A-3.8.3.9.(1) and (2).)

**[2] 2)** Tactile information signs required by Subsections 3.4.5., 3.4.6. and 9.9.11., and Article 3.8.2.10. shall

[a] a) have Braille and tactile characters in accordance with Clauses 4.6~~5~~.6.2 and 4.6~~5~~.6.3 of CSA/ASC B651:23, "Accessible design for the built environment",

[b] b) be installed on the wall closest to the latch side of the door or on the nearest wall on the right side of the door, where there is no wall at the latch side, and

[c] c) be centred 1 500 mm above the finished floor with the edge of the sign located not more than 300 mm from the door.

(See Note A-3.8.3.9.(1) and (2).)

**[3] 3)** Signs required by Article 3.8.2.10. shall incorporate the International Symbol of Access or the International Symbol of Access for Hearing Loss and appropriate graphical or textual information that clearly indicates the type of facilities available. (See Note A-3.8.3.9.(3).)

**[4] 4)** Tactile direction indicators referred to in Sentence 3.8.2.10.(5) shall comply with Clauses 4.4~~3~~.5.4.1, 4.4~~3~~.5.4.3 and 4.4~~3~~.5.4.4 of CSA/ASC B651:23, "Accessible design for the built environment".

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## Impact analysis

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**Simplification of NBC Subsection 3.8.3.**

***Impact on compliance and enforcement:*** The proposed change is expected to simplify compliance with and enforcement of Subsection 3.8.3. by providing a single list of minimum requirements. The importance of simplicity and clarity in what constitutes the minimum is expected to increase in future years as accessibility requirements expand in the Codes, which would be facilitated by the simplified NBC framework in Subsection 3.8.3.

***Impact on accessibility:*** The proposed change would not substantively impact the current minimum performance level of the current accessibility requirements in Subsection 3.8.3., which are relatively aligned with CSA B651-18. A benefit is that removing this pathway option would make it easier to develop new requirements and update specific requirements in the NBC in a targeted way, without being constrained to aligning with CSA B651 in its entirety and without introducing minimum requirements that do not match in the dual-pathway system. Simplifying the framework to a single set of requirements would also make it easier to consider additional standards as relevant to the NBC, such as the emerging publications by Accessibility Standards Canada.

Designers could continue to voluntarily follow CSA B651:23 and meet or surpass most minimum NBC requirements for accessibility.

***Impact on the provinces and territories:*** The proposed change would align the NBC structure with that of the codes in Alberta and Ontario, which do not include the dual pathway that appears in NBC Subsection 3.8.3. By simplifying the targeted alignment of NBC requirements with specific CSA/ASC B651:23 requirements, it may be easier to harmonize aspects of the codes across Canada because individual requirements can be analyzed for their impacts in individual geographic regions.

**Relevant updates to the remaining provisions that specifically reference CSA B651-18**

The proposed change also proposes to update the CSA B651-18 edition to CSA/ASC B651:23, where it is directly referenced in the NBC pathway, for some requirements for exterior walks, signage and tactile direction indicators. Most of the differences between the two editions of the standard are related to additional explanatory material and images that will ultimately improve understanding and simplify compliance for designers, manufacturers and builders aiming to comply with the NBC, as well as for building officials in charge of enforcement. There are minor technical differences, largely related to removing redundant requirements for signage, clarifying the application of exterior path requirements to plazas, and improving the luminance contrast requirements for tactile walking surface indicators that are yellow.

Future proposed changes to the NBC may aim to align with CSA/ASC B651:23, where justified, as minimum requirements.

## Enforcement implications

By proposing only one "minimum" pathway in NBC Subsection 3.8.3., this proposed change reduces the number of different requirements that building officials need to be aware of and would make it easier for building officials to verify compliance.

## Who is affected

Designers and builders would more easily be able to identify and comply with minimum NBC requirements (and continue to voluntarily comply with CSA/ASC B651:23 and/or exceed NBC minimum requirements should they choose to).

Building officials would more easily be able to identify and enforce the minimum requirements in the NBC.

### Supporting Document(s)

Supporting Document for PCF 2192
(supporting_document_for_pcf_2192_2026-10-14.pdf)

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[3.3.1.19.] 3.3.1.19. ([1] 1) [F30-OS3.1]**

**[3.8.2.10.] 3.8.2.10. ([1] 1) [F74-OA2]**

**[3.8.2.10.] 3.8.2.10. ([1] 1) no attributions**

**[3.8.2.10.] 3.8.2.10. ([2] 2) [F74-OA2]**

**[3.8.2.10.] 3.8.2.10. ([3] 3) [F74-OA2]**

**[3.8.2.10.] 3.8.2.10. ([3] 3) no attributions**

**[3.8.2.10.] 3.8.2.10. ([4] 4) [F74-OA2]**

**[3.8.2.10.] 3.8.2.10. ([4] 4) no attributions**

**[3.8.2.10.] 3.8.2.10. ([5] 5) no attributions**

**[3.8.3.1.] 3.8.3.1. ([1] 1) no attributions**

**[3.8.3.3.] 3.8.3.3. ([1] 1) ([a] a) [F73-OA1]**

**[3.8.3.3.] 3.8.3.3. ([1] 1) ([a] a) [F30-OS3.1]**

**[3.8.3.3.] 3.8.3.3. ([1] 1) ([b] b) [F73-OA1]**

[3.8.3.3.] 3.8.3.3. ([1] 1) ([c] c)

[3.8.3.3.] 3.8.3.3. ([1] 1) ([d] d) [F30-OS3.1]

[3.8.3.9.] 3.8.3.9. ([1] 1) [F74-OA2]

[3.8.3.9.] 3.8.3.9. ([1] 1) [F73-OA1]

[3.8.3.9.] 3.8.3.9. ([2] 2) [F74-OA2]

[3.8.3.9.] 3.8.3.9. ([2] 2) [F73-OA1]

[3.8.3.9.] 3.8.3.9. ([3] 3) [F74-OA2]

[3.8.3.9.] 3.8.3.9. ([3] 3) [F73-OA1]

[3.8.3.9.] 3.8.3.9. ([4] 4) [F74-OA2]

# Proposed Change 2173

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 3.6.4.3.(1) (first printing)** |
| Subject: | Building Fire Safety |
| Title: | Requirements for Certain Discrete Products Installed in Plenums |
| Description: | This proposed change adds CAN/ULC-S142:2016, "Standard Method of Fire Test for Heat and Visible Smoke Release for Discrete Products", as a test method for these discrete stand-alone, non-continuous products installed in concealed spaces used as plenums. |
| Related Code Change Request(s): | CCR 1793 |

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

Clause 3.6.4.3.(1)(a) of the National Building Code of Canada (NBC) requires materials located within certain concealed spaces used as plenums to have a flame-spread rating not more than 25 and a smoke developed classification not more than 50, with certain exceptions. Where the ratings cannot be determined using the test methods described in CAN/ULC-S102, “Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies,” as required by Article 3.1.12.1., Sentence 3.6.4.3.(1) provides other testing requirements by type of component.

The term “discrete products,” as used in CAN/ULC-S142:2016, “Standard Method of Fire Test for Heat and Visible Smoke Release for Discrete Products,” refers to stand-alone, non-continuous products that are not installed in a continuous manner. These products cannot be tested using the tunnel equipment referenced in CAN/ULC-S102.

Sentence 3.6.4.3.(1) does not currently include requirements for these discrete products. As a result, discrete products that are tested in conformance with CAN/ULC-S142 do not have a clear acceptance pathway; this proposed change addresses the gap in the NBC.

## Justification

CAN/ULC-S102 requires test specimens that are large, continuous, and approximately 0.5 m to 0.6 m in width and 7.32 m in length. Many components placed in concealed plenum spaces cannot be tested using this method due to their geometry, mass, type of installation, or inability to be fabricated into continuous tunnel-test specimens.

By contrast, CAN/ULC-S142 was developed specifically to evaluate the fire performance of discrete products that are not suitable for testing in conformance with CAN/ULC-S102. The test method described in CAN/ULC-S142 exposes products to a 60 kW ignition source and measures heat release and smoke production using oxygen-consumption calorimetry. Acceptable products must exhibit a peak heat release rate of 100 kW or less, a maximum normalized optical density of 0.5 or less, and an average normalized optical density of 0.15 or less. These thresholds demonstrate that discrete products conforming to CAN/ULC-S142 can limit the severity and effects of fire within a plenum in a manner consistent with the intent of the NBC.

To clarify the acceptance of discrete products installed within concealed spaces used as plenums, this proposed change includes a reference to CAN/ULC-S142 to align the Code with the requirements specified in the standard.

## PROPOSED CHANGE

**[3.6.4.3.] 3.6.4.3. Plenum Requirements**

**[1] 1)** A concealed space used as a *plenum* within a floor assembly or within a roof assembly need not conform to Sentence 3.1.5.18.(1) and Article 3.6.5.1., provided

[a] a) all materials within the concealed space have a *flame-spread rating* not more than 25 and a smoke developed classification not more than 50, except for

[i] i) tubing for pneumatic controls,

[ii] ii) optical fibre cables and electrical wires and cables with *combustible* insulation, jackets or sheathes that are used for the transmission of voice, sound or data and conform to Sentences 3.1.4.3.(2) and 3.1.5.21.(2),

[iii] iii) totally enclosed non-metallic raceways with an FT6 rating, when tested in accordance with Sentence 3.1.5.23.(2), in *buildings* required to be of *noncombustible construction* or in *buildings* or parts of *buildings* permitted to be of *encapsulated*

*mass timber construction*, ~~and~~

[iv] iv) totally enclosed non-metallic raceways with an FT4 rating, when tested in accordance with Clause 3.1.5.23.(1)(a), in *buildings* permitted to be of *combustible construction*, and

[v] --) discrete stand-alone, non-continuous products that are not installed in a continuous manner, when tested in accordance with CAN/ULC-S142, "Standard Method of Fire Test for Heat and Visible Smoke Release for Discrete Products," and

[b] b) the supports for the ceiling membrane are of *noncombustible* material having a melting point not below 760°C.

## Impact analysis

No significant additional cost impacts are anticipated. The proposed change would clarify the appropriate acceptance pathway for discrete, stand-alone, non-continuous products that are not installed in a continuous manner and therefore may not be appropriately tested using CAN/ULC-S102.

For discrete products, CAN/ULC-S142 is considered a more suitable test method than CAN/ULC-S102, because it better reflects the product configuration and intended installation conditions. This approach is consistent with the industry position that such products should be evaluated using a test method that is technically appropriate to how they are used in buildings. Manufacturers are not expected to incur significant additional expenses to demonstrate compliance, as the proposed change would clarify the applicable test method.

The proposed change would also reduce project costs by providing a clear compliance pathway and avoiding unnecessary redesign, substitution or uncertainty regarding the use of discrete products in certain concealed spaces, where testing in accordance with CAN/ULC-S102 is not applicable. Benefits would include improved clarity for design professionals, manufacturers, and authorities having jurisdiction (AHJs), as well as more consistent application of fire safety requirements.

## Enforcement implications

No additional enforcement resources are expected as a result of this proposed change. AHJs would continue to ensure that these discrete products comply with the applicable referenced standard for their intended applications. This proposed change simply specifies the correct test method to be applied, without impacting the enforcement process or the responsibility of AHJs to verify compliance with the referenced standard.

## Who is affected

This proposed change may affect a wide range of stakeholders involved in design, specification, manufacture, approval and construction; including, but not limited to, designers, specifiers, manufacturers, building owners, contractors and building officials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[3.6.4.3.] 3.6.4.3. ([1] 1) [F02-OS1.2]**

# Proposed Change 1666

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 3.8.2.3. (first printing)** |
| Subject: | Accessibility — Low-Cost and No-Cost Items |
| Title: | Clarification of Requirements for Certain Clear Spaces Where Required for Barrier-free Facilities |
| Description: | This proposed change requires clear floor spaces to be connected to a barrier-free path of travel where these spaces are required for barrier-free facilities. |
| Related Code Change Request(s): | CCR 1781, CCR 1783 |

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) prescribes requirements for clear floor spaces within or adjacent to facilities that are intended to be barrier-free, such as lavatories, mirrors, telephones, water fountains, and water closets. The purpose of these clear floor spaces is to enable people using mobility devices to "park" their devices while using building facilities (e.g., while drinking from a water fountain). However, the NBC does not explicitly require that there be space to maneuver a mobility device when approaching or leaving the stationary position. This was also commented on in relation to another proposed change for the 2020 edition of the NBC.

While it may be implied that a barrier-free path of travel should connect to all the barrier-free facilities in a building (such as a path from the entrance of a washroom to a lavatory and to a barrier-free water closet), the NBC only states that a barrier-free path of travel be provided to all normally occupied floor areas.

The possible lack of a continuous barrier-free path could impede the movement of people using mobility devices and impede their access to and use of facilities in the building.

## Justification

This proposed change would clarify that, where clear floor spaces are required by barrier-free facilities, the clear floor space

- needs to be served by a barrier-free path of travel, and
- is permitted to overlap (unless prohibited in specific cases).

By clarifying that required clear floor spaces need to be served by a barrier-free path of travel, this proposed change is expected to limit the probability that a person who uses a wheeled mobility device would not be able to circulate to or maneuver by barrier-free facilities.

This proposed change introduces a related explanatory Note to provide additional clarity on the intended interpretation of this proposed change.

This proposed change is also being introduced in response to a public review comment that was received during the 2020 Codes cycle.

## PROPOSED CHANGE

**[3.8.2.3.] 3.8.2.3. Areas Requiring or Served by a Barrier-Free Path of Travel (See Note A-3.8.2.3.)**

**[1] 1)** Except as permitted by Sentence (2), a *barrier-free* path of travel from the entrances required by Sentence 3.8.2.2.(1) to be *barrier-free* shall be provided throughout the entrance *storey* and within all other normally occupied *floor areas*. (See Article 3.3.1.7. for additional requirements regarding *floor areas* above or below the *first storey* to which a *barrier-free* path of travel is required.)

**[2] 2)** A *barrier-free* path of travel for persons in wheelchairs is not required

[a] a) to *service rooms*,

[b] b) to elevator machine rooms,

[c] c) to janitors' rooms,

[d] d) to *service spaces*,

[e] e) to crawl spaces,

[f] f) to *attic or roof spaces*,

[g] g) to the floor level above or below the entrance level in *buildings* no more than 2 *storeys* in *building height* or in 2-*storey suites*, unless the floor level above or below (see Note A-3.8.2.3.(2)(g))

[i] i) is served by a passenger elevator, a platform-equipped

passenger-elevating device, an escalator or an inclined moving walk,

[ii] ii) is 600 $m^2$ or more in *floor area*,

[iii] iii) contains facilities that are not contained on the entrance level, but that are integral to the principal function of the entrance level, or

[iv] iv) contains an *assembly occupancy* more than 100 $m^2$ in *floor area*,

[h] h) within a parking level with no *barrier-free* parking spaces,

[i] i) within *high-hazard industrial occupancies*,

[j] j) within portions of a *floor area* with fixed seats in an *assembly occupancy* where those portions are not part of the *barrier-free* path of travel to spaces designated for wheelchair use,

[k] k) within floor levels of a *suite* of *residential occupancy* that are not at the same level as the entry level to the *suite*, or

[l] l) within a *suite* of *residential occupancy* that has not been designated by an *authority having jurisdiction* to be accessible for use by persons with physical disabilities.

**[3] --)** Where a clear floor space is required to serve a *barrier-free* facility, the clear floor space shall

[a] --) be served by a *barrier-free* path of travel, and

[b] --) unless otherwise specified, be permitted to overlap another clear floor space, including a *barrier-free* path of travel.

(See Note A-3.8.2.3.(3).)

**[4] 3)** In an *assembly occupancy*, the number of spaces designated for wheelchair use within rooms or areas with fixed seats shall conform to Table 3.8.2.3. (See also Article 3.8.3.22. for additional requirements.)

**[5] 4)** The number of spaces designated for wheelchair use within waiting rooms or areas with fixed seats shall conform to Table 3.8.2.3. (See Note A-3.8.2.3.(4).) (See also Article 3.8.3.22. for additional requirements.)

**[6] 5)** Except as provided in Sentence (6), in an *assembly occupancy* with more than 25 fixed seats, each row of seats served by two aisles shall have one adaptable seat conforming to Subsection 3.8.3. located adjacent to one of the aisles. (See Note A-3.8.2.3.(5) and (6) and 3.8.3.22.(1) and (4).)

**[7] 6)** At least 5% of the adaptable seats required by Sentence (5) but no more than 20 adaptable seats shall adjoin a *barrier-free* path of travel. (See Note A-3.8.2.3.(5) and (6) and 3.8.3.22.(1) and (4).)

**Table [3.8.2.3.] 3.8.2.3.**
**Designated Wheelchair Spaces**
**Forming Part of Sentences [3.8.2.3.] 3.8.2.3.([4] 3) and ([5] 4)**

| Number of Fixed Seats in Seating Area | Number of Spaces Required for Wheelchairs |
|---|---|
| 2 - 99 | 2 |
| 100 - 499 | 3, plus 1 for each additional increment of 70 seats in excess of 100 |
| 500 - 1 999 | 9, plus 1 for each additional increment of 80 seats in excess of 500 |
| 2 000 - 7 999 | 28, plus 1 for each additional increment of 95 seats in excess of 2 000 |
| Over 7 999 | 91, plus 1 for each additional increment of 100 seats in excess of 8 000 |

**Note A-3.8.2.3.(3) Clear Floor Spaces Served by the Barrier-Free Path of Travel.**

Sentence 3.8.2.3.(3) is intended to ensure the building facilities that are required to be barrier-free and have a clear floor space in accordance with Subsection 3.8.3. also connect to the barrier-free path of travel. Examples of these building facilities are certain lavatories, mirrors, water fountains, water closets and telephones. The connection between the barrier-free path of travel and the clear floor space enables a person using a wheeled mobility device to travel to the barrier-free building facility and maneuver within the clear floor space that is adjacent to, or within, the facility without being impeded.

## Impact analysis

This proposed change is expected to improve the accessibility of barrier-free facilities for people who use wheeled mobility aids by providing explicit clarity that the clear floor spaces near these facilities need to be served by a barrier-free path of travel.

For designers who do not yet in practice connect clear floor spaces serving barrier-free facilities to the barrier free path of travel in their designs, the impact of this proposed change would be greater. Floor layouts and the location of facilities requiring clear floor spaces for accessibility purposes may need to be adjusted so that these spaces are served by a barrier-free path of travel and can be more easily accessed by their intended users.

For designers who already incorporate barrier-free paths of travel throughout floor areas to serve all relevant barrier-free facilities, the impact of this proposed change is expected to be negligible because their designs in practice are already compliant.

## Enforcement implications

This proposed change is expected to simplify enforcement by providing greater clarity on where a barrier-free path of travel needs to connect to clear floor spaces serving barrier-free building facilities. The dimensional requirements can be verified using existing practices.

## Who is affected

Designers and builders would need to ensure that their designs meet accessibility requirements for access to buildings and use of building facilities.

Regulators who review plans and buildings would need to check that clear floor spaces are adequately connected to a barrier-free path of travel.

People using wheelchairs or other mobility devices would be better able to access and use barrier-free building facilities.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[3.8.2.3.] 3.8.2.3. ([1] 1) [F73-OA1]**

**[3.8.2.3.] 3.8.2.3. ([2] 2) no attributions**

**[3.8.2.3.] -- ([3] --) [F73-OA1]**

**[3.8.2.3.] -- ([3] --) [F74-OA2]**

**[3.8.2.3.] 3.8.2.3. ([4] 3) [F74-OA2]**

**[3.8.2.3.] 3.8.2.3. ([5] 4) [F74-OA2]**

**[3.8.2.3.] 3.8.2.3. ([6] 5) [F74-OA2]**

**[3.8.2.3.] 3.8.2.3. ([6] 5) [F10-OS3.7]** Applies to portion of Code text: "... each row of seats served by two aisles shall have one adaptable seat conforming to Subsection 3.8.3. located adjacent to one of the aisles."

**[3.8.2.3.] 3.8.2.3. ([7] 6) [F74-OA2]**

# Proposed Change 2225

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 5.9.1.1. (first printing)**<br>**NBC25 Div.B 9.25.2.2.(1) (first printing)**<br>**NBC25 Div.B 9.25.2.5.(1) (first printing)**<br>**NBC25 Div.B 9.36.2.4.(1) (first printing)** |
| Subject: | Environmental Separation |
| Title: | Introduction of References to CAN/ULC 743.1:2020 and CAN/ULC 743.2:2021 |
| Description: | This proposed change introduces references to CAN/ULC 743.1:2020, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 1: Material Specification," and CAN/ULC 743.2:2021, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 2: Installation," to the NBC. |
| Related Code Change Request(s): | CCR 1656, CCR 1657 |

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

Currently, no explicit requirements related to low-pressure spray-applied two-component polyurethane foam are included in Parts 5 or 9 of the National Building Code of Canada (NBC). Nevertheless, this material is commonly used in practice to provide resistance to heat flow and air movement.

This situation leads to inconsistencies in the use of this material in design and construction across Canada and in the performance of this material where used. These inconsistencies could result in poor thermal barrier performance and poor air barrier performance, which could result in inadequate indoor air quality, mould growth and the reduced resistance to deterioration of wall and roof assemblies.

## Justification

Currently, the use of low-pressure spray-applied two-component polyurethane foam in Canada is not governed by minimum requirements in the NBC. Therefore, it is very difficult for building officials to enforce minimum performance requirements for this material, which has led to its inconsistent use in design and construction. To address this situation, this proposed change introduces references to standards in Parts 5 and 9 of the NBC that provide the minimum material and installation requirements for low-pressure spray-applied two-component polyurethane foam.

CAN/ULC 743.1, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 1: Material Specification," and CAN/ULC 743.2, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 2: Installation,"

- reflect the minimum performance level in terms of material specification and installation,
- are suitable for reference in the NBC,
- would harmonize the minimum performance of this material across Canada, and
- would support minimizing the risks to the health of Canadians caused by poor thermal performance and poor air barrier performance, which could result in inadequate indoor air quality, mould growth and the reduced resistance to deterioration of wall and roof assemblies.

## PROPOSED CHANGE

**NBC25 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 |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| 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/C836M | Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course |
| ASTM | C840 (1) (2) | Standard Specification for Application and Finishing of Gypsum Board |
| ASTM | C920 | 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 (3) | Standard Specification for Gypsum Board |
| ASTM | C1658/C1658M (4) | Standard Specification for Glass Mat Gypsum Panels |
| ASTM | D1227/D1227M | Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing |
| ASTM | D3019/D3019M (5) | Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered |
| ASTM | D3679 (6) | Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding |
| ASTM | D4477 (7) | 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 (8) | Standard Specification for Polypropylene (PP) Siding |
| ASTM | D7793 (9) | 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-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-51.33-M | Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction |
| CGSB | CAN/CGSB-51.34 | Polyethylene sheet for use in building construction – Material specification |
| 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 |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| CSA | A123.24 | Standard test method for wind resistance of vegetated roof assembly |
| CSA | A123.25 | Asphalt core boards used in roofing |
| 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 | G401 | Corrugated steel pipe and buried structures |
| 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-704.1 | Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced |
| ULC | CAN/ULC 712.1 | Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Material Specification |
| ULC | CAN/ULC 712.2 | Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Installation |
| ULC | CAN/ULC 717.1 | Standard for Flat Wall Insulating Concrete Form (ICF) Units – Material Properties |
| ULC | CAN/ULC 743.1:2020 | Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 1: Material Specification |
| ULC | CAN/ULC 743.2:2021 | Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 2: Installation |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| 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-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 Insulating Wood Fibre 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 |

**Notes to Table [5.9.1.1.] 5.9.1.1.:**

(1) See Note A-Table 5.9.1.1.

(2) Flat wall insulating concrete form units shall conform to CAN/ULC 717.1 in lieu of ASTM E2634 as indicated in ASTM C840.

(3) 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.

(4) 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.

(5) 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.

(6) 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.

(7) 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.

(8) 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.

(9) 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.

**NBC25 Div.B 9.25.2.2.(1) (first printing)**
**[9.25.2.2.] 9.25.2.2. Insulation Materials**

**[1] 1)** Except as required in Sentence (2), thermal insulation shall conform to the requirements of
[a] a) ASTM C726, "Standard Specification for Mineral Wool Roof Insulation Board",
[b] b) CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced",

[c] c) CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill",

[d] g) CAN/ULC-704.1, "Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced",

[e] j) CAN/ULC 712.1, "Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Material Specification",

[f] --) CAN/ULC 743.1:2020, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 1: Material Specification",

[g] d) CAN/ULC-S701.1, "Standard for Thermal Insulation, Polystyrene Boards",

[h] e) CAN/ULC-S702.1, "Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification",

[i] f) CAN/ULC-S703, "Standard for Cellulose Fibre Insulation (CFI) for Buildings",

[j] h) CAN/ULC-S705.1, "Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification", or

[k] i) CAN/ULC-S706.1, "Standard for Insulating Wood Fibre Boards for Buildings". ~~or~~

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**NBC25 Div.B 9.25.2.5.(1) (first printing)**

**[9.25.2.5.] 9.25.2.5. Installation of Spray-Applied Polyurethane**

**[1] 1)** Spray-applied polyurethane insulation shall be installed in accordance with

[a] b) CAN/ULC 712.2, "Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Installation",

[b] --) CAN/ULC 743.2:2021, "Standard for Thermal Insulation – Low Pressure Applied Two Component Spray Polyurethane Foam, Part 2: Installation", or

[c] a) CAN/ULC-S705.2, "Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application". ~~or~~

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**NBC25 Div.B 9.36.2.4.(1) (first printing)**

**[9.36.2.4.] 9.36.2.4. Calculation of Effective Thermal Resistance of Assemblies**

**[1] 1)** In calculating the thermal resistance of assemblies for the purpose of comparison with the requirements of Articles 9.36.2.6. and 9.36.2.8., the thermal bridging effect of closely spaced, repetitive structural members, such as studs and joists, and of ancillary members, such as lintels, sills and plates, shall be accounted for. (See Note A-9.36.2.4.(1).)

**Note A-9.36.2.4.(1) Calculating the Effective Thermal Resistance of Building Envelope Assemblies.**

The general theory of heat transfer is based on the concept of the thermal transmittance through an element over a given surface area under the temperature difference across the element (see Sentence 9.36.1.2.(2)). As such, the NECB requires all building envelope assemblies and components to comply with the maximum U-values (overall thermal transmittance) stated therein. However, the requirements in Subsection 9.36.2. are stated in RSI values (effective thermal resistance values), which are the reciprocal of U-values.

To calculate effective thermal resistance, Section 9.36. requires that contributions from all portions of an assembly—including heat flow through studs and insulation—be taken into account because the same insulation product (nominal insulation value) can produce different effective thermal resistance values in different framing configurations. The resulting effective thermal resistance of an assembly also depends on the thermal properties and thickness of the building materials used and their respective location.

The following paragraphs provide the calculations to determine the effective thermal resistance values for certain assemblies and the thermal characteristics of common building materials. The Tables in Notes A-9.36.2.6.(1) and A-9.36.2.8.(1) confirm the compliance of common building assemblies.

**Calculating the Effective Thermal Resistance of a Steel-frame Assembly**

The parallel-path flow method described above for wood-frame assemblies involves simple one-dimensional heat flow calculations based on two assumptions:

- that the heat flow through the thermal bridge (the stud) is parallel to the heat flow through the insulation, and
- that the temperature at each plane is constant.

Tests performed on steel-frame walls have shown that neither of these assumptions properly represents the highly two-dimensional heat flow that actually occurs. The difference between what is assumed and what actually occurs is even more significant in steel-frame assemblies. The results achieved using the calculation method below compare well with those achieved from actual tests. The method provides a good approximation if a thermal resistance value of 0.0000161 ($m^2 \times K$)/W per mm (or a conductivity of 62 (W×m)/($m^2 \times °C$)) is used (this value is associated with galvanized steel with a carbon content of 0.14%).

To calculate the effective thermal resistance of a building envelope assembly consisting of steel framing, $RSI_{eff}$, use the following equation:

$$RSI_{eff} = K_1 RSI_{T1} + K_2 RSI_{T3}$$

where

$RSI_{T1}$ = effective thermal resistance of building envelope assembly determined using parallel-path flow method for wood-frame assemblies (use framing and cavity percentages in Table A-9.36.2.4.(1)-C),

$RSI_{T3}$ = $RSI_{T2}$ + thermal resistance values of all other components except steel studs and insulation,
where $RSI_{T2}$ = effective thermal resistance of steel studs and insulation determined using parallel-path flow method for wood-frame assemblies,

$K_1$ = applicable value from Table A-9.36.2.4.(1)-B, and

$K_2$ = applicable value from Table A-9.36.2.4.(1)-B.

**Table [A-9.36.2.4.(1)-B] A-9.36.2.4.(1)-B**
**Values for $K_1$ and $K_2$**

| Framing Spacing, mm | $K_1$ | $K_2$ |
|---|---|---|
| < 500 without insulating sheathing | 0.33 | 0.67 |
| < 500 with insulating sheathing | 0.40 | 0.60 |
| ≥ 500 | 0.50 | 0.50 |

**Table [A-9.36.2.4.(1)-C] A-9.36.2.4.(1)-C**
**Framing and Cavity Percentages for Typical Steel-frame Assemblies (1)**

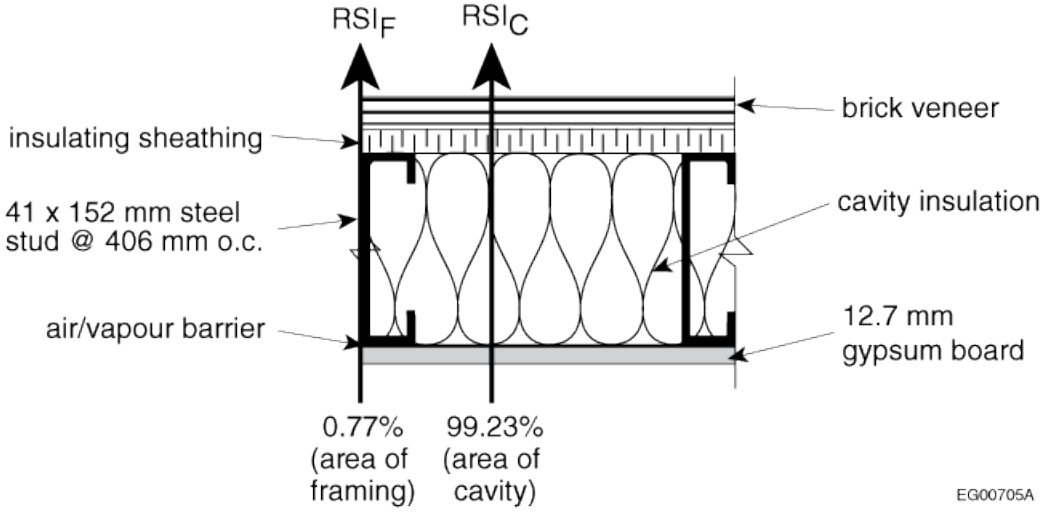
| Steel-frame Assemblies | Frame Spacing, mm o.c. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | < 500 | | ≥ 500 | | < 2100 | | ≥ 2100 | |
| | % Area Framing | % Area Cavity | % Area Framing | % Area Cavity | % Area Framing | % Area Cavity | % Area Framing | % Area Cavity |
| Roofs, ceilings, floors | 0.43 | 99.57 | 0.33 | 99.67 | — | — | — | — |
| Above-grade walls and strapping | 0.77 | 99.23 | 0.67 | 99.33 | — | — | — | — |
| Below-grade walls and strapping | 0.57 | 99.43 | 0.33 | 99.67 | — | — | — | — |
| Sheet steel wall | — | — | — | — | 0.08 | 99.92 | 0.06 | 99.94 |

**Note to Table [A-9.36.2.4.(1)-C] A-9.36.2.4.(1)-C:**

(1) The framing percentages given in this Table are based on common framing practices and not simply on the width of the studs and cavity. They are based on 18-gauge (1.2 mm) steel; however, test results indicate that, for the range of thicknesses normally used in light-steel framing, the actual thickness has very little effect on the effective thermal resistance. If the actual % areas of framing and cavity are known, those should be used rather than the ones in this Table.

**Example – Calculation of $RSI_{eff}$ for a 41 × 152 mm Steel-frame Wall Assembly with Studs 406 mm o.c.**

**Figure [A-9.36.2.4.(1)-B] 1-**
**$RSI_{eff}$ calculation parameters for a 41 × 152 mm steel-frame wall assembly**



**1. Calculate $RSI_{T1}$**

| Materials in Assembly | $RSI_F$ (thermal resistance through framing) | $RSI_C$ (thermal resistance through cavity) |
|---|---|---|
| Outside air film | 0.03 | 0.03 |
| Brick veneer | 0.07 | 0.07 |
| Air space (25 mm thick) | 0.18 | 0.18 |
| Extruded polystyrene (38 mm thick × RSI 0.035/mm) | 1.33 | 1.33 |
| Steel stud (152 mm thick × RSI 0.0000161/mm) | 0.0023 | — |
| Insulation (152 mm thick; RSI 3.52 (R20) batts) | — | 3.52 |
| Polyethylene (vapour barrier) | — | — |
| Gypsum (12.7 mm thick) | 0.08 | 0.08 |
| Interior air film | 0.12 | 0.12 |
| Total | 1.81 | 5.33 |
| % area framing and cavity from Table A-9.36.2.4.(1)-C | 0.77% | 99.23% |
| $RSI_{T1} = \frac{100}{\frac{0.77}{1.81} + \frac{99.23}{5.33}} = \frac{5.25\left(m^2K\right)}{W}$ | (U-value = 0.19 W/(m²×K)) | |

**2. Calculate $RSI_{T2}$**

| Materials in Assembly | $RSI_F$ (thermal resistance through framing) | $RSI_C$ (thermal resistance through cavity) |
|---|---|---|
| Steel stud (152 mm thick × RSI 0.0000161/mm) | 0.0023 | — |
| Insulation (152 mm thick; RSI 3.52 (R20) batts) | — | 3.52 |

| Materials in Assembly | $RSI_F$ (thermal resistance through framing) | $RSI_C$ (thermal resistance through cavity) |
|---|---|---|
| Total | 0.0023 | 3.52 |
| % area framing and cavity from Table A-9.36.2.4.(1)-C | 0.77% | 99.23% |
| $RSI_{T2} = \frac{100}{\frac{0.77}{0.0023} + \frac{99.23}{3.52}} = \frac{0.27\left(m^2K\right)}{W}$ | (U-value = 3.69 W/(m²×K)) | |

**3. Calculate $RSI_{T3}$**

| Materials in Assembly | RSI through Assembly |
|---|---|
| Outside air film | 0.03 |
| Brick veneer | 0.07 |
| Air space (25 mm thick) | 0.18 |
| Extruded polystyrene (38 mm thick × RSI 0.035/mm) | 1.33 |
| $RSI_{T2}$ | 0.27 |
| Polyethylene (vapour barrier) | — |
| Gypsum (12.7 mm thick) | 0.08 |
| Interior air film | 0.12 |
| | $RSI_{T3}$ = 2.08 ($m^2$×K)/W (U-value = 0.48 W/($m^2$×K)) |

**4. Calculate $RSI_{eff}$**

$RSI_{eff} = (K_1 \times RSI_{T1}) + (K_2 \times RSI_{T3}) = (0.40 \times \cdot\ 5.25) + (0.60 \times 2.08) = 3.35$ ($m^2$×K)/W (U-value = 0.30 W/($m^2$×K))

**Table [A-9.36.2.4.(1)-D] A-9.36.2.4.(1)-D**
**Thermal Resistance Values of Common Building Materials (1)**

| Air Films | Thickness of Material | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |
|---|---|---|---|
| Exterior: | | | |
| ceiling, floors and walls wind 6.7 m/s (winter) | — | — | 0.03 |

| | | | |
|---|---|---|---|
| Interior: | | | |
| ceiling (heat flow up) | — | — | 0.11 |
| floor (heat flow down) | — | — | 0.16 |
| walls (heat flow horizontal) | — | — | 0.12 |
| **Air Cavities** (2) (3) | Thickness of Air Space | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |
| Ceiling (heat flow up) faced with non-reflective material (4) | 13 mm | — | 0.15 |
| | 20 mm | — | 0.15 |
| | 40 mm | — | 0.16 |
| | 90 mm | — | 0.16 |
| Floors (heat flow down) faced with non-reflective material (4) | 13 mm | — | 0.16 |
| | 20 mm | — | 0.18 |
| | 40 mm | — | 0.20 |
| | 90 mm | — | 0.22 |
| Walls (heat flow horizontal) faced with non-reflective material (4) | 9.5 mm | — | 0.15 |
| | 13 mm | — | 0.16 |
| | 20 mm | — | 0.18 |
| | 40 mm | — | 0.18 |
| | 90 mm | — | 0.18 |
| **Cladding Materials** | Thickness of Material | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |
| Brick: | | | |
| fired clay (1 800–2 200 kg/$m^3$) | 90 mm | 0.0007 | 0.063 |
| concrete: sand and gravel, or stone (2 400 kg/$m^3$) | 90 mm | 0.0004 | 0.036 |
| Cement/lime, mortar, and stucco | — | 0.0009 | — |
| Wood shingles: | | | |
| 400 mm, 190 mm exposure | — | — | 0.15 |
| 400 mm, 300 mm exposure (double exposure) | — | — | 0.21 |
| insulating backer board | 8 mm | — | 0.25 |
| Siding: | | | |

| | | | |
|---|---|---|---|
| Metal or vinyl siding over sheathing: | | | |
| hollow-backed | — | — | 0.11 |
| insulating-board-backed | 9.5 mm nominal | — | 0.32 |
| foiled-backed | 9.5 mm nominal | — | 0.52 |
| Wood: | | | |
| bevel, 200 mm, lapped | 13 mm | — | 0.14 |
| bevel, 250 mm, lapped | 20 mm | — | 0.18 |
| drop, 200 mm | 20 mm | — | 0.14 |
| hardboard | 11 mm | — | 0.12 |
| plywood, lapped | 9.5 mm | — | 0.10 |
| Stone: | | | |
| quartzitic and sandstone (2240 kg/$m^3$) | — | 0.0003 | — |
| calcitic, dolomitic, limestone, marble, and granite (2240 kg/$m^3$) | — | 0.0004 | — |
| Fibre-cement: single-faced, cellulose fibre-reinforced cement | 6.35 mm | 0.003 | 0.023 |
| | 8 mm | 0.003 | 0.026 |
| **Roofing Materials** (5) | Thickness of Material | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |
| Asphalt roll roofing | — | — | 0.03 |
| Asphalt/tar | — | 0.0014 | — |
| Built-up roofing | 10 mm | — | 0.06 |
| Crushed stone | — | 0.0006 | — |
| Metal deck | — | — | negligible |
| Shingle: | | | |
| asphalt | — | — | 0.08 |
| wood | — | — | 0.17 |
| Slate | 13 mm | — | 0.01 |
| **Sheathing Materials** | Thickness of Material | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |

| | | | |
|---|---|---|---|
| Gypsum sheathing | 12.7 mm | 0.0063 | 0.08 |
| Insulating fibreboard | — | 0.016 | — |
| Particleboard: | | | |
| low density (593 kg/$m^3$) | — | 0.0098 | — |
| medium density (800 kg/$m^3$) | — | 0.0077 | — |
| high density (993 kg/$m^3$) | — | 0.0059 | — |
| Plywood – generic softwood | 9.5 mm | 0.0087 | 0.083 |
| | 11 mm | | 0.096 |
| | 12.5 mm | | 0.109 |
| | 15.5 mm | | 0.135 |
| | 18.5 mm | | 0.161 |
| Plywood – Douglas fir | 9.5 mm | 0.0111 | 0.105 |
| | 11 mm | | 0.122 |
| | 12.5 mm | | 0.139 |
| | 15.5 mm | | 0.172 |
| | 18.5 mm | | 0.205 |
| Sheet materials: | | | |
| permeable felt | — | — | 0.011 |
| seal, 2 layers of mopped (0.73 kg/$m^3$) | — | — | 0.210 |
| seal, plastic film | — | — | negligible |
| Waferboard (705 kg/$m^3$) | — | 0.0095 | — |
| Oriented strandboard (OSB) | 9.5 mm | 0.0098 | 0.093 |
| | 11 mm | | 0.108 |
| **Insulation Materials** (6) | Thickness of Material | Thermal Resistance (RSI), ($m^2$×K)/W per mm | Thermal Resistance (RSI), ($m^2$×K)/W for thickness listed |
| Blanket and batt: rock or glass mineral fibre (CAN/ULC-S702.1) | | | |
| R12 | 89/92 mm | — | 2.11 |
| R14 | 89/92 mm | — | 2.46 |
| R19 (7) (R20 compressed) | 140 mm | — | 3.34 |
| R20 | 152 mm | — | 3.52 |
| R22 | 140/152 mm | — | 3.87 |
| R22.5 | 152 mm | — | 3.96 |
| R24 | 140/152 mm | — | 4.23 |

| | | | |
|---|---|---|---|
| R28 | 178/216 mm | — | 4.93 |
| R31 | 241 mm | — | 5.46 |
| R35 | 267 mm | — | 6.16 |
| R40 | 279/300 mm | — | 7.04 |
| **Insulation Materials** (6) (continued) | Thickness of Material | Thermal Resistance (RSI), $(m^2 \times K)/W$ per mm | Thermal Resistance (RSI), $(m^2 \times K)/W$ for thickness listed |
| Boards and slabs: | | | |
| Roof board | — | 0.018 | — |
| Building board or ceiling tile, lay-in panel | — | 0.016 | — |
| Polyisocyanurate/polyurethane-faced sheathing: Types 1, 2 and 3 (CAN/ULC-704.1) | | | |
| permeably faced | 25 mm | 0.03818 | 0.97 |
| | 50 mm | 0.0360 | 1.80 |
| impermeably faced | 25 mm | 0.03937 | 1.00 |
| | 50 mm | 0.0374 | 1.87 |
| Expanded polystyrene (CAN/ULC-S701.1) (8) | | | |
| Type 1 | 25 mm | 0.026 | 0.65 |
| Type 2 | 25 mm | 0.028 | 0.71 |
| Type 3 | 25 mm | 0.030 | 0.76 |
| Extruded polystyrene: Types 2, 3 and 4 (CAN/ULC-S701.1) | 25 mm | 0.035 | 0.88 |
| | 50 mm | 0.0336 | 1.68 |
| Semi-rigid glass fibre wall/roof insulation (48 $kg/m^3$) | 25 mm | 0.0298 | 0.757 |
| Semi-rigid rock wool wall insulation (56 $kg/m^3$) | 25 mm | 0.0277 | 0.704 |
| Loose-fill insulation | | | |
| Cellulose (CAN/ULC-S703) | — | 0.025 | — |
| Glass fibre loose fill insulation for attics (CAN/ULC-S702.1) | 112 to 565 mm | 0.01875 | — |
| Glass fibre loose fill insulation for walls (CAN/ULC-S702.1) | 89 mm | 0.02865 | 2.55 |
| | 140 mm | 0.0289 | 4.05 |
| | 152 mm | 0.030 | 4.23 |

| | | | |
|---|---|---|---|
| Perlite | — | 0.019 | — |
| Vermiculite | — | 0.015 | — |
| Spray-applied insulation | | | |
| Sprayed polyurethane foam | | | |
| medium density (CAN/ULC-S705.1) | 25 mm | 0.036 | 0.90 |
| | 50 mm | 0.036 | 1.80 |
| light density (CAN/ULC 712.1) | 25 mm | 0.026 | 0.65 |
| Low pressure applied two component spray polyurethane foam (CAN/ULC 743.1:2020) | 50 mm | 0.028 | 1.40 |
| Sprayed cellulosic fibre (CAN/ULC-S703) | settled thickness | 0.024 | — |
| Spray-applied glass-fibre insulation (CAN/ULC-S702.1) | | | |
| density: 16 kg/m$^3$ | 89 mm | 0.025 | 2.30 |
| | 140 mm | 0.025 | 3.53 |
| density: 28.8 kg/m$^3$ | 89 mm | 0.029 | 2.64 |
| | 140 mm | 0.029 | 4.06 |
| **Structural Materials** | Thickness of Material | Thermal Resistance (RSI), (m$^2$×K)/W per mm | Thermal Resistance (RSI), (m$^2$×K)/W for thickness listed |
| Concrete | | | |
| Low-density aggregate | | | |
| expanded shale, clay, slate or slags, cinders (1 600 kg/m$^3$) | — | 0.0013 | — |
| perlite, vermiculite, and polystyrene bead (480 kg/m$^3$) | — | 0.0063 | — |
| Normal-density aggregate | | | |
| sand and gravel or stone aggregate (2 400 kg/m$^3$) | — | 0.0004 | — |
| Hardwood (9) (10) | | | |
| Ash | — | 0.0063 | — |
| Birch | — | 0.0055 | — |
| Maple | — | 0.0063 | — |
| Oak | — | 0.0056 | — |

| | | | |
|---|---|---|---|
| Softwood [9] [10] | | | |
| Amabilis fir | — | 0.0080 | — |
| California redwood | — | 0.0089 | — |
| Douglas fir-larch | — | 0.0069 | — |
| Eastern white cedar | — | 0.0099 | — |
| Eastern white pine | — | 0.0092 | — |
| Hemlock-fir | — | 0.0084 | — |
| Lodgepole pine | — | 0.0082 | — |
| Red pine | — | 0.0077 | — |
| Western hemlock | — | 0.0074 | — |
| Western red cedar | — | 0.0102 | — |
| White spruce | — | 0.0097 | — |
| Yellow cyprus-cedar | — | 0.0077 | — |
| Wood, structural framing, spruce-pine-fir [11] | — | 0.0085 | — |
| Steel, galvanized sheet, 0.14% carbon content | — | 0.0000161 | — |
| **Concrete Blocks** | Thickness of Material | Thermal Resistance (RSI), $(m^2×K)/W$ per mm | Thermal Resistance (RSI), $(m^2×K)/W$ for thickness listed |
| Limestone aggregate with 2 cells | | | |
| cells filled with perlite | 190 mm | — | 0.37 |
| | 290 mm | — | 0.65 |
| Light-weight units (expanded shale, clay, slate or slag aggregate) with 2 or 3 cells | | | |
| no insulation in cells | 90 mm | — | 0.24 |
| | 140 mm | — | 0.30 |
| | 190 mm | — | 0.32 |
| | 240 mm | — | 0.33 |
| | 290 mm | — | 0.41 |
| cells filled with perlite | 140 mm | — | 0.74 |
| | 190 mm | — | 0.99 |
| | 290 mm | — | 1.35 |
| cells filled with vermiculite | 140 mm | — | 0.58 |
| | 190 mm | — | 0.81 |

| | | | |
|---|---|---|---|
| | 240 mm | — | 0.98 |
| | 290 mm | — | 1.06 |
| cells filled with molded EPS beads | 190 mm | — | 0.85 |
| molded EPS inserts in cells | 190 mm | — | 0.62 |
| Medium-weight units (combination of normal- and low-mass aggregate) with 2 or 3 cells | | | |
| no insulation in cells | 190 mm | — | 0.26 |
| cells filled with molded EPS beads | 190 mm | — | 0.56 |
| molded EPS inserts in cells | 190 mm | — | 0.47 |
| cells filled with perlite | 190 mm | — | 0.53 |
| cells filled with vermiculite | 190 mm | — | 0.58 |
| Normal-weight units (sand and gravel aggregate) with 2 or 3 cells | | | |
| no insulation in cells | 90 mm | — | 0.17 |
| | 140 mm | — | 0.19 |
| | 190 mm | — | 0.21 |
| | 240 mm | — | 0.24 |
| | 290 mm | — | 0.26 |
| cells filled with perlite | 190 mm | — | 0.35 |
| cells filled with vermiculite | 140 mm | — | 0.40 |
| | 190 mm | — | 0.51 |
| | 240 mm | — | 0.61 |
| | 290 mm | — | 0.69 |
| **Hollow Clay Bricks** | Thickness of Material | Thermal Resistance (RSI), $(m^2 \times K)/W$ per mm | Thermal Resistance (RSI), $(m^2 \times K)/W$ for thickness listed |
| Multi-celled without insulation in cells | 90 mm | — | 0.27 |
| Rectangular 2-cell | | | |
| no insulation in cells | 140 mm | — | 0.39 |
| | 190 mm | — | 0.41 |
| | 290 mm | — | 0.47 |
| cells filled with vermiculite | 140 mm | — | 0.65 |

| | | | |
|---|---|---|---|
| | 190 mm | — | 0.86 |
| | 290 mm | — | 1.29 |
| Rectangular 3-cell | | | |
| no insulation in cells | 90 mm | — | 0.35 |
| | 140 mm | — | 0.38 |
| | 190 mm | — | 0.41 |
| | 240 mm | — | 0.43 |
| | 290 mm | — | 0.45 |
| cells filled with vermiculite | 140 mm | — | 0.68 |
| | 190 mm | — | 0.86 |
| | 240 mm | — | 1.06 |
| | 290 mm | — | 1.19 |
| **Interior Finish Materials** (12) | Thickness of Material | Thermal Resistance (RSI), $(m^2×K)/W$ per mm | Thermal Resistance (RSI), $(m^2×K)/W$ for thickness listed |
| Gypsum board | — | 0.0061 | — |
| Hardboard – medium-density (800 $kg/m^3$) | — | 0.0095 | — |
| Interior finish (plank, tile) board | — | 0.0198 | — |
| Particleboard | | | |
| low-density (590 $kg/m^3$) | — | 0.0098 | — |
| medium-density (800 $kg/m^3$) | — | 0.0074 | — |
| high-density (1 000 $kg/m^3$) | — | 0.0059 | — |
| underlay | 15.9 mm | — | 0.140 |
| Plywood | — | 0.0087 | — |
| Flooring material | | | |
| Carpet and fibrous pad | — | — | 0.370 |
| Carpet and rubber pad | — | — | 0.220 |
| Cork tile | 3.2 mm | — | 0.049 |
| Hardwood flooring | 19 mm | — | 0.120 |
| Terrazzo | 25 mm | — | 0.014 |
| Tile (linoleum, vinyl, rubber) | — | — | 0.009 |
| Tile (ceramic) | 9.5 mm | — | 0.005 |
| Wood subfloor | 19 mm | — | 0.170 |
| Plastering | | | |

| | | | |
|---|---|---|---|
| Cement plaster: sand aggregate | — | 0.0014 | — |
| Gypsum plaster | | | |
| low-density aggregate | — | 0.0044 | — |
| sand aggregate | — | 0.0012 | — |

**Notes to Table [A-9.36.2.4.(1)-D] A-9.36.2.4.(1)-D:**

(1) The thermal resistance values given in Table A-9.36.2.4.(1)-D are generic values for the materials listed or minimum acceptable values taken from the standards listed. Values published by manufacturers for their proprietary materials may differ slightly but are permitted to be used, provided they were obtained in accordance with the test methods referenced in Article 9.36.2.2. For materials not listed in the Table or where the listed value does not reflect the thickness of the product, the thermal resistance value has to be calculated by dividing the material's thickness, in m, by its conductivity, in W/(m×K), which can be found in the manufacturer's literature.

(2) RSI values can be interpolated for air cavity sizes that fall between 9.5 and 90 mm, and they can be moderately extrapolated for air cavities measuring more than 90 mm.

(3) Where strapping is installed, use the RSI value for an air layer of equivalent thickness.

(4) Reflective insulation material may contribute a thermal property value depending on its location and installation within an assembly. Where a value is obtained through evaluation carried out in accordance with Clause 9.36.2.2.(4)(b), it may be included in the calculation of the thermal resistance or transmittance of the specific assembly.

(5) Materials installed towards the exterior of a vented air space in a roof assembly cannot be included in the calculation of effective thermal resistance of the roof assembly.

(6) All types of cellular foam plastic insulation manufactured to be able to retain a blowing agent, other than air, for a period longer than 180 days shall be tested for long-term thermal resistance (LTTR) in accordance with CAN/ULC-S770, "Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams". This LTTR value shall be input as the design thermal resistance value for the purpose of energy calculations in Section 9.36. Product standards contain a baseline LTTR for a thickness of 50 mm, from which the LTTR for other thicknesses can be calculated.

(7) An RSI 3.52 (R20) batt compressed into a 140 mm cavity has a thermal resistance value of 3.34 (R19); if installed uncompressed in a 152 mm cavity (e.g. in a metal stud assembly), it will retain its full thermal resistance value of 3.52 ($m^2$×K)/W.

(8) Expanded polystyrene insulation is not manufactured to be able to retain a blowing agent; it is therefore not necessary to test its LTTR. See (6) .

(9) The thermal resistance values for wood species are based on a moisture content (MC) of 12%. In Canada, equilibrium moisture content for wood in buildings ranges from 8–14%. The difference between the thermal properties of wood species with 12% MC and those with 14% MC is negligible.

(10) For wood species not listed in the Table, the RSI value of a wood species of equal or greater density (or specific gravity (relative density)) can be used since the thermal resistance of wood is directly related to its density (higher density wood has a lower thermal resistance).

(11) 0.0085 is considered a common value for structural softwood (see also the "ASHRAE Handbook – Fundamentals").

(12) Materials installed towards the interior of a conditioned air space cannot be included in the calculation of effective thermal resistance of the assembly.

## Impact analysis

This proposed change is expected to result in no or low cost implications. In practice, manufacturers have been expected to meet the requirements of the material standard (CAN/ULC 743.1) since it was first published in 2020. Designers and installers have had access to the installation standard (CAN/ULC 743.2) since it was first published in 2021.

## Enforcement implications

Because neither of these standards has ever been included in the NBC, designers and authorities having jurisdiction have not been able to enforce minimum requirements when low-pressure spray-applied two-component polyurethane foam has been used. As a result of this proposed change, building officials would be able to request proof of compliance with the material standard, CAN/ULC 743.1, and the installation standard, CAN/ULC 743.2. Compliance with these standards could be enforced without additional resources.

In addition, the inclusion of references to these standards would provide uniform minimum performance requirements across Canada for use by building officials when evaluating design submissions, thus improving the enforcement of the NBC.

## Who is affected

Adding references to these two standards in the NBC would decrease the likelihood of confusion for building officials, building owners, designers, specification writers, contractors and manufacturers, as the Code would contain explicit minimum performance requirements for these materials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 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]** Applies to floor assemblies.

**[5.9.1.1.] 5.9.1.1. ([1] 1) ([a] a) [F61,F63-OS1.4]** Applies where required life safety systems are incorporated in environmental separators.

**[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**

**NBC25 Div.B 9.25.2.2.(1) (first printing)**

**[9.25.2.2.] 9.25.2.2. ([1] 1) [F51,F63,F80-OH1.1,OH1.2]**

**[9.25.2.2.] 9.25.2.2. ([1] 1) [F63,F80-OS2.3]**

**NBC25 Div.B 9.25.2.5.(1) (first printing)**

**[9.25.2.5.] 9.25.2.5. ([1] 1) [F51,F41,F63-OH1.1] [F51,F63-OH1.2]**

**[9.25.2.5.] 9.25.2.5. ([1] 1) [F63-OS2.3]**

**NBC25 Div.B 9.36.2.4.(1) (first printing)**

**[9.36.2.4.] 9.36.2.4. ([1] 1) [F92-OE1.1]**

# Proposed Change 2226

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 5.9.1.1. (first printing)**<br>**NBC25 Div.B 9.29.5.2. (first printing)** |
| Subject: | Environmental Separation |
| Title: | Fibre-reinforced Gypsum Panels |
| Description: | This proposed change introduces ASTM C1278/C1278M-24, "Standard Specification for Fiber-Reinforced Gypsum Panel," in the NBC. |
| Related Code Change Request(s): | CCR 1834 |

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

Several common fibre-reinforced gypsum panels are available on the market and used across Canada. However, Table 5.9.1.1. and Sentence 9.29.5.2.(1) of Division B of the National Building Code of Canada (NBC) do not currently reference a standard for panels made of this material, which limits the flexibility of design and construction. The NBC does not currently reference a performance standard for panels made of this material, which is safe, appropriate and commonly used. The absence of such a referenced performance standard in the NBC may add a regulatory barrier to the use of these panels and increase design and construction costs.

This proposed change updates the NBC to reflect standard industry practice and the gypsum products that are currently used in Canada.

## Justification

This proposed change introduces references to ASTM C1278/C1278M-24, "Standard Specification for Fiber-Reinforced Gypsum Panel," in Table 5.9.1.1. and Sentence 9.29.5.2.(1), which would permit fibre-reinforced gypsum panels to be used in several applications.

This proposed change would improve flexibility in the design and construction of buildings and reduce costs and regulatory barriers since more options would be available to Code users.

For consistency with the existing requirements of Table 5.9.1.1., this proposed change also requires the flame-spread rating of gypsum panels to be determined in accordance with CAN/ULC-S102, "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies."

## PROPOSED CHANGE

**NBC25 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 | C836/C836M | Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course |
| ASTM | C840 (1) (2) | Standard Specification for Application and Finishing of Gypsum Board |
| ASTM | C920 | 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 | C1278/C1278M-24 (3) | Standard Specification for Fiber-Reinforced Gypsum Panel |
| 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 (4) | Standard Specification for Gypsum Board |
| ASTM | C1658/C1658M (5) | Standard Specification for Glass Mat Gypsum Panels |
| ASTM | D1227/D1227M | Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing |
| ASTM | D3019/D3019M (6) | Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered |
| ASTM | D3679 (7) | Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding |
| ASTM | D4477 (8) | Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit |
| 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 |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| ASTM | D7254 (9) | Standard Specification for Polypropylene (PP) Siding |
| ASTM | D7793 (10) | 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-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-51.33-M | Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction |
| CGSB | CAN/CGSB-51.34 | Polyethylene sheet for use in building construction – Material specification |
| 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 | A123.24 | Standard test method for wind resistance of vegetated roof assembly |
| CSA | A123.25 | Asphalt core boards used in roofing |
| CSA | A123.51 | Asphalt shingle application on roof slopes 1:6 and steeper |
| CSA | A165.1 | Concrete block masonry units |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| 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 | G401 | Corrugated steel pipe and buried structures |
| 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-704.1 | Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced |
| ULC | CAN/ULC 712.1 | Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Material Specification |
| ULC | CAN/ULC 712.2 | Standard for Thermal Insulation – Light Density, Open Cell Spray Applied Semi-Rigid Polyurethane Foam – Installation |
| ULC | CAN/ULC 717.1 | Standard for Flat Wall Insulating Concrete Form (ICF) Units – Material Properties |
| 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-S705.1 | Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification |

| Issuing Agency | Document Number | Title of Document |
|---|---|---|
| ULC | CAN/ULC-S705.2 | Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application |
| ULC | CAN/ULC-S706.1 | Standard for Insulating Wood Fibre 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 |

**Notes to Table [5.9.1.1.] 5.9.1.1.:**

(1) See Note A-Table 5.9.1.1.

(2) Flat wall insulating concrete form units shall conform to CAN/ULC 717.1, in lieu of ASTM E2634, as indicated in ASTM C840.

(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 C1278/C1278M-24.

(4) 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.

(5) 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.

(6) 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.

(7) 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.

(8) 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.

(9) 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.

(10) 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.

**NBC25 Div.B 9.29.5.2. (first printing)**

**[9.29.5.2.] 9.29.5.2. Materials**

**[1] 1)** Except as provided in Sentence (2) regarding *flame-spread ratings*, gypsum board shall conform to

[a] a) ASTM C1177/C1177M, "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing",

[b] b) ASTM C1178/C1178M, "Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel",

[c] --) ASTM C1278/C1278M-24, “Standard Specification for Fiber-Reinforced Gypsum Panel”,

[d] c) ASTM C1396/C1396M, "Standard Specification for Gypsum Board", or

[e] d) ASTM C1658/C1658M, "Standard Specification for Glass Mat Gypsum Panels".

**[2] 2)** The *flame-spread ratings* of gypsum board shall be determined in accordance with CAN/ULC-S102, "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies".

## Impact analysis

No additional costs are expected to be incurred as a result of adding references to this standard in Table 5.9.1.1. and Sentence 9.29.5.2.(1). The proposed change simply adds more options of panel material. Formally including more gypsum board products that are commonly used in the construction industry would remove potential regulatory barriers to the use of gypsum board products that are more appropriate for the end use.

Adding a reference in the NBC for fibre-reinforced gypsum panels could reduce costs where designers spend time and resources to identify appropriate materials for panels and to verify that fibre-reinforced gypsum panels perform as intended.

## Enforcement implications

This proposed change can be enforced by the existing Code-enforcement infrastructure. The industry and regulators should already be familiar with the products that conform to this standard, which was first published in 1999. As such, no additional training is anticipated to be necessary for Code users. Formally including more gypsum board products commonly used in construction and clarifying the application of requirements for flame-spread ratings for these products would simplify enforcement of the NBC.

## Who is affected

Adding references to this standard would decrease the likelihood of confusion for building officials, building owners, designers, specification writers, contractors, and manufacturers since there would be explicit minimum performance requirements in the NBC for fibre-reinforced gypsum panels.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 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]** Applies to floor assemblies.

**[5.9.1.1.] 5.9.1.1. ([1] 1) ([a] a) [F61,F63-OS1.4]** Applies where required life safety systems are incorporated in environmental separators.

**[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**

**NBC25 Div.B 9.29.5.2. (first printing)**

**[9.29.5.2.] 9.29.5.2. ([1] 1) [F20,F80-OP2.1,OP2.3] [F22,F80-OP2.4]**

**[9.29.5.2.] 9.29.5.2. ([1] 1) [F20,F80-OS2.1,OS2.3]**

**[9.29.5.2.] 9.29.5.2. ([1] 1) [F20,F22,F80-OS1.2]** Applies where interior finishes are required to act as fire protection for foamed plastics or to contribute to the required fire resistance of assemblies.

**[9.29.5.2.] 9.29.5.2. ([1] 1) [F20,F22,F80,F81-OH1.1,OH1.2]** Applies where interior finishes support or serve as required environmental separation elements.

**[9.29.5.2.] 9.29.5.2. ([2] 2) [F02,F03-OS1.2]**

# Proposed Change 2256

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 6.3.1.3. (first printing)** |
| Subject: | Fire Alarm and Detection Systems |
| Title: | Acceptable Monitoring Devices for the Ventilation of Storage Garages |
| Description: | This proposed change requires the carbon monoxide monitoring devices and nitrogen dioxide or other acceptable monitoring devices required by Sentence 6.3.1.3.(2) to conform to CAN/ULC 588:2024A, "Gas and Vapour Detectors and Sensors, Including Accessories." |
| Related Code Change Request(s): | CCR 1287 |

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 6.3.1.3. of the National Building Code of Canada (NBC) currently requires storage garages to have a mechanical ventilation system designed to limit the concentration of carbon monoxide or nitrogen dioxide by using monitoring devices when a continuous supply of outdoor air is not provided at an acceptable rate. However, the NBC does not contain a provision requiring these monitoring devices to meet minimum performance requirements by conforming to a National Standard of Canada.

## Justification

This proposed change introduces a requirement in Article 6.3.1.3. for acceptable monitoring devices for carbon monoxide or nitrogen dioxide in storage garages to comply with CAN/ULC 588:2024A, "Gas and Vapour Detectors and Sensors, Including Accessories." Previous Canadian standards have applied to carbon monoxide alarms rather than carbon monoxide detectors.

CAN/ULC 588 requires toxic combustible gas and vapour detectors to be able to connect to a power source, signaling circuits and optional remote control circuits. Additional features, such as a heat detector, heat sensor, smoke detector, smoke sensor, or audible signaling appliance/device, are permitted to be incorporated into the toxic combustible gas and vapour detector assembly. However, these features must be evaluated in accordance with their respective applicable standards.

This proposed change requires monitoring devices used in storage garages to conform to CAN/ULC 588. This proposed change would create uniformity in the minimum performance requirements, which is critical for ensuring that such monitoring devices function reliably, especially in industrial and commercial applications like storage garages.

## PROPOSED CHANGE

**NBC25 Div.B 6.3.1.3. (first printing)**

**[6.3.1.3.] 6.3.1.3. Ventilation of Storage Garages**

**[1] 1)** Except as provided in Sentences ~~(4)~~(5) and ~~(6)~~(7), an enclosed *storage garage* for five or more motor vehicles shall have a mechanical ventilation system designed to

[a] a) limit the concentration of carbon monoxide to not more than 100 parts per million parts of air,

[b] b) limit the concentration of nitrogen dioxide to not more than 3 parts per million parts of air, where the majority of the vehicles stored are powered by diesel-fuelled engines, or

[c] c) provide, during operating hours, a continuous supply of outdoor air at a rate of not less than 3.9 L/s for each square metre of *floor area* (see Article 3.3.1.21.).

(See Note A-6.3.1.3.(1).) (See also Sentence 3.3.5.4.(4).)

**[2] 2)** Mechanical ventilation systems provided in accordance with Clause (1)(a) shall be controlled by carbon monoxide monitoring devices, and systems provided in accordance with Clause (1)(b) shall be controlled by nitrogen dioxide or other acceptable monitoring devices. (See Note A-6.3.1.3.(2).)

**[3] --)** The carbon monoxide monitoring devices and nitrogen dioxide or other acceptable monitoring devices required by Sentence (2) shall conform to CAN/ULC 588:2024A, "Gas and Vapour Detectors and Sensors, Including

Accessories."

**[4] 3)** Mechanical ventilation systems provided in accordance with Sentence (1) shall be designed such that the pressure in the *storage garage* is less than the pressure in adjoining *buildings* of other *occupancy*, or in adjacent portions of the same *building* having a different *occupancy*.

**[5] 4)** In *storage garages* subject to the requirements of Sentences (1) and (2), where motor vehicles are parked by mechanical means, the ventilation requirements may be reduced by one half.

**[6] 5)** Except as provided in Sentence ~~(6)~~(7), ticket and attendant booths of *storage garages* shall be pressurized with a supply of uncontaminated air.

**[7] 6)** The requirements of Sentences (1) to ~~(5)~~(6) shall not apply to *open-air storeys* in a *storage garage*.

## Impact analysis

This proposed change enhances existing provisions in the NBC by requiring certain monitoring devices, which are used to control the ventilation of storage garages, to conform to CAN/ULC 588. This proposed change would improve the reliability, accuracy and system integration of these monitoring devices while protecting occupants from hazardous levels of exposure.

This proposed change should improve the safety and performance of monitoring devices, may improve the reliability of monitoring devices, and would better integrate monitoring devices conforming to CAN/ULC 588 into building systems while maintaining compliance with the NBC.

There are already combustible gas and vapour monitoring devices on the market that are tested in conformance with other standards, such as ANSI/UL 2075, "Gas and Vapor Detectors and Sensors." Assuming there are no differences in the product technology or the listing process, this proposed change is not expected to increase the cost of the required monitoring devices in Canada.

Requiring carbon monoxide monitoring devices and nitrogen dioxide or other acceptable monitoring devices to conform to a National Standard of Canada would provide certainty for building officials, designers, specification writers, contractors and manufacturers regarding the minimum performance requirements of the NBC.

## Enforcement implications

The proposed change could be enforced without requiring additional resources. However, since CAN/ULC 588 is a standard that has not been previously referenced in the NBC, regulators may need to become familiar with this standard to facilitate enforcement of the requirement.

## Who is affected

Stakeholders such as designers, specifiers, manufacturers, building owners, building officials and contractors may need additional training to become familiar with, understand and apply the requirements of CAN/ULC 588 in order to design or install acceptable monitoring devices.

Manufacturers may need to adapt their products to meet the new regulatory requirements.

Building owners may need training to better understand the operating mechanisms of all the monitoring devices installed in their buildings.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 Div.B 6.3.1.3. (first printing)**

**[6.3.1.3.] 6.3.1.3. ([1] 1) [F50,F44-OS3.4]**

**[6.3.1.3.] 6.3.1.3. ([2] 2) [F44-OS3.4]**

**[6.3.1.3.] -- ([3] --) [F44-OS3.4]**

**[6.3.1.3.] 6.3.1.3. ([4] 3) [F44-OS3.4]**

**[6.3.1.3.] 6.3.1.3. ([5] 4) [F50,F44-OS3.4]**

**[6.3.1.3.] 6.3.1.3. ([6] 5) [F50,F44-OH1.1]**

**[6.3.1.3.] 6.3.1.3. ([6] 5) [F50,F44-OS3.4]**

**[6.3.1.3.] 6.3.1.3. ([7] 6) no attributions**

# Proposed Change 2257

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 6.9.3. (first printing)**<br>**NBC25 Div.B 9.32.3.9. (first printing)** |
| Subject: | Fire Alarm and Detection Systems |
| Title: | Carbon Monoxide Detectors Installed in Lieu of Carbon Monoxide Alarms |
| Description: | This proposed change introduces requirements for carbon monoxide detectors that are connected to a building fire alarm system in lieu of carbon monoxide alarms. |
| Related Code Change Request(s): | CCR 1286, CCR 1288 |

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, the National Building Code of Canada (NBC) does not permit the connection of carbon monoxide (CO) detectors to a building fire alarm system in lieu of CO alarms. However, the installation and use of CO detectors would enable the monitoring of CO levels in real time, which is an added benefit compared to relying on alarms that sound only when CO levels become unsafe.

## Justification

Recently, CAN/ULC 588:2024A, “Gas and Vapour Detectors and Sensors, Including Accessories,” was published. Prior to the publication of this National Standard of Canada, there were no standards covering CO detectors in Canada, only CO alarms.

This proposed change updates Subsection 6.9.3. and Article 9.32.3.9. of the NBC to allow CO detectors that conform to CAN/ULC 588 to be installed in buildings in lieu of CO alarms.

CO detectors that conform to CAN/ULC 588 must be able to connect to a power source, signaling circuits and optional remote control circuits. Additional features, such as a heat detector, heat sensor, smoke detector, smoke sensor, or audible signaling appliance/device, are permitted to be incorporated into the toxic combustible gas and vapour detector assembly. However, these features must be evaluated in accordance with their respective applicable standards.

CO detectors can be used in a variety of applications, and this proposed change would give designers of buildings with a fire alarm system the option to install CO detectors in lieu of CO alarms.

## PROPOSED CHANGE

**NBC25 Div.B 6.9.3. (first printing)**

### [6.9.3.] 6.9.3. Carbon Monoxide Alarms

#### [6.9.3.1.] 6.9.3.1. Carbon Monoxide Alarms

[1] **1)** This Article applies to every *building* that contains a *residential occupancy*, a *care occupancy* with individual *suites*, or a *care occupancy* containing sleeping rooms not within a *suite*, and that also contains

[a] a) a fuel-burning *appliance*, or

[b] b) a *storage garage*.

[2] **2)** Carbon monoxide (CO) alarms required by this Article shall

[a] a) conform to CSA 6.19, "Residential carbon monoxide alarming devices",

[b] b) be equipped with an integral alarm that satisfies the audibility requirements of CSA 6.19, "Residential carbon monoxide alarming devices",

[c] c) have no disconnect switch between the overcurrent device and the CO alarm, where the CO alarm is powered by the electrical system serving the *suite* (see Note A-6.9.3.1.(2)(c)), and

[d] d) be mechanically fixed at a height above the floor as recommended by the manufacturer.

[3] **3)** Where a fuel-burning *appliance* is installed in a *suite* of *residential occupancy* or in a *suite* of *care occupancy*, a CO alarm shall be installed

[a] a) inside each bedroom, or

[b] b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

[4] **4)** Where a fuel-burning *appliance* is installed in a *service room* that is not in a *suite* of *residential occupancy* nor in a *suite* of *care occupancy*, a CO

alarm shall be installed

[a] a) either inside each bedroom, or if outside, within 5 m of each bedroom door, measured following corridors and doorways, in every *suite* of *residential occupancy* or *suite* of *care occupancy* that shares a wall or floor/ceiling assembly with the *service room*, and

[b] b) in the *service room*.

**[5] 5)** For each *suite* of *residential occupancy* or *suite* of *care occupancy* that shares a wall or floor/ceiling assembly with a *storage garage* or that is adjacent to an attic or crawl space to which the *storage garage* is also adjacent, a CO alarm shall be installed

[a] a) inside each bedroom, or

[b] b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

**[6] --)** CO detectors are permitted to be installed in lieu of CO alarms, provided the CO detectors

[a] --) conform to CAN/ULC 588:2024A, "Gas and Vapour Detectors and Sensors, Including Accessories,"

[b] --) are capable of independently sounding audible signals within the individual *suites*,

[c] --) except as permitted in Sentence (7), are installed in conformance with CAN/ULC-S524, "Standard for Installation of Fire Alarm Systems," and

[d] --) form part of the fire alarm system.

**[7] --)** The CO detectors described in Sentence (6) are permitted to sound localized alarms within individual *suites*, but need not sound an alarm throughout the rest of the *building*.

---

**NBC25 Div.B 9.32.3.9. (first printing)**

**[9.32.3.9.] 9.32.3.9. Carbon Monoxide Alarms**

**(See Note A-9.32.3.9.)**

**[1] 1)** This Article applies to every *building* that contains a *residential occupancy* and that also contains

[a] a) a fuel-burning *appliance*, or

[b] b) a *storage garage*.

**[2] 2)** Carbon monoxide (CO) alarms required by this Article shall

[a] a) conform to CSA 6.19, "Residential carbon monoxide alarming devices",

[b] b) be equipped with an integral alarm that satisfies the audibility requirements of CSA 6.19, "Residential carbon monoxide alarming devices",

[c] c) have no disconnect switch between the overcurrent device and the CO alarm, where the CO alarm is powered by the *dwelling unit*'s electrical system, and

[d] d) be mechanically fixed at a height recommended by the

manufacturer.

**[3] 3)** Where a room contains a solid-fuel-burning *appliance*, a CO alarm conforming to CSA 6.19, "Residential carbon monoxide alarming devices", shall be mechanically fixed

[a] a) at the manufacturer's recommended height where these instructions specifically mention solid-fuel-burning *appliances*, or

[b] b) in the absence of specific instructions related to solid-fuel-burning *appliances*, on or near the ceiling.

**[4] 4)** Where a fuel-burning *appliance* is installed in a *suite* of *residential occupancy*, a CO alarm shall be installed

[a] a) inside each bedroom, or

[b] b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

**[5] 5)** Where a fuel-burning *appliance* is installed in a *service room* that is not in a *suite* of *residential occupancy*, a CO alarm shall be installed

[a] a) either inside each bedroom, or if outside, within 5 m of each bedroom door, measured following corridors and doorways, in every *suite* of *residential occupancy* that shares a wall or floor/ceiling assembly with the *service room*, and

[b] b) in the *service room*.

**[6] 6)** For each *suite* of *residential occupancy* that shares a wall or floor/ceiling assembly with a *storage garage* or that is adjacent to an attic or crawl space to which the *storage garage* is also adjacent, a CO alarm shall be installed

[a] a) inside each bedroom, or

[b] b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

**[7] 7)** Where CO alarms are installed in a house with a *secondary suite* including their common spaces, the CO alarms shall be wired so that the activation of any one CO alarm causes all CO alarms within the house with a *secondary suite* including their common spaces to sound.

**[8] --)** CO detectors are permitted to be installed in lieu of CO alarms, provided the CO detectors

[a] --) conform to CAN/ULC 588:2024A, “Gas and Vapour Detectors and Sensors, Including Accessories,”

[b] --) are capable of independently sounding audible signals within the individual *suites*,

[c] --) except as permitted in Sentence (9), are installed in conformance with CAN/ULC-S524, “Standard for Installation of Fire Alarm Systems,” and

[d] --) form part of the fire alarm system.

**[9] --)** CO detectors described in Sentence (8) are permitted to sound localized alarms within individual *suites*, but need not sound an alarm throughout the rest of the *building*.

## Impact analysis

This proposed change enhances existing provisions in the NBC by allowing the installation of CO detectors conforming to CAN/ULC 588 in lieu of CO alarms. This proposed change would improve the reliability, accuracy and system integration of CO detectors while protecting occupants from exposure to hazardous levels of CO.

This proposed change should improve the safety and performance of CO detectors, as the proposed change would require the CO detectors that are installed in buildings in lieu of CO alarms to conform to CAN/ULC 588, which may improve the reliability of CO monitoring devices and better integrate such devices with building systems while maintaining compliance with the NBC.

A CO alarm that conforms to CSA 6.19, "Residential carbon monoxide alarming devices," costs approximately $35–$90, whereas a CO detector that conforms to CAN/ULC 588 costs approximately $140–$270. Although a CO detector costs approximately $105–$180 more than a CO alarm, this proposed change would allow either to be installed. This proposed change does not make the use of CO detectors the only compliance option.

## Enforcement implications

This proposed change can be enforced without requiring additional resources, as a CO detector conforming to CAN/ULC 588 would be installed in place of a CO alarm. However, since CAN/ULC 588 is a standard that has not been previously referenced in the NBC, regulators may need to become familiar with this standard to facilitate enforcement of the requirement.

## Who is affected

Stakeholders such as designers, specifiers, manufacturers, building owners, building officials and contractors may need additional training to become familiar with, understand and apply the requirements of CAN/ULC 588 in order to design for the use of or install acceptable CO detectors.

Manufacturers may need to adapt their products to meet the new regulatory requirements.

Building owners may need training to better understand the operating mechanisms of all the monitoring devices installed in their buildings.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 Div.B 6.9.3. (first printing)**

**[6.9.3.1.] 6.9.3.1. ([1] 1) no attributions**

**[6.9.3.1.] 6.9.3.1. ([2] 2) ([a] a),([b] b),([d] d) [F44-OS3.4]**

**[6.9.3.1.] 6.9.3.1. ([2] 2) ([c] c) [F81-OS3.4]**

**[6.9.3.1.] 6.9.3.1. ([3] 3) [F44-OS3.4]**

**[6.9.3.1.] 6.9.3.1. ([4] 4) [F44-OS3.4]**

**[6.9.3.1.] 6.9.3.1. ([5] 5) [F44-OS3.4]**

**[6.9.3.1.] -- ([6] --) [F44-OS3.4]**

**[6.9.3.1.] -- ([7] --) no attributions**

**NBC25 Div.B 9.32.3.9. (first printing)**

**[9.32.3.9.] 9.32.3.9. ([1] 1) no attributions**

**[9.32.3.9.] 9.32.3.9. ([2] 2) ([a] a),([b] b),([d] d) [F44-OS3.4] ([c] c) [F81-OS3.4]**

**[9.32.3.9.] 9.32.3.9. ([3] 3) [F44-OS3.4]**

**[9.32.3.9.] 9.32.3.9. ([4] 4) [F44-OS3.4]**

**[9.32.3.9.] 9.32.3.9. ([5] 5) [F44-OS3.4]**

**[9.32.3.9.] 9.32.3.9. ([6] 6) [F44-OS3.4]**

**[9.32.3.9.] 9.32.3.9. ([7] 7) [F11-OS3.4]**

**[9.32.3.9.] -- ([8] --) [F44-OS3.4]**

**[9.32.3.9.] -- ([9] --) no attributions**

# Proposed Change 2160

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.13.4. (first printing)** |
| Subject: | Radon and Soil Gas Mitigation |
| Title: | Active Side-Wall Radon Stack |
| Description: | This proposed change adds the option of an active side-wall radon stack as a means of meeting the requirements for radon mitigation in dwelling units and home-type care occupancies that have a floor assembly in contact with the ground. |

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

Radon is a colourless, odourless, radioactive gas that occurs naturally as a result of the decay of radium. It is found in varying concentrations as a component of soil gas in all regions of Canada. It is known to enter dwelling units by infiltration into basements and crawl spaces.

The 2025 edition of the National Building Code of Canada (NBC) mandates the installation of a passive vertical radon stack during construction for certain occupancies. However, use of a vertical stack may not be practical for specific dwelling unit designs, such as open-concept construction.

## Justification

This proposed change introduces the option of an active side-wall vented subfloor depressurization system with a radon fan, and specifies the minimum and maximum airflow at the exhaust. This option would provide an alternative to the requirement for a passive vertical stack where the vertical stack is not practical for specific dwelling unit designs.

The minimum requirement for the active side-wall radon stack is only intended to provide an equivalent performance to the passive system, not to reduce radon levels to a certain value.

## PROPOSED CHANGE

### [9.13.4.] 9.13.4. Soil Gas Control

(See Note A-9.13.4.)

#### [9.13.4.1.] 9.13.4.1. Application and Scope

**[1] 1)** This Subsection applies to

[a] a) a *conditioned space* that has a wall, roof or floor assembly that is in contact with the ground,

[b] b) the rough-in of a *conditioned space* that has a wall, roof or floor assembly that is in contact with the ground, and

[c] c) a ~~passive vertical~~ radon stack for a *conditioned space* that has a wall, roof or floor assembly that is in contact with the ground.

**[2] 2)** This Subsection addresses the leakage of *soil* gas from the ground into the *building*.

#### [9.13.4.2.] 9.13.4.2. Protection from Soil Gas Ingress

**[1] 1)** All wall, roof and floor assemblies separating a *conditioned space* from the ground shall be provided with an *air barrier system* conforming to Subsection 9.25.3. that provides a level of radon gas diffusion protection equivalent to that provided by 0.15 mm polyethylene sheet conforming to CAN/CGSB-51.34, "Polyethylene sheet for use in building construction – Material specification".

**[2] 2)** Except as provided in Sentence (4), *dwelling units* and *home-type care occupancies* where a floor assembly separates a *conditioned space* from the ground shall be provided with a passive vertical radon stack, conforming to Article 9.13.4.4., or an active side-wall radon stack, conforming to Article 9.13.4.5., that is made of components that are compatible with adjoining materials described in Article 9.13.4.3.

**[3] 3)** Where *buildings* are used for *occupancies* other than those described in Sentence (2), protection from radon ingress and the means to address

high radon concentrations in the future shall conform to

[a] a) Article 9.13.4.3., or

[b] b) Parts 5 and 6 (see Articles 5.4.1.1. and 6.2.1.1.).

(See Note A-9.13.4.2.(3).)

**[4] 4)** Where an entrance at *grade* contains a floor assembly separating a *conditioned space* from the ground and provides direct access to a stairway leading up to a *dwelling unit* or *home-type care occupancy* located above another *dwelling unit* or *home-type care occupancy*, the entrance and space under the stairway need not comply with Sentence (2).

### [9.13.4.3.] 9.13.4.3. Rough-in for a Subfloor Depressurization System (See Note A-9.13.4.3.)

**[1] 1)** Floors-on-ground shall be provided with a rough-in for subfloor depressurization consisting of

[a] a) a gas-permeable layer, an inlet and an outlet as described in Sentence (2), or

[b] b) clean granular material and a pipe as described in Sentence (3).

**[2] 2)** The rough-in referred to in Clause (1)(a) shall include

[a] a) a gas-permeable layer installed in the space between the air barrier and the ground to allow the depressurization of that space,

[b] b) an inlet that allows for the effective depressurization of the gas-permeable layer (see Note A-9.13.4.3.(2)(b) and (3)(b)(i)), and

[c] c) an outlet in the *conditioned space* that

[i] i) permits connection to depressurization equipment,

[ii] ii) is sealed to maintain the integrity of the *air barrier system*, and

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

**[3] 3)** The rough-in referred to in Clause (1)(b) shall include

[a] a) clean granular material installed below the floor-on-ground in accordance with Sentence 9.16.2.1.(1), and

[b] b) a pipe not less than 100 mm in diameter installed through the floor, such that

[i] i) its bottom opening is located in the granular layer required in Clause (a) at or near the centre of the floor and not less than 100 mm of granular material projects beyond the bottom opening of the pipe measured along its axis (see Note A-9.13.4.3.(2)(b) and (3)(b)(i)),

[ii] ii) its bottom opening is protected by a low-pressure-drop stainless steel mesh with 10 mm to 12.5 mm openings or by a product and fitting system that provide an equivalent level of air-flow performance and corrosion resistance,

[iii] iii) its top opening permits connection to depressurization

equipment and is provided with an airtight cap, unless a ~~passive vertical~~ radon stack conforming to Article 9.13.4.4. or 9.13.4.5. is connected to the rough-in, and

[iv] iv) the pipe is clearly labeled near the cap and, if applicable, at every 1.8 m and at every change in direction to indicate that it is intended only for the removal of radon from below the floor-on-ground.

### [9.13.4.4.] 9.13.4.4. Passive Vertical Radon Stack (See Note A-9.13.4.4.)

**[1] 1)** The passive vertical radon stack ~~required by~~referred to in Sentence 9.13.4.2.(2) shall be installed

[a] a) in a *conditioned space* in accordance with Clauses 7.2.2.3 and 7.2.3.2 to 7.2.4.2 of CAN/CGSB-149.11, "Radon control options for new construction in low-rise residential buildings",

[b] b) except as provided in Sentence (2), in the vertical direction, and

[c] c) such that its rooftop termination conforms to Table 9.13.4.4.-A.

**Table [9.13.4.4.-A] 9.13.4.4.-A**
**Minimum Clearances for Rooftop Termination of Passive Vertical Radon Stacks**
**Forming Part of Clause 9.13.4.4.(1)(c)**

| Description | Minimum Clearance, m |
|---|---|
| Vertical clearance above the roof at the point of penetration | 0.15 |
| Vertical clearance above windows and doors | 0.6 |
| Vertical clearance above mechanical air intakes | 0.9 |
| Horizontal clearance from windows, doors and mechanical air intakes | 3 |
| Clearance horizontally from vertical walls that extend above the penetrated roof | 3 |

**[2] 2)** Where it is not possible to install a passive vertical radon stack entirely in the vertical direction, the stack is permitted to include a horizontal offset on each *storey*, including the *basement*, provided each offset

[a] a) is not more than 3.6 m long,

[b] b) is connected using 22.5° to 90° fittings, and

[c] c) has a slope not less than 1 in 50.

(See Note A-9.13.4.4.(2).)

**[3] 3)** Piping and connections for the passive vertical radon stack

[a] a) shall conform to Clauses 7.1.3.1.1 to 7.1.3.1.3 and 7.1.3.1.5 to 7.1.3.2.6 of CAN/CGSB-149.11, "Radon control options for new construction in low-rise residential buildings", and

[b] b) shall not be perforated above the level of the air barrier system.

**[4] 4)** Piping runs for the passive vertical radon stack that are located inside hollow walls or partitions within 43 mm of the wall or partition surface shall be protected against physical damage and puncture at the intersections of joists, studs, plates and other framing members by the use of steel plates or sleeves not less than 1.59 mm thick.

**[5] 5)** Except as provided in Sentence (6), the portion of the passive vertical radon stack that passes through the unconditioned *attic or roof space* shall be

[a] a) located within a cylindrical space not less than 500 mm in diameter and not less than 1 000 mm high, and

[b] b) insulated in accordance with Table 9.13.4.4.-B.

(See Note A-9.13.4.4.(5) and (6).)

**Table [9.13.4.4.-B] 9.13.4.4.-B**
**Insulation of Passive Vertical Radon Stack in Unconditioned Space**
**Forming Part of Clause 9.13.4.4.(5)(b)**

| 2.5% January Design Temperature, °C | Maximum Stack Height Above Roof, m | Insulation, RSI | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0.70 | 1.41 | 2.11 | 2.82 | 3.52 | 4.23 |
| | | Maximum Length of Stack in Unconditioned Space, m | | | | | |
| −5 or warmer | 0.30 | 4.71 | 6.86 | 7.92 | 9.45 | 10.48 | 11.70 |
| −6 to −11 | 0.30 | 2.59 | 3.91 | 4.83 | 5.53 | 6.29 | 6.86 |
| −12 to −17 | 0.30 | 1.28 | 2.59 | 3.08 | 3.43 | 3.78 | 4.11 |
| −18 to −24 | 0.15 | 1.25 | 1.94 | 2.47 | 2.93 | 3.32 | 3.63 |
| | 0.30 | 0.64 | 0.98 | 1.28 | 1.52 | 1.68 | 1.86 |
| | 0.30 (1) | 1.51 | 2.32 | 2.93 | 3.47 | 3.90 | 4.30 |
| −25 to −29 | 0.15 | 1.16 | 1.52 | 1.95 | 2.32 | 2.62 | 2.90 |
| | 0.30 | 0.40 | 0.61 | 0.76 | 0.91 | 1.04 | 1.16 |
| | 0.30 (1) | 1.34 | 1.92 | 2.47 | 2.90 | 3.26 | 3.60 |
| −30 to −34 | 0.15 | 0.94 | 1.22 | 1.58 | 1.83 | 2.07 | 2.32 |
| | 0.30 | 0.21 | 0.30 | 0.40 | 0.46 | 0.52 | 0.58 |

| 2.5% January Design Temperature, °C | Maximum Stack Height Above Roof, m | Insulation, RSI | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0.70 | 1.41 | 2.11 | 2.82 | 3.52 | 4.23 |
| | | Maximum Length of Stack in Unconditioned Space, m | | | | | |
| | 0.30 (1) | 1.25 | 1.65 | 2.10 | 2.47 | 2.77 | 3.05 |
| −35 or colder | 0.15 | 0.76 | 0.98 | 1.25 | 1.52 | 1.71 | 2.59 |
| | 0.15 (1) | 1.22 | 1.65 | 2.07 | 2.44 | 2.77 | 3.05 |
| | 0.30 (1) | 1.05 | 1.28 | 1.74 | 2.01 | 2.29 | 2.53 |

**Note to Table [9.13.4.4.-B] 9.13.4.4.-B:**

(1) The portion of the passive vertical radon stack that extends above the roof shall be insulated to RSI 0.704 and protected from physical damage.

**[6] 6)** Where it is not possible to provide the cylindrical space described in Clause (5)(a) within an unconditioned *attic or roof space* or where the passive vertical radon stack passes through a *dwelling unit* above, the cylindrical space shall be provided within the *conditioned space*. (See Note A-9.13.4.4.(5) and (6).)

**[7] 7)** The exhaust~~top~~ opening at the top of the passive vertical radon stack shall be ~~fitted with a stainless steel mesh with 10 mm to 12.5 mm openings or by a product and fitting system that provide an equivalent level of air-flow performance and corrosion resistance~~protected in accordance with Article 9.13.4.6.

**[9.13.4.5.] --- Active Side-Wall Radon Stack**

**[1] --)** The active side-wall radon stack referred to in Sentence 9.13.4.2.(2) shall

[a] --) be installed in a *conditioned space*,

[b] --) conform to Clauses 7.1.3 and 7.3.4.3 of CAN/CGSB 149.11, "Radon control options for new construction in low-rise residential buildings",

[c] --) have a radon pipe that

[i] --) penetrates to an exterior wall at a right angle,

[ii] --) is watertight at the penetration,

[iii] --) has an exhaust end that extends not less than 150 mm measured from the exterior surface of the *building* at the penetration, and

[iv] --) has a clearance of not less than 200 mm from all interior walls, and

[d] --) be connected to a radon fan in continuous operation.

**[2] --)** The radon fan described in Clause (1)(d) shall

[a] --) meet the requirements of CSA C22.2 No. 113, "Fans and Ventilators",

[b] --) provide an airflow rate of not less than 14 L/s and not more than 28 L/s measured at the exhaust opening to the outdoors,

[c] --) be installed according to the manufacturer's instructions,

[d] --) be installed with flexible couplers, and

[e] --) have all seams and enclosures, other than the inlet and outlet ports of the fan housing, sealed.

**[3] --)** The exhaust opening of the active side-wall radon stack to the outdoors shall be protected in accordance with Article 9.13.4.6.

**[4] --)** The active side-wall radon stack shall be tested for air leakage, with the radon fan in operation, using the soap test method.

**[5] --)** With the radon fan operating at its normal exhaust capacity, the airflow at the exhaust opening of the discharge pipe shall be measured and the fan airflow adjusted and permanently fixed so that the airflow at the exhaust opening of the discharge pipe is within ±10% of the exhaust capacity required in Clause (2)(a).

**[6] --)** The airflow measurements required by Sentence (5) shall be taken using a method accurate to within ±15% of the flow rate being measured.

### [9.13.4.6.] --- Protection of Exhaust Opening of Radon Stack

**[1] --)** The exhaust opening to the outdoors of the radon discharge pipe and fitting system shall be fitted with a stainless steel mesh with 10 mm to 12.5 mm openings or by a product and fitting system that provide an equivalent level of air-flow performance and corrosion resistance.

### Note A-9.13.4. Soil Gas Control.

Outdoor air entering a dwelling through above-grade leaks in the building envelope normally improves the indoor air quality in the dwelling by reducing the concentrations of pollutants and water vapour. It is only undesirable because it cannot be controlled. On the other hand, air entering a dwelling through below-grade leaks in the envelope may increase the water vapour content of the indoor air and may also bring in a number of pollutants picked up from the soil. This mixture of air, water vapour and pollutants is sometimes referred to as "soil gas." One pollutant often found in soil gas is radon.

Sentence 9.13.4.2.(1), which requires the installation of an air barrier system, addresses the protection from all common naturally occurring soil gases, including nitrogen, carbon dioxide, oxygen, methane and radon, while the remainder of Article 9.13.4.2. along with Articles 9.13.4.3. ~~and 9.13.4.4.~~ to 9.13.4.6., which require the provision of the means to depressurize the space between the air barrier and the ground, specifically address the capability to mitigate high radon concentrations in the future, should this become necessary.

Radon is a colourless, odourless, radioactive gas that occurs naturally as a result of the decay of radium. It is found to varying degrees as a component of soil gas in all regions

of Canada and is known to enter dwelling units by infiltration into basements and crawl spaces. The presence of radon in sufficient quantity can lead to an increased risk of lung cancer.

The potential for high levels of radon infiltration is very difficult to evaluate prior to construction and thus a radon problem may only become apparent once the building is completed and occupied. Therefore various sections of Part 9 require the application of certain measures that will minimize radon infiltration in all dwellings. These measures are

- low in cost,
- difficult to retrofit, and
- desirable for other benefits they provide.

The principal method of resisting the ingress of all soil gases, a resistance which is required for all buildings (see Sentence 9.13.4.2.(1)), is to seal the interface between the soil and the occupied space, so far as is reasonably practicable. Sections 9.18. and 9.25. contain requirements for air and soil gas barriers in assemblies in contact with ground, including those in crawl spaces. Providing control joints to reduce cracking of foundation walls and airtight covers for sump pits (see Section 9.14.) are other measures that can help achieve this objective. The requirements provided in Subsection 9.25.3. are explained in Notes A-9.25.3.4. and 9.25.3.6. and Note A-9.25.3.6.(2)(a).

The principal method of minimizing radon infiltration into a building is to ensure that the pressure difference across the ground/space interface is positive (i.e., towards the outside) so that the inward flow of radon through any remaining leaks will be minimized. The requirements provided in Article 9.13.4.3. are explained in Note A-9.13.4.3.

## Impact analysis

Requirements for the installation of a passive vertical radon stack in dwelling units and home-type care occupancies that have a wall, roof or floor assembly in contact with the ground were introduced in the NBC 2025.

The national average construction cost for the installation of a passive vertical radon stack in a three-storey house with basement had been determined to be $1 273. The passive vertical radon stack is expected to function without maintenance, inspection or replacement over a 75-year service life [1]. The construction and installation cost of an active side-wall radon stack (comprising radon fan, piping and connections) is determined to be $1 585 nationally. The maintenance cost for the system is $3 500 to $4 500 over a 75-year service life. Therefore, choosing to install an active side-wall radon stack in accordance with this proposed change would represent an increased cost of $3 812 to $4 812 over its 75-year service life compared to the current Code requirement. This estimate does not account for the cost of operating the fan.

The benefits of this proposed change are identical to those for the passive vertical radon stack. The impact analysis for the requirement to install a passive vertical radon stack in Part 9 residential occupancies demonstrated that the main benefit would be

preventing 10 000 to 16 000 radon-associated lung cancer deaths in Canada over 100 years. The cumulative number of lung cancer deaths prevented over 100 years was estimated to be 10 356 (8 601–12 208) for the lower residential radon exposure and 16 132 (14 402–17 586) for the upper estimate of current residential radon exposure [1]. Although the costs incurred for installing radon stacks (either passive vertical or active side-wall) in new housing construction always exceeds the savings from lung cancer treatment for cases prevented, the cumulative cost per lung cancer death prevented decreases steeply after implementation and drops below the Treasury Board of Canada Secretariat reference value after 30 to 40 years [1].

**Reference**

[1] "Impact Analysis of Installing Passive Radon Stacks in Part 9 Residential Occupancies," National Research Council Canada, Ottawa, May 2022.

## Enforcement implications

The proposed changes related to the active side-wall stack (depressurization) option would require the inspection of the subfloor depressurization system from the subfloor connection to the exterior termination and verification that the fan is operating. Airflow measurements would need to be either collected by the authority having jurisdiction or supplied by the contractor prior to occupancy.

## Who is affected

Designers may need to change their designs to better facilitate the termination of the active side-wall radon stack to the exterior when using this option. If the design includes a finished basement, certain elements may need to be moved to accommodate the active stack. For example, walls may need to be moved to conceal the stack or, where walls are not able to be moved, the location where the sub-slab collection pipe penetrates the slab may need to be moved. Further, windows and air intakes near the radon exhaust opening may need to be moved where minimum clearances cannot be met in a current design.

Contractors may be required to add the active subfloor depressurization system to their construction procedures. As a result, further changes to their designs may be required to better facilitate the termination of the active side-wall radon stack at the rim joist. This option may also require moving walls or the location where the sub-slab collection pipe penetrates the slab.

Occupants would benefit from the reduction of exposure to radon gas. This option may require changes to designs to better facilitate the termination of the active side-wall radon stack at the rim joist. It may also require moving walls or the location where the sub-slab collection pipe penetrates the slab.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[9.13.4.1.] 9.13.4.1. ([1] 1) no attributions

[9.13.4.1.] 9.13.4.1. ([2] 2) no attributions

[9.13.4.2.] 9.13.4.2. ([1] 1) no attributions

[9.13.4.2.] 9.13.4.2. ([1] 1) [F40-OH1.1]

[9.13.4.2.] 9.13.4.2. ([2] 2) no attributions

[9.13.4.2.] 9.13.4.2. ([2] 2) [F40-OH1.1]

[9.13.4.2.] 9.13.4.2. ([3] 3) [F40-OH1.1]

[9.13.4.2.] 9.13.4.2. ([4] 4) no attributions

[9.13.4.3.] 9.13.4.3. ([1] 1) [F40-OH1.1]

[9.13.4.3.] 9.13.4.3. ([2] 2) [F40-OH1.1]

[9.13.4.3.] 9.13.4.3. ([3] 3) no attributions

[9.13.4.3.] 9.13.4.3. ([3] 3) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([1] 1) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([2] 2) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([3] 3) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([4] 4) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([5] 5) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([5] 5) [F51-OH1.1]

[9.13.4.4.] 9.13.4.4. ([6] 6) [F40-OH1.1]

[9.13.4.4.] 9.13.4.4. ([7] 7) [F42-OH2.5]

[9.13.4.5.] -- ([1] --) [F40-OH1.1]

[9.13.4.5.] -- ([2] --) [F40-OH1.1]

[9.13.4.5.] -- ([3] --) [F42-OH2.5]

[9.13.4.5.] -- ([4] --) [F40-OH1.1]

[9.13.4.5.] -- ([5] --) [F53-OH1.1]

[9.13.4.5.] -- ([5] --) [F43,F50,F53-OS3.4]

[9.13.4.5.] -- ([6] --) [F53-OH1.1]

[9.13.4.6.] -- ([1] --) [F42-OH2.5]

# Proposed Change 2216

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.23.13. (first printing)** |
| Subject: | Structural Design (Part 9) — Lateral Loads |
| Title: | Roof Load Transfer to Braced Wall Panels |
| Description: | This proposed change addresses the transfer of loads between the roof structure and braced wall panels. |

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 requirements in Sentence 9.23.13.5.(3) of the 2025 edition of the National Building Code of Canada (NBC) regarding the transfer of lateral loads from roof framing members to braced wall panels are unclear and have created confusion within the truss industry. The intent of the existing Sentence is to ensure that stronger wall types (WSP-B or higher) can effectively transfer lateral loads to and from the roof structure. However, the requirements and figures in the associated explanatory Note do not clearly illustrate how blocking elements should be constructed or connected, nor do they provide sufficient information on the design loads that blocking elements must resist or clarify the differences between partial- and full-height blocking configurations.

Improper or inconsistent blocking can result in inadequate lateral load transfer, truss rotation, or damage to truss connections, potentially reducing the building’s ability to resist wind and seismic forces. The lack of clarity can also create uncertainty among designers, builders and truss manufacturers regarding how to design and apply blocking details. Inconsistent interpretation resulting from these gaps may lead to construction quality issues and non-compliance with the intent of the requirements, posing safety concerns.

Clarifying this requirement is necessary to ensure consistent, safe and constructible methods for transferring lateral loads from roof structures to braced wall panels, while maintaining the prescriptive nature of Part 9.

## Justification

This proposed change clarifies the current requirements for transferring lateral loads from roof structures to braced wall panels and expands on them by directly addressing the missing technical detail and risk of inconsistent interpretation identified in the current provisions. The new Article 9.23.13.6. and its accompanying tables establish prescriptive requirements for solid blocking, blocking panels and engineered truss panels, including their construction, materials and fastening details. These proposed revisions are intended to resolve confusion about how blocking elements should be constructed and connected, thereby reducing the likelihood of improper load transfer and limiting the probability of damage to roof components.

This proposed change introduces consistent fastening patterns and acceptable materials (such as solid lumber or structural composite lumber), and references venting provisions for full-height blocking to maintain attic ventilation. By referencing the factored shear resistance values in new Table 9.23.13.6.-C, this proposed change specifies that blocking or truss panels must meet or exceed the strength of the braced wall panel below, which addresses the uncertainty about load capacity and would improve reliability in lateral load transfer. Clear differentiation between full-height and partial-height configurations—including specific fastening requirements and minimum gaps for partial-height blocking—would reduce confusion in application and limit the probability of inadequate load paths or truss movement. Collectively, these clarifications provide a consistent prescriptive method that supports safe, practical and verifiable roof-to-wall load transfer practices.

Implementing this proposed change at the National Model Code level is the most effective approach to resolve the problem that originated in the wording of the NBC 2025 and affects prescriptive construction practices. This proposed change promotes the consistent interpretation of the requirements for transferring lateral loads from roof structures to braced wall panels and their application where the National Model Codes are adopted by provincial and territorial authorities. This proposed change also limits the probability of unsafe conditions under wind and seismic loading, and maintains the prescriptive intent of NBC Part 9 while improving clarity, consistency and constructability.

## PROPOSED CHANGE

### [9.23.13.] 9.23.13. Bracing to Resist Lateral Loads Due to Wind and Earthquake

(See Note A-9.23.13.)

### [9.23.13.1.] 9.23.13.1. Requirements for Low to Moderate Wind and Seismic Forces

### [9.23.13.2.] 9.23.13.2. Requirements for High Wind and Seismic Forces

### [9.23.13.3.] 9.23.13.3. Requirements for Extreme Wind and Seismic Forces

### [9.23.13.4.] 9.23.13.4. Braced Wall Bands

### [9.23.13.5.] 9.23.13.5. Braced Wall Panels in Braced Wall Bands

**[1] 1)** Except as provided in Sentences (2) and 9.23.13.12.(2) to (4), and Article 9.23.13.9., *braced wall panels* shall

[a] a) be located within *braced wall bands*,

[b] b) be laterally supported at each floor level and the roof,

[c] c) extend, as applicable, from the top of the supporting footing, slab or subfloor to the underside of the floor, ceiling or roof framing above, and

[d] d) conform to the spacing and dimensions given in Table 9.23.13.5. and Article 9.23.13.9.

**Table [9.23.13.5.] 9.23.13.5.**
**Spacing and Dimensions of Braced Wall Bands and Braced Wall Panels Forming Part of Sentences [9.23.13.4.] 9.23.13.4.([1] 1) and [9.23.13.5.] 9.23.13.5.([1] 1)**

| Description | Spacing and Dimensions of *Braced Wall Bands* and *Braced Wall Panels* (1) (2) (3) |
|---|---|
| Maximum distance between centre lines of adjacent *braced wall bands* measured from the furthest points between centres of the bands (4) | 10.6 m |
| Maximum distance between required *braced wall panels* measured from the edges of the panels | 6.4 m |
| Maximum distance from the end of a *braced wall band* to the edge of the closest required *braced wall panel* | 2.4 m |
| Minimum length of individual wood-sheathed *braced wall panels*: | |
| • panel located at the end of a *braced wall band* where the *braced wall panel* connects to an intersecting *braced wall panel* | 600 mm |

| Description | Spacing and Dimensions of *Braced Wall Bands* and *Braced Wall Panels* (1) (2) (3) |
|---|---|
| • panel not located at the end of a *braced wall band* or *braced wall panel* located at the end of a *braced wall band* where the *braced wall panel* does not connect to an intersecting *braced wall panel* | 750 mm |
| Minimum length of individual *braced wall panels* sheathed only with gypsum board | 1.2 m |
| Minimum length of individual diagonal-lumber-sheathed *braced wall panels* | 1.2 m |
| Minimum total length of all *braced wall panels* in a *braced wall band* | Per Article 9.23.13.9. |

**Notes to Table [9.23.13.5.] 9.23.13.5.:**

(1) See Note A-Table 9.23.13.5.

(2) All constructions include support of a roof load in addition to the indicated number of floors.

(3) See Article 9.23.13.12. for additional system considerations.

(4) See Sentence (2) for an exception for *basements* and crawl spaces.

**[2] 2)** In *basements* or crawl spaces where the perimeter *foundation* walls extend from the footings to the underside of the supported floor, *braced wall bands* constructed with *braced wall panels* shall

[a] a) have a total length of *braced wall panels* not less than the total length of *braced wall panels* in the *braced wall band* in the *storey* above, and

[b] b) be spaced not more than

[i] i) 15 m from the perimeter *foundation* walls,

[ii] ii) 15 m from interior *foundation* walls, and

[iii] iii) 15 m from adjacent *braced wall bands* constructed with *braced wall panels*.

(See Note A-9.23.13.5.(2).)

~~**[3] 3)** Interior or exterior wood-sheathed *braced wall panels*, other than panels of WSP-A framing type, in the uppermost *storey* shall~~

~~[a] a) extend to the roof framing, and~~

~~[b] b) have their top plate connected to~~

~~[i] i) top chords of perpendicular or offset parallel trusses by using~~

~~blocking panels or other methods of lateral load transfer designed by the roof truss manufacturer,~~

[ii] ii) ~~perpendicular or offset parallel joists or rafters by using blocking of the same construction as the *braced wall panel* below, or~~

[iii] iii) ~~rafters, joists or trusses by using methods of lateral load transfer designed in accordance with good engineering practice.~~

~~(See Note A-9.23.13.5.(3) and (4).)~~

**~~[4] 4)~~** ~~The top plates of *braced wall panels* described in Sentence (3) shall be fastened in accordance with Table 9.23.3.4. (See Note A-9.23.13.5.(3) and (4).)~~

**[9.23.13.6.] --- Braced Wall Panel Connections to Roof Framing**

**[1] --)** The top plates of *braced wall panels* that directly support a roof shall be fastened to the roof framing in accordance with Table 9.23.3.4.

**[2] --)** Except as provided in Sentences (3) to (6), the *braced wall panels* described in Sentence (1) shall extend to the roof framing with their top plates connected to

[a] --) roof sheathing between perpendicular or offset parallel rafters, joists or trusses using full-height blocking in accordance with Table 9.23.13.6.-A,

[b] --) perpendicular rafters, joists or trusses using partial-height blocking in accordance with Table 9.23.13.6.-B, or

[c] --) rafters, joists or trusses by using methods of lateral load transfer designed in accordance with good engineering practice or Part 4.

(See Note A-9.23.13.6.(2).)

## Table [9.23.13.6.-A]
## Full-Height Blocking to Connect Braced Wall Panels to Roof Sheathing Between Roof Framing
## Forming Part of Clause 9.23.13.6.(2)(a)

| Blocking Type | Construction Type | Fastening Details |
|---|---|---|
| Solid blocking (1) (2) | 38 mm solid lumber or equivalent (3) | Solid blocking fastened to the top plate of the *braced wall panel* below and the roof sheathing fastened to the solid blocking using the same fastener size and spacing as required for the reference framing type (4) of the *braced wall panel* below with toe-nailing. |
| Blocking panels (5) | Same as or better than the reference framing type (4) of the *braced wall panel* below. | Blocking panel fastened to the top plate of the braced wall panel below and the roof sheathing fastened to the blocking panel using the same fastener size and spacing as required for the reference framing type (4) of the *braced wall panel* below. |
| Engineered truss panels | Designed to meet or exceed the factored shear resistance of the reference framing type (4) of the *braced wall panel* below. (6) | The engineered truss panel fastened to the top plate of the *braced wall panel* and the roof sheathing fastened to the engineered truss panel as specified by the truss design engineer to meet or exceed the connection capacity required for the reference framing type (4) of the *braced wall panel* below. |

**Notes to Table [9.23.13.6.-A] :**

(1) See Sentence 9.23.13.6.(4).

(2) Built-up or stacked solid blocking is not permitted.

(3) Structural composite lumber having a minimum thickness of 32 mm is permitted in lieu of solid lumber.

(4) See Sentence 9.23.3.5.(3) for reference framing types, minimum sheathing thickness, maximum stud spacing, and specifications for fasteners.

(5) See Sentence 9.23.13.6.(5).

(6) See Sentence 9.23.13.6.(9).

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**Table [9.23.13.6.-B]**
**Partial-Height Blocking (1) to Connect Braced Wall Panels to Roof Framing**
**Forming Part of Clause 9.23.13.6.(2)(b)**

| Blocking Type | Construction Type | Fastening Details |
|---|---|---|
| Solid blocking (2) (3) | 38 mm solid lumber or equivalent (4) | Solid blocking fastened to the top plate of the *braced wall panel* below using 82 mm nails at 150 mm o.c. and fastened to the roof framing with 2 per toe nailed or 3 end nailed. |
| Blocking panels (5) | Same as or better than the reference framing type (6) of the *braced wall panel* below. | Bottom horizontal components of the blocking panel fastened to the top plate of the *braced wall panel* below using 82 mm nails at 150 mm o.c. and the vertical blocking components to truss web or filler blocks with 82 mm nails at 150 mm o.c. |
| Engineered truss panels | Designed to meet or exceed the factored shear resistance of the reference framing type (7) of the *braced wall panel* below. | Specified by the truss design engineer to meet or exceed the connection capacity of the reference framing type (6) of the *braced wall panel* below. |

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**Notes to Table [9.23.13.6.-B] :**

(1) See Sentence 9.23.13.6.(6).

(2) See Sentence 9.23.13.6.(4).

(3) Built-up or stacked solid blocking is not permitted.

(4) Structural composite lumber having a minimum thickness of 32 mm is permitted in lieu of solid lumber.

(5) See Sentence 9.23.13.6.(5).

(6) See Sentence 9.23.3.5.(3) for reference framing types, minimum sheathing thickness, maximum stud spacing, and specifications for fasteners.

(7) See Sentence 9.23.13.6.(9).

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**[3] --)** Blocking described in Sentence (2) is not required

[a] --) where the *braced wall panels* described in Sentence (1) belong to

[i] --) gypsum-sheathed reference framing type GWB-A, GWB-B, GWB-C or GWB-D, or

[ii] --) wood-sheathed reference framing type WSP-A, or

[b] --) where the distance between the top of the *braced wall panel* and the underside of the roof sheathing is less than or equal to 140 mm.

**[4] --)** Solid blocking is not permitted to be used where the distance between the top of the *braced wall panel* and underside of the roof sheathing is greater than 286 mm.

**[5] --)** Blocking panels are not permitted to be used where the distance between the top of the *braced wall panel* and underside of the roof sheathing is greater than 1 200 mm.

**[6] --)** Partial-height blocking is not permitted to be used where the *braced wall panel* below belongs to reference framing type WSP-D or WSP-E.

**[7] --)** Where partial-height blocking is used, the gap between the top of the blocking and the roof sheathing shall not exceed 50 mm.

**[8] --)** *Attic or roof space* venting shall comply with Subsection 9.19.1. (See Note A-9.23.13.6.(8).)

**[9] --)** Where the engineered truss panels referred to in Tables 9.23.13.6.-A and -B are used, these panels shall be capable of meeting or exceeding the values for factored shear resistance in Table 9.23.13.6.-C that correspond to the reference framing type of the *braced wall panel* below.

**Table [9.23.13.6.-C]**
**Factored Shear Resistance of the Reference Framing Type of the Braced Wall Panel**
**Forming Part of Sentence 9.23.13.6.(9)**

| Reference Framing Type | Factored Shear Resistance, kN/m |
|---|---|
| WSP-B | 6.22 |
| WSP-C | 7.15 |
| WSP-D | 7.85 |
| WSP-E | 8.71 |
| DWB | 5.77 |

**[9.23.13.7.] 9.23.13.6. Materials in Braced Wall Panels**

**[9.23.13.8.] 9.23.13.7. Simplified Method for Determining Minimum Length of Bracing**

**[9.23.13.9.] 9.23.13.8. Table Method for Determining Minimum Length of Bracing**

**[9.23.13.10.] 9.23.13.9. Calculation Method for Determining Minimum Length of Bracing**

**[9.23.13.11.] 9.23.13.10. Foundation Cripple Walls**

**[9.23.13.12.] 9.23.13.11. Cripple Walls in Stepped Foundations**

**[9.23.13.13.] 9.23.13.12. Additional System Considerations**

~~**Note A-9.23.13.5.(3) and (4) Connection of Braced Wall Panels to Roof Framing.**~~

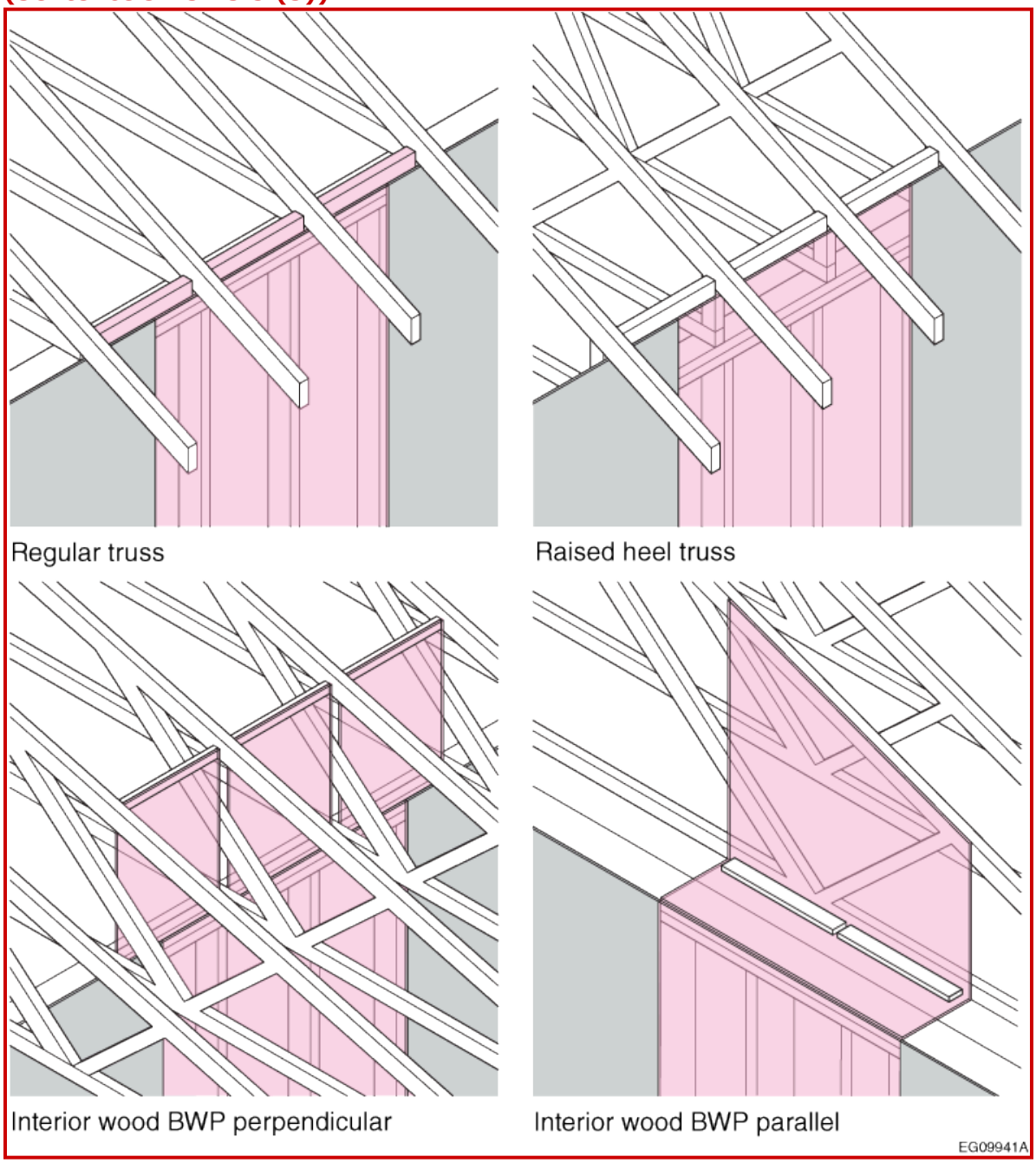
~~Braced wall panels that are sheathed with gypsum board alone have a significantly lower lateral resistance than wood-sheathed braced wall panels. For gypsum-sheathed braced wall panels, the typical lateral bracing of trusses is usually adequate to transfer the lateral loads from the bottom chords to the top chords of the truss.~~

~~The connection of interior gypsum-sheathed braced wall panels to trusses also needs to accommodate vertical movement of the roof framing in order to facilitate "truss uplift" and to prevent the gypsum board from cracking.~~

~~The connection of interior or exterior wood-sheathed braced wall panels (BWP), other than panels of WSP-A framing type, to roof framing is illustrated in~~

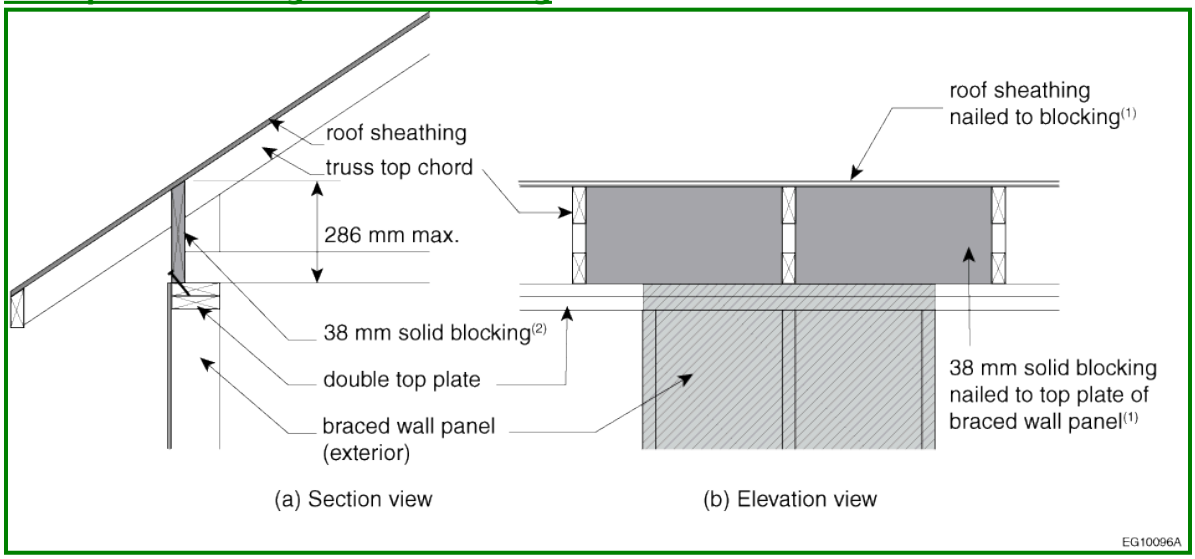
~~Figure A-9.23.13.5.(3) and (4).~~

**~~Figure [A-9.23.13.5.(3) and (4)] A-9.23.13.5.(3) and (4)~~**
**~~Connection of wood-sheathed braced wall panels to roof framing~~**
**~~(Sentence 9.23.13.5.(3))~~**



## Note A-9.23.13.6.(2) Examples of Braced Wall Panel Connections to Roof Framing.

### Figure [A-9.23.13.6.(2)-A]
### Example of full-height solid blocking

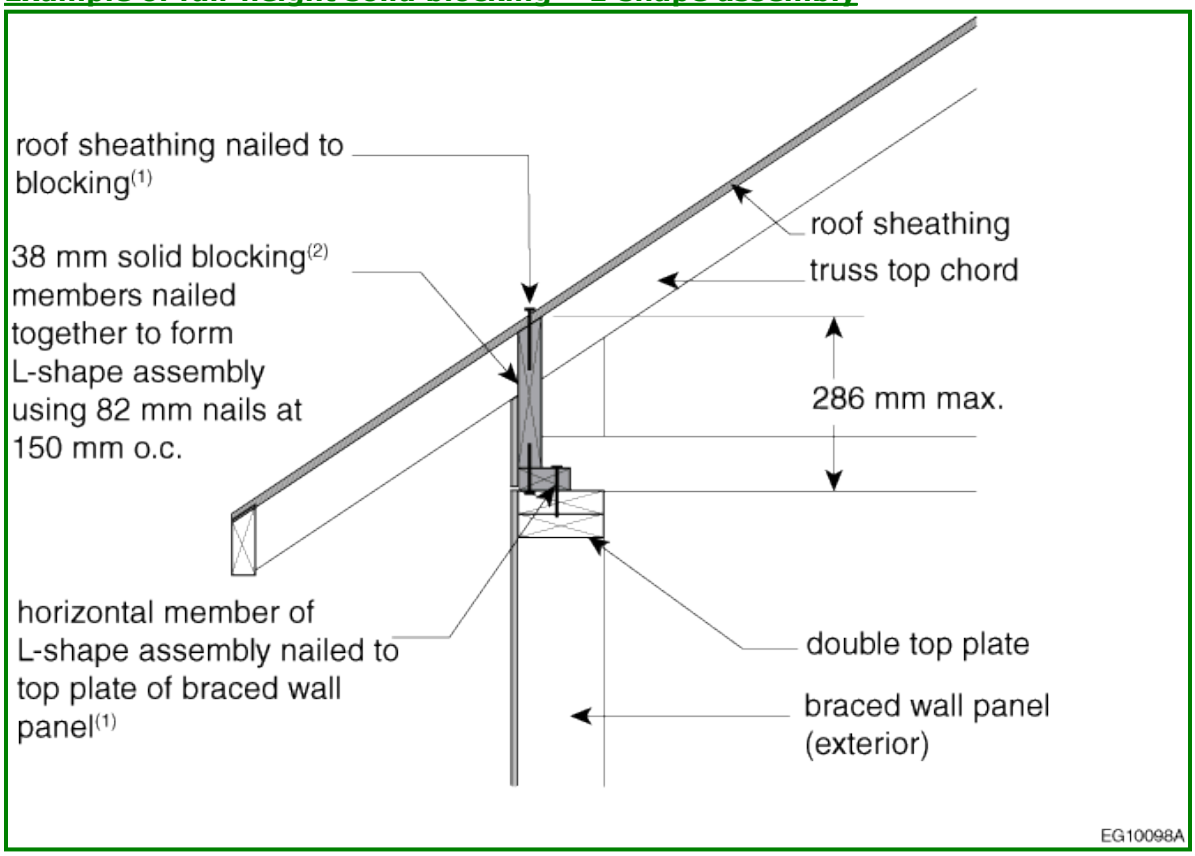



**Notes to Figure :**

(1) See Table 9.23.13.6.-A for fastening details.

(2) See Table 9.23.13.6.-A for construction type.

**Figure [A-9.23.13.6.(2)-B]**
**Example of full-height solid blocking – L-shape assembly**

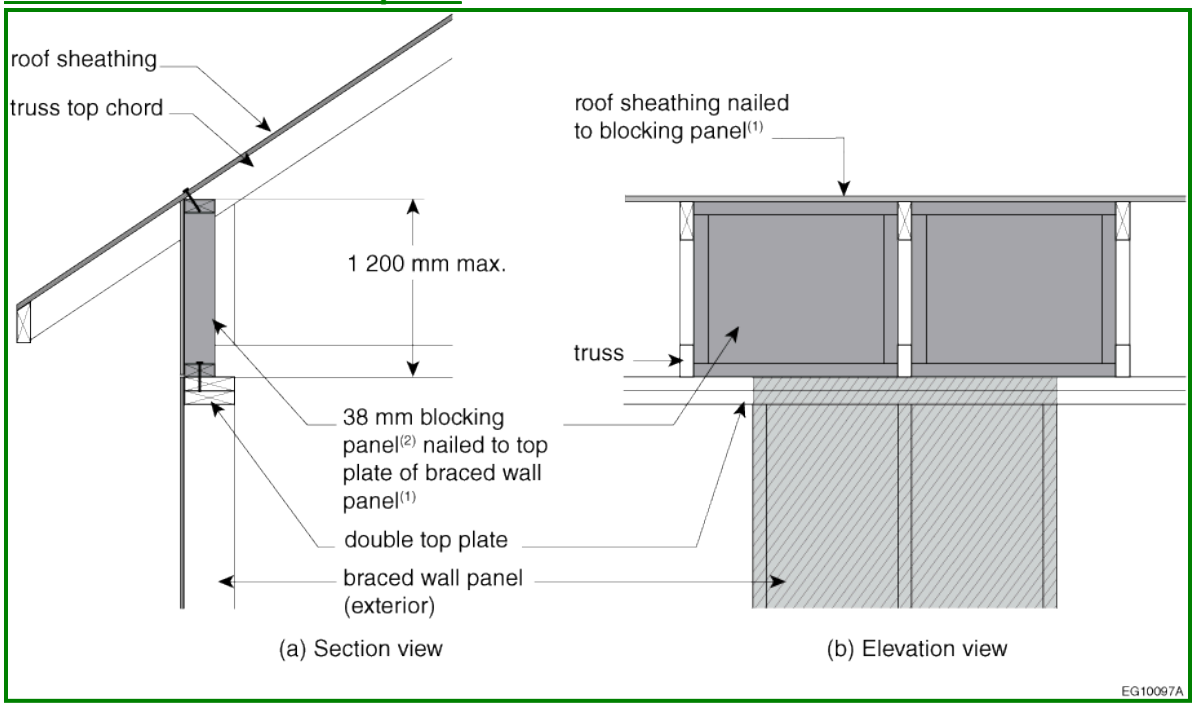



**Notes to Figure :**

(1) See Table 9.23.13.6.-A for fastening details.

(2) See Table 9.23.13.6.-A for construction type.

**Figure [A-9.23.13.6.(2)-C]**
**Example of full-height blocking panels – perpendicular roof framing members and exterior braced wall panel**

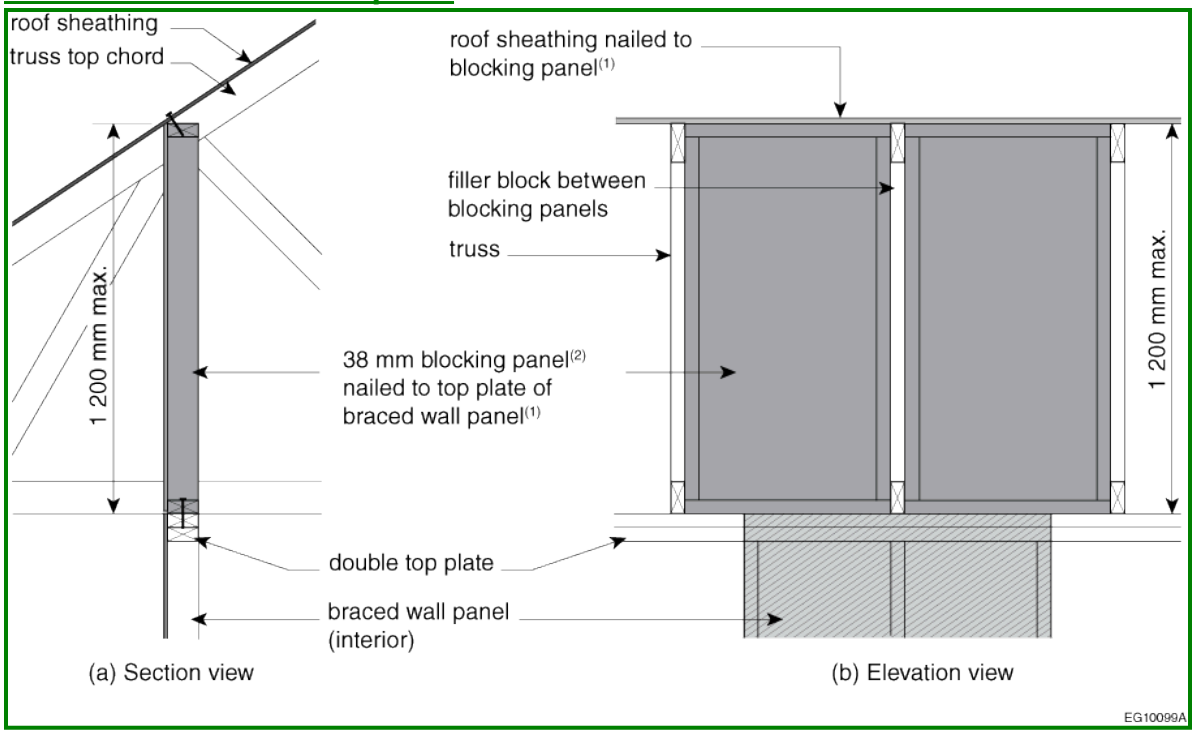



**Notes to Figure :**

(1) See Table 9.23.13.6.-A for fastening details.

(2) See Table 9.23.13.6.-A for construction type.

## Figure [A-9.23.13.6.(2)-D]
## Example of full-height blocking panels – perpendicular roof framing members and interior braced wall panel

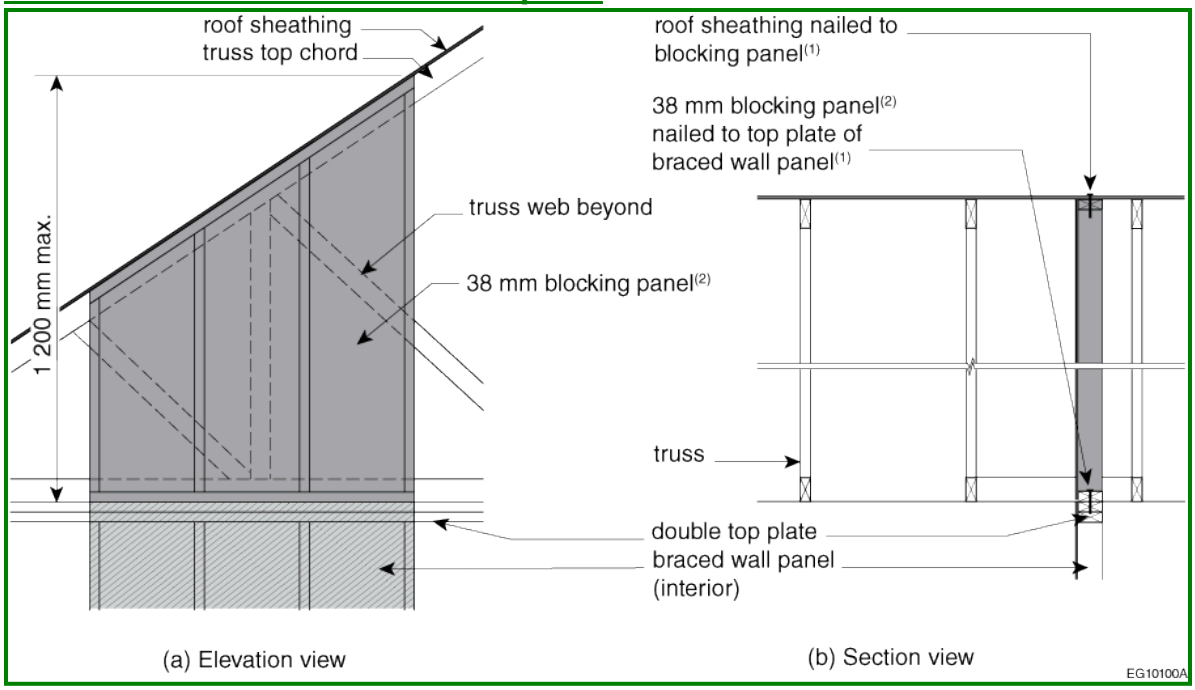



**Notes to Figure :**

(1) See Table 9.23.13.6.-A for fastening details.

(2) See Table 9.23.13.6.-A for construction type.

## Figure [A-9.23.13.6.(2)-E]
## Example of full-height blocking panels – parallel and offset roof framing members and interior braced wall panel

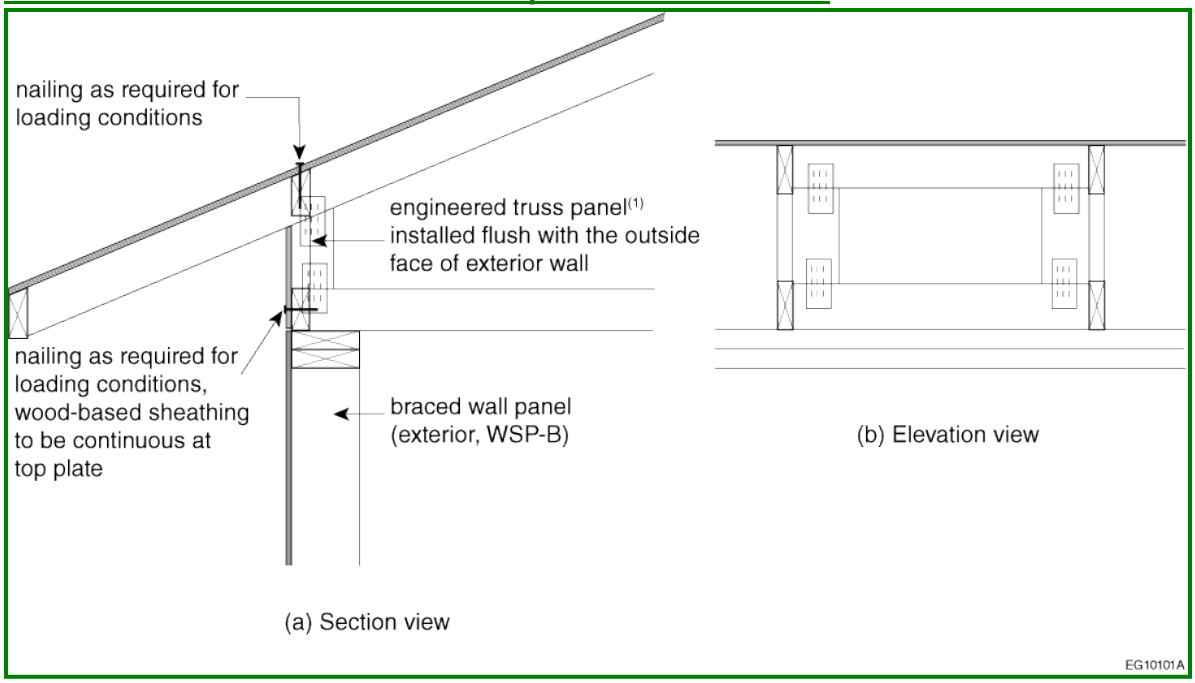



### Notes to Figure :

(1) See Table 9.23.13.6.-A for fastening details.

(2) See Table 9.23.13.6.-A for construction type.

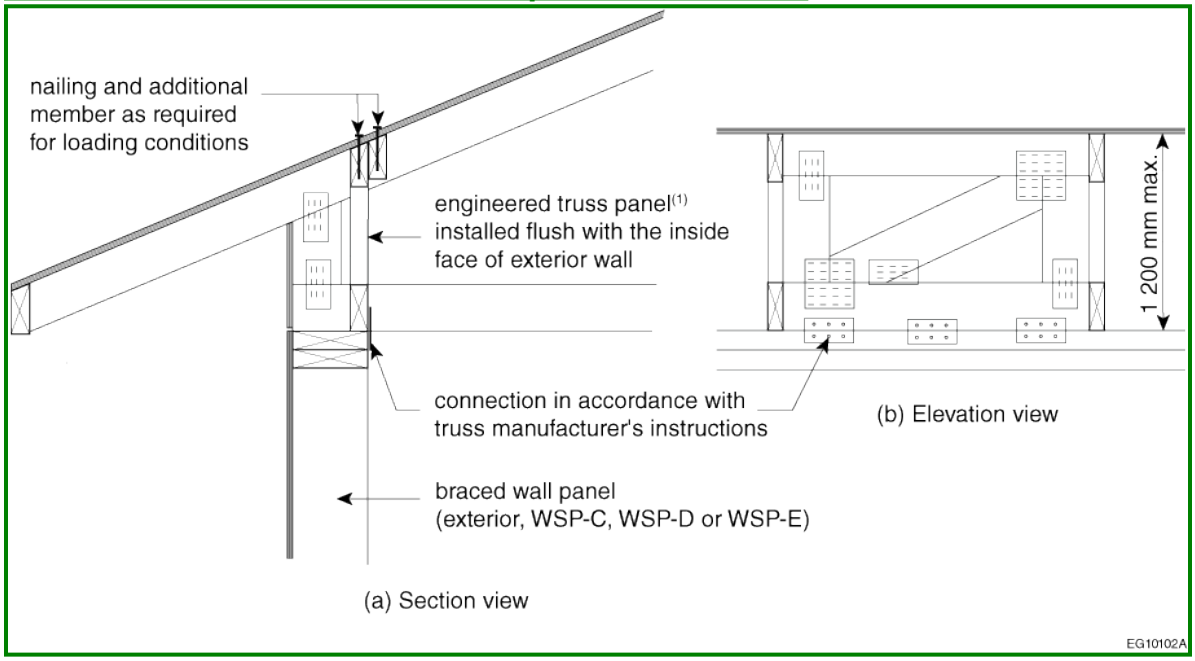
**Figure [A-9.23.13.6.(2)-F]**
**Example of full-height engineered truss panels – perpendicular roof framing members and exterior braced wall panel – outside face**




**Note to Figure :**

(1) See Table 9.23.13.6.-A.

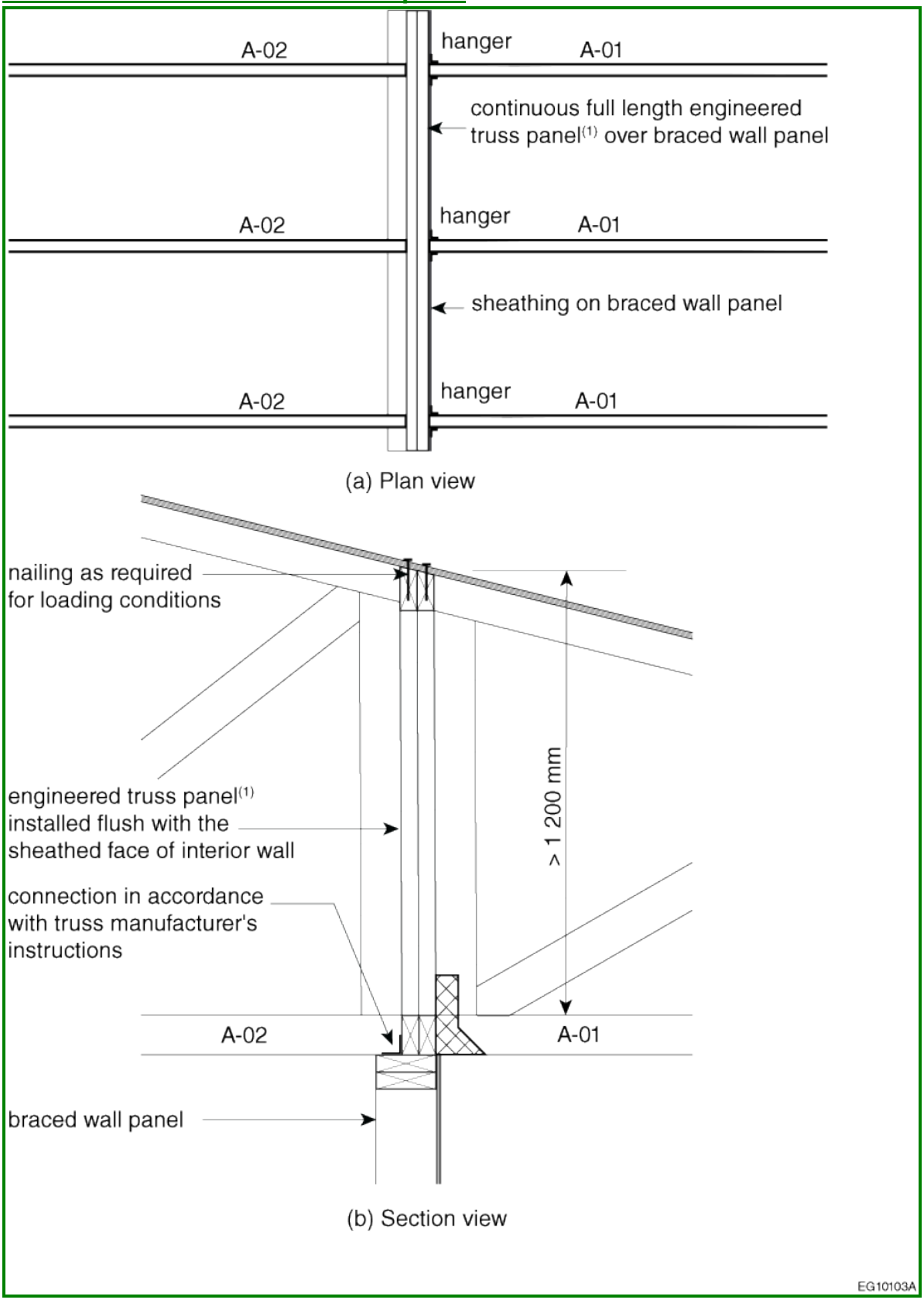
**Figure [A-9.23.13.6.(2)-G]**
**Example of full-height engineered truss panels – perpendicular roof framing members and exterior braced wall panel – inside face**




**Note to Figure :**

(1) See Table 9.23.13.6.-A.

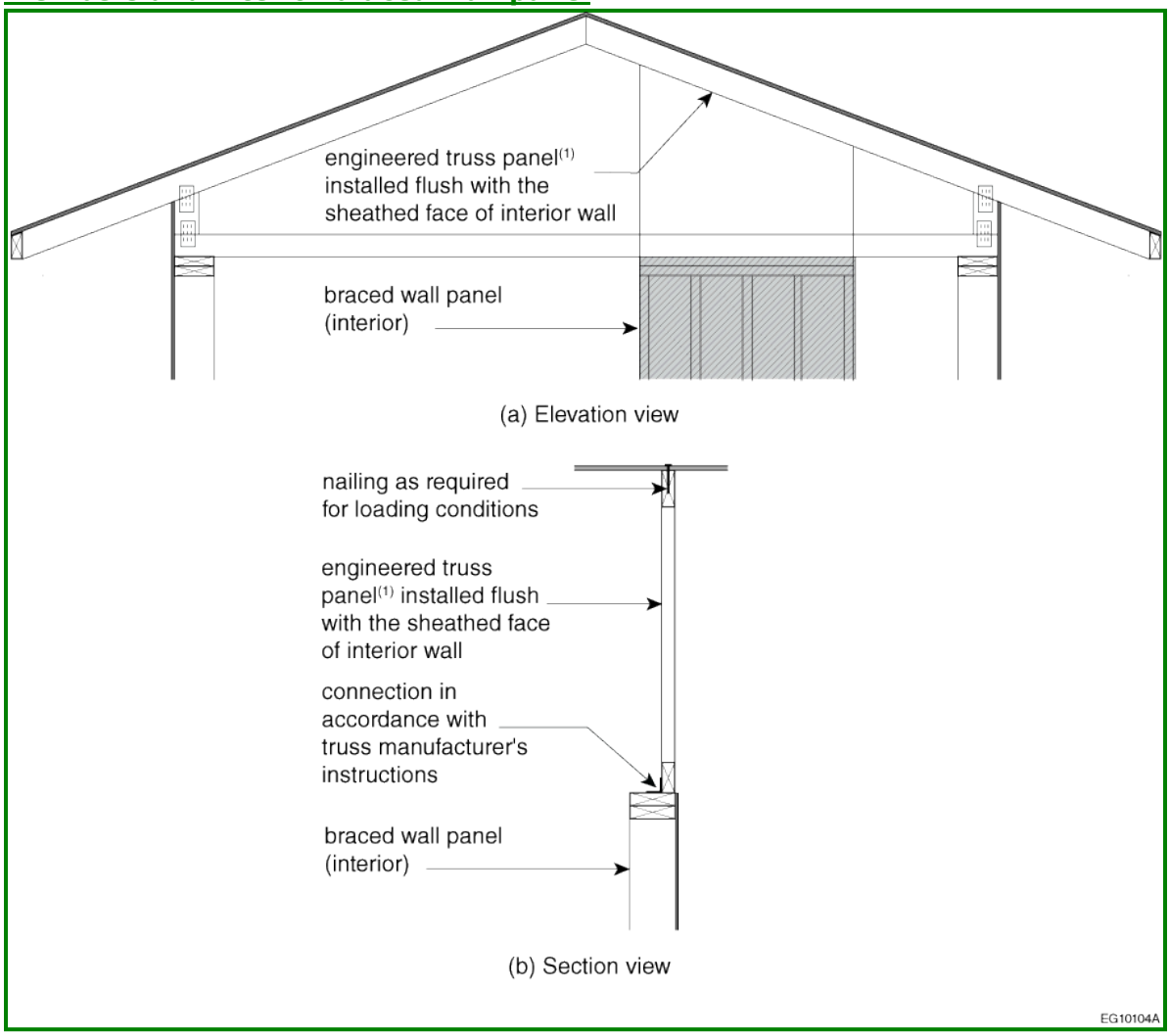
**Figure [A-9.23.13.6.(2)-H]**
**Example of full-height engineered truss panels – perpendicular roof framing members and interior braced wall panel**




**Note to Figure :**

(1) See Table 9.23.13.6.-A.

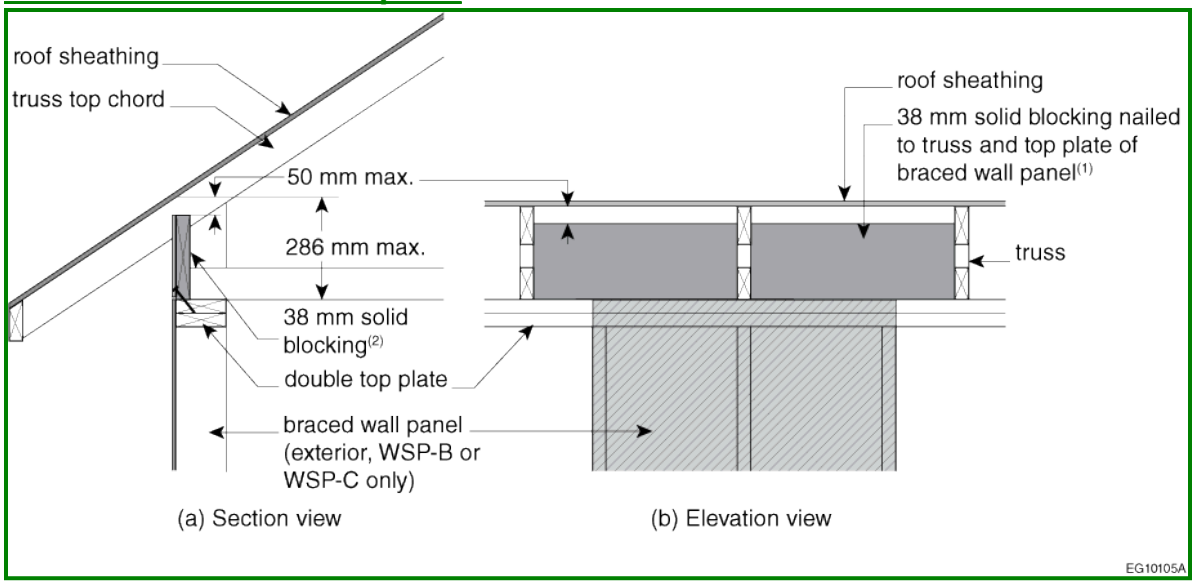
**Figure [A-9.23.13.6.(2)-I]**
**Example of full-height engineered truss panels – parallel roof framing members and interior braced wall panel**




**Note to Figure :**

(1) See Table 9.23.13.6.-A.

**Figure [A-9.23.13.6.(2)-J]**
**Example of partial-height solid blocking – perpendicular roof framing members and exterior braced wall panel**

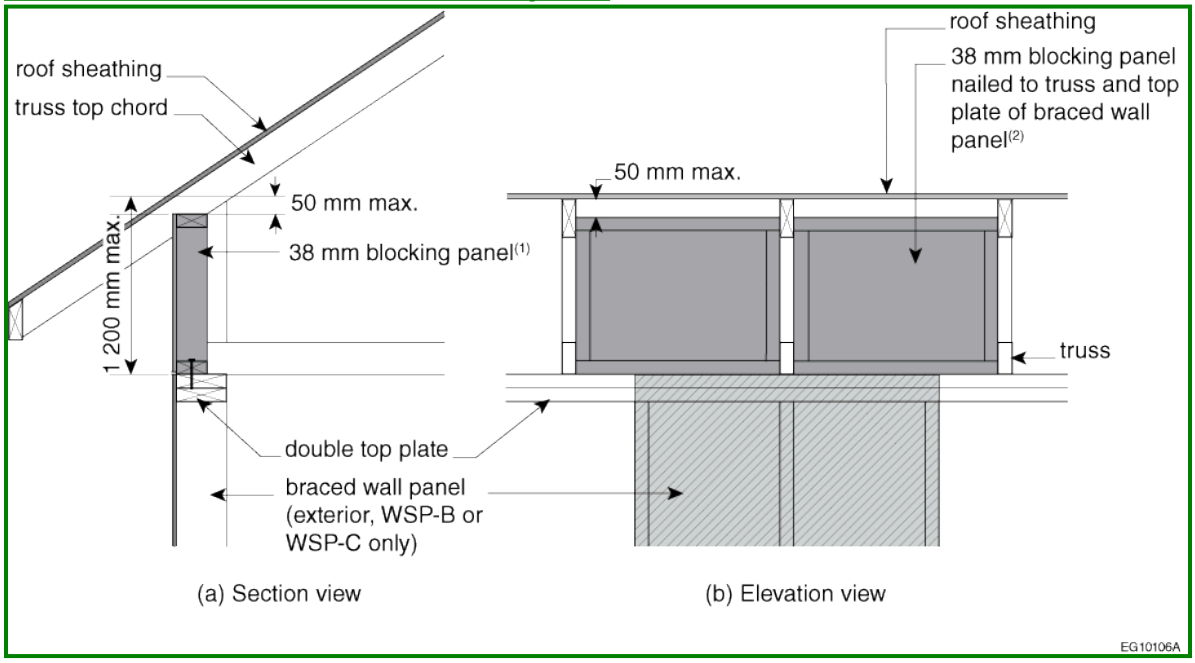



**Notes to Figure :**

(1) See Table 9.23.13.6.-B for fastening details.

(2) See Table 9.23.13.6.-B for construction type.

**Figure [A-9.23.13.6.(2)-K]**
**Example of partial-height blocking panels – perpendicular roof framing members and exterior braced wall panel**




**Notes to Figure :**

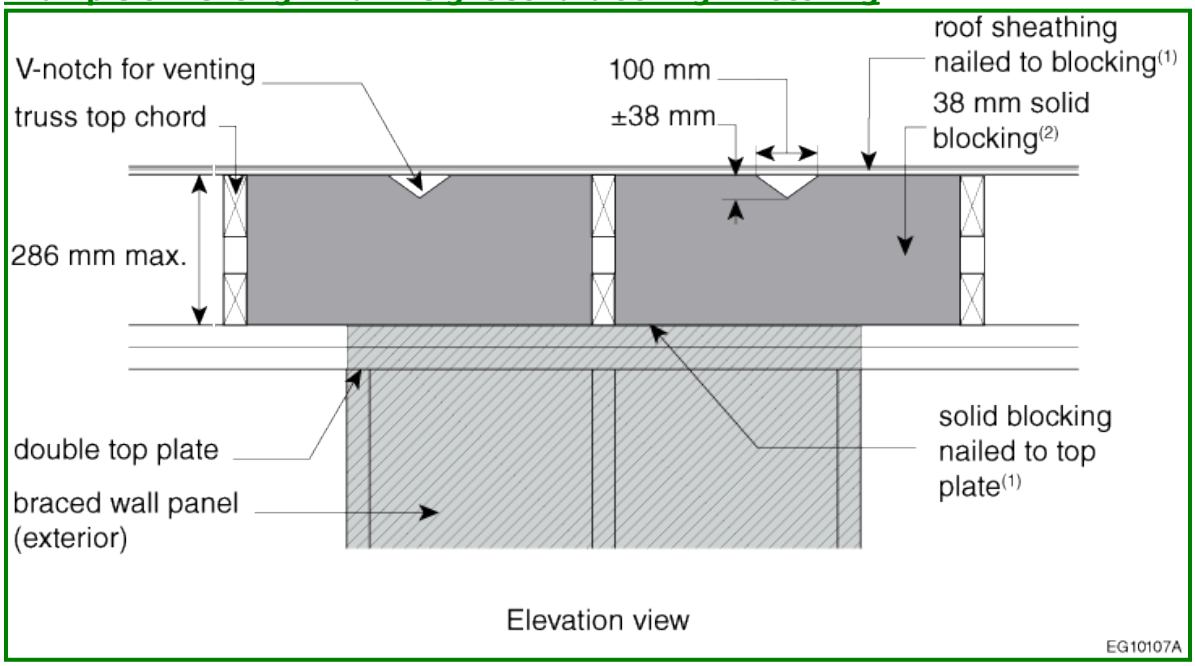
(1) See Table 9.23.13.6.-B for construction type.

(2) See Table 9.23.13.6.-B for fastening details.

## Note A-9.23.13.6.(8) Examples of Venting in Full-Height Solid Blocking and Blocking Panels with Perpendicular Roof Framing Members and Exterior Braced Wall Panels.

An unobstructed vent area at the perimeter of the attic or roof space can be maintained by notching or drilling holes through full-height solid blocking or blocking panels as shown in Figures 9.23.13.6.(8)-A to -D.

**Figure [A-9.23.13.6.(8)-A]**
**Example of venting in full-height solid blocking – notching**



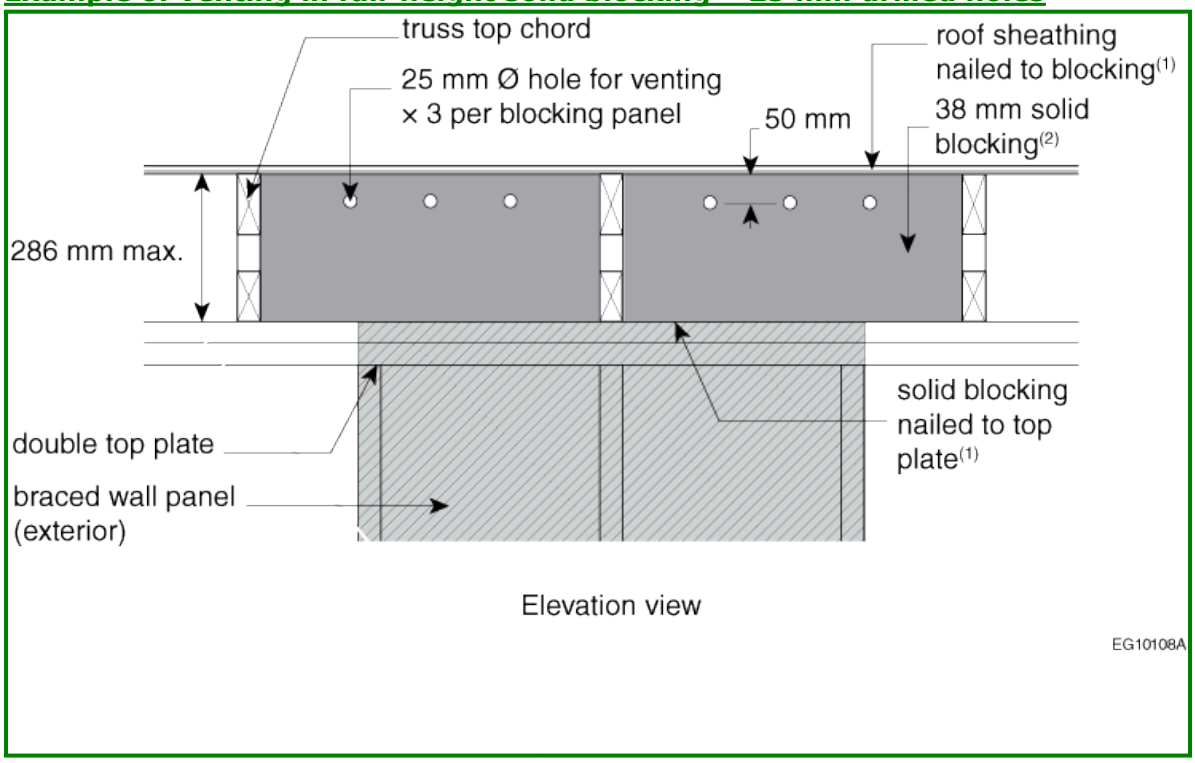

**Notes to Figure :**

(1) See Table 9.23.13.6.-B for fastening details.

(2) See Table 9.23.13.6.-B for construction type.

**Figure [A-9.23.13.6.(8)-B]**

**Example of venting in full-height solid blocking – 25 mm drilled holes**



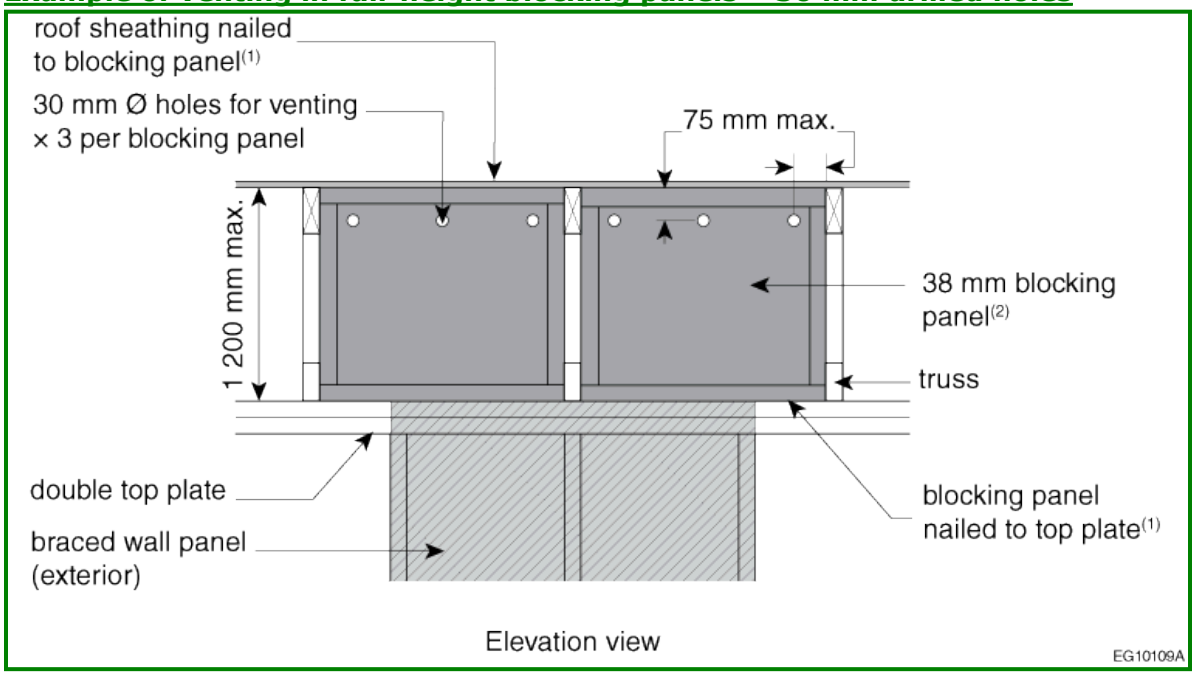

**Notes to Figure :**

(1) See Table 9.23.13.6.-B for fastening details.

(2) See Table 9.23.13.6.-B for construction type.

**Figure [A-9.23.13.6.(8)-C]**

**Example of venting in full-height blocking panels – 30 mm drilled holes**

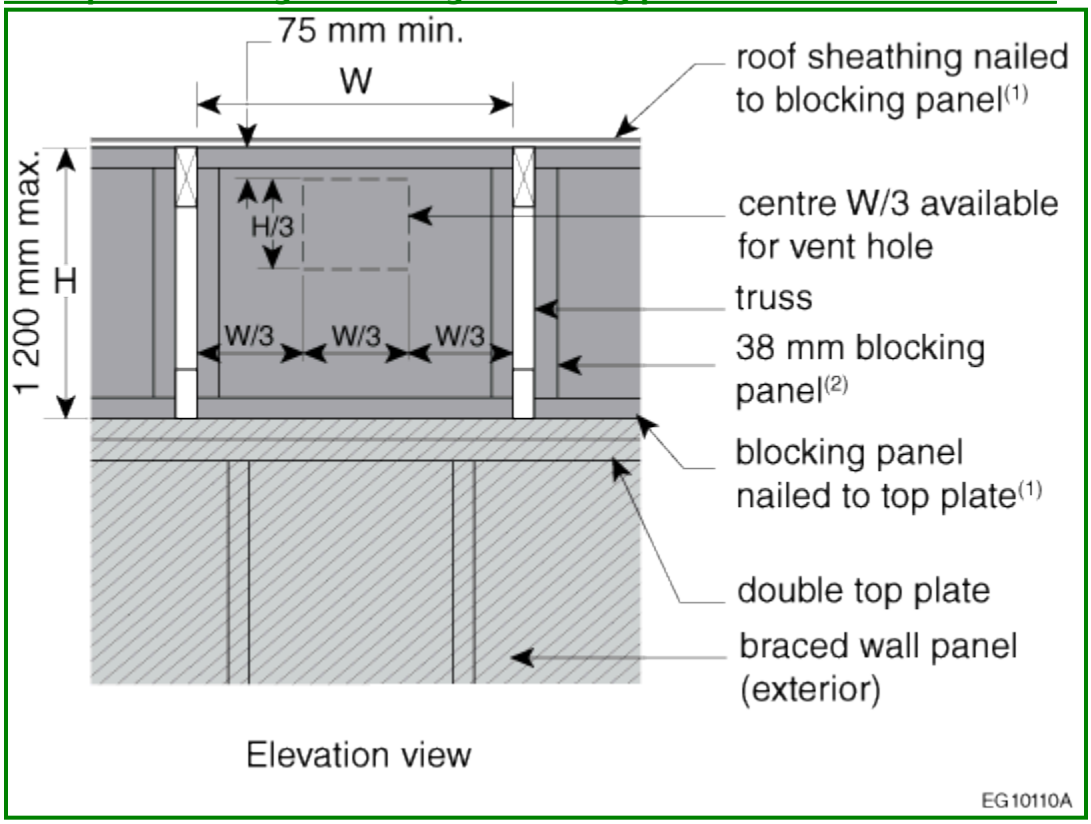



**Notes to Figure :**

(1) See Table 9.23.13.6.-B for fastening details.

(2) See Table 9.23.13.6.-B for construction type.

**Figure [A-9.23.13.6.(8)-D]**
**Example of venting in full-height blocking panels – vent hole in centre**




**Notes to Figure :**

(1) See Table 9.23.13.6.-B for fastening details.

(2) See Table 9.23.13.6.-B for construction type.

## Impact analysis

The proposed change is expected to result in cost savings. Although there are costs associated with the installation of solid blocking, blocking panels, or truss panels (see table below), the requirements, as clarified by this proposed change, provide the necessary guidance to reduce the need to pay professional fees (see the "Benefit Analysis" section below).

**Cost Analysis**

This proposed change does not introduce new requirements for blocking to facilitate lateral load transfer; since the requirements already exist, there is an existing cost associated with the existing requirement. However, this proposed change clarifies the requirements for blocking, which may result in cost savings.

The costs for blocking are determined based on the construction and connection details that are chosen as a result of the reasonable interpretation of the existing requirements in Sentences 9.23.13.5.(3) and (4)-2025 as shown in the figures included in the explanatory Note. The cost analysis of this proposed change includes a range of costs

reflecting possible interpretations of the existing requirements (and figures, i.e., the visual interpretation of the engineered solutions that are provided by a professional engineer).

The cost analysis also includes the assumptions identified below.

Table 1 shows an assessment of the difference in costs of the existing requirements for blocking compared to the requirements as clarified in this proposed change (i.e., Article 9.23.13.6.-2030).

The two locations have been selected to represent both an area with low-to-moderate wind or seismic forces (i.e., Toronto, Ont.) and an area with high wind or seismic forces (i.e., Victoria, BC), using climatic data and seismic parameters from NBC Tables C-2 and C-3.

The A4 building archetype features brick veneer on the front elevation and stucco siding on the sides. In Toronto, these claddings classify the construction as heavyweight. In Victoria, however, heavyweight construction would require longer exterior walls than available; therefore, vinyl siding is used instead to classify the construction as normal weight.

**Table 1. Construction Costs(1)(2)(3) for Lateral Load Transfer Blocking in Two Locations**

| Location | Blocking Type | Sentences 9.23.13.5.(3) and (4)-2025 | Article 9.23.13.6.-2030 | Cost Difference |
|---|---|---|---|---|
| **Toronto, Ont.** | Solid blocking(4)(5) | $220–$320 | $320 | $0–$100 |
| | Blocking panels(5)(6) | $325–$680 | $680 | $0–$355 |
| | Engineered truss panels(7) | N/A | N/A | $41 |
| **Victoria, BC** | Solid blocking(4)(5) | $310–$520 | $520 | $0–$210 |
| | Blocking panels(5)(6) | $425–$1 005 | $1 005 | $0–$580 |
| | Engineered truss panels(7) | N/A | N/A | $64 |

Notes to Table 1:

1. Costs are based on RSMeans data from Gordian for 2026 Q1.

2. Cost adjustments per RSMeans include a 15% mark-up for difficulty working within trusses, a 20% contingency allowance since the estimate is based on conceptual design, and a 10% construction management fee, plus overhead and profit.

3. The assessment of existing costs is based on Sentences 9.23.13.5.(3) and (4)-2025 (as shown in the figures in the Note as specified). For the lower cost value in the third column of Table 1, the analysis assumes 38 × 89 mm blocking and 11 mm OSB sheathing at the truss heel (see Figures A-9.23.13.5.(3) and (4)-2025, Raised heel truss) with heel heights of 286 mm and 600 mm for solid blocking and blocking panels, respectively. For the higher cost value, the analysis assumes an engineered solution

similar to that required by Article 9.23.13.6.-2030. The range of existing costs associated with Sentences 9.23.13.5.(3) and (4)-2025 reflects a reasonable interpretation of the figures in the explanatory Note.

4. Costs for solid blocking in accordance with Article 9.23.13.6.-2030 are based on a raised heel truss between 140 mm and 286 mm and 38 × 286 mm solid blocking.

5. The quantities of solid blocking and blocking panels were determined by calculating the length of required braced wall panels for the A4 building archetype (see supporting documents) using the Calculation Method in NBC Article 9.23.13.9. and are specific to the climatic data and seismic parameters for the two locations.

6. Costs for blocking panels in accordance with Article 9.23.13.6.-2030 are based on a raised heel truss of 600 mm and use 38 × 89 mm top, bottom and side framing with 11 mm OSB sheathing to match the WSP-B blocking panel below.

7. The cost difference for engineered truss panels is based on data provided by the Western Wood Truss Association of British Columbia and reflects expected design efficiencies resulting from the proposed clarification of the loads in Sentence 9.23.13.6.(9)-2030. The resulting design efficiencies are expected to reduce costs by approximately $2.75 per 600 mm tall panel between trusses and $3.10 per 1 200 mm tall panel between trusses. Based on the A4 building archetype, fifteen 600 mm panels are required in Toronto, representing an estimated cost savings of approximately $41. In Victoria, twenty-two 600 mm panels and one 1 200 mm panel are required, representing an estimated cost savings of approximately $64.

**Benefit Analysis**

As identified in the Problem section, Subclause 9.23.13.5.(3)(b)(i)-2025 lacks clarity regarding construction requirements for blocking panels, leaving the interpretation to the builder or owner. Alternatively, the roof truss manufacturer can support compliance by designing to meet the lateral load transfer requirements. In both cases, a professional engineer is likely needed to develop the solution and/or to specify the design loads, resulting in additional engineering fees. Representatives of the Western Wood Truss Association of British Columbia report that these fees are typically $1 500 to $2 500 in Victoria, depending on building size. The lateral load provisions in NBC 2025 have not yet been adopted in Ontario; therefore, the requirement does not currently exist in Toronto and the corresponding engineering fees remain unknown. As such, professional fees in Toronto are assumed to be the same as in Victoria for the purpose of this analysis.

This proposed change benefits Code users by clarifying the requirements, which in turn means engineering fees can be saved, resulting in a cost savings of $1 500 to $2 500. For the purpose of this analysis, based on the area of the A4 building archetype (1 373 $ft.^2$), the lower end cost savings ($1 500) is used for comparison against the costs provided in Table 1 above.

**Conclusion**

This proposed change offsets the new costs for blocking with the costs saved related to professional fees. Therefore, the cost impact for the proposed change is a net savings ranging from $920 ($1 500–$580) to $1 459 ($1 500–$41), depending on the blocking type and location. The net cost reduction represents the overall benefit of making the proposed changes.

## Enforcement implications

The proposed change provides regulators with additional prescriptive information to support the assessment of compliance, improving enforceability compared to the current NBC requirements. Multiple options are provided to allow flexibility during construction and to support enforcement across the range of scenarios that may be encountered on site.

Some training may be required, particularly in regions where lateral load bracing requirements are relatively new (e.g., areas with low-to-moderate seismic and wind loads). However, the figures included in the explanatory Note are expected to support training and improve general understanding of the requirements.

## Who is affected

This proposed change addresses concerns raised by the truss industry and supports manufacturers by providing information for the design and construction of engineered truss panels where roof trusses are used as roof framing. This proposed change removes the need for roof truss manufacturers to retain professional engineers to determine the loads that engineered truss panels must be designed to meet or exceed, thereby reducing the associated time and costs.

This proposed change also provides information to support builders when site-built lateral load transfer blocking is used instead of engineered truss panels, or where the roof framing does not consist of roof trusses (e.g., where rafters or joists are used instead).

### Supporting Document(s)

A4 archetype (a4_archetype.pdf)
Minimum total length of braced wall panels using the calculation method (minbwplength_calculationmethod.pdf)
RSMeans costing data for impact analysis (costing_data_for_impact_analysis.pdf)

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[9.23.13.1.] 9.23.13.1. ([1] 1) no attributions**

**[9.23.13.1.] 9.23.13.1. ([2] 2)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.1.] 9.23.13.1. ([2] 2)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.1.] 9.23.13.1. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]**

**[9.23.13.1.] 9.23.13.1. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.1.] 9.23.13.1. ([2] 2) [F22-OS3.1]** Applies to walls that support floors. **[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.1.] 9.23.13.1. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.2.] 9.23.13.2. ([1] 1) no attributions**

**[9.23.13.2.] 9.23.13.2. ([2] 2) no attributions**

**[9.23.13.3.] 9.23.13.3. ([1] 1) no attributions**

**[9.23.13.4.] 9.23.13.4. ([1] 1)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.4.] 9.23.13.4. ([1] 1)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.4.] 9.23.13.4. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.4.] 9.23.13.4. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.4.] 9.23.13.4. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.4.] 9.23.13.4. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.4.] 9.23.13.4. ([2] 2)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.4.] 9.23.13.4. ([2] 2)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.4.] **9.23.13.4. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.4.] **9.23.13.4. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.4.] **9.23.13.4. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.4.] **9.23.13.4. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.5.] **9.23.13.5. ([1] 1)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.5.] **9.23.13.5. ([1] 1)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.5.] **9.23.13.5. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.5.] **9.23.13.5. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.5.] **9.23.13.5. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.5.] **9.23.13.5. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.5.] **9.23.13.5. ([2] 2)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.5.] **9.23.13.5. ([2] 2)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.5.] **9.23.13.5. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.5.] **9.23.13.5. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.5.] **9.23.13.5. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.5.] **9.23.13.5. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

~~[9.23.13.5.] 9.23.13.5. ([3] 3)~~
~~[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]~~

~~[9.23.13.5.] 9.23.13.5. ([3] 3)~~

~~[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]~~

~~[9.23.13.5.] 9.23.13.5. ([3] 3) [F20,F22-OS1.2] Applies to the assemblies required to provide fire resistance.~~

~~[9.23.13.5.] 9.23.13.5. ([3] 3) [F22-OS3.1] Applies to walls that support floors.[F22-OS3.7] Applies to walls that contain doors or windows required for emergency egress.~~

~~[9.23.13.5.] 9.23.13.5. ([3] 3) [F20,F22-OH4] Applies to walls that support floors.~~

~~[9.23.13.5.] 9.23.13.5. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3] Applies to elements that support or are part of an environmental separator.~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F20,F22-OS1.2] Applies to the assemblies required to provide fire resistance.~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F22-OS3.1] Applies to walls that support floors.[F22-OS3.7] Applies to walls that contain doors or windows required for emergency egress.~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F20,F22-OH4] Applies to walls that support floors.~~

~~[9.23.13.5.] 9.23.13.5. ([4] 4) [F20,F22-OH1.1,OH1.2,OH1.3] Applies to elements that support or are part of an environmental separator.~~

**[9.23.13.6.] -- ([1] --) no attributions**

**[9.23.13.6.] -- ([1] --) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.6.] -- ([1] --) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.6.] -- ([1] --) [F20,F22-OS1.2]** Applies to the assemblies required to provide fire resistance.

**[9.23.13.6.] -- ([1] --) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.6.] -- ([1] --) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.6.] -- ([1] --) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.6.] -- ([2] --) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.6.] -- ([2] --) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.6.] -- ([2] --) [F20,F22-OS1.2]** Applies to the assemblies required to

provide fire resistance.

**[9.23.13.6.] -- ([2] --) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.6.] -- ([2] --) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.6.] -- ([2] --) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.6.] -- ([3] --) no attributions**

**[9.23.13.6.] -- ([4] --) no attributions**

**[9.23.13.6.] -- ([5] --) no attributions**

**[9.23.13.6.] -- ([6] --) no attributions**

**[9.23.13.6.] -- ([7] --) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.6.] -- ([7] --) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.6.] -- ([7] --) [F20,F22-OS1.2]** Applies to the assemblies required to provide fire resistance.

**[9.23.13.6.] -- ([7] --) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.6.] -- ([7] --) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.6.] -- ([7] --) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.6.] -- ([8] --) no attributions**

**[9.23.13.6.] -- ([9] --) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.6.] -- ([9] --) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.6.] -- ([9] --) [F20,F22-OS1.2]** Applies to the assemblies required to provide fire resistance.

**[9.23.13.6.] -- ([9] --) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.6.] -- ([9] --) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.6.] -- ([9] --) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.7.] 9.23.13.6. ([1] 1)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.7.] 9.23.13.6. ([1] 1)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.7.] **9.23.13.6. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.7.] **9.23.13.6. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.7.] **9.23.13.6. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.7.] **9.23.13.6. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.7.] **9.23.13.6. ([2] 2) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.7.] **9.23.13.6. ([2] 2) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.7.] **9.23.13.6. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.7.] **9.23.13.6. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.7.] **9.23.13.6. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.7.] **9.23.13.6. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.7.] **9.23.13.6. ([3] 3) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.7.] **9.23.13.6. ([3] 3) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.7.] **9.23.13.6. ([3] 3) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.7.] **9.23.13.6. ([3] 3) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.7.] **9.23.13.6. ([3] 3) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.7.] **9.23.13.6. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.7.] **9.23.13.6. ([4] 4) no attributions**

[9.23.13.7.] **9.23.13.6. ([5] 5) no attributions**

**[9.23.13.8.] 9.23.13.7. ([1] 1) no attributions**

**[9.23.13.8.] 9.23.13.7. ([2] 2) no attributions**

**[9.23.13.8.] 9.23.13.7. ([3] 3) no attributions**

**[9.23.13.9.] 9.23.13.8. ([1] 1) no attributions**

**[9.23.13.9.] 9.23.13.8. ([2] 2)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.9.] 9.23.13.8. ([2] 2)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.9.] 9.23.13.8. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.9.] 9.23.13.8. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.9.] 9.23.13.8. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.9.] 9.23.13.8. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.9.] 9.23.13.8. ([3] 3)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.9.] 9.23.13.8. ([3] 3)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.9.] 9.23.13.8. ([3] 3) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.9.] 9.23.13.8. ([3] 3) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.9.] 9.23.13.8. ([3] 3) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.9.] 9.23.13.8. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.9.] 9.23.13.8. ([4] 4) no attributions**

**[9.23.13.9.] 9.23.13.8. ([5] 5) no attributions**

**[9.23.13.9.] 9.23.13.8. ([5] 5)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.9.] 9.23.13.8. ([5] 5)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.9.] **9.23.13.8. ([5] 5) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.9.] **9.23.13.8. ([5] 5) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.9.] **9.23.13.8. ([5] 5) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.9.] **9.23.13.8. ([5] 5) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.10.] **9.23.13.9. ([1] 1) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.10.] **9.23.13.9. ([1] 1) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.10.] **9.23.13.9. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.10.] **9.23.13.9. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.10.] **9.23.13.9. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.10.] **9.23.13.9. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.10.] **9.23.13.9. ([2] 2) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.10.] **9.23.13.9. ([2] 2) [F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.10.] **9.23.13.9. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.10.] **9.23.13.9. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.10.] **9.23.13.9. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.10.] **9.23.13.9. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.10.] **9.23.13.9. ([3] 3) [F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.10.] **9.23.13.9. ([3] 3)**

**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.10.] 9.23.13.9. ([3] 3) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.10.] 9.23.13.9. ([3] 3) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.10.] 9.23.13.9. ([3] 3) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.10.] 9.23.13.9. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.10.] 9.23.13.9. ([4] 4) no attributions**

**[9.23.13.10.] 9.23.13.9. ([4] 4)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.10.] 9.23.13.9. ([4] 4)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.10.] 9.23.13.9. ([4] 4) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.10.] 9.23.13.9. ([4] 4) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.10.] 9.23.13.9. ([4] 4) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.10.] 9.23.13.9. ([4] 4) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.10.] 9.23.13.9. ([5] 5)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

**[9.23.13.10.] 9.23.13.9. ([5] 5)**
**[F20-OP2.1,OP2.3,OP2.5] [F22-OP2.3,OP2.4,OP2.5]**

**[9.23.13.10.] 9.23.13.9. ([5] 5) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

**[9.23.13.10.] 9.23.13.9. ([5] 5) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

**[9.23.13.10.] 9.23.13.9. ([5] 5) [F20,F22-OH4]** Applies to walls that support floors.

**[9.23.13.10.] 9.23.13.9. ([5] 5) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

**[9.23.13.10.] 9.23.13.9. ([6] 6) no attributions**

[9.23.13.11.] **9.23.13.10. ([1] 1)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.11.] **9.23.13.10. ([1] 1)**
**[F20-OP2.1,OS2.3,OS2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.11.] **9.23.13.10. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.11.] **9.23.13.10. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.11.] **9.23.13.10. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.11.] **9.23.13.10. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.11.] **9.23.13.10. ([2] 2) no attributions**

[9.23.13.11.] **9.23.13.10. ([2] 2)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.11.] **9.23.13.10. ([2] 2)**
**[F20-OP2.1,OS2.3,OS2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.11.] **9.23.13.10. ([2] 2) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.11.] **9.23.13.10. ([2] 2) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.11.] **9.23.13.10. ([2] 2) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.11.] **9.23.13.10. ([2] 2) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.11.] **9.23.13.10. ([3] 3) no attributions**

[9.23.13.11.] **9.23.13.10. ([3] 3)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.11.] **9.23.13.10. ([3] 3)**
**[F20-OP2.1,OS2.3,OS2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.11.] **9.23.13.10. ([3] 3) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.11.] **9.23.13.10. ([3] 3) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.11.] **9.23.13.10. ([3] 3) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.11.] **9.23.13.10. ([3] 3) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.11.] **9.23.13.10. ([4] 4)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.11.] **9.23.13.10. ([4] 4)**
**[F20-OP2.1,OS2.3,OS2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.11.] **9.23.13.10. ([4] 4) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.11.] **9.23.13.10. ([4] 4) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.11.] **9.23.13.10. ([4] 4) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.11.] **9.23.13.10. ([4] 4) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.12.] **9.23.13.11. ([1] 1)**
**[F20-OS2.1,OS2.3,OS2.5] [F22-OS2.3,OS2.4,OS2.5]**

[9.23.13.12.] **9.23.13.11. ([1] 1)**
**[F20-OP2.1,OS2.3,OS2.5] [F22-OP2.3,OP2.4,OP2.5]**

[9.23.13.12.] **9.23.13.11. ([1] 1) [F20,F22-OS1.2]** Applies to assemblies required to provide fire resistance.

[9.23.13.12.] **9.23.13.11. ([1] 1) [F22-OS3.1]** Applies to walls that support floors.**[F22-OS3.7]** Applies to walls that contain doors or windows required for emergency egress.

[9.23.13.12.] **9.23.13.11. ([1] 1) [F20,F22-OH4]** Applies to walls that support floors.

[9.23.13.12.] **9.23.13.11. ([1] 1) [F20,F22-OH1.1,OH1.2,OH1.3]** Applies to elements that support or are part of an environmental separator.

[9.23.13.13.] **9.23.13.12. ([1] 1) no attributions**

[9.23.13.13.] **9.23.13.12. ([2] 2) no attributions**

[9.23.13.13.] **9.23.13.12. ([3] 3) no attributions**

[9.23.13.13.] **9.23.13.12. ([4] 4) no attributions**

[9.23.13.13.] **9.23.13.12. ([5] 5) no attributions**

[9.23.13.13.] **9.23.13.12. ([6] 6) no attributions**

**[9.23.13.13.] 9.23.13.12. ([7] 7) no attributions**

**[9.23.13.13.] 9.23.13.12. ([8] 8) no attributions**

# Proposed Change 2240

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.32.3.10. (first printing)** |
| Subject: | Heating, Ventilating and Air-conditioning Systems |
| Title: | Replacement of a Withdrawn Standard with New Standards for Fans |
| Description: | This proposed change updates the referenced standards for the testing of fans by replacing CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment," with ANSI/ASHRAE 51-25 (ANSI/AMCA 210-25), "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating," and ANSI/AMCA 300-24, "Reverberation Room Methods of Sound Testing of Fans." |
| Related Code Change Request(s): | CCR 597 |

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) currently references CAN/CSA-C260-M90, "Rating the Performance of Residential Mechanical Ventilating Equipment." However, CSA Group has withdrawn this standard, and there are no products on the market that are currently tested or listed in accordance with it. Continuing to reference CAN/CSA-C260-M in the NBC creates an enforcement gap because designers and contractors cannot demonstrate compliance, and building officials cannot verify fan capacity or sound ratings, using an obsolete standard.

## Justification

To ensure that the NBC remains enforceable and aligned with current industry practice, references to CAN/CSA-C260-M should be replaced with active standards that provide equivalent or superior methods of testing.

This proposed change updates the referenced standard to ANSI/ASHRAE 51-25 (ANSI/AMCA 210-25), “Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating,” for fan airflow capacity testing, and to ANSI/AMCA 300-24, “Reverberation Room Methods of Sound Testing of Fans,” for sound ratings.

ANSI/ASHRAE 51-25 (ANSI/AMCA 210-25) and ANSI/AMCA 300-24 are widely recognized standards that are currently used by manufacturers and provide reliable and verifiable test data. Introducing them in the NBC would eliminate the need to reference a withdrawn CSA standard, ensure that performance data for fans could be consistently verified, and avoid confusion for designers, contractors, manufacturers and building officials.

## PROPOSED CHANGE

**NBC25 Div.B 9.32.3.10. (first printing)**

**[9.32.3.10.] 9.32.3.10. Fans**

**(See Note A-9.32.3.10.)**

**[1] 1)** Except as provided in Sentence (4), capacity ratings for required fans shall be determined in accordance with

[a] a) ANSI/ASHRAE 51-25 (ANSI/AMCA 210-25), “Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating",~~CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment",ANSI/AMCA 210-25/ASHRAE 51-25, “Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating,“~~ or

[b] b) HVI Publication 916, "Airflow Test Procedure".

**[2] 2)** Sound ratings for fans shall be determined in accordance with

[a] a) ANSI/AMCA 300-24, “Reverberation Room Methods of Sound Testing of Fans”,~~CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment",~~ or

[b] b) HVI Publication 915, "Loudness Testing and Rating Procedure".

**[3] 3)** Capacity ratings for fans shall be measured at the external static pressure differentials shown in Table 9.32.3.10.-A.

**[4] 4)** Fans in heat/energy recovery ventilators used to provide one or more required fans shall have their airflow at normal temperature rated in accordance with CAN/CSA-C439, "Laboratory methods of test for rating the performance of heat/energy-recovery ventilators".

**[5] 5)** Where a heat/energy recovery ventilator is used to provide one or more

required fans, it shall have a low-temperature ventilation reduction factor of not less than 50% when tested in accordance with CAN/CSA-C439, "Laboratory methods of test for rating the performance of heat/energy-recovery ventilators", at an outdoor temperature at least as low as the outdoor design temperature for the location where the ventilation system is to be installed, but the outdoor design temperature need not be lower than −25°C.

**Table [9.32.3.10.-A] 9.32.3.10.-A**
**Minimum External Static Pressure Differential for Rating of Fans**
**Forming Part of Sentence [9.32.3.10.] 9.32.3.10.([3] 3)**

| Fan Configuration or Application | Minimum External Static Pressure Differential to be Used in Determining Rated Capacity |
|---|---|
| Fans installed with ducts connected on both sides, any application | 100 Pa (0.4 inch water column) |
| Fans installed with ducts on one side only, used as the principal ventilation fan in exhaust-only systems permitted by Article 9.32.3.6. | 62 Pa (0.25 inch water column) |
| Other required fans | 25 Pa (0.1 inch water column) |

**[6] 6)** Fans, including make-up air supply fans, installed to satisfy Articles 9.32.3.3. to 9.32.3.8. with less than 1 m of duct between themselves and the visible interior surfaces of rooms other than unfinished *basements*, furnace rooms, utility rooms and attics, shall have a sound rating complying with Table 9.32.3.10.-B when operating at the required flow rate.

**[7] 7)** Mechanical ventilation devices shall conform to CSA C22.2 No. 113, "Fans and ventilators".

**Table [9.32.3.10.-B] 9.32.3.10.-B**
**Maximum Sound Rating for Fans**
**Forming Part of Sentence [9.32.3.10.] 9.32.3.10.([6] 6)**

| Fan Application | Maximum Sound Rating, sones | |
|---|---|---|
| | ~~Rated according to CAN/CSA-C260-M~~ | Rated according to ANSI/AMCA 300-24 or HVI Publication 915 |
| Principal ventilation fan | ~~2.0~~ | 2.5 |
| Supplemental fans installed in bathrooms and their make-up air fans | ~~2.5~~ | 3.5 |
| Supplemental fans installed in kitchens and their make-up air fans | ~~No rating required~~ | No rating required |

## Impact analysis

This proposed change should have minimal to no cost implications for the industry and regulators.

Manufacturers already test fans in accordance with the cited ANSI/ASHRAE and ANSI/AMCA standards, which are internationally recognized and widely applied in the North American market.

This proposed change would benefit designers and specification writers by deleting references to a withdrawn standard and introducing references to new standards that are already used in the industry.

This proposed change would benefit building officials and enforcement agencies by eliminating ambiguity and ensuring that fan capacity and sound ratings are based on current test methods. This proposed change would increase consistency in compliance verification and avoid disputes related to an unavailable or obsolete standard.

Overall, this proposed change would benefit stakeholders by clarifying and modernizing the NBC.

## Enforcement implications

This proposed change would allow building officials to verify fan capacity and sound ratings using active and available standards, which would eliminate relying on a withdrawn CSA standard and improve consistency in enforcement.

## Who is affected

Designers and specification writers would be able to reference updated and available standards when selecting and documenting fans.

Contractors and installers would be assured that specified products are tested in accordance with current methods and are readily available in the market.

Manufacturers and suppliers already use ANSI/AMCA standards, so no additional testing burden is expected.

Building officials and regulators would be able to refer to clear and enforceable standards when verifying the performance capacity and sound ratings of fans.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 Div.B 9.32.3.10. (first printing)**

**[9.32.3.10.] 9.32.3.10. ([1] 1) [F40,F50,F52,F53-OH1.1] [F51,F52-OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([1] 1) [F53,F63-OS2.3]**

**[9.32.3.10.] 9.32.3.10. ([2] 2) [F81-OH1.1,OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([3] 3) [F53-OH1.1,OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([3] 3) [F53-OS3.4]**

**[9.32.3.10.] 9.32.3.10. ([4] 4) [F40,F50,F52,F53-OH1.1] [F51,F52-OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([5] 5) [F81-OH1.1,OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([6] 6) [F81-OS3.4]**

**[9.32.3.10.] 9.32.3.10. ([6] 6) [F81-OH1.1,OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([7] 7) [F40,F50,F52,F53-OH1.1] [F51,F52-OH1.2]**

**[9.32.3.10.] 9.32.3.10. ([7] 7) [F81-OS3.4]**

# Proposed Change 2267

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.32.3.11. (first printing)** |
| Subject: | Piping and Duct Insulation |
| Title: | Minimum Thermal Resistance Value for Duct Insulation |
| Description: | This proposed change increases the minimum thermal resistance value (RSI) for duct insulation. |

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
- [ ] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

## Problem

Part 9 of the National Building Code of Canada (NBC) 2025 provisions mandate a minimum thermal resistance value of RSI 0.5 (m2×K)/W for the insulation of exhaust ducts passing through unheated spaces and of intake ducts carrying untempered outdoor air through heated spaces. As building envelope assemblies become tighter and indoor relative humidity levels are sustained at higher levels, RSI 0.5 is increasingly proving insufficient to prevent condensation in extreme temperature differentials. Furthermore, several provinces and territories have adopted more stringent thermal resistance requirements for these specific duct runs, creating a fragmented regulatory landscape.

## Justification

This proposed change increases the minimum required thermal resistance value from RSI 0.5 (m2×K)/W to RSI 0.75 (m2×K)/W for the insulation of the following applications:

- exhaust ducts passing through an unheated space or not separated from an

unheated space by an insulated building assembly, and
- intake ducts carrying untempered, unmixed outdoor air through a heated space.

The primary justification for this increase is to mitigate the elevated risk of condensation caused by the psychrometric realities of modern, airtight building envelope assemblies. Specifically, this enhanced thermal resistance provides a necessary buffer against extreme temperature differentials in the following:

**Exhaust Ducts**: For exhaust air travelling through unheated spaces, upgrading to RSI 0.75 would ensure the moist exhaust air remains above its dew point until it terminates outside. This upgrade would prevent interior duct condensation, frost buildup, and subsequent water damage from backflow.

**Intake Ducts**: For cold outdoor air travelling through heated spaces, the higher RSI 0.75 insulation would act as a more robust thermal break. The increased insulation would prevent the outermost surface of the duct from cooling to the ambient indoor dew point, thereby mitigating the risk of concealed condensation, moisture damage, and mould growth within floor or wall cavities.

Additionally, this increase would align the National Model Codes with the more progressive standards for mechanical installation that have already been adopted by some provincial and territorial authorities, standardizing manufacturing outputs and simplifying cross-jurisdictional compliance for builders.

## PROPOSED CHANGE

**NBC25 Div.B 9.32.3.11. (first printing)**

**[9.32.3.11.] 9.32.3.11. Ducts**

**(See Note A-9.32.3.11.)**

**[1] 1)** Except as provided in Sentence (6), ventilation ducts and their fittings shall conform to the requirements of Article 9.33.6.2., except that *exhaust ducts* serving only a bathroom or water-closet room are permitted to be of *combustible* material, provided they are reasonably airtight and constructed of a material impervious to water.

**[2] 2)** *Exhaust ducts* shall not discharge into heated or unheated enclosed spaces.

**[3] 3)** Where an *exhaust duct* passes through an unheated space or is not separated from an unheated space by an insulated *building* assembly, the duct shall be insulated to not less than RSI 0.75~~0.5~~.

**[4] 4)** Where a duct carrying outdoor air that is not tempered and not mixed with indoor air passes through heated space, it shall be

[a] a) insulated to not less than RSI 0.75~~0.5~~, and

[b] b) provided with a *vapour barrier*.

**[5] 5)** All exhaust intakes located within 3 m horizontally of a *cooktop* shall be equipped with a grease filter at the intake end.

**[6] 6)** Ductwork for cooking *appliance* exhaust fans shall

[a] a) be of *noncombustible*, corrosion-resistant material,

[b] b) lead directly to the outdoors with no connections to other exhaust fans or ducts, and

[c] c) be equipped with a grease filter at the intake end.

**[7] 7)** All ductwork shall be installed to avoid crushing and shall be permanently supported to prevent sagging.

**[8] 8)** Joints in all ventilation system ducting shall be sealed with mastic, metal foil duct tape or the manufacturers' specified sealants.

**[9] 9)** Except where the size of a duct can be determined using Table 9.32.3.11.-A or Table 9.32.3.11.-B, duct sizes shall be determined according to Subsection 9.33.4.

**Table [9.32.3.11.-A] 9.32.3.11.-A**
**Equivalent Duct Sizes**
**Forming Part of Sentence [9.32.3.11.] 9.32.3.11.([9] 9)**

| Fan's External Static Pressure, Pa | Duct Diameter, mm | Maximum Airflow in Duct, L/s | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 7 | 15 | 25 | 35 | 50 | 75 | 100 |
| | | Maximum Length of Duct, m | | | | | | |
| 25 | 75 | 6 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 100 | 25 | 6 | 2 | 1 | 0 | 0 | 0 |
| | 125 | 60 | 17 | 6 | 3 | 1 | 0 | 0 |
| | 150 | 60 | 42 | 16 | 8 | 4 | 2 | 1 |
| | 175 | 60 | 60 | 34 | 18 | 9 | 4 | 2 |
| | 200 | 60 | 60 | 60 | 35 | 18 | 8 | 5 |
| 50 | 75 | 16 | 4 | 1 | 0 | 0 | 0 | 0 |
| | 100 | 60 | 16 | 6 | 3 | 1 | 0 | 0 |
| | 125 | 60 | 47 | 18 | 9 | 5 | 2 | 1 |
| | 150 | 60 | 60 | 44 | 23 | 12 | 5 | 3 |
| | 175 | 60 | 60 | 60 | 49 | 25 | 12 | 7 |
| | 200 | 60 | 60 | 60 | 60 | 48 | 22 | 13 |
| 62.5 | 75 | 22 | 5 | 2 | 1 | 0 | 0 | 0 |

| Fan's External Static Pressure, Pa | Duct Diameter, mm | Maximum Airflow in Duct, L/s | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 7 | 15 | 25 | 35 | 50 | 75 | 100 |
| | | Maximum Length of Duct, m | | | | | | |
| | 100 | 60 | 21 | 8 | 4 | 2 | 1 | 0 |
| | 125 | 60 | 60 | 24 | 12 | 6 | 3 | 1 |
| | 150 | 60 | 60 | 58 | 31 | 15 | 7 | 4 |
| | 175 | 60 | 60 | 60 | 60 | 33 | 15 | 9 |
| | 200 | 60 | 60 | 60 | 60 | 60 | 29 | 17 |
| 100 | 75 | 38 | 9 | 3 | 1 | 0 | 0 | 0 |
| | 100 | 60 | 36 | 14 | 7 | 3 | 1 | 1 |
| | 125 | 60 | 60 | 41 | 22 | 11 | 5 | 3 |
| | 150 | 60 | 60 | 60 | 53 | 27 | 12 | 7 |
| | 175 | 60 | 60 | 60 | 60 | 57 | 27 | 15 |
| | 200 | 60 | 60 | 60 | 60 | 60 | 51 | 30 |
| 150 | 75 | 59 | 14 | 5 | 2 | 1 | 0 | 0 |
| | 100 | 60 | 57 | 22 | 11 | 6 | 2 | 1 |
| | 125 | 60 | 60 | 60 | 34 | 17 | 8 | 4 |
| | 150 | 60 | 60 | 60 | 60 | 42 | 20 | 11 |
| | 175 | 60 | 60 | 60 | 60 | 60 | 42 | 24 |
| | 200 | 60 | 60 | 60 | 60 | 60 | 60 | 46 |

**[10] 10)** In using Table 9.32.3.11.-A,

[a] a) when sizing branch ducts, “maximum length of duct” refers to the physical length of the duct from the interior grille served by that branch duct to the exterior hood,

[b] b) when sizing a trunk duct, “maximum length of duct” refers to the physical length of the duct from the interior grille of the longest branch served by that trunk to the exterior hood,

[c] c) outdoor air supply ducts shall be sized as trunk ducts,

[d] d) “maximum airflow in duct” refers to the maximum airflow rate that a given section of duct (branch or trunk) must provide to satisfy the ventilation system design, and

[e] e) “fan's external static pressure” refers to the external static pressure

at which the fan is rated to achieve the maximum airflow rate that the fan is required or intended to provide.

[11] **11)** Where flexible duct is used, it may be sized by choosing the next higher diameter in Table 9.32.3.11.-A or by choosing the diameter for a duct twice as long as the actual length.

[12] **12)** Where rectangular duct is used in place of round duct, it shall be selected according to Table 9.32.3.11.-B.

**Table [9.32.3.11.-B] 9.32.3.11.-B**
**Equivalent Duct Sizes**
**Forming Part of Sentences [9.32.3.11.] 9.32.3.11.([9] 9) and ([12] 12)**

| Required Round Duct Size, mm | Permitted Equivalent Rectangular Duct Size, mm | | | |
|---|---|---|---|---|
| | Stack duct | 100 mm depth | 125 mm depth | 150 mm depth |
| 75 | 75 × 150 | 50 × 100 | — | — |
| 100 | 75 × 250 | 75 × 100 | 75 × 125 | 75 × 150 |
| 125 | 75 × 250 | 125 × 100 | 100 × 125 | 100 × 150 |
| 150 | 75 × 300 | 200 × 100 | 150 × 125 | 125 × 150 |
| 175 | 75 × 350 | 275 × 100 | 200 × 125 | 175 × 150 |
| > 175 | Design to Subsection 9.33.4. | | | |

## Impact analysis

The direct material cost increase associated with this proposed change would be marginal. Upgrading to an RSI 0.75 insulated flex duct or sleeve for heat/energy-recovery ventilator (HRV/ERV) systems adds a minor premium. As RSI 0.50 products cost $3.00 to $3.60 per linear foot and RSI 0.75 products cost $3.80 to $5.00 per linear foot, the premium would be only $0.80 to $1.40 per linear foot. Given the short lengths of these specific runs in residential occupancies, the impact on the total HVAC installation cost would be negligible. Labour expenditures would remain unchanged, as the installation and sealing methodology for RSI 0.75 products is identical to that required for current RSI 0.50 products.

## Enforcement implications

No change to current enforcement procedures would be required. Building officials could verify compliance through visual inspection of the manufacturer’s printed RSI value on the outermost surface of the insulated duct or sleeve during the standard mechanical inspection.

## Who is affected

Designers, engineers, architects, builders, building officials, and consultants.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NBC25 Div.B 9.32.3.11. (first printing)**

**[9.32.3.11.] 9.32.3.11. ([1] 1) no attributions**

**[9.32.3.11.] 9.32.3.11. ([1] 1) [F81-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([2] 2) [F40,F52,F63-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([2] 2) [F52,F63-OS2.3]**

**[9.32.3.11.] 9.32.3.11. ([3] 3) [F63-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([3] 3) [F63,F80-OS2.3]**

**[9.32.3.11.] 9.32.3.11. ([4] 4) [F63-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([5] 5) [F41,F82-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([5] 5) [F01,F82-OS1.1]**

**[9.32.3.11.] 9.32.3.11. ([6] 6) ([a] a),([b] b),([c] c) [F02,F03-OS1.1] ([a] a) [F80-OS1.1] ([c] c) [F82-OS1.1]**

**[9.32.3.11.] 9.32.3.11. ([7] 7) [F41,F53,F80-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([8] 8) [F40,F41-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([8] 8) [F40,F63-OS2.3]**

**[9.32.3.11.] 9.32.3.11. ([9] 9) [F40,F50,F52,F53-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([9] 9) [F53-OS3.4]**

**[9.32.3.11.] 9.32.3.11. ([10] 10) no attributions**

**[9.32.3.11.] 9.32.3.11. ([11] 11) no attributions**

**[9.32.3.11.] 9.32.3.11. ([12] 12) [F40,F50,F52,F53-OH1.1]**

**[9.32.3.11.] 9.32.3.11. ([12] 12) [F53-OS3.4]**

# Proposed Change 2205

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.36.1.1.(1) (first printing)**<br>**NBC25 Div.B 9.36.1.3. (first printing)**<br>**NBC25 Div.B 9.36.1.4. (first printing)**<br>**NBC25 Div.B 9.36.15. (first printing)**<br>**NBC25 Div.B 9.36.16. (first printing)**<br>**NBC25 Div.B 9.37. (first printing)** |
| Subject: | Greenhouse Gas Emissions |
| Title: | New Section 9.37.-2030 on Operational GHG Emissions |
| Description: | This proposed change moves the provisions in Subsections 9.36.15. and 9.36.16. to a new Section to separate requirements for operational greenhouse gas emissions from those for energy efficiency. |

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 2025 edition of the National Building Code of Canada introduced requirements to minimize excessive emissions of operational greenhouse gases (GHGs). These requirements were included in Section 9.36., but address a different Environment Objective than energy efficiency.

## Justification

Moving the operational GHG emissions requirements to their own Section would provide clarity for Code users.

## PROPOSED CHANGE

**[9.36.1.1.] 9.36.1.1. Scope**

**[1] 1)** This Section is concerned with the energy used by *buildings*~~, and GHG emissions resulting from the supply and consumption of that energy,~~ as a result of

[a] a) the design and construction of the *building* envelope, and

[b] b) the design and construction or specification of systems and equipment for

[i] i) heating, ventilating or air-conditioning, and

[ii] ii) service water heating.

(See Note A-9.36.1.1.(1).)

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**[9.36.1.3.] 9.36.1.3. Compliance**

**[1] 1)** Except as provided in Article 9.36.1.4. and Sentences (3) and (4), *buildings* shall comply with

[a] a) the prescriptive or trade-off requirements in Subsections 9.36.2. to 9.36.4.,

[b] b) the performance requirements in Subsection 9.36.6.,

[c] c) the NECB, or

[d] d) for compliance with Energy Performance Tiers 1 to 5,

[i] i) the tiered performance requirements in Subsection 9.36.7.,

[ii] ii) the tiered energy use intensity requirements in Subsection 9.36.8.,

[iii] iii) the tiered points-based prescriptive trade-off requirements in Subsection 9.36.9.,

[iv] iv) the tiered prescriptive path requirements in Subsections 9.36.10. to 9.36.14., or

[v] v) the NECB.

~~**[2] 2)** Except as provided in Article 9.36.1.4. and Sentences (3) to (5), *buildings* shall comply with~~

~~[a] a) the tiered operational GHG emissions performance requirements in Subsection 9.36.15.,~~

~~[b] b) the tiered operational GHG emissions prescriptive requirements in Subsection 9.36.16., or~~

~~[c] c) the NECB.~~

**[3] 3)** *Buildings* containing non-*residential occupancies* whose combined total *floor area* exceeds 300 $m^2$ or *medium-hazard industrial occupancies* shall comply with the NECB.

**[4] 4)** *Buildings* or portions of *buildings* that are not required to be *conditioned spaces* are exempted from the requirements of this Section. (See Note A-9.36.1.3.(4).)

~~**[5] 5)** Extensions added to *existing buildings* that have a *floor area* not greater~~

~~than 60% of the original gross *floor area* of the *existing building* are exempted from the requirements of Subsections 9.36.15. and 9.36.16.~~

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**[9.36.1.4.] 9.36.1.4. Application**

**(See Note A-9.36.1.4.)**

**[1] 1)** Subsections 9.36.2. to 9.36.4. and 9.36.10. to 9.36.14. apply to

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

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

**[2] 2)** Subsections 9.36.6. to 9.36.8. ~~and 9.36.15.~~ apply only to

[a] a) houses with or without a *secondary suite*, and

[b] b) *buildings* containing only *dwelling units* and common spaces whose total *floor area* does not exceed 20% of the total *floor area* of the *building*.

(See Note A-9.36.1.4.(2).)

**[3] 3)** Subsection~~s~~ 9.36.9.~~and 9.36.16.~~ appl~~y~~ies only to *buildings* of *residential occupancy* to which Part 9 applies.

**Note A-9.36.1.4. Compliance Options According to Building Type and Size.**

Table A-9.36.1.4. describes the types and sizes of Part 9 buildings to which Section 9.36. and the NECB apply.

**Table [9.36.1.4.] A-9.36.1.4.**
**Energy Efficiency Compliance Options for Part 9 Buildings (1)**

| Building Types and Sizes | Energy Efficiency Compliance Options | | | | | | | ~~Operational GHGe Compliance Options~~ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NBC 9.36.2. to 9.36.4. (Prescriptive) | NBC 9.36.6. (Performance) | NBC 9.36.7. (Tiered Performance Path) | NBC 9.36.8. (Tiered Energy Use Intensity Path) | NBC 9.36.9. (Points-based Tiered Prescriptive Trade-off Path) | NBC 9.36.10. to 9.36.14. (Tiered Prescriptive Path) | NECB | ~~NBC 9.36.15. (Tiered Performance Path)~~ | ~~NBC 9.36.16. (Tiered Prescriptive Path)~~ | ~~NECB~~ |
| • Houses with or without a secondary suite<br>• Buildings containing only dwelling units with common spaces ≤ 20% of building's total floor area (2) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ~~✓~~ | ~~✓~~ | ~~✓~~ |
| • Other buildings of residential occupancy to which Part 9 applies (3) | ✓ | X | X | X | ✓ | ✓ | ✓ | ~~X~~ | ~~✓~~ | ~~✓~~ |

| Building Types and Sizes | Energy Efficiency Compliance Options | | | | | | | ~~Operational GHGe Compliance Options~~ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NBC 9.36.2. to 9.36.4. (Prescriptive) | NBC 9.36.6. (Performance) | NBC 9.36.7. (Tiered Performance Path) | NBC 9.36.8. (Tiered Energy Use Intensity Path) | NBC 9.36.9. (Points-based Tiered Prescriptive Trade-off Path) | NBC 9.36.10. to 9.36.14. (Tiered Prescriptive Path) | NECB | ~~NBC 9.36.15. (Tiered Performance Path)~~ | ~~NBC 9.36.16. (Tiered Prescriptive Path)~~ | ~~NECB~~ |
| • Buildings containing Group D, E or F3 occupancies whose combined total floor area ≤ 300 $m^2$ (excluding parking garages that serve residential occupancies)<br>• Buildings with a mix of Group C and Group D, E or F3 occupancies where the non-residential portion's combined total floor area ≤ 300 $m^2$ (excluding parking | ✓ | X | X | X | X | ✓ | ✓ | ~~X~~ | ~~X~~ | ~~✓~~ |

| Building Types and Sizes | Energy Efficiency Compliance Options | | | | | | | ~~Operational GHGe Compliance Options~~ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NBC 9.36.2. to 9.36.4. (Prescriptive) | NBC 9.36.6. (Performance) | NBC 9.36.7. (Tiered Performance Path) | NBC 9.36.8. (Tiered Energy Use Intensity Path) | NBC 9.36.9. (Points-based Tiered Prescriptive Trade-off Path) | NBC 9.36.10. to 9.36.14. (Tiered Prescriptive Path) | NECB | ~~NBC 9.36.15. (Tiered Performance Path)~~ | ~~NBC 9.36.16. (Tiered Prescriptive Path)~~ | ~~NECB~~ |
| garages that serve residential occupancies) | | | | | | | | | | |
| • Buildings containing Group D, E or F3 occupancies whose combined total floor area > 300 $m^2$ | X | X | X | X | X | X | ✓ | ~~X~~ | ~~X~~ | ~~✓~~ |
| • Buildings containing F2 occupancies of any size | X | X | X | X | X | X | ✓ | ~~X~~ | ~~X~~ | ~~✓~~ |

**Notes to Table [9.36.1.4.] A-9.36.1.4.:**

(1) ✓ = Requirements apply to building type
X = Requirements do not apply to building type

(2) The walls that enclose a common space are excluded from the calculation of floor area of that common space.

(3) Refers to buildings other than houses with or without a secondary suite and buildings containing only dwelling units with common spaces ≤ 20% of building's total floor area.

**Note A-9.36.1.4.(2) and 9.37.1.4.(1) Houses and Common Spaces.**

~~**[9.36.15.] 9.36.15. Tiered Operational GHG Emissions Compliance: Performance Path**~~

~~**[9.36.15.1.] 9.36.15.1. Scope**~~

~~**[1] 1)** This Subsection is concerned with GHG emissions, determined at the time of design, resulting from the supply and consumption of the energy used by the *building*~~

~~[a] a) for~~

~~[i] i) systems used for heating, ventilating and air-conditioning, and~~

~~[ii] ii) systems used to heat service water, or~~

~~[b] b) as determined in accordance with Subsection 9.36.6.~~

~~**[9.36.15.2.] 9.36.15.2. Application**~~

~~**[1] 1)** This Subsection applies to the *buildings* described in Article 9.36.1.4.~~

~~**[9.36.15.3.] 9.36.15.3. Definitions**~~

~~**[1] 1)** For the purpose of this Subsection, the term "annual operational GHG emissions" shall mean the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.~~

~~**[2] 2)** For the purpose of this Subsection, the term "operational GHG emissions target" shall mean the annual operational GHG emissions of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the house energy target or produced off-site in generating the energy sources used to meet the house energy target.~~

**[9.36.15.4.] 9.36.15.4. Performance Compliance**

**[1] 1)** Except as provided in Sentence (5), compliance with this Subsection shall be achieved by designing and constructing *buildings* in accordance with one of the GHG emissions performance levels A to F specified in Table 9.36.15.4., each of which corresponds to

[a] a) the annual operational GHG emissions of the proposed house, expressed as a percent operational GHG emissions target, or

[b] b) the percentage of improvement of the annual operational GHG emissions of the proposed house relative to the operational GHG emissions target of the reference house, expressed as a percent improvement.

**Table [9.36.15.4.] 9.36.15.4.**
**GHG Emissions Performance Levels**
**Forming Part of Sentences [9.36.15.4.] 9.36.15.4.([1] 1) and ([2] 2)**

| GHG Emissions Performance Level | Percent Operational GHG Emissions Target (1) | Percent Improvement |
|---|---|---|
| A | ≤ 10% | ≥ 90% |
| B | ≤ 25% | ≥ 75% |
| C | ≤ 50% | ≥ 50% |
| D | ≤ 75% | ≥ 25% |
| E | ≤ 90% | ≥ 10% |
| F | ≤ 100% | ≥ 0% |

**Note to Table [9.36.15.4.] 9.36.15.4.:**

(1) See Sentence (2).

**[2] 2)** Compliance of the proposed house with one of GHG emissions performance levels A to F specified in Table 9.36.15.4. shall be determined by

[a] a) dividing the annual operational GHG emissions of the proposed house by the operational GHG emissions target of the reference house to derive the percent operational GHG emissions target, or

[b] b) subtracting the annual operational GHG emissions of the proposed house from the operational GHG emissions target of the reference house and dividing the result by the operational GHG emissions

target of the reference house to derive the percent improvement.

**[3] 3)** The annual operational GHG emissions of the proposed house shall be determined in accordance with Article 9.36.15.6.

**[4] 4)** The operational GHG emissions target of the reference house shall be determined in accordance with Article 9.36.15.7.

**[5] 5)** Where the house cannot reasonably be connected to the provincial or territorial electrical power grid, compliance with this Subsection shall be achieved by reporting the annual operational GHG emissions of the proposed house calculated in accordance with Article 9.36.15.6.

**[9.36.15.5.] 9.36.15.5. GHG Emissions Factors**

**(See Note A-9.36.15.5.)**

**[1] 1)** Except as provided in Sentences (2) to (4), the GHG emissions factors used in Articles 9.36.15.6. and 9.36.15.7. shall be in conformance with the values established by the provincial or territorial government having jurisdiction.

**[2] 2)** Where permitted by the provincial or territorial government having jurisdiction, the GHG emissions factor for an energy source may be obtained from the regulated utility responsible for providing the energy source to the *building* site.

**[3] 3)** Where they have not been established in accordance with Sentences (1) and (2), the GHG emissions factors shall be in conformance with Tables 9.36.15.5.-A and 9.36.15.5.-B.

**Table [9.36.15.5.-A] 9.36.15.5.-A**
**GHG Emissions Factors for Electricity and Utility Gas by Province or Territory**
**Forming Part of Sentence [9.36.15.5.] 9.36.15.5.([3] 3)**

| Province or Territory | GHG Emissions Factor by Energy Source, g $CO_2e$/kWh | |
|---|---|---|
| | Electricity (1) | Utility Gas (2) |
| British Columbia | 1.32 | 190 |
| Alberta | 181.86 | 189 |
| Saskatchewan | 146.60 | 185 |
| Manitoba | 0.00 | 185 |
| Ontario | 57.90 | 185 |
| Québec | 0.38 | 186 |

| | | |
|---|---|---|
| New Brunswick | 77.88 | 185 |
| Nova Scotia | 161.64 | 190 |
| Prince Edward Island | 77.88 | 185 |
| Newfoundland and Labrador | 11.08 | 185 |
| Yukon | 25.00 | 190 |
| Northwest Territories | 6.82 | 185 |
| Nunavut | 465.16 | 190 |

**Notes to Table [9.36.15.5.-A] 9.36.15.5.-A:**

(1) GHG emissions factors for electricity are an average of the 2031–2035 values provided by Environment and Climate Change Canada at https://data-donnees.az.ec.gc.ca/data/substances/monitor/canada-s-greenhouse-gas-emissions-projections and were current in June 2023.

(2) GHG emissions factors for utility gas are based on estimates in the Environment and Climate Change Canada "National Inventory Report 1990–2020: Greenhouse Gas Sources and Sinks in Canada."

**Table [9.36.15.5.-B] 9.36.15.5.-B**
**GHG Emission Factors for Other Energy Sources**
**Forming Part of Sentence [9.36.15.5.] 9.36.15.5.([3] 3)**

| Energy Source | GHG Emissions Factor (1) | |
|---|---|---|
| | In g $CO_2e$/L | In g $CO_2e$/kWh |
| Diesel | 2 690 | 250 |
| Oil, heating or light fuel | 2 755 | 270 |
| Oil, heavy fuel | 3 176 | 274 |
| Propane | 1 548 | 218 |

**Note to Table [9.36.15.5.-B] 9.36.15.5.-B:**

(1) GHG emissions factors are values provided by Environment and Climate Change Canada at https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html (Version 1.1).

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**[4] 4)** For energy sources supplied by a district energy plant, the GHG emissions factors shall

[a] a) be in conformance with Table 9.36.15.5.-C, or

[b] b) be determined by a qualified person representing the district energy plant operator (see Note A-9.36.15.5.(4)(b) and (5)).

**Table [9.36.15.5.-C] 9.36.15.5.-C**
**GHG Emissions Factors for Energy Sources Supplied by a District Energy Plant**
**Forming Part of Clause 9.36.15.5.(4)(a)**

| Energy Source | GHG Emissions Factor, (1) g $CO_2e$/kWh |
|---|---|
| Chilled water | 128 |
| Hot water | 362 |
| Steam | 383 |

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**Note to Table [9.36.15.5.-C] 9.36.15.5.-C:**

(1) GHG emissions factors are values sourced from ANSI/ASHRAE 228, "Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance".

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**[5] 5)** Where they have not otherwise been established in accordance with this Article, the GHG emissions factors shall be determined by a qualified person. (See Note A-9.36.15.5.(4)(b) and (5).)

**[9.36.15.6.] 9.36.15.6. Annual Operational GHG Emissions of the Proposed House**

**[1] 1)** The annual operational GHG emissions of the proposed house, $CO_2e_{proposed}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{proposed} = \sum_{ES} (E_{reg,ES} \times GEF_{ES})/1\ 000$$

where

$E_{reg,ES}$ = annual energy consumption of the equipment and systems regulated by the NBC, as listed in Clauses 9.36.6.4.(1)(a) to (d), for each energy source (ES), in kWh, determined by modeling the proposed house in accordance with Article 9.36.6.9., and

$GEF_{ES}$ = GHG emissions factor for the corresponding energy source, in g $CO_2e$/kWh, as specified in Article 9.36.15.5.

**[9.36.15.7.] 9.36.15.7. Operational GHG Emissions Target of the Reference House**

**[1] 1)** The operational GHG emissions target of the reference house, $CO_2e_{target}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{target} = CO_2e_{NHreg} + CO_2e_{SH} + CO_2e_{SWH}$$

where

$CO_2e_{NHreg}$ = annual operational GHG emissions of all non-heating equipment and systems regulated by the NBC, in kg $CO_2e$, determined in accordance with Sentence (2),

$CO_2e_{SH}$ = annual operational GHG emissions from space heating, in kg $CO_2e$, determined in accordance with Sentence (3), and

$CO_2e_{SWH}$ = annual operational GHG emissions from service water heating, in kg $CO_2e$, determined in accordance with Sentence (4).

**[2] 2)** The annual operational GHG emissions of all non-heating equipment and systems regulated by the NBC, $CO_2e_{NHreg}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{NHreg} = E_{NHreg} \times GEF_{elec} \,/\, 1\,000$$

where

$E_{NHreg}$ = annual energy consumption of all non-heating systems and equipment regulated by the NBC, as listed in Clauses 9.36.6.4.(1)(b) and (d), in the reference house, in kWh, determined by modeling the reference house in accordance with Article 9.36.6.13., and

$GEF_{elec}$ = GHG emissions factor for electricity, in g $CO_2e$/kWh, as specified in Article 9.36.15.5.

[3] 3) The annual operational GHG emissions from space heating, $CO_2e_{SH}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{SH} = TED_{SH} \times 235 / 1\,000$$

where

$TED_{SH}$ = annual thermal energy demand of the space-heating system, including baseboard heating, in the reference house, in kWh, determined by modeling the reference house in accordance with Subsection 9.36.6., and

235 = reference GHG emissions factor for space heating, in g $CO_2e$/kWh.

(See Note A-9.36.15.7.(3) and (4).)

[4] 4) The annual operational GHG emissions from service water heating, $CO_2e_{SWH}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{SWH} = TED_{SWH} \times 260 / 1\,000$$

where

$TED_{SWH}$ = annual thermal energy demand of the service water heating system in the reference house, in kWh, determined by modeling the reference house in accordance with Subsection 9.36.6., and

260 = reference GHG emissions factor for service water heating, in g $CO_2e$/kWh.

(See Note A-9.36.15.7.(3) and (4).)

**Note A-9.36.15.5. Unit Conversions.**

A volumetric quantity of a fuel can be converted to an equivalent amount of energy, in kWh, using the conversion factors provided in Table A-9.36.15.5.

**Table [9.36.15.5.] A-9.36.15.5.**
**Unit Conversions for Energy Sources**

| Energy Source | Unit | Energy per Unit, (1) kWh |
|---|---|---|
| Diesel | L | 10.74 |
| Natural gas | $m^3$ | 10.36 |

| Energy Source | Unit | Energy per Unit, (1) kWh |
|---|---|---|
| Oil, heating or light fuel | L | 10.20 |
| Oil, heavy fuel | L | 11.59 |
| Propane | L | 7.09 |

**Note to Table [9.36.15.5.] A-9.36.15.5.:**

(1) The energy per unit is the approximate energy content, in GJ, of the fuel from https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx converted to kWh (1 GJ = 277.7778 kWh).

**Note A-9.36.15.5.(4)(b) and (5) Qualified Person.**

A qualified person is a person with training and expertise in building energy analysis and includes

a. a GHG verifier certified in accordance with ISO/IEC 17024, "Conformity assessment – General requirements for bodies operating certification of persons", who
   i. demonstrates competence with the use of ISO 14064-1, "Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals", or
   ii. is accredited in accordance with ISO 14065, "General principles and requirements for bodies validating and verifying environmental information", and ISO 14066, "Environmental information – Competence requirements for teams validating and verifying environmental information", and
b. a person qualified by the authority having jurisdiction.

**Note A-9.36.15.7.(3) and (4) Thermal Energy Demand.**

Thermal energy demand is the amount of heating energy that is output from all types of heating equipment.

For space heating, heating equipment includes electric, gas, hot water, and any other equipment used for the purpose of space heating and ventilation. The heating output of any equipment whose source of energy is not directly provided by a utility (electricity, gas or district) must still be counted towards $TED_{SH}$.

For service water heating, heating equipment includes electric resistance elements or gas heaters/burners of hot water storage tanks or instantaneous water heaters, heat pump water heaters, and any other equipment used for the purpose of service water heating. The heating output of any equipment whose source of energy is not directly provided by a utility (electricity, gas or district) must still be counted towards $TED_{SWH}$.

## [9.36.16.] 9.36.16. Tiered Operational GHG Emissions Compliance: Prescriptive Path

### [9.36.16.1.] 9.36.16.1. Scope

[1] 1) This Subsection is concerned with GHG emissions, determined at the time of design, resulting from the supply and consumption of energy used by the *building* for

[a] a) systems used for heating, ventilating and air-conditioning, and

[b] b) systems used to heat service water.

### [9.36.16.2.] 9.36.16.2. Application

[1] 1) This Subsection applies to the *buildings* described in Article 9.36.1.4.

### [9.36.16.3.] 9.36.16.3. Compliance

[1] 1) The GHG emissions factor (GEF) for an energy source shall be determined in accordance with Article 9.36.15.5.

[2] 2) The total number of energy conservation points achieved by the *building* shall be determined in accordance with

[a] a) the tiered points-based prescriptive trade-off requirements in Subsection 9.36.9., or

[b] b) the tiered prescriptive requirements in

[i] i) Subsection 9.36.10., where Tier 1 is assigned 0 energy conservation points,

[ii] ii) Reserved,

[iii] iii) Reserved,

[iv] iv) Reserved, or

[v] v) Subsection 9.36.14., where Tier 5 is assigned 75 energy conservation points.

[3] 3) Compliance with this Subsection shall be achieved by designing and constructing *buildings* in accordance with one of the GHG emissions performance levels A to F specified in Article 9.36.16.4.

### [9.36.16.4.] 9.36.16.4. GHG Emissions Performance Levels

[1] 1) Except as provided in Sentence (2), to comply with one of the GHG emissions performance levels A to F, the *building* shall be designed and constructed so that its total number of energy conservation points, as determined in accordance with Sentence 9.36.16.3.(2), meets or exceeds the minimum number of energy conservation points required for that GHG emissions performance level, as specified in Tables 9.36.16.4.-A to 9.36.16.4.-F for the energy sources or types of equipment used for space and service water heating and the applicable GHG emissions factor for electricity.

**Table [9.36.16.4.-A] 9.36.16.4.-A**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level A**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity $GEF_7$ (1) $g\ CO_2e/kWh$ | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF ≤ 100 | 70 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| Heat pump (3) with electric supplemental system (4) | Electric tankless or *storage-type service water heater* or heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 65 |
| Other energy source (5) | Other energy source (5) | GEF < 200 | 10 |

**Notes to Table [9.36.16.4.-A] 9.36.16.4.-A:**

(1) GEF = GHG emissions factor

(2) See Sentence 9.36.16.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

**Table [9.36.16.4.-B] 9.36.16.4.-B**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level B**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF ≤ 100 | 35 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| | | 25 < GEF ≤ 100 | 35 |
| Heat pump (3) with electric supplemental system (4) | Heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 10 |
| | | 100 < GEF < 200 | 65 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 20 |
| | | 100 < GEF < 200 | 65 |
| Other energy source (5) | Other energy source (5) | GEF < 200 | 10 |

**Notes to Table [9.36.16.4.-B] 9.36.16.4.-B:**

(1) GEF = GHG emissions factor

(2) See Sentence 9.36.16.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

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**Table [9.36.16.4.-C] 9.36.16.4.-C**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level C**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF < 200 | 35 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| | | 25 < GEF ≤ 100 | 35 |
| | | 100 < GEF < 200 | 40 |
| Heat pump (3) with electric supplemental system (4) | Heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 10 |
| | | 100 < GEF < 200 | 15 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 0 |
| | | 25 < GEF < 200 | 15 |

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) | |
|---|---|---|---|---|
| Space Heating | Service Water Heating | | | |
| Heat pump (3) with utility gas or propane supplemental system (4) | Electric, utility gas, or propane tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 35 (5) | |
| Other energy source (6) | Other energy source (6) | GEF < 200 | 10 | |

**Notes to Table [9.36.16.4.-C] 9.36.16.4.-C:**

(1) GEF = GHG emissions factor

(2) See Sentence 9.36.16.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Based on the use of the GEFs for utility gas and propane listed in Tables 9.36.15.5.-A and 9.36.15.5.-B, respectively.

(6) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

**Table [9.36.16.4.-D] 9.36.16.4.-D**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level D**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity $GEF_r$ (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas or propane | Utility gas or propane | GEF < 200 (3) | 35 (4) |
| | Electricity | GEF ≤ 100 | 10 (4) |
| Electricity | Electricity | GEF < 200 | 10 |
| Heat pump (5) with electric supplemental system (6) | Electric tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 0 |
| Heat pump (5) with utility gas or propane supplemental system (6) | Electric, utility gas, or propane tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 10 (4) |
| Other energy source (7) | Other energy source (7) | GEF < 200 | 10 |

**Notes to Table [9.36.16.4.-D] 9.36.16.4.-D:**

(1) GEF = GHG emissions factor

(2) See Sentence 9.36.16.3.(2).

(3) Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.

(4) Based on the use of the GEFs for utility gas and propane listed in Tables 9.36.15.5.-A and 9.36.15.5.-B, respectively.

(5) Electrically operated.

(6) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(7) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

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**Table [9.36.16.4.-E] 9.36.16.4.-E**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level E**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas or propane | Utility gas or propane | GEF < 200 (3) | 15 (4) |
| | Electricity or other energy source (5) | GEF < 200 | 0 |
| Electricity, heat pump (6) with electric, utility gas, or propane supplemental system, (7) or other energy source (5) | Utility gas, electricity, propane, or other energy source (5) | GEF < 200 | 0 |

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**Notes to Table [9.36.16.4.-E] 9.36.16.4.-E:**

(1) ~~GEF = GHG emissions factor~~

(2) ~~See Sentence 9.36.16.3.(2).~~

(3) ~~Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.~~

(4) ~~Based on the use of the GEFs for utility gas and propane listed in Tables 9.36.15.5.-A and 9.36.15.5.-B, respectively.~~

(5) ~~Other energy source with GEF ≤ 25 g $CO_2e$/kWh.~~

(6) ~~Electrically operated.~~

(7) ~~The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.~~

**Table [9.36.16.4.-F] 9.36.16.4.-F**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level F**
**Forming Part of Sentence [9.36.16.4.] 9.36.16.4.([1] 1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas | Utility gas, electricity, propane, or other energy source (3) | GEF < 200 | 0 |
| Propane | Propane | GEF < 200 (4) | 10 (5) |
| | Electricity or other energy source (3) | GEF < 200 | 0 |
| Electricity, heat pump (6) with electric, utility gas, or propane supplemental system, (7) or other energy source (3) | Utility gas, electricity, propane, or other energy source (3) | GEF < 200 | 0 |

**Notes to Table [9.36.16.4.-F] 9.36.16.4.-F:**

(1) GEF = GHG emissions factor

(2) See Sentence 9.36.16.3.(2).

(3) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

(4) Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.

(5) ~~Based on the use of the GEFs for propane in Table 9.36.15.5.-B.~~

(6) ~~Electrically operated.~~

(7) ~~The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.~~

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~~[2] 2)~~ ~~Where the *building* cannot reasonably be connected to the provincial or territorial electrical power grid, the *building* shall be exempted from compliance with the requirements of this Subsection.~~

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# [9.37.] -- Operational GHG Emissions

## [9.37.1.] -- General

### [9.37.1.1.] --- Scope

[1] --) Except as provided in Articles 9.37.3.1. and 9.37.4.1., this Section is concerned with the GHG emissions, resulting from the supply and consumption of energy used by the *building*, as a result of

[a] --) the design and construction of the *building* envelope, and

[b] --) the design and construction or specification of systems and equipment for

[i] --) heating, ventilating or air-conditioning, and

[ii] --) service water heating.

### [9.37.1.2.] --- Definitions

[1] --) For the purpose of this Section, the term "annual operational GHG emissions" shall mean the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.

[2] --) For the purpose of this Section, the term "operational GHG emissions target" shall mean the annual operational GHG emissions of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the house energy target or produced off-site in generating the energy sources used to meet the house energy target.

[3] --) For the purpose of this Section, the term "common space" shall have the meaning stated in Sentence 9.36.1.4.(2).

**[4] --)** For the purpose of this Section, the term "house energy target" shall have the meaning stated in Sentence 9.36.1.2.(6).

**[5] --)** For the purposes of this Section, the term "house" shall have the meaning stated in Sentence 9.36.1.2.(9).

### [9.37.1.3.] --- Compliance

**[1] --)** Except as provided in ~~Article 9.36.1.4.~~Article 9.37.1.4. and Sentences (2) to (4), *buildings* shall comply with

[a] --) the tiered operational GHG emissions performance requirements in Subsection 9.37.3.,

[b] --) the tiered operational GHG emissions prescriptive requirements in Subsection 9.37.4., or

[c] --) the NECB.

**[2] --)** *Buildings* containing non-*residential occupancies* whose combined total *floor area* exceeds 300 $m^2$ or *medium-hazard industrial occupancies* shall comply with the NECB.

**[3] --)** *Buildings* or portions of *buildings* that are not required to be *conditioned spaces* are exempted from the requirements of this Section.

**[4] --)** Extensions added to *existing buildings* that have a *floor area* not greater than 60% of the original gross *floor area* of the *existing building* are exempted from the requirements of ~~Subsections 9.36.15. and 9.36.16.~~Subsections 9.37.3. and 9.37.4.

### [9.37.1.4.] --- Application

**[1] --)** Subsection 9.37.3. applies only to

[a] --) houses with or without a *secondary suite*, and

[b] --) *buildings* containing only *dwelling units* and common spaces whose total *floor area* does not exceed 20% of the total *floor area* of the *building*.

(See Note A-9.36.1.4.(2) and 9.37.1.4.(1).)

**[2] --)** Subsection 9.37.4. applies only to *buildings* of *residential occupancy* to which Part 9 applies.

## [9.37.2.] -- GHG Emissions Factors

### [9.37.2.1.] --- GHG Emissions Factors (See Note A-9.37.2.1.)

**[1] --)** Except as provided in ~~this~~ Sentences (2) to (4)~~ction~~, the GHG emissions factors used in ~~Articles 9.36.15.6. and 9.36.15.7.~~this Section shall be in conformance with the values established by the provincial or territorial government having jurisdiction.

**[2] --)** Where permitted by the provincial or territorial government having jurisdiction, the GHG emissions factor for an energy source may be

obtained from the regulated utility responsible for providing the energy source to the *building* site.

**[3] --)** Where they have not been established in accordance with Sentences (1) and (2), the GHG emissions factors shall be in conformance with ~~and 9.36.15.5.-B~~Tables 9.37.2.1.-A and -B.

**Table [9.37.2.1.-A]**
**GHG Emissions Factors for Electricity and Utility Gas by Province or Territory**
**Forming Part of Sentence 9.37.2.1.(3)**

| Province or Territory | GHG Emissions Factor by Energy Source, g $CO_2e$/kWh | |
|---|---|---|
| | Electricity (1) | Utility Gas (2) |
| British Columbia | 1.32 | 190 |
| Alberta | 181.86 | 189 |
| Saskatchewan | 146.60 | 185 |
| Manitoba | 0.00 | 185 |
| Ontario | 57.90 | 185 |
| Québec | 0.38 | 186 |
| New Brunswick | 77.88 | 185 |
| Nova Scotia | 161.64 | 190 |
| Prince Edward Island | 77.88 | 185 |
| Newfoundland and Labrador | 11.08 | 185 |
| Yukon | 25.00 | 190 |
| Northwest Territories | 6.82 | 185 |
| Nunavut | 465.16 | 190 |

**Notes to Table [9.37.2.1.-A] :**

(1) GHG emissions factors for electricity are an average of the 2031–2035 values provided by Environment and Climate Change Canada at https://data-donnees.az.ec.gc.ca/data/substances/monitor/canada-s-greenhouse-gas-emissions-projections and were current in June 2023.

(2) GHG emissions factors for utility gas are based on estimates in the Environment and Climate Change Canada "National Inventory Report 1990–2020: Greenhouse Gas Sources and Sinks in Canada."

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**Table [9.37.2.1.-B]**
**GHG Emission Factors for Other Energy Sources**
**Forming Part of Sentence 9.37.2.1.(3)**

| Energy Source | GHG Emissions Factor (1) | |
|---|---|---|
| | In g $CO_2e$/L | In g $CO_2e$/kWh |
| Diesel | 2 690 | 250 |
| Oil, heating or light fuel | 2 755 | 270 |
| Oil, heavy fuel | 3 176 | 274 |
| Propane | 1 548 | 218 |

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**Note to Table [9.37.2.1.-B] :**

(1) GHG emissions factors are values provided by Environment and Climate Change Canada at https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html (Version 1.1).

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**[4] --)** For energy sources supplied by a district energy plant, the GHG emissions factors shall

[a] --) be in conformance with ~~Table 9.36.15.5.-C~~Table 9.37.2.1.-C, or

[b] --) be determined by a qualified person representing the district energy plant operator (see ~~Note A-9.36.15.5.(4)(b) and (5)~~Note A-9.37.2.1.(4)(b) and (5)).

**Table [9.37.2.1.-C]**
**GHG Emissions Factors for Energy Sources Supplied by a District Energy Plant**
**Forming Part of Clause 9.37.2.1.(4)(a)**

| Energy Source | GHG Emissions Factor, (1) g $CO_2e$/kWh |
|---|---|
| Chilled water | 128 |
| Hot water | 362 |
| Steam | 383 |

**Note to Table [9.37.2.1.-C] :**

(1) GHG emissions factors are values sourced from ANSI/ASHRAE 228, "Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance".

**[5] --)** Where they have not otherwise been established in accordance with this Article, the GHG emissions factors shall be determined by a qualified person. (See Note 9.37.2.1.(4)(b) and (5)~~Note A-9.36.15.5.(4)(b) and (5)~~.)

## [9.37.3.] -- Tiered Operational GHG Emissions Compliance: Performance Path

### [9.37.3.1.] --- Scope

**[1] --)** This Subsection is concerned with GHG emissions, determined at the time of design, resulting from the supply and consumption of the energy used by the *building*

[a] --) for

[i] --) systems used for heating, ventilating and air-conditioning, and

[ii] --) systems used to heat service water, or

[b] --) as determined in accordance with Subsection 9.36.6.

### [9.37.3.2.] --- Application

**[1] --)** This Subsection applies to the *buildings* described in ~~Article 9.36.1.4.~~Article 9.37.1.4.

### [9.37.3.3.] --- Performance Compliance

**[1] --)** Except as provided in Sentence (5), compliance with this Subsection shall be achieved by designing and constructing *buildings* in accordance with

one of the GHG emissions performance levels A to F specified in Table 9.37.3.3.~~Table 9.36.15.4.~~, each of which corresponds to

[a] --) the annual operational GHG emissions of the proposed house, expressed as a percent operational GHG emissions target, or

[b] --) the percentage of improvement of the annual operational GHG emissions of the proposed house relative to the operational GHG emissions target of the reference house, expressed as a percent improvement.

**Table [9.37.3.3.]**
**GHG Emissions Performance Levels**
**Forming Part of Sentences 9.37.3.3.(1) and (2)**

| GHG Emissions Performance Level | Percent Operational GHG Emissions Target (1) | Percent Improvement |
|---|---|---|
| A | ≤ 10% | ≥ 90% |
| B | ≤ 25% | ≥ 75% |
| C | ≤ 50% | ≥ 50% |
| D | ≤ 75% | ≥ 25% |
| E | ≤ 90% | ≥ 10% |
| F | ≤ 100% | ≥ 0% |

**Note to Table [9.37.3.3.] :**

(1) See Sentence (2).

**[2] --)** Compliance of the proposed house with one of GHG emissions performance levels A to F specified in ~~Table 9.36.15.4.~~ Table 9.37.3.3. shall be determined by

[a] --) dividing the annual operational GHG emissions of the proposed house by the operational GHG emissions target of the reference house to derive the percent operational GHG emissions target, or

[b] --) subtracting the annual operational GHG emissions of the proposed house from the operational GHG emissions target of the reference house and dividing the result by the operational GHG emissions target of the reference house to derive the percent improvement.

**[3] --)** The annual operational GHG emissions of the proposed house shall be determined in accordance with ~~Article 9.36.15.6.~~Article 9.37.3.4.

**[4] --)** The operational GHG emissions target of the reference house shall be determined in accordance with ~~Article 9.36.15.7.~~Article 9.37.3.5.

**[5] --)** Where the house cannot reasonably be connected to the provincial or territorial electrical power grid, compliance with this Subsection shall be achieved by reporting the annual operational GHG emissions of the proposed house calculated in accordance with ~~Article 9.36.15.6.~~Article 9.37.3.4.

### [9.37.3.4.] --- Annual Operational GHG Emissions of the Proposed House

**[1] --)** The annual operational GHG emissions of the proposed house, $CO_2e_{proposed}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{proposed} = \sum_{ES} (E_{reg,ES} \times GEF_{ES})/1\ 000$$

where

$E_{reg,ES}$ = annual energy consumption of the equipment and systems regulated by the NBC, as listed in Clauses 9.36.6.4.(1)(a) to (d), for each energy source (ES), in kWh, determined by modeling the proposed house in accordance with Article 9.36.6.9., and

$GEF_{ES}$ = GHG emissions factor for the corresponding energy source, in g $CO_2e$/kWh, as specified in Article 9.37.2.1.~~Article 9.36.15.5.~~

### [9.37.3.5.] --- Operational GHG Emissions Target of the Reference House

**[1] --)** The operational GHG emissions target of the reference house, $CO_2e_{target}$, in kg $CO_2e$, shall be determined using the following equation:

$$CO_2e_{target} = CO_2e_{NHreq} + CO_2e_{SH} + CO_2e_{SWH}$$

where

$CO_2e_{NHreq}$ = annual operational GHG emissions of all non-heating equipment and systems regulated by the NBC, in kg $CO_2e$, determined in accordance with Sentence (2),

$CO_2e_{SH}$ = annual operational GHG emissions from space heating, in kg $CO_2e$, determined in accordance with Sentence (3), and

$CO_2e_{SWH}$ = annual operational GHG emissions from service water heating, in kg $CO_2e$, determined in accordance with Sentence (4).

**[2] --)** The annual operational GHG emissions of all non-heating equipment and systems regulated by the NBC, $CO_2e_{NHreq}$, in kg $CO_2e$, shall be

determined using the following equation:

$$CO_2e_{NHreg} = E_{NHreg} \times GEF_{elec} \div 1\,000$$

where

$E_{NHreg}$ = annual energy consumption of all non-heating systems and equipment regulated by the NBC, as listed in Clauses 9.36.6.4.(1)(b) and (d), in the reference house, in kWh, determined by modeling the reference house in accordance with Article 9.36.6.13., and

$GEF_{elec}$ = GHG emissions factor for electricity, in g $CO_2$e/kWh, as specified in Article 9.37.2.1.~~Article 9.36.15.5.~~

**[3] --)** The annual operational GHG emissions from space heating, $CO_2e_{SH}$, in kg $CO_2$e, shall be determined using the following equation:

$$CO_2e_{SH} = TED_{SH} \times 235 \div 1\,000$$

where

$TED_{SH}$ = annual thermal energy demand of the space-heating system, including baseboard heating, in the reference house, in kWh, determined by modeling the reference house in accordance with Subsection 9.36.6., and

235 = reference GHG emissions factor for space heating, in g $CO_2$e/kWh.

(See ~~Note A-9.36.15.7.(3) and (4)~~Note A-9.37.3.5.(3) and (4).)

**[4] --)** The annual operational GHG emissions from service water heating, $CO_2e_{SWH}$, in kg $CO_2$e, shall be determined using the following equation:

$$CO_2e_{SWH} = TED_{SWH} \times 260 \div 1\,000$$

where

$TED_{SWH}$ = annual thermal energy demand of the service water heating system in the reference house, in kWh, determined by modeling the reference house in accordance with Subsection 9.36.6., and

260 = reference GHG emissions factor for service water heating, in g $CO_2$e/kWh.

(See ~~Note A-9.36.15.7.(3) and (4)~~Note A-9.37.3.5.(3) and (4).)

## [9.37.4.] -- Tiered Operational GHG Emissions Compliance: Prescriptive Path

### [9.37.4.1.] --- Scope

**[1] --)** This Subsection is concerned with GHG emissions, determined at the time of design, resulting from the supply and consumption of energy used by the *building* for

[a] --) systems used for heating, ventilating and air-conditioning, and

[b] --) systems used to heat service water.

### [9.37.4.2.] --- Application

**[1] --)** This Subsection applies to the *buildings* described in Article 9.37.1.4.

### [9.37.4.3.] --- Compliance

**[1] --)** The GHG emissions factor (GEF) for an energy source shall be determined in accordance with ~~Article 9.36.15.5.~~Article 9.37.2.1.

**[2] --)** The total number of energy conservation points achieved by the *building* shall be determined in accordance with

[a] --) the tiered points-based prescriptive trade-off requirements in Subsection 9.36.9., or

[b] --) the tiered prescriptive requirements in

[i] --) Subsection 9.36.10., where Tier 1 is assigned 0 energy conservation points,

[ii] --) Reserved,

[iii] --) Reserved,

[iv] --) Reserved, or

[v] --) Subsection 9.36.14., where Tier 5 is assigned 75 energy conservation points.

**[3] --)** Compliance with this Subsection shall be achieved by designing and constructing *buildings* in accordance with one of the GHG emissions performance levels A to F specified in ~~Article 9.36.16.4.~~Article 9.37.4.4.

### [9.37.4.4.] --- GHG Emissions Performance Levels

**[1] --)** Except as provided in Sentence (2), to comply with one of the GHG emissions performance levels A to F, the *building* shall be designed and constructed so that its total number of energy conservation points, as determined in accordance with ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2)., meets or exceeds the minimum number of energy conservation points required for that GHG emissions performance level, as specified in ~~Tables 9.36.16.4.-A to 9.36.16.4.-F~~Tables 9.37.4.4.-A to -F for the energy sources or types of equipment used for space- and service water heating systems and the applicable GHG emissions factor for electricity.

## Table [9.37.4.4.-A]
## Minimum Number of Energy Conservation Points for GHG Emissions Performance Level A
## Forming Part of Sentence 9.37.4.4.(1)

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF ≤ 100 | 70 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| Heat pump (3) with electric supplemental system (4) | Electric tankless or *storage-type service water heater* or heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 65 |
| Other energy source (5) | Other energy source (5) | GEF < 200 | 10 |

**Notes to Table [9.37.4.4.-A] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Other energy source with GEF ≤ 25 g $CO_2$e/kWh.

**Table [9.37.4.4.-B]**
**Minimum Number of Energy Conservation Points for GHG Emissions Performance Level B**
**Forming Part of Sentence 9.37.4.4.(1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2$e/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF ≤ 100 | 35 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| | | 25 < GEF ≤ 100 | 35 |
| Heat pump (3) with electric supplemental system (4) | Heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 10 |
| | | 100 < GEF < 200 | 65 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 20 |
| | | 100 < GEF < 200 | 65 |
| Other energy source (5) | Other energy source (5) | GEF < 200 | 10 |

**Notes to Table [9.37.4.4.-B] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Other energy source with GEF ≤ 25 g $CO_2$e/kWh.

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**Table [9.37.4.4.-C]**
**Minimum Number of Energy Conservation Points for GHG Emissions**
**Performance Level C**
**Forming Part of Sentence 9.37.4.4.(1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2$e/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Electricity | Heat pump water heater | GEF ≤ 25 | 10 |
| | | 25 < GEF < 200 | 35 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 15 |
| | | 25 < GEF ≤ 100 | 35 |
| | | 100 < GEF < 200 | 40 |
| Heat pump (3) with electric supplemental system (4) | Heat pump water heater | GEF ≤ 25 | 0 |
| | | 25 < GEF ≤ 100 | 10 |
| | | 100 < GEF < 200 | 15 |
| | Electric tankless or *storage-type service water heater* | GEF ≤ 25 | 0 |
| | | 25 < GEF < 200 | 15 |

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) | |
|---|---|---|---|---|
| Space Heating | Service Water Heating | | | |
| Heat pump (3) with utility gas or propane supplemental system (4) | Electric, utility gas, or propane tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 35 (5) | |
| Other energy source (6) | Other energy source (6) | GEF < 200 | 10 | |

**Notes to Table [9.37.4.4.-C] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Electrically operated.

(4) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(5) Based on the use of the GEFs for utility gas and propane listed in ~~Tables 9.36.15.5.-A and 9.36.15.5.-B~~Tables 9.37.2.1.-A and -B, respectively.

(6) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

## Table [9.37.4.4.-D]
## Minimum Number of Energy Conservation Points for GHG Emissions
## Performance Level D
## Forming Part of Sentence 9.37.4.4.(1)

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas or propane | Utility gas or propane | GEF < 200 (3) | 35 (4) |
| | Electricity | GEF ≤ 100 | 10 (4) |
| Electricity | Electricity | GEF < 200 | 10 |
| Heat pump (5) with electric supplemental system (6) | Electric tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 0 |
| Heat pump (5) with utility gas or propane supplemental system (6) | Electric, utility gas, or propane tankless or *storage-type service water heater* or heat pump water heater | GEF < 200 | 10 (4) |
| Other energy source (7) | Other energy source (7) | GEF < 200 | 10 |

**Notes to Table [9.37.4.4.-D] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.

(4) Based on the use of the GEFs for utility gas and propane listed in ~~Tables 9.36.15.5.-A and 9.36.15.5.-B~~Tables 9.37.2.1.-A and -B, respectively.

(5) Electrically operated.

(6) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

(7) Other energy source with GEF ≤ 25 g $CO_2$e/kWh.

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**Table [9.37.4.4.-E]**
**Minimum Number of Energy Conservation Points for GHG Emissions**
**Performance Level E**
**Forming Part of Sentence 9.37.4.4.(1)**

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2$e/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas or propane | Utility gas or propane | GEF < 200 (3) | 15 (4) |
| | Electricity or other energy source (5) | GEF < 200 | 0 |
| Electricity, heat pump (6) with electric, utility gas, or propane supplemental system, (7) or other energy source (5) | Utility gas, electricity, propane, or other energy source (5) | GEF < 200 | 0 |

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**Notes to Table [9.37.4.4.-E] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.

(4) Based on the use of the GEFs for utility gas and propane listed in ~~Tables 9.36.15.5.-A and 9.36.15.5.-B~~Tables 9.37.2.1.-A and -B, respectively.

(5) Other energy source with GEF ≤ 25 g $CO_2$e/kWh.

(6) Electrically operated.

(7) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

## Table [9.37.4.4.-F]
## Minimum Number of Energy Conservation Points for GHG Emissions
## Performance Level F
## Forming Part of Sentence 9.37.4.4.(1)

| Energy Source or Type of Equipment | | Electricity GEF, (1) g $CO_2e$/kWh | Minimum Number of Energy Conservation Points (2) |
|---|---|---|---|
| Space Heating | Service Water Heating | | |
| Utility gas | Utility gas, electricity, propane, or other energy source (3) | GEF < 200 | 0 |
| Propane | Propane | GEF < 200 (4) | 10 (5) |
| | Electricity or other energy source (3) | GEF < 200 | 0 |
| Electricity, heat pump (6) with electric, utility gas, or propane supplemental system, (7) or other energy source (3) | Utility gas, electricity, propane, or other energy source (3) | GEF < 200 | 0 |

**Notes to Table [9.37.4.4.-F] :**

(1) GEF = GHG emissions factor

(2) See ~~Sentence 9.36.16.3.(2)~~Sentence 9.37.4.3.(2).

(3) Other energy source with GEF ≤ 25 g $CO_2e$/kWh.

(4) Accounts for GHG emissions from electricity used for non-heating systems and equipment that are regulated by this Code.

(5) Based on the use of the GEFs for propane in ~~Table 9.36.15.5.-B~~Table 9.37.2.1.-B.

(6) Electrically operated.

(7) The heat pump must have a percentage of rated capacity at 8.3°C to required capacity of heating appliances determined in accordance with Sentence 9.33.5.1.(1) that is greater than or equal to 60%; the remainder of the heating load must be met by either the heat pump or the supplemental system.

---

**[2] --)** Where the *building* cannot reasonably be connected to the provincial or territorial electrical power grid, the *building* shall be exempted from compliance with the requirements of this Subsection.

**Note A-9.37.2.1. Unit Conversions.**

A volumetric quantity of a fuel can be converted to an equivalent amount of energy, in kWh, using the conversion factors provided in Table A-9.37.2.1.

**Table [9.37.2.1.]**
**Unit Conversions for Energy Sources**

| Energy Source | Unit | Energy per Unit, (1) kWh |
|---|---|---|
| Diesel | L | 10.74 |
| Natural gas | $m^3$ | 10.36 |
| Oil, heating or light fuel | L | 10.20 |
| Oil, heavy fuel | L | 11.59 |
| Propane | L | 7.09 |

---

**Note to Table [9.37.2.1.] :**

(1) The energy per unit is the approximate energy content, in GJ, of the fuel from https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx converted to kWh (1 GJ = 277.7778 kWh).

---

**Note A-9.37.2.1.(4)(b) and (5) Qualified Person.**

A qualified person is a person with training and expertise in building energy analysis and includes (a) a GHG verifier certified in accordance with ISO/IEC 17024, "Conformity assessment – General requirements for bodies operating certification of persons," who (i) demonstrates competence with the use of ISO 14064-1, "Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals," or (ii) is accredited in accordance with ISO 14065, "General principles and requirements for bodies validating and verifying environmental information," and ISO 14066, "Environmental information – Competence requirements for teams validating and verifying environmental information," and (b) a person qualified by the authority having jurisdiction.

**Note A-9.37.3.5.(3) and (4) Thermal Energy Demand.**

Thermal energy demand is the amount of heating energy that is output from all types of heating equipment.

For space heating, heating equipment includes electric, gas, hot water, and any other equipment used for the purpose of space heating and ventilation. The heating output of any equipment whose source of energy is not directly provided by a utility (electricity, gas or district) must still be counted towards $TED_{SH}$.

For service water heating, heating equipment includes electric resistance elements or gas heaters/burners of hot water storage tanks or instantaneous water heaters, heat pump water heaters, and any other equipment used for the purpose of service water heating. The heating output of any equipment whose source of energy is not directly provided by a utility (electricity, gas or district) must still be counted towards $TED_{SWH}$.

## Impact analysis

This proposed change does not impact the application of requirements, but instead clarifies the objective of the requirements.

## Enforcement implications

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

## Who is affected

Regulators, builders, designers, engineers, architects, contractors and consultants.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[9.36.1.1.] 9.36.1.1. ([1] 1) no attributions

[9.36.1.3.] 9.36.1.3. ([1] 1) no attributions

[9.36.1.3.] 9.36.1.3. ([1] 1) ([c] c)

~~[9.36.1.3.] 9.36.1.3. ([2] 2) no attributions~~

[9.36.1.3.] 9.36.1.3. ([3] 3) no attributions

[9.36.1.3.] 9.36.1.3. ([4] 4) no attributions

~~[9.36.1.3.] 9.36.1.3. ([5] 5) no attributions~~

[9.36.1.4.] 9.36.1.4. ([1] 1) no attributions

[9.36.1.4.] 9.36.1.4. ([1] 1) no attributions

[9.36.1.4.] 9.36.1.4. ([2] 2) no attributions

[9.36.1.4.] 9.36.1.4. ([3] 3) no attributions

~~[9.36.15.1.] 9.36.15.1. ([1] 1) no attributions~~

~~[9.36.15.2.] 9.36.15.2. ([1] 1) no attributions~~

~~[9.36.15.3.] 9.36.15.3. ([1] 1) no attributions~~

~~[9.36.15.3.] 9.36.15.3. ([2] 2) no attributions~~

~~[9.36.15.4.] 9.36.15.4. ([1] 1) no attributions~~

~~[9.36.15.4.] 9.36.15.4. ([1] 1) [F101-OE2.1]~~

~~[9.36.15.4.] 9.36.15.4. ([2] 2) [F101-OE2.1]~~

~~[9.36.15.4.] 9.36.15.4. ([3] 3) no attributions~~

~~[9.36.15.4.] 9.36.15.4. ([4] 4) no attributions~~

~~[9.36.15.4.] 9.36.15.4. ([5] 5) [F101-OE2.1]~~

~~[9.36.15.5.] 9.36.15.5. ([1] 1) no attributions~~

~~[9.36.15.5.] 9.36.15.5. ([2] 2) [F101-OE2.1]~~

~~[9.36.15.5.] 9.36.15.5. ([3] 3) [F101-OE2.1]~~

~~[9.36.15.5.] 9.36.15.5. ([4] 4) [F101-OE2.1]~~

~~[9.36.15.5.] 9.36.15.5. ([5] 5) no attributions~~

~~[9.36.15.6.] 9.36.15.6. ([1] 1) [F101-OE2.1]~~

~~[9.36.15.7.] 9.36.15.7. ([1] 1) [F101-OE2.1]~~

~~[9.36.15.7.] 9.36.15.7. ([2] 2) [F101-OE2.1]~~

~~[9.36.15.7.] 9.36.15.7. ([3] 3) [F101-OE2.1]~~

~~[9.36.15.7.] 9.36.15.7. ([4] 4) [F101-OE2.1]~~

~~[9.36.16.1.] 9.36.16.1. ([1] 1) no attributions~~

~~[9.36.16.2.] 9.36.16.2. ([1] 1) no attributions~~

~~[9.36.16.3.] 9.36.16.3. ([1] 1) no attributions~~

~~[9.36.16.3.] 9.36.16.3. ([2] 2) no attributions~~

~~[9.36.16.3.] 9.36.16.3. ([3] 3) no attributions~~

~~[9.36.16.4.] 9.36.16.4. ([1] 1) [F101-OE2.1]~~

~~[9.36.16.4.] 9.36.16.4. ([2] 2) [F101-OE2.1]~~

[9.37.1.1.] -- ([1] --) no attributions

[9.37.1.2.] -- ([1] --) no attributions

[9.37.1.2.] -- ([2] --) no attributions

[9.37.1.2.] -- ([3] --) no attributions

[9.37.1.2.] -- ([4] --) no attributions

[9.37.1.2.] -- ([5] --) no attributions

[9.37.1.3.] -- ([1] --) no attributions

[9.37.1.3.] -- ([1] --) (c)

[9.37.1.3.] -- ([2] --) no attributions

[9.37.1.3.] -- ([3] --) no attributions

[9.37.1.3.] -- ([4] --) no attributions

[9.37.1.4.] -- ([1] --) no attributions

[9.37.1.4.] -- ([2] --) no attributions

[9.37.2.1.] -- ([1] --) no attributions

[9.37.2.1.] -- ([2] --) [F101-OE2.1]

[9.37.2.1.] -- ([3] --) [F101-OE2.1]

[9.37.2.1.] -- ([4] --) [F101-OE2.1]

[9.37.2.1.] -- ([5] --) no attributions

[9.37.3.1.] -- ([1] --) no attributions

[9.37.3.2.] -- ([1] --) no attributions

[9.37.3.3.] -- ([1] --) no attributions

[9.37.3.3.] -- ([1] --) [F101-OE2.1]

[9.37.3.3.] -- ([2] --) [F101-OE2.1]

[9.37.3.3.] -- ([3] --) no attributions

[9.37.3.3.] -- ([4] --) no attributions

[9.37.3.3.] -- ([5] --) [F101-OE2.1]

[9.37.3.4.] -- ([1] --) [F101-OE2.1]

[9.37.3.5.] -- ([1] --) [F101-OE2.1]

[9.37.3.5.] -- ([2] --) [F101-OE2.1]

[9.37.3.5.] -- ([3] --) [F101-OE2.1]

[9.37.3.5.] -- ([4] --) [F101-OE2.1]

[9.37.4.1.] -- ([1] --) no attributions

[9.37.4.2.] -- ([1] --) no attributions

[9.37.4.3.] -- ([1] --) no attributions

[9.37.4.3.] -- ([2] --) no attributions

[9.37.4.3.] -- ([3] --) no attributions

[9.37.4.4.] -- ([1] --) [F101-OE2.1]

[9.37.4.4.] -- ([2] --) [F101-OE2.1]

# Proposed Change 2181

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.36.1.3.(1) (first printing)** |
| Subject: | Energy Efficiency for Houses |
| Title: | Minimum Energy Performance Compliance Level |
| Description: | This proposed change removes "base code" requirements as a compliance path option and sets Energy Performance Tier 1 as the minimum performance level. |

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
- [ ] Large Buildings
- [ ] Occupant safety in use
- [ ] Structural Requirements
- [x] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

## Problem

Subsections 9.36.2. to 9.36.4., and 9.36.6. of the National Building Code of Canada (NBC) provide the minimum performance, or "base code," requirements upon which the performance improvement levels of the energy performance tiers are based.

Although the Energy Performance Tier 1, in Subsections 9.36.7. to 9.36.10., provides a similar performance level, the base code requirements differ from those of Tier 1. The slight differences may complicate demonstrating and determining Code compliance for Code users and building officials.

In addition, once a jurisdiction enforces an energy performance tier that is higher than Tier 1, the base code requirements are no longer an independent compliance option, but are instead referenced by the requirements of the higher tier.

This proposed change removes the reference to the base code requirements in Sentence 9.36.1.3.(1) (and moves some content from Subclauses to Clauses) to avoid confusion about whether the base code requirements are available independently to demonstrate Code compliance.

## Justification

Removing references to Subsections 9.36.2. to 9.36.4. and 9.36.6. as compliance options in Sentence 9.36.1.3.(1) would reduce confusion for Code users and building officials and ensure that the intended minimum energy performance tiers enforced by a jurisdiction are met.

## PROPOSED CHANGE

**[9.36.1.3.] 9.36.1.3. Compliance**

**[1] 1)** Except as provided in Article 9.36.1.4. and Sentences (3) and (4), *buildings* shall comply with one of Energy Performance Tiers 1 to 5, using

[a] a) the tiered performance requirements in Subsection 9.36.7., ~~the prescriptive or trade-off requirements in Subsections 9.36.2. to 9.36.4.,~~

[b] b) the tiered energy use intensity requirements in Subsection 9.36.8.,~~the performance requirements in Subsection 9.36.6.,~~

[c] c) the tiered points-based prescriptive trade-off requirements in Subsection 9.36.9., ~~the NECB, or~~

[d] d) the tiered prescriptive path requirements in Subsections 9.36.10. to 9.36.14., or~~for compliance with Energy Performance Tiers 1 to 5,~~

[i] i) ~~the tiered performance requirements in Subsection 9.36.7.,~~

[ii] ii) ~~the tiered energy use intensity requirements in Subsection 9.36.8.,~~

[iii] iii) ~~the tiered points-based prescriptive trade-off requirements in Subsection 9.36.9.,~~

[iv] iv) ~~the tiered prescriptive path requirements in Subsections 9.36.10. to 9.36.14., or~~

[v] v) ~~the NECB.~~

[e] --) the NECB.

## Impact analysis

This proposed change would not impact the minimum performance level for Energy Performance Tier 1. Code users would continue to have four compliance options available for demonstrating compliance with Energy Performance Tier 1.

The Tier 1 prescriptive path requirements in Subsection 9.36.10. reference the base code requirements in Subsections 9.36.2. to 9.36.4. and align with the Tier 1 requirements in the points-based prescriptive trade-off path in Subsection 9.36.9. The incremental cost of installing a heat/energy recovery ventilator, as required by

Subsection 9.36.10, could be offset by the reduced cost for lower insulation values.

Using the Tier 1 performance requirements in Subsection 9.36.7. rather than those in Subsection 9.36.6. to demonstrate compliance would not result in any additional costs as the requirements are identical.

In addition, the energy use intensity compliance path in Subsection 9.36.8. is available to Code users for demonstrating compliance with Tier 1 and may result in lower incremental construction costs for some types of housing.

This proposed change would benefit Code users and enforcement officials by providing increased clarity.

## Enforcement implications

As the proposed change would simply clarify the available compliance options for minimum energy performance, it would not require additional Code enforcement resources.

## Who is affected

Regulators, builders, designers, engineers, architects, contractors and consultants.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[9.36.1.3.] 9.36.1.3. ([1] 1) no attributions**

~~**[9.36.1.3.] 9.36.1.3. ([1] 1) ([c] c)**~~

**[9.36.1.3.] 9.36.1.3. ([1] 1) ([e] --)**

# Proposed Change 2057

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.36.2.4. (first printing)**<br>**NBC25 Div.B 9.36.6. (first printing)**<br>**NBC25 Div.B 9.36.7.3.(3) (first printing)** |
| Subject: | Performance Compliance — Energy Performance |
| Title: | Requirements for Energy Modeling Software |
| Description: | This proposed change updates ANSI/ASHRAE 140, "Method of Test for Evaluating Building Performance Simulation Software," to the 2023 edition, adds a new Article on the testing of energy modeling software, and harmonizes terminology. |

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 2025 edition of the National Building Code of Canada (NBC) was intended to reference ANSI/ASHRAE 140-2011, "Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs," to identify acceptable software for carrying out compliance calculations for energy modeling; however, the NBC 2025 was prematurely updated to the 2023 edition of this standard for consistency with the 2025 edition of the National Energy Code of Canada for Buildings. This proposed change ensures that the public review process is still followed for this change to the NBC.

The 2011 edition of ANSI/ASHRAE 140 includes test cases for the evaluation of building performance software, but does not include information on what should be considered as acceptable software results for those test cases. The absence of mandatory pass/fail criteria means that building officials would only need to confirm that energy modeling software is capable of running the tests, but not that the results are within an

acceptable range. The 2011 edition of the standard thus presents building officials with a gap in the Code requirements when they try to determine whether the software used to demonstrate Code compliance complies with the standard.

In addition, the Code uses inconsistent terminology when referring to energy modeling software, which may cause confusion for Code users.

## Justification

Referencing ANSI/ASHRAE 140-2023, "Method of Test for Evaluating Building Performance Simulation Software," would address the problem by providing pass/fail criteria by which compliance of the software with the standard may be determined.

The 2023 edition of ANSI/ASHRAE 140

- introduces normative (i.e., mandatory) acceptance criteria for determining if energy modeling software is suitable for use by the AHJ, and
- adds informative sections for AHJs on developing the acceptance criteria.

ANSI/ASHRAE 140-2023 also includes test suites that are new or have been updated since the 2011 edition in the following addenda [1]:

- ground coupled slab-on-grade analytical verification tests (ANSI/ASHRAE 140-2011, Addendum *a*),
- air-side HVAC equipment analytical verification tests (ANSI/ASHRAE 140-2014, Addendum *a*),
- building thermal envelope and fabric load tests (ANSI/ASHRAE 140-2017, Addendum *a*), and
- weather drivers tests (ANSI/ASHRAE 140-2020, Addendum *a*).

In addition, consistent use of the term "energy modeling software," would clarify the Code requirements in other provisions that reference this software.

**References**

[1] The listed addenda are available at https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda.

## PROPOSED CHANGE

**[9.36.2.4.] 9.36.2.4. Calculation of Effective Thermal Resistance of Assemblies**

**Note A-9.36.2.4.(4) Credit for Unheated Spaces Protecting the Building Envelope.**

The reduction in RSI afforded by Sentence 9.36.2.4.(4) is intended to provide a simple credit under the prescriptive path for any unheated space that protects a component of the building envelope. The credited value is conservative because it cannot take into account the construction of the enclosure surrounding the unheated space, which may

or may not comply with the Code; as such, too many variables, such as its size or airtightness, may negate any higher credit that could be allowed.

There may be energy modeling softwaresimulation tools that can be used under the performance path to provide a better assessment of the effect of an indirectly heated space; thisese softwaretools may be used to calculate the credit more accurately when an unheated space is designed to provide significantly better protection than the worst-case situation assumed here. Vented spaces, such as attic and roof spaces or crawl spaces, are considered as exterior spaces; the RSI-value credit allowed in Sentence 9.36.2.4.(4) can therefore not be applied in the calculation of the effective thermal resistance of assemblies separating conditioned spaces from vented spaces.

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## [9.36.6.] 9.36.6. Energy Performance Compliance

### [9.36.6.1.] 9.36.6.1. Scope and Application

### [9.36.6.2.] 9.36.6.2. Definitions

### [9.36.6.3.] 9.36.6.3. Compliance

### [9.36.6.4.] 9.36.6.4. Calculation Methods

**[1] 1)** Except as provided in Sentence (2), the energy model calculations shall account for the annual energy consumption of systems and equipment required for

[a] a) space heating,

[b] b) ventilation,

[c] c) service water heating, and

[d] d) where installed, space cooling.

(See Note A-9.36.6.4.(1).)

**[2] 2)** Redundant or back-up equipment for the systems and equipment listed in Sentence (1) is permitted to be excluded from the energy model, provided it is equipped with controls and is not required to meet the space-conditioning load of the house. (See Note A-9.36.6.4.(2).)

**[3] 3)** The schedules used in the energy model shall

[a] a) be based on a time interval not greater than one hour, where the energy model evaluates the performance of the house over hourly intervals, or

[b] b) be applied in an hourly-bin model then averaged, where the energy model does not evaluate the performance of the house over hourly intervals.

**[4] 4)** The energy model calculations shall account for the loads due to heat gains from occupants, lighting and miscellaneous equipment, which shall be fixed for every day of the year, by

[a] a) following the schedule provided in Table 9.36.6.4., and

[b] b) increasing the loads for each hour by 3.58 W per square metre of *floor area* in common spaces, if applicable.

**Table [9.36.6.4.] 9.36.6.4.**
**Default Schedule for Internal Heat Gain Loads (1)**
**Forming Part of Sentence [9.36.6.4.] 9.36.6.4.([4] 4)**

| **Houses without a *Secondary Suite* (2)** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Load, in W, Before Noon | | | | | | | | | | | |
| 12 a.m. | 1 a.m. | 2 a.m. | 3 a.m. | 4 a.m. | 5 a.m. | 6 a.m. | 7 a.m. | 8 a.m. | 9 a.m. | 10 a.m. | 11 a.m. |
| 646 | 454 | 452 | 431 | 429 | 450 | 522 | 597 | 696 | 724 | 745 | 811 |
| Average Load, in W, After Noon | | | | | | | | | | | |
| 12 p.m. | 1 p.m. | 2 p.m. | 3 p.m. | 4 p.m. | 5 p.m. | 6 p.m. | 7 p.m. | 8 p.m. | 9 p.m. | 10 p.m. | 11 p.m. |
| 815 | 768 | 738 | 749 | 760 | 895 | 1159 | 1305 | 1288 | 1218 | 981 | 783 |
| Each *Dwelling Unit* in Residential *Buildings* with Two or More *Dwelling Units* (2) | | | | | | | | | | | |
| Average Load, in W, Before Noon | | | | | | | | | | | |
| 12 a.m. | 1 a.m. | 2 a.m. | 3 a.m. | 4 a.m. | 5 a.m. | 6 a.m. | 7 a.m. | 8 a.m. | 9 a.m. | 10 a.m. | 11 a.m. |
| 397 | 284 | 283 | 270 | 269 | 282 | 324 | 368 | 426 | 442 | 455 | 493 |
| Average Load, in W, After Noon | | | | | | | | | | | |
| 12 p.m. | 1 p.m. | 2 p.m. | 3 p.m. | 4 p.m. | 5 p.m. | 6 p.m. | 7 p.m. | 8 p.m. | 9 p.m. | 10 p.m. | 11 p.m. |
| 496 | 468 | 451 | 457 | 463 | 543 | 697 | 783 | 773 | 732 | 593 | 477 |

**Notes to Table [9.36.6.4.] 9.36.6.4.:**

(1) The schedule indicates at what time of day the heat gains from the metabolic activity of the occupants and occupant-dependent appliance, lighting and receptacle electrical loads are present; it does not account for heat gains from exterior lighting, lighting of unconditioned spaces, service water heating systems and HVAC equipment.

(2) See Note A-Table 9.36.6.4.

**[5] 5)** The energy model calculations shall account for the following space-heating temperature set-points:

[a] a) 20°C in all living spaces above the *basement*,

[b] b) 19°C in *basements* and common spaces, and

[c] c) 15°C in crawl spaces intended to be *conditioned spaces*.

**[6] 6)** The energy model calculations shall account for a space-cooling temperature set-point of 25°C in all *conditioned spaces* served by the cooling system.

**[7] 7)** The energy model calculations shall account for a thermostatic control that responds to fluctuations of ±0.5°C from the temperature set-point. (See Note A-9.36.6.4.(7).)

**[8] 8)** Energy modeling software that~~If a computer program~~ is used to carry out the compliance calculations~~, the calculation methods employed in the energy model~~ shall conform to

[a] a) the testing requirements for energy modeling software stated in Article 9.36.6.17.-2030, or~~be used for both the reference and proposed houses, and~~

[b] b) an equivalent test method~~be tested in accordance with ANSI/ASHRAE 140, "Method of Test for Evaluating Building Performance Simulation Software", with variations in the computer program from the range recommended therein reported in accordance with Division C~~.

**[9] 9)** The proposed and reference houses shall both be modeled using the same approach and assumptions, except where *building* components or energy efficiency features are permitted by this Subsection to be different.

**[10] 10)** The energy model calculations shall account for the effect of airtightness in accordance with Sentence 9.36.6.10.(10) or Article 9.36.5.3., as applicable.

**[11] 11)** The energy model calculations shall account for heat transfer through elements separating *conditioned space* from unconditioned space, the exterior or the ground.

**[9.36.6.5.] 9.36.6.5. Climatic Data**

**[9.36.6.6.] 9.36.6.6. Building Envelope Calculations**

**[9.36.6.7.] 9.36.6.7. HVAC System Calculations**

**[9.36.6.8.] 9.36.6.8. Service Water Heating System Calculations**

**[9.36.6.9.] 9.36.6.9. General Requirements for Modeling the Proposed House**

**[9.36.6.10.] 9.36.6.10. Modeling Building Envelope of Proposed House**

**[9.36.6.11.] 9.36.6.11. Modeling HVAC System of Proposed House**

**[9.36.6.12.] 9.36.6.12. Modeling Service Water Heating System of Proposed House**

**[9.36.6.13.] 9.36.6.13. General Requirements for Modeling the Reference House**

**[9.36.6.14.] 9.36.6.14. Modeling Building Envelope of Reference House**

**[9.36.6.15.] 9.36.6.15. Modeling HVAC System of Reference House**

**[9.36.6.16.] 9.36.6.16. Modeling Service Water Heating System of Reference House**

**[9.36.6.17.] --- Testing of Energy Modeling Software**

**[1] --)** Energy modeling software shall be tested in accordance with the Class II, Tier 1 tests of ANSI/ASHRAE 140-2023, "Method of Test for Evaluating Building Performance Simulation Software." (See Note A-9.36.6.17.(1).)

**[2] --)** The results of the tests required by Sentence (1) shall meet the acceptance criteria established using statistical confidence interval ranges as described in Annex B22, with the range calculated at a confidence interval not greater than 93%.

**[3] --)** The same tested version of the energy modeling software shall be used to model the proposed house and the reference house.

**Note A-9.36.6.3.(1) Energy Modeling.**

The energy modeling of the proposed and reference houses should be performed using the same energy modeling software. An energy modeling platform other than the EnerGuide Rating System may be used to demonstrate compliance with Clause 9.36.6.3.(1)(a).

**Note A-9.36.6.3.(8)(a) 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 energy 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 energy 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 that of the reference house or a design cooling intensity of not more than 10 $W/m^3$. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.6. may nevertheless be prone to overheating in some circumstances. This requirement does not prescribe the installation of cooling systems in new construction.

**Note A-9.36.6.15.(6) Default Settings.**

The default settings in energy ~~performance~~ modeling software for houses are an appropriate source of part-load performance values of equipment.

**Note A-9.36.6.17.(1) Testing of Energy Modeling Software.**

The Class II, Tier 1 tests in ANSI/ASHRAE 140-2023, "Method of Test for Evaluating Building Performance Simulation Software," are applicable to software that models low-rise wood-frame construction, which dominates the residential construction industry in Canada. Designers who model high thermal mass and passive solar designs should consider using software that has also been verified using Tier 2 Tests.

Note that Code users are not expected to perform this testing themselves; instead, Code users should refer to the reports typically produced by reputable vendors of energy modeling software on the compliance of their products with ANSI/ASHRAE 140.

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**[9.36.7.3.] 9.36.7.3. Energy Performance Improvement Compliance Calculations**

**[1] 3)** 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.(3).)

**Note A-9.36.7.3.(3) Annual Gross Space Heat Loss.**

The annual gross space heat loss has been selected as a good proxy for heat loss due to building envelope performance. It is readily extracted from energy modeling software~~building simulation models~~ and correlates well with the combined conductive (through both fenestration and opaque elements) and air leakage losses, while excluding solar and internal gains. The inclusion of ventilation losses is not strictly relevant to building envelope performance, but their contribution to the annual gross space heat loss is generally small and, given that unbalanced ventilation is permitted by the Code and thus may be modeled, disaggregating energy losses due to unintentional air leakage from those due to intentional ventilation can be difficult for~~in~~ most energy modeling software~~simulation models~~.

## Impact analysis

This proposed change is expected to be cost neutral for energy modelers. The NBC already requires that software used for energy modeling be tested in accordance with ANSI/ASHRAE 140. The additional burden of testing software to the 2023 edition of the standard rests with the vendors of energy modeling software, many of whom already incurred much of this cost when they submitted results during the development of the acceptance criteria.

Overall, this approach would encourage greater accuracy and consistency in building performance simulation software. No comments were provided during the public review of the new acceptance criteria in ANSI/ASHRAE 140-2023, which reflects the consensus reached within the software and modeling community.

## Enforcement implications

Currently, building officials need to confirm that energy modeling software complies with ANSI/ASHRAE 140 by visiting the website of the energy modeling software vendor. Energy modeling software vendors should provide enough information to allow users to verify that the results meet the criteria set in the standard; it is not expected that building officials would perform this testing themselves.

## Who is affected

Energy modelers, energy modeling software vendors, and building officials.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[9.36.2.4.] 9.36.2.4. ([1] 1) [F92-OE1.1]**

**[9.36.2.4.] 9.36.2.4. ([2] 2) no attributions**

**[9.36.2.4.] 9.36.2.4. ([3] 3) [F92-OE1.1]**

**[9.36.2.4.] 9.36.2.4. ([4] 4) no attributions**

**[9.36.6.1.] 9.36.6.1. ([1] 1) no attributions**

**[9.36.6.1.] 9.36.6.1. ([2] 2) no attributions**

**[9.36.6.2.] 9.36.6.2. ([1] 1) no attributions**

**[9.36.6.2.] 9.36.6.2. ([2] 2) no attributions**

**[9.36.6.3.] 9.36.6.3. ([1] 1) no attributions**

**[9.36.6.3.] 9.36.6.3. ([2] 2) [F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([3] 3) [F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([4] 4) [F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([5] 5) [F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([6] 6) [F99-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([7] 7) [F95,F99-OE1.1]**

**[9.36.6.3.] 9.36.6.3. ([8] 8) [F95,F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([1] 1) no attributions**

**[9.36.6.4.] 9.36.6.4. ([2] 2) no attributions**

**[9.36.6.4.] 9.36.6.4. ([3] 3) [F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([4] 4) [F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([5] 5) [F95,F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([6] 6) [F95,F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([7] 7) [F95,F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([8] 8) [F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([9] 9) [F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([10] 10) [F90,F99-OE1.1]**

**[9.36.6.4.] 9.36.6.4. ([11] 11) [F90,F99-OE1.1]**

**[9.36.6.5.] 9.36.6.5. ([1] 1) [F99-OE1.1]**

[9.36.6.5.] 9.36.6.5. ([2] 2) [F99-OE1.1]

[9.36.6.5.] 9.36.6.5. ([3] 3) [F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([1] 1) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([2] 2) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([3] 3) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([4] 4) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([5] 5) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([6] 6) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([7] 7) [F92,F93,F95,F96,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([8] 8) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([9] 9) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([10] 10) [F92,F99-OE1.1]

[9.36.6.6.] 9.36.6.6. ([11] 11) [F92,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([1] 1) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([2] 2) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([3] 3) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([4] 4) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([5] 5) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([6] 6) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([7] 7) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([8] 8) [F95,F99-OE1.1]

[9.36.6.7.] 9.36.6.7. ([9] 9) [F95,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([1] 1) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([2] 2) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([3] 3) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([4] 4) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([5] 5) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([6] 6) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([7] 7) [F96,F99-OE1.1]

[9.36.6.8.] 9.36.6.8. ([8] 8) [F96,F99-OE1.1]

[9.36.6.9.] 9.36.6.9. ([1] 1) [F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([1] 1) [F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([2] 2) no attributions

[9.36.6.10.] 9.36.6.10. ([3] 3) no attributions

[9.36.6.10.] 9.36.6.10. ([4] 4) [F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([5] 5) [F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([6] 6) [F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([7] 7) [F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([8] 8) no attributions

[9.36.6.10.] 9.36.6.10. ([9] 9) [F90,F91,F92,F95,F99-OE1.1]

[9.36.6.10.] 9.36.6.10. ([10] 10) [F90,F91,F92,F93,F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([1] 1) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([2] 2) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([3] 3) [F92,F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([4] 4) [F95,F99,F100-OE1.1]

[9.36.6.11.] 9.36.6.11. ([5] 5) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([6] 6) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([7] 7) no attributions

[9.36.6.11.] 9.36.6.11. ([8] 8) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([9] 9) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([10] 10) [F95,F99,F100-OE1.1]

[9.36.6.11.] 9.36.6.11. ([11] 11) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([12] 12) [F95,F99,F100-OE1.1]

[9.36.6.11.] 9.36.6.11. ([13] 13) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([14] 14) [F95,F99,F100-OE1.1]

[9.36.6.11.] 9.36.6.11. ([15] 15) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([16] 16) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([17] 17) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([18] 18) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([19] 19) [F95,F99-OE1.1]

[9.36.6.11.] 9.36.6.11. ([20] 20) [F95,F99-OE1.1]

[9.36.6.12.] 9.36.6.12. ([1] 1) [F96,F99-OE1.1]

[9.36.6.12.] 9.36.6.12. ([2] 2) no attributions

[9.36.6.13.] 9.36.6.13. ([1] 1) [F99-OE1.1]

[9.36.6.13.] 9.36.6.13. ([2] 2) [F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([1] 1) [F92,F95,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([2] 2) [F90,F91,F92,F95,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([3] 3) [F92,F95,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([4] 4) [F92,F95,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([5] 5) [F92,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([6] 6) [F92,F95,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([7] 7) [F92,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([8] 8) [F92,F99-OE1.1]

[9.36.6.14.] 9.36.6.14. ([9] 9) [F92,F99,F95-OE1.1]

[9.36.6.14.] 9.36.6.14. ([10] 10) [F92,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([1] 1) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([2] 2) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([3] 3) [F95,F99,F100-OE1.1]

[9.36.6.15.] 9.36.6.15. ([4] 4) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([5] 5) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([6] 6) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([7] 7) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([8] 8) [F95,F99,F100-OE1.1]

[9.36.6.15.] 9.36.6.15. ([9] 9) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([10] 10) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([11] 11) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([12] 12) [F95,F99,F100-OE1.1]

[9.36.6.15.] 9.36.6.15. ([13] 13) [F95,F99,F100-OE1.1]

[9.36.6.15.] 9.36.6.15. ([14] 14) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([15] 15) [F95,F99-OE1.1]

[9.36.6.15.] 9.36.6.15. ([16] 16) [F95,F99-OE1.1]

[9.36.6.16.] 9.36.6.16. ([1] 1) [F95,F99-OE1.1]

[9.36.6.16.] 9.36.6.16. ([2] 2) [F95,F99-OE1.1]

**[9.36.6.16.] 9.36.6.16. ([3] 3) [F95,F99-OE1.1]**

**[9.36.6.17.] -- ([1] --) [F99-OE1.1]**

**[9.36.6.17.] -- ([2] --) [F99-OE1.1]**

**[9.36.6.17.] -- ([3] --) [F99-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([1] 3) [F90,F91,F92,F93,F95,F100-OE1.1]**

# Proposed Change 2182

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.36.6.15.(2) (first printing)**<br>**NBC25 Div.B 9.36.6.16.(1) (first printing)**<br>**NBC25 Div.B Table 9.36.7.2. (first printing)**<br>**NBC25 Div.B 9.36.7.3. (first printing)** |
| Subject: | Energy Efficiency for Houses |
| Title: | Update to Energy Modeling Rules for Heat Pumps |
| Description: | This proposed change updates energy modeling rules for heat pumps for the reference house and Energy Performance Tier 1, and adds a percent heat loss reduction requirement for Tier 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

Heat pumps are treated as an energy source in Sentences 9.36.6.15.(2) and 9.36.6.16.(1) of the National Building Code of Canada (NBC). However, this treatment could cause confusion, as heat pumps can be powered by electricity or gas, which are also listed as energy sources. To provide clarity, heat pumps should be treated as a type of equipment.

Currently, the modeling rules for heat pumps in Subsection 9.36.6. and Energy Performance Tier 1 are inconsistent when compared to Energy Performance Tiers 2 to 5. However, Subsection 9.36.6. and Tier 1 require the Code user to model the energy performance of a heat pump in both the reference and proposed houses when a heat pump is installed in the proposed house. When a heat pump is installed in the proposed house, Sentence 9.36.7.3.(2) permits comparison with equipment of the same type as

its secondary or back-up system in the reference house. As a result, Code users are credited for the energy savings provided by a heat pump compared to less efficient space-heating equipment, but only in higher Energy Performance Tiers.

Removing the requirement from Sentence 9.36.7.3.(2) to model a heat pump in the reference house for Tier 1 could permit a 30% decrease in the building envelope performance of the proposed house, compared to a building envelope designed according to Subsection 9.36.2. In order to maintain an acceptable minimum performance of the building envelope, a heat loss reduction target for Tier 1 should be added to Table 9.36.7.2.

The NBC also includes inconsistent modeling rules for service water heating as compared to space heating. For space heating in Tiers 2 to 5, the efficiency of a heat pump in the proposed house is allowed to be compared to that of the back-up heating system in the reference house. However, for service water heating in all tiers, the efficiency of a heat pump water heater in the proposed house must be compared to that of a heat pump water heater in the reference house. As a result, an energy performance credit is not provided for the more efficient heat pump service water heaters (compared to storage-type service water heaters).

## Justification

This proposed change removes heat pumps from the list of energy sources used for energy modeling, which would allow energy efficiency improvements to be recognized when comparing different types of HVAC or service water heating equipment and their respective efficiencies.

Removing the exception for Tier 1 from Sentence 9.36.7.3.(2) would allow Code users to be credited for the expected energy savings that result from the installation of a heat pump in compliance with the Code.

Adding a requirement for heat loss reduction of ≥ 0% in Tier 1 to Table 9.36.7.2. would limit the risk of the design of deficient building envelopes where a heat pump is installed in a proposed house complying with Energy Performance Tier 1.

Adding new Sentence 9.36.7.3.(3)-2030, which allows heat pump water heaters to be compared to storage-type service water heaters of the same energy source in the reference house, would permit Code users to benefit from the increased energy savings related to the performance of the heat pump water heater. As a result, this proposed change would also remove the discrepancy between heat pumps that are used for space heating and service water heating.

## PROPOSED CHANGE

**[9.36.6.15.] 9.36.6.15. Modeling HVAC System of Reference House**

**[1] 2)** The energy model calculations for the reference house shall include the

same features as those used for the proposed house with regard to

[a] a) the principal heating and cooling energy sources, which are gas, electricity, oil, propane~~,~~ or wood ~~or a heat pump~~,

[b] b) the primary and secondary energy sources, which are gas, electricity, oil, propane~~,~~ or wood ~~or a heat pump~~, and

[c] c) the ventilation rate (see Sentence 9.36.6.11.(6)).

(See Note A-9.36.6.15.(2) and 9.36.6.16.(1).)

**Note A-9.36.6.15.(2) and 9.36.6.16.(1) Primary and Secondary Energy Sources.**

Energy sources for the principal heating and cooling systems and for the service water heating systems do not include heat pumps or renewable energy generation sources.

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**[9.36.6.16.] 9.36.6.16. Modeling Service Water Heating System of Reference House**

**[1] 1)** The energy source of the reference house's service water heating system, which is gas, electricity, oil, propane~~,~~ or wood ~~or a heat pump~~, shall be the same as that for the system in the proposed house. (See Note A-9.36.6.15.(2) and 9.36.6.16.(1).)

**Table [9.36.7.2.] 9.36.7.2.**
**Energy Performance Tiers for Buildings and Houses**
**Forming Part of Sentence 9.36.7.2.(1)**

| Total Volume of *Conditioned Space* Within the *Building* or House | Energy Performance Metrics | Target Energy Performance | | | | |
|---|---|---|---|---|---|---|
| | | Applicable Energy Performance Tier | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| > 300 $m^3$ and where volume is not determined | Percent heat loss reduction (1) | ~~n/a~~≥ 0% | ≥ 5% | ≥ 10% | ≥ 20% | ≥ 40% |
| | Percent improvement (2) | ≥ 0% | ≥ 10% | ≥ 20% | ≥ 40% | ≥ 70% |
| | OR | | | | | |
| | Percent house energy target (3) | ≤ 100% | ≤ 90% | ≤ 80% | ≤ 60% | ≤ 30% |

| Total Volume of *Conditioned Space* Within the *Building* or House | Energy Performance Metrics | Target Energy Performance | | | | |
|---|---|---|---|---|---|---|
| | | Applicable Energy Performance Tier | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| ≤ 300 $m^3$ | Percent heat loss reduction (1) | ~~n/a~~≥ 0% | ≥ 0% | ≥ 5% | ≥ 15% | ≥ 25% |
| | Percent improvement (2) | ≥ 0% | ≥ 0% | ≥ 10% | ≥ 30% | ≥ 60% |
| | OR | | | | | |
| | Percent house energy target (3) | ≤ 100% | ≤ 100% | ≤ 90% | ≤ 70% | ≤ 40% |

**Notes to Table [9.36.7.2.] 9.36.7.2.:**

(1) See Sentence 9.36.7.3.(5)-2030~~Sentence 9.36.7.3.(4)~~.

(2) See Sentence 9.36.7.3.(6)-2030~~Sentence 9.36.7.3.(5)~~.

(3) See Sentence 9.36.7.3.(7)-2030~~Sentence 9.36.7.3.(6)~~.

**[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 9.36.6. 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 (3), and

[c] c) the peak cooling load of the proposed and reference houses.

(See Note A-9.36.7.3.(1).)

**[2] 2)** ~~Except for energy performance tier 1, w~~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.

**[3] --)** Where service water heating is provided by a heat pump water heater in the proposed house, the reference house shall be modeled using a *storage-type service water heater* that complies with the energy efficiency requirements in Article 9.36.4.2. that

[a] --) has the same energy source as the heat pump water heater, or

[b] --) is gas-fired, if the energy source of the heat pump water heater is not included in Table 9.36.4.2.

**[4] 3)** 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.(4)~~Note A-9.36.7.3.(3)~~.)

**[5] 4)** 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.

**[6] 5)** 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.

**[7] 6)** 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.

**[8] 7)** The airtightness value used in the energy model for the proposed house shall be

[a] a) the airtightness value set out in Clause 9.36.6.10.(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 9.36.5.3.(1) and the appropriate airtightness value set out in Sentence 9.36.6.10.(9) can be selected.

(See Note A-9.36.7.3.(8)~~Note A-9.36.7.3.(7)~~.)

**Note A-9.36.7.3.(4~~3~~) Annual Gross Space Heat Loss.**

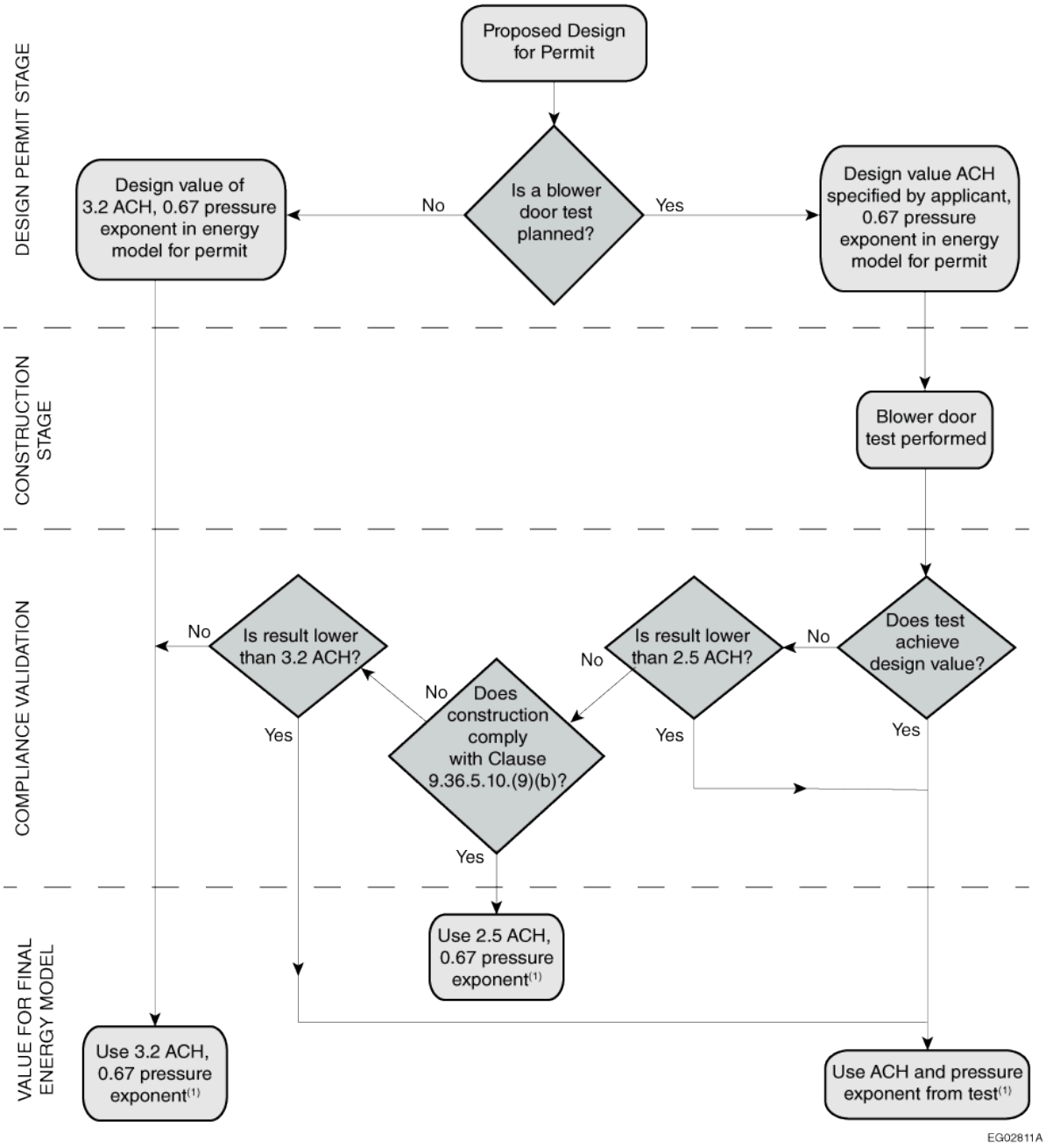
The annual gross space heat loss has been selected as a good proxy for heat loss due to building envelope performance. It is readily extracted from building simulation models and correlates well with the combined conductive (through both fenestration and opaque elements) and air leakage losses, while excluding solar and internal gains. The inclusion of ventilation losses is not strictly relevant to building envelope performance, but their contribution to the annual gross space heat loss is generally small and, given that unbalanced ventilation is permitted by the Code and thus may be modeled, disaggregating energy losses due to unintentional air leakage from those due

to intentional ventilation can be difficult in most simulation models.

**Note A-9.36.7.3.(8~~7~~) Airtightness Testing.**

The flow chart in Figure A-9.36.7.3.(7) outlines the intended interpretation of Sentence 9.36.7.3.(7). Airtightness testing is voluntary, however, not testing will result in the proposed house model using a default airtightness of 3.2 air changes per hour (ACH) at 50 Pa pressure difference and a pressure exponent of 0.67.

**Figure [A-9.36.7.3.(87)] A-9.36.7.3.(7)**
**Determining the appropriate airtightness value to use in the energy model calculations in the tiered energy performance compliance path**




**Note to Figure A-9.36.7.3.(7):**

(1) Airtightness value and pressure exponent of reference house shall be as per Sentence 9.36.6.14.(2).

Where testing is to be carried out, Code users may use a design value for ACH at 50 Pa pressure difference in the proposed house that they expect to achieve upon testing. Good airtightness is a significant contributor to energy-efficient performance and is likely to be needed to achieve the higher energy performance tiers, however, it requires careful detailing and planning. Caution is advised when choosing a design airtightness

value, especially for Code users who are not used to delivering highly airtight buildings. Industry resources are available to assist with selecting and achieving a design airtightness.

Once an airtightness test has been performed, Code users may choose whether to use the test result, the default value of 3.2 ACH at 50 Pa pressure difference or, where the requirements of Clause 9.36.6.10.(9)(b) have been met, 2.5 ACH at 50 Pa pressure difference. It is important to note that a tested pressure exponent may only be used in cases where the tested ACH is used.

## Impact analysis

This proposed change would assist Code users by providing a benefit that recognizes energy savings where the design of the proposed building includes a heat pump or heat pump water heater to achieve Code compliance.

No additional costs are expected as the result of this proposed change, as it only provides more options for achieving the energy performance targets in Table 9.36.7.2. where a heat pump or heat pump water heater is voluntarily installed in the proposed house.

Also, no additional costs are expected as the result of the proposed changes to Tier 1, as no consideration was previously given for energy performance compliance achieved through the installation of a heat pump; the proposed house would still have needed to comply with the energy performance target for Tier 1 in Table 9.36.7.2. A heat loss reduction target of ≥ 0% would still permit Code users to use the trade-off performance path for building envelope components to optimize the cost of Code-compliant designs.

## Enforcement implications

This proposed change can be enforced by the infrastructure currently available to enforce the Code. By removing the exception for the modeling of heat pumps in Tier 1, this proposed change adds clarity that facilitates enforcement.

## Who is affected

Regulators, builders, designers, engineers, architects, contractors and consultants.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[9.36.6.15.] 9.36.6.15. ([1] 2) [F95,F99-OE1.1]**

**[9.36.6.16.] 9.36.6.16. ([1] 1) [F95,F99-OE1.1]**

N/A

**[9.36.7.3.] 9.36.7.3. ([1] 1) no attributions**

**[9.36.7.3.] 9.36.7.3. ([2] 2) no attributions**

**[9.36.7.3.] 9.36.7.3. ([2] 2) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.7.3.] -- ([3] --) no attributions**

**[9.36.7.3.] -- ([3] --) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([4] 3) [F90,F91,F92,F93,F95,F100-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([5] 4) [F99-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([6] 5) [F99-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([7] 6) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]**

**[9.36.7.3.] 9.36.7.3. ([8] 7) [F90,F91,F92,F93,F95,F100-OE1.1]**

# Proposed Change 2044

| | |
|---|---|
| **Code Reference(s):** | **NBC25 Div.B 9.36.12. (first printing)** |
| Subject: | Energy Efficiency for Houses |
| Title: | Energy Performance Tier 3 of the Prescriptive Path |
| Description: | This proposed change provides energy-efficiency requirements for compliance with Tier 3 of the energy performance compliance prescriptive path. |

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

The 2020 edition of the National Building Code of Canada (NBC) introduced energy efficiency performance tiers in Section 9.36. of Division B, with increasing levels of improvement for buildings and houses, to provide authorities having jurisdiction with the option to adopt the energy performance levels most suitable to their needs.

Although performance modeling is common in the industry, many Code users have requested that prescriptive compliance paths remain in the National Model Codes to provide simplicity in achieving energy compliance.

Failure to develop a prescriptive compliance path for Tier 3 could force Code users to rely on more complicated compliance paths.

## Justification

The proposed prescriptive requirements for Tier 3 would provide acceptable solutions for different components of the building to improve the total energy performance. Together with the tiered energy performance path in Subsection 9.36.7. and the tiered points-based prescriptive trade-off path in Subsection 9.36.9., the prescriptive path is one of the compliance options that provide an acceptable means of achieving the performance goal of reducing energy consumption by at least 20% and percent heat loss by at least 10% for buildings with a volume of conditioned space (or "conditioned volume") greater than 300 $m^3$, and by reducing energy consumption by at least 10% and percent heat loss by at least 5% for buildings with a conditioned volume less than or equal to 300 $m^3$.

In developing the Tier 3 prescriptive solutions, many different possible solutions were considered. These possible solutions were compared against the points-based trade-off path to ensure compliance.

**Building Envelope**

A Tier 3 envelope package was developed for each climate zone. 240 building archetypes were modeled and categorized by volume, with 219 having a conditioned volume greater than 300 $m^3$ and 21 having a volume of less than or equal to 300 $m^3$.

For the applicable building volume and climate zone, two criteria were used to define acceptable Tier 3 building envelope package solutions:

1. At least 80% of the archetypes must comply with the Tier 3 requirement for percentage heat loss reduction.
2. On average, the archetypes must have a peak heating load less than their reference building.

There are numerous combinations of envelope measures that meet the above criteria. Therefore, additional selection criteria needed to be defined to reduce the number of prescriptive envelope package solutions to one for each climate and building volume.

The two additional criteria were as follows:

1. Solutions should minimize incremental costs.
2. Component performance of the building envelope must consistently increase across climate zones.

A fourth criterion was defined to ensure that, when going from a warmer to colder climate zone, the thermal performance of a building envelope component was not reduced. For example, a solution that uses 4.88 RSI for the effective thermal resistance of above-grade walls in climate zone 6 would not be used if the solution for climate zone 5 used 5.69 RSI for above-grade walls.

**Airtightness**

There is no mandatory airtightness level that must be met to achieve Tier 3.

**HVAC and Service Water Heating System**

Heat/energy recovery ventilators (HRVs/ERVs) are considered an economical way to save energy; it was proposed that all Tier 3 houses be equipped with HRVs/ERVs with a minimum 70% sensible recovery efficiency. As HRVs/ERVs are required for the Tier 1 and Tier 2 packages, the requirement is maintained in the Tier 3 package.

For buildings with a conditioned volume less than or equal to 300 $m^3$, no upgrades beyond Code-minimum space heating systems are required to achieve Tier 3. For buildings with a conditioned volume greater than 300 $m^3$, upgrades are required when heating with a gas- or oil-fired furnace.

For buildings with a conditioned volume less than or equal to 300 $m^3$, no upgrades beyond Code-minimum service water heating systems are required to achieve Tier 3. For buildings with a conditioned volume greater than 300 $m^3$, upgrades are required when the water heater is gas- or oil-fired.

## PROPOSED CHANGE

### [9.36.12.] 9.36.12. Tiered Energy Performance Compliance: Tier 3 Prescriptive Path

**[9.36.12.1.] --- Scope and Application**

**[1] --)** This Subsection is concerned with achieving compliance with Energy Performance Tier 3, as specified in Table 9.36.7.2., through prescriptive requirements.

**[2] --)** This Subsection applies only to *buildings* that are equipped with a heat/energy-recovery ventilator conforming to Article 9.36.3.9. (See Note A-9.36.12.2.(1)(a).)

**[9.36.12.2.] --- Compliance**

**[1] --)** Compliance with this Subsection shall be achieved by

[a] -- designing and constructing the *building* envelope in accordance with Articles 9.36.2.1. to 9.36.2.5., 9.36.2.9., 9.36.2.10., and 9.36.12.3. to 9.36.12.5. (see Note A-9.36.12.2.(1)(a)),

[b] -- designing and constructing or specifying systems and equipment for heating, ventilating or air-conditioning in accordance with Article 9.36.12.6., and

[c] -- designing and constructing or specifying systems and equipment for service water heating in accordance with Article 9.36.12.7.

**[9.36.12.3.] --- Above-Ground Opaque Building Assemblies**

**[1] --)** Except as provided in Article 9.36.2.5. 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

[a] -- Table 9.36.12.3.-A, where the total volume of *conditioned space* within the *building* is less than or equal to 300 $m^3$,

[b] -- Table 9.36.12.3.-B, where the total volume of *conditioned space* within the *building* is greater than 300 $m^3$ or not determined, and

[i] -- the principal *space-heating appliance* is oil- or gas-fired or a heat pump, as specified in Table 9.36.12.6., and

[ii] -- the service water heating equipment is oil- or gas-fired or a heat pump, as specified in Table 9.36.12.7., or

[c] -- Table 9.36.12.3.-C.

**Table [9.36.12.3.-A]**
**Tier 3 Effective Thermal Resistance of Above-Ground Opaque Building Assemblies Described in Clause 9.36.12.3.(1)(a)**
**Forming Part of Clause 9.36.12.3.(1)(a)**

| Above-Ground Opaque *Building* Assembly | 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 |
| | Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W | | | | | |
| Ceilings below attics | 6.91 | 8.67 | 8.67 | 10.43 | 10.43 | 10.43 |
| Cathedral ceilings and flat roofs | 4.67 | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 |
| Walls | 3.08 | 3.08 | 3.28 | 3.28 | 3.85 | 3.85 |
| Floors over unheated spaces | 4.67 | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 |

**Note to Table [9.36.12.3.-A] :**

(1) See Article 1.1.3.1.

**Table [9.36.12.3.-B]**
**Tier 3 Effective Thermal Resistance of Above-Ground Opaque Building Assemblies Described in Clause 9.36.12.3.(1)(b)**
**Forming Part of Clause 9.36.12.3.(1)(b)**

| Above-Ground Opaque *Building* Assembly | 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 |
| | Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W | | | | | |
| Ceilings below attics | 6.91 | 8.67 | 10.43 | 10.43 | 10.43 | 10.43 |
| Cathedral ceilings and flat roofs | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 | 5.02 |
| Walls | 3.28 | 3.28 | 3.58 | 3.69 | 4.29 | 4.57 |
| Floors over unheated spaces | 4.67 | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 |

**Note to Table [9.36.12.3.-B] :**

(1) See Article 1.1.3.1.

**Table [9.36.12.3.-C]**
**Tier 3 Effective Thermal Resistance of Above-Ground Opaque Building Assemblies Described in Clause 9.36.12.3.(1)(c)**
**Forming Part of Clause 9.36.12.3.(1)(c)**

| Above-Ground Opaque *Building* Assembly | 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 |
| | Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W | | | | | |
| Ceilings below attics | 6.91 | 10.43 | 12.19 | 12.19 | 12.19 | 12.19 |
| Cathedral ceilings and flat roofs | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 | 5.02 |
| Walls | 4.40 | 4.40 | 4.57 | 4.57 | 5.45 | 5.45 |
| Floors over unheated spaces | 4.67 | 4.67 | 4.67 | 5.02 | 5.02 | 5.02 |

**Note to Table [9.36.12.3.-C] :**

(1) See Article 1.1.3.1.

**[2] --)** 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.

**[3] --)** Except for tubular daylighting devices, the effective thermal resistance of skylight shafts shall be not less than that of the above-ground walls.

**[9.36.12.4.] --- Fenestration, Doors and Skylights**

**[1] --)** Except as provided in Sentences (2) to (8), fenestration and doors shall have an overall thermal transmittance (U-value) not greater than, or an Energy Rating not less than, that shown in Table 9.36.12.4. for the applicable heating-degree days of the *building* location. (See Note A-9.36.2.7.(1) and (3).)

**Table [9.36.12.4.]**
**Tier 3 Thermal Characteristics of Fenestration and Doors**
**Forming Part of Sentence 9.36.12.4.(1)**

| Component | 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 |
| Windows and doors | Max. U-value, W/($m^2$×K) | 1.44 | 1.22 | 1.22 | 1.22 | 1.05 | 1.05 |
| | Min. Energy Rating | 29 | 34 | 34 | 34 | 40 | 40 |

**Notes to Table [9.36.12.4.] :**

(1) See Note A-Table 9.36.2.7.-A.

(2) See Article 1.1.3.1.

**[2] --)** The solar heat gain coefficient of fenestration and doors shall comply with Sentence 9.36.2.7.(2).

**[3] --)** Skylights shall have a U-value not greater than that shown in Table 9.36.2.7.-C for the applicable heating-degree days of the *building* location. (See Note A-9.36.2.7.(1) and (3).)

**[4] --)** Glass block assemblies separating *conditioned space* from unconditioned space or the exterior shall have

[a] -- ) a U-value of not more than 2.9 W/($m^2$×K), and

[b] -- ) a total aggregate area of not more than 1.85 $m^2$.

**[5] --)** One door separating a *conditioned space* from an unconditioned space or the exterior is permitted to have a U-value up to 2.6 W/($m^2$×K).

**[6] --)** Storm windows and storm doors need not comply with Sentence (1).

**[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.

**[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.

**[9.36.12.5.] --- Opaque Building Assemblies Below-Grade or in Contact with the Ground**

**[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] --)** Except as provided in 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

[a] -- ) Table 9.36.12.5.-A, where the total volume of *conditioned space* within the *building* is less than or equal to 300 $m^3$,

[b] -- ) Table 9.36.12.5.-B, where the total volume of *conditioned space* within the *building* is greater than 300 $m^3$ or not determined, and

[i] -- ) the principal *space-heating appliance* is gas- or oil-fired or a heat pump, as specified in Table 9.36.12.6., and

[ii] -- ) the service water heating equipment is gas- or oil-fired or a heat pump, as specified in Table 9.36.12.7., or

[c] -- ) Table 9.36.12.5.-C.

**Table [9.36.12.5.-A]**
**Tier 3 Effective Thermal Resistance of Building Assemblies Below-Grade or in Contact with the Ground Described in Clause 9.36.12.5.(2)(a)**
**Forming Part of Clause 9.36.12.5.(2)(a)**

| ***Building* Assembly Below-*Grade* or in Contact with the Ground** (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** |
| | **Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W** | | | | | |
| *Foundation* walls | 1.99 | 2.98 | 2.98 | 3.46 | 3.46 | 3.97 |
| Unheated floors (3) below frost line (4) (5) | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated |
| Unheated floors (3) above frost line (5) | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 4.44 | 4.44 |
| Heated floors (6) | 2.32 | 2.32 | 2.32 | 2.84 | 2.84 | 2.84 |
| Slabs-on-grade with an integral footing (6) | 1.96 | 1.96 | 1.96 | 3.72 | 3.72 | 4.59 |

**Notes to Table [9.36.12.5.-A] :**

(1) See Note A-Tables 9.36.2.8.-A and -B.

(2) See Article 1.1.3.1.

(3) Does not apply to below-*grade* floors over heated crawl spaces.

(4) Typically applies to floors-on-ground in full-height *basements*.

(5) Refers to undisturbed frost line before house is constructed.

(6) See Sentence 9.25.2.3.(5) for requirement on placement of insulation. The design of slabs-on-grade with an integral footing is addressed in Part 4 (see Article 9.16.1.2.).

**Table [9.36.12.5.-B]**
**Tier 3 Effective Thermal Resistance of Building Assemblies Below-Grade or in Contact with the Ground Described in Clause 9.36.12.5.(2)(b)**
**Forming Part of Clause 9.36.12.5.(2)(b)**

| ***Building* Assembly Below-*Grade* or in Contact with the Ground** (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** |
| | **Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W** | | | | | |
| *Foundation* walls | 2.98 | 3.46 | 3.46 | 4.78 | 4.78 | 4.78 |
| Unheated floors (3) below frost line (4) (5) | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated |
| Unheated floors (3) above frost line (5) | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 4.44 | 4.44 |
| Heated floors (6) | 2.32 | 2.32 | 2.32 | 2.84 | 2.84 | 2.84 |
| Slabs-on-grade with an integral footing (6) | 1.96 | 1.96 | 2.84 | 3.72 | 3.72 | 4.59 |

**Notes to Table [9.36.12.5.-B] :**

(1) See Note A-Tables 9.36.2.8.-A and -B.

(2) See Article 1.1.3.1.

(3) Does not apply to below-*grade* floors over heated crawl spaces.

(4) Typically applies to floors-on-ground in full-height *basements*.

(5) Refers to undisturbed frost line before house is constructed.

(6) See Sentence 9.25.2.3.(5) for requirement on placement of insulation. The design of slabs-on-grade with an integral footing is addressed in Part 4 (see Article 9.16.1.2.).

---

**Table [9.36.12.5.-C]**
**Tier 3 Effective Thermal Resistance of Building Assemblies Below-Grade or in Contact with the Ground Described in Clause 9.36.12.5.(2)(c)**
**Forming Part of Clause 9.36.12.5.(2)(c)**

| ***Building* Assembly Below-*Grade* or in Contact with the Ground (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** |
| | **Minimum Effective Thermal Resistance (RSI), ($m^2$×K)/W** | | | | | |
| *Foundation* walls | 3.46 | 3.46 | 3.90 | 4.78 | 4.78 | 5.22 |
| Unheated floors (3) below frost line (4) (5) | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated | uninsulated |
| Unheated floors (3) above frost line (5) | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 | 1.96 |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 4.44 | 4.44 |
| Heated floors (6) | 2.32 | 2.32 | 2.32 | 2.84 | 2.84 | 2.84 |
| Slabs-on-grade with an integral footing (6) | 1.96 | 1.96 | 3.72 | 3.72 | 4.59 | 4.59 |

**Notes to Table [9.36.12.5.-C] :**

(1) See Note A-Tables 9.36.2.8.-A and -B.

(2) See Article 1.1.3.1.

(3) Does not apply to below-*grade* floors over heated crawl spaces.

(4) Typically applies to floors-on-ground in full-height *basements*.

(5) Refers to undisturbed frost line before house is constructed.

(6) See Sentence 9.25.2.3.(5) for requirement on placement of insulation. The design of slabs-on-grade with an integral footing is addressed in Part 4 (see Article 9.16.1.2.).

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**[9.36.12.6.] --- HVAC Systems**

**[1] --)** HVAC systems, equipment and installations shall be designed and constructed or specified in accordance with Articles 9.36.3.2. to 9.36.3.8. and 9.36.3.11. and this Article.

**[2] --)** Where HVAC systems, equipment or techniques other than those described in Articles 9.36.3.2. to 9.36.3.8. and 9.36.3.11. and this Article are used, the *building* shall be designed and constructed in accordance with the energy efficiency requirements of the NECB.

**[3] --)** Ventilation systems serving *buildings* to which this Subsection applies shall be equipped with a heat/energy recovery ventilator conforming to Article 9.36.3.9.

**[4] --)** The sensible recovery efficiency (SRE) measured at an outside air test temperature of 0°C of the heat/energy recovery ventilator described in Sentence (3) shall be not less than 70%.

**[5] --)** Heat pumps shall have an output capacity tested at the standard test temperature of 8.3°C that is equivalent to at least 60% of the design heat loss of the *building*.

**[6] --)** HVAC equipment and components shall comply with the performance requirements stated in

[a] --) Table 9.36.12.6., where the total volume of *conditioned space* within the *building* is greater than 300 $m^3$ or not determined, or

[b] --) Table 9.36.3.10., where the total volume of *conditioned space* within the *building* is less than or equal to 300 $m^3$.

**Table [9.36.12.6.]**
**Tier 3 Performance Requirements for HVAC Equipment in Buildings Where Total Volume of Conditioned Space > 300 $m^3$ or Not Determined**
**Forming Part of Clause 9.36.12.6.(6)(a)**

| Principal Heating System (1) | Performance Requirement (2) |
|---|---|
| Gas-fired combined space- and service water heating systems (combos) (3) | TPF ≥ 0.85 |

| | |
|---|---|
| Gas-fired warm-air *furnaces* (3) | AFUE ≥ 98% |
| Oil-fired *appliances* | AFUE ≥ 87% |
| Heat pumps | See Table 9.36.3.10. |
| Other *space-heating appliances* | See Table 9.36.3.10. |

**Notes to Table [9.36.12.6.] :**

(1) See Table 9.36.3.10. for the corresponding performance testing standard.

(2) The symbols and abbreviations used in this column have the following meanings:

AFUE = annual fuel utilization efficiency
TPF = thermal performance factor

(3) Includes propane.

**[7] --)** Natural gas and propane fireplaces shall comply with Sentence 9.36.3.10.(2).

**[9.36.12.7.] --- Service Water Heating Equipment**

**[1] --)** Service water heating equipment and components shall be designed and constructed or specified in accordance with Subsection 9.36.4. and this Article.

**[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 energy efficiency requirements of the NECB.

**[3] --)** Service water heating equipment and components shall comply with the performance requirements stated in

[a] --) Table 9.36.12.7., where the total volume of *conditioned space* within the *building* is greater than 300 $m^3$ or not determined, or

[b] --) Table 9.36.4.2., where the total volume of *conditioned space* within the *building* is less than or equal to 300 $m^3$.

**Table [9.36.12.7.]**
**Tier 3 Performance Requirements for Service Water Heating Equipment in Buildings Where Total Volume of Conditioned Space > 300 $m^3$ or Not Determined**
**Forming Part of Subclause 9.36.12.3.(1)(a)(ii) and Clause 9.36.12.7.(3)(a)**

| Type of Equipment (1) | Performance Requirement (2) |
|---|---|
| *Storage type service water heaters* | |
| Gas-fired (3) | UEF ≥ 0.83 or EF ≥ 0.8 |
| Oil-fired | UEF ≥ 0.83 or EF ≥ 0.8 |
| Gas-fired combined space- and service water heating systems (combos) (3) | TPF ≥ 0.85 |
| Other service water heating equipment | See Table 9.36.4.2. |

**Notes to Table [9.36.12.7.] :**

(1) See Table 9.36.4.2. for the corresponding performance testing standard.

(2) The symbols and abbreviations used in this column have the following meanings:

UEF = uniform energy factor
EF = energy factor
TPF = thermal performance factor

(3) Includes propane.

**Note A-9.36.12.2.(1)(a) Other Compliance Options.**

Buildings that do not comply with requirements of the Tier 3 prescriptive path set out in Subsection 9.36.12. are permitted to meet the requirements of the performance paths (Subsection 9.36.7. or 9.36.8.) or the points-based prescriptive trade-off path (Subsection 9.36.9.) to achieve the Tier 3 energy performance target provided in Table 9.36.7.2.

## Impact analysis

This proposed change would improve energy performance by providing the prescriptive requirements for building envelopes, service water heating systems and HVAC systems to achieve Energy Performance Tier 3.

Buildings with a total volume of conditioned space of less than or equal to 300 $m^3$ have the following energy performance targets: a percent improvement of ≥10%, a percent energy target of ≤90% and a percent heat loss reduction of ≥5%.

Buildings with a total volume of conditioned space of greater than 300 m³ have the following energy performance targets: a percent improvement of ≥20%, a percent energy target of ≤80% and a percent heat loss reduction of ≥10%.

**The incremental costing below is derived from the specifications and detailed costing data found in the supporting document.** Total costs by archetype have been rounded to the nearest $10.

## Incremental Costing for Tier 3 by Archetype

### Archetype A1 — Apartment/condominium unit, one bedroom

**Table 1. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A1**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 13.93 |
| Floor area | 46.30 |
| Insulated attic area | 46.30 |
| Window area | 2.36 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 105.45 |

Tier 1 and Tier 2 are identical for Archetype A1, as its conditioned volume is ≤ 300$m^3$.

**Table 2. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A1**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Above-grade walls | –51.35* | –51.35* | –34.44* | –34.44* | 136.14 | 136.14 |
| Windows and sliding glass doors | 172.76 | 243.79 | 243.79 | 138.86 | 125.95 | 125.95 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| SWH | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **320** | **390** | **410** | **300** | **460** | **460** |

*See supplemental document Section 3.4.

### Archetype A2 — Bungalow, detached without basement or garage

**Table 3. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A2**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 126.05 |
| Ground floor area | 95.00 |
| Slab in contact with the ground | 101.7 |
| Insulated attic area | 95.00 |
| Window area | 10.75 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 217.44 |

Tier 1 and Tier 2 are identical for Archetype A2, as its conditioned volume is ≤ 300$m^3$.

**Table 4. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A2**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 754.30 | 754.18 | 922.45 | 0.00 | 0.00 |
| Above-grade walls | –464.66* | –464.66* | –311.61* | –311.61* | 1,231.92 | 1,231.92 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Windows and sliding glass doors | 786.95 | 1,110.48 | 1,110.48 | 632.53 | 573.73 | 573.73 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| SWH | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **520** | **1,600** | **1,750** | **1,440** | **2,010** | **2,010** |

*See supplemental document Section 3.4.

## Archetype A3 — Bungalow, detached with basement and garage

**Table 5. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A3**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 69.49 |
| Foundation walls | 46.10 |
| Ground floor area | 90.45 |
| Insulated attic area | 90.45 |
| Window area | 19.74 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 411.36 |

**Table 6. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A3 – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 718.06 | 1,596.34 | 878.28 | 0.00 | 0.00 |
| Above-grade walls | –171.79* | –171.79* | 5.59 | 422.98 | 1,069.67 | 1,335.99 |
| Foundation walls | 1,318.41 | 239.78 | 1,558.19 | 2,005.82 | 2,005.82 | 2,005.82 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,445.05 | 2,039.16 | 2,039.16 | 1,161.51 | 1,053.43 | 1,053.43 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **7,410** | **7,850** | **10,220** | **9,490** | **9,150** | **9,420** |

*See supplemental document Section 3.4.

**Table 7. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A3 – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,596.44 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 84.37 | 84.37 | 340.71 | 679.14 | 390.53 | 656.85 |
| Foundation walls | 0.00 | 239.72 | 239.78 | 527.81 | 527.81 | 527.81 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 567.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **5,470** | **5,350** | **7,000** | **6,030** | **5,740** | **6,010** |

**Table 8. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A3 – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 718.06 | 1,596.34 | 878.28 | 0.00 | 0.00 |
| Above-grade walls | –171.79* | –171.79* | 5.59 | 422.98 | 1,069.67 | 1,335.99 |
| Foundation walls | 1,318.41 | 239.78 | 1,558.19 | 2,005.82 | 2,005.82 | 2,005.82 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,445.05 | 2,039.16 | 2,039.16 | 1,161.51 | 1,053.43 | 1,053.43 |

| | | | | | | |
|---|---|---|---|---|---|---|
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **4,670** | **4,910** | **7,280** | **6,550** | **6,210** | **6,480** |

*See supplemental document Section 3.4.

**Table 9. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A3 – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,596.44 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 84.37 | 84.37 | 340.71 | 679.14 | 390.53 | 656.85 |
| Foundation walls | 0.00 | 239.72 | 239.78 | 527.81 | 527.81 | 527.81 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 567.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **2,730** | **2,400** | **4,060** | **3,090** | **2,800** | **3,070** |

**Table 10. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A3 – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 718.06 | 1,596.34 | 878.28 | 0.00 | 0.00 |
| Above-grade walls | –171.79* | –171.79* | 5.59 | 422.98 | 1,069.67 | 1,335.99 |
| Foundation walls | 1,318.41 | 239.78 | 1,558.19 | 2,005.82 | 2,005.82 | 2,005.82 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 1,445.05 | 2,039.16 | 2,039.16 | 1,161.51 | 1,053.43 | 1,053.43 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **2,790** | **3,020** | **5,400** | **4,670** | **4,330** | **4,600** |

*See supplemental document Section 3.4.

**Table 11. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A3 – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,596.44 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 84.37 | 84.37 | 340.71 | 679.14 | 390.53 | 656.85 |
| Foundation walls | 0.00 | 239.72 | 239.78 | 527.81 | 527.81 | 527.81 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 567.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **2,790** | **3,020** | **5,200** | **4,470** | **4,130** | **4,400** |

**Table 12. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A3 – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 1,596.34 | 2,394.51 | 1,676.45 | 798.17 | 798.17 |
| Above-grade walls | 1,079.83 | 1,079.83 | 1,079.83 | 1,079.83 | 2,937.28 | 2,937.28 |
| Foundation walls | 2,867.95 | 239.72 | 2,796.43 | 2,005.82 | 2,005.82 | 2,277.52 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 1,445.05 | 2,039.14 | 2,039.16 | 1,161.50 | 1,053.52 | 1,053.52 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **5,590** | **5,150** | **8,510** | **6,120** | **6,990** | **7,270** |

**Table 13. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A3 – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 730.85 | 2,394.21 | 798.17 | 797.77 | 797.77 |
| Above-grade walls | 1,335.99 | 1,335.99 | 1,335.99 | 1,335.99 | 2,258.14 | 2,258.14 |
| Foundation walls | 239.78 | 239.72 | 1,478.01 | 527.81 | 527.81 | 799.51 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | $0.00 | 0.00 |
| Windows and sliding glass doors | 567.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **2,340** | **2,510** | **5,210** | **2,660** | **3,580** | **3,850** |

## Archetype A4 — 2-storey, detached

**Table 14. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A4**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 142.78 |
| Foundation walls | 22.69 |
| Ground floor area | 57.25 |
| Insulated attic area | 70.56 |
| Window area | 15.74 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 427.46 |

**Table 15. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A4 – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 560.16 | 1,245.31 | 685.15 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –352.97* | –352.97* | 11.50 | 869.09 | 2,197.84 | 2,745.05 |
| Foundation walls | 648.91 | 118.02 | 766.93 | 987.25 | 987.25 | 987.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,152.23 | 1,625.95 | 1,625.95 | 926.15 | 839.97 | 839.97 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **6,470** | **6,970** | **8,670** | **8,490** | **9,050** | **9,590** |

*See supplemental document Section 3.4.

**Table 16. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A4 – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,245.38 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 173.36 | 173.36 | 537.83 | 1,395.42 | 802.42 | 1,349.62 |
| Foundation walls | 0.00 | 117.99 | 118.02 | 259.78 | 259.78 | 259.78 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 452.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **5,650** | **5,310** | **6,720** | **6,480** | **5,880** | **6,430** |

**Table 17. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A4 – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 560.16 | 1,245.31 | 685.15 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –352.97* | –352.97* | 11.50 | 869.09 | 2,197.84 | 2,745.05 |
| Foundation walls | 648.91 | 118.02 | 766.93 | 987.25 | 987.25 | 987.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,152.23 | 1,625.95 | 1,625.95 | 926.15 | 839.97 | 839.97 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **3,530** | **4,030** | **5,730** | **5,550** | **6,110** | **6,650** |

*See supplemental document Section 3.4.

**Table 18. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A4 – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,245.38 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 173.36 | 173.36 | 537.83 | 1,395.42 | 802.42 | 1,349.62 |
| Foundation walls | 0.00 | 117.99 | 118.02 | 259.78 | 259.78 | 259.78 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 452.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **2,710** | **2,370** | **3,780** | **3,540** | **2,940** | **3,490** |

**Table 19. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A4 – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 560.16 | 1,245.31 | 685.15 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –352.97* | –352.97* | 11.50 | 869.09 | 2,197.84 | 2,745.05 |
| Foundation walls | 648.91 | 118.02 | 766.93 | 987.25 | 987.25 | 987.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,152.23 | 1,625.95 | 1,625.95 | 926.15 | 839.97 | 839.97 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,650** | **2,150** | **3,850** | **3,670** | **4,220** | **4,770** |

*See supplemental document Section 3.4.

**Table 20. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A4 – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,245.38 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 173.36 | 173.36 | 537.83 | 1,395.42 | 802.42 | 1,349.62 |
| Foundation walls | 0.00 | 117.99 | 118.02 | 259.78 | 259.78 | 259.78 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 452.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **830** | **490** | **1,900** | **1,650** | **1,060** | **1,610** |

**Table 21. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A4 – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 1,245.31 | 1,867.96 | 1,307.80 | 622.65 | 622.65 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 2,218.71 | 2,218.71 | 2,218.71 | 2,218.71 | 6,035.18 | 6,035.18 |
| Foundation walls | 766.93 | 117.99 | 1,376.37 | 987.25 | 987.25 | 1,120.98 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 1,152.23 | 1,625.94 | 1,625.95 | 926.14 | 840.04 | 840.04 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **4,340** | **5,410** | **7,290** | **5,640** | **8,690** | **8,820** |

**Table 22. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A4 – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 570.14 | 1,867.72 | 622.65 | 622.34 | 622.34 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 2,745.05 | 2,745.05 | 2,745.05 | 2,745.05 | 4,639.76 | 4,639.76 |
| Foundation walls | 118.02 | 117.99 | 727.47 | 259.78 | 259.78 | 393.51 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and glass doors | 452.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **3,510** | **3,630** | **5,340** | **3,630** | **5,520** | **5,660** |

## Archetype A5 — Row house, 2-storey

**Table 23. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A5 (Mid-Unit)**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 38.44 |
| Foundation walls | 7.14 |
| Ground floor area | 54.50 |
| Insulated attic area | 74.05 |
| Window area | 12.12 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 425.35 |

**Table 24. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (Mid-Unit) – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 587.87 | 1,306.90 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –95.03* | –95.03* | 3.09 | 233.98 | 591.71 | 739.04 |
| Foundation walls | 204.20 | 37.14 | 241.33 | 310.66 | 310.66 | 310.66 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 887.24 | 1,252.00 | 1,252.00 | 713.14 | 646.79 | 646.79 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **6,020** | **6,810** | **7,830** | **7,000** | **6,570** | **6,730** |

*See supplemental document Section 3.4.

**Table 25. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (Mid-Unit) – Gas-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 46.67 | 46.67 | 144.80 | 375.68 | 216.03 | 363.35 |
| Foundation walls | 0.00 | 37.13 | 37.14 | 81.75 | 81.75 | 81.75 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 348.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **5,420** | **5,110** | **6,310** | **5,280** | **5,120** | **5,270** |

**Table 26. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (Mid-Unit) – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 587.87 | 1,306.90 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –95.03* | –95.03* | 3.09 | 233.98 | 591.71 | 739.04 |
| Foundation walls | 204.20 | 37.14 | 241.33 | 310.66 | 310.66 | 310.66 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 887.24 | 1,252.00 | 1,252.00 | 713.14 | 646.79 | 646.79 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **3,080** | **3,870** | **4,890** | **4,060** | **3,630** | **3,780** |

*See supplemental document Section 3.4.

**Table 27. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (Mid-Unit) – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 46.67 | 46.67 | 144.80 | 375.68 | 216.03 | 363.35 |
| Foundation walls | 0.00 | 37.13 | 37.14 | 81.75 | 81.75 | 81.75 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 348.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **2,480** | **2,160** | **3,370** | **2,340** | **2,180** | **2,330** |

**Table 28. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (Mid-Unit) – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 587.87 | 1,306.90 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –95.03* | –95.03* | 3.09 | 233.98 | 591.71 | 739.04 |
| Foundation walls | 204.20 | 37.14 | 241.33 | 310.66 | 310.66 | 310.66 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 887.24 | 1,252.00 | 1,252.00 | 713.14 | 646.79 | 646.79 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,200** | **1,990** | **3,010** | **2,180** | **1,750** | **1,900** |

*See supplemental document Section 3.4.

**Table 29. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (Mid-Unit) – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 46.67 | 46.67 | 144.80 | 375.68 | 216.03 | 363.35 |
| Foundation walls | 0.00 | 37.13 | 37.14 | 81.75 | 81.75 | 81.75 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 348.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **590** | **280** | **1,490** | **460** | **300** | **440** |

**Table 30. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (Mid-Unit) – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 1,306.90 | 1,960.35 | 1,372.48 | 653.45 | 653.45 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 597.33 | 597.33 | 597.33 | 597.33 | 1,624.82 | 1,624.82 |
| Foundation walls | 241.33 | 37.13 | 433.11 | 310.66 | 310.66 | 352.74 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 887.24 | 1,252.00 | 1,252.00 | 713.14 | 646.84 | 646.84 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,920** | **3,390** | **4,440** | **3,190** | **3,430** | **3,470** |

**Table 31. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (Mid-Unit) – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 598.34 | 1,960.10 | 653.45 | 653.12 | 653.12 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 739.04 | 739.04 | 739.04 | 739.04 | 1,249.14 | 1,249.14 |
| Foundation walls | 37.14 | 37.13 | 228.92 | 81.75 | 81.75 | 123.83 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 348.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,320** | **1,570** | **2,930** | **1,470** | **1,980** | **2,030** |

**Table 32. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A5 (End-Unit)**

| **Area Part of or Surrounded by Building Envelope** | **Total Area, $m^2$** |
|---|---|
| Above-grade walls | 90.34 |
| Foundation walls | 16.14 |
| Ground floor area | 54.50 |
| Insulated attic area | 74.05 |
| Window area | 13.59 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 425.35 |

**Table 33. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (End-Unit) – Gas-Fired**

| **Building Component** | **Incremental Cost, $** | | | | | |
|---|---|---|---|---|---|---|
| | **Climate Zone** | | | | | |
| | **4** | **5** | **6** | **7A** | **7B** | **8** |
| Ceiling below attic | 0.00 | 587.96 | 1,306.98 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –223.14* | –223.14* | 7.23 | 550.17 | 1,390.33 | 1,737.24 |
| Foundation walls | 461.60 | 83.93 | 545.53 | 702.25 | 702.25 | 702.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 994.79 | 1,403.85 | 1,403.85 | 799.64 | 725.30 | 725.30 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **6,260** | **6,880** | **8,290** | **7,790** | **7,840** | **8,190** |

*See supplemental document Section 3.4.

**Table 34. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (End-Unit) – Gas-Fired**

| **Building Component** | **Incremental Cost, $** | | | | | |
|---|---|---|---|---|---|---|
| | **Climate Zone** | | | | | |
| | **4** | **5** | **6** | **7A** | **7B** | **8** |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 109.31 | 109.31 | 340.58 | 882.62 | 507.71 | 853.71 |
| Foundation walls | 0.00 | 83.93 | 85.54 | 184.80 | 184.80 | 184.80 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 390.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gas-fired furnace | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 | 2,300.00 |
| Gas-fired storage-type water heater | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 | 2,523.00 |
| **Total** | **5,520** | **5,220** | **6,560** | **5,890** | **5,510** | **5,860** |

**Table 35. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (End-Unit) – Oil-Fired**

| **Building Component** | **Incremental Cost, $** | | | | | |
|---|---|---|---|---|---|---|
| | **Climate Zone** | | | | | |
| | **4** | **5** | **6** | **7A** | **7B** | **8** |
| Ceiling below attic | 0.00 | 587.96 | 1,306.98 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –223.14* | –223.14* | 7.23 | 550.17 | 1,390.33 | 1,737.24 |
| Foundation walls | 461.60 | 83.93 | 545.53 | 702.25 | 702.25 | 702.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 994.79 | 1,403.85 | 1,403.85 | 799.64 | 725.30 | 725.30 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **3,310** | **3,930** | **5,340** | **4,850** | **4,900** | **5,250** |

*See supplemental document Section 3.4.

**Table 36. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (End-Unit) – Oil-Fired**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 109.31 | 109.31 | 340.58 | 882.62 | 507.71 | 853.71 |
| Foundation walls | 0.00 | 83.93 | 85.54 | 184.80 | 184.80 | 184.80 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 390.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oil-fired furnace | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 | 1,510.00 |
| Oil-fired storage-type water heater | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 | 371.00 |
| **Total** | **2,580** | **2,270** | **3,610** | **2,950** | **2,570** | **2,920** |

**Table 37. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (End-Unit) – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 587.96 | 1,306.98 | 719.03 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | –223.14* | –223.14* | 7.23 | 550.17 | 1,390.33 | 1,737.24 |
| Foundation walls | 461.60 | 83.93 | 545.53 | 702.25 | 702.25 | 702.25 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 994.79 | 1,403.85 | 1,403.85 | 799.64 | 725.30 | 725.30 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,430** | **2,050** | **3,460** | **2,970** | **3,020** | **3,360** |

*See supplemental document Section 3.4.

**Table 38. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (End-Unit) – Heat Pump**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 0.00 | 1,306.98 | 0.00 | 0.00 | 0.00 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 109.31 | 109.31 | 340.58 | 882.62 | 507.71 | 853.71 |
| Foundation walls | 0.00 | 83.93 | 85.54 | 184.80 | 184.80 | 184.80 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 390.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heat pump | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Code minimum storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **700** | **390** | **1,730** | **1,070** | **690** | **1,040** |

**Table 39. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A5 (End-Unit) – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 1,306.98 | 1,960.10 | 1,372.15 | 653.12 | 653.12 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | $0.00 |
| Above-grade walls | 1,403.88 | 1,403.88 | 1,403.88 | 1,403.88 | 3,818.67 | 3,818.67 |
| Foundation walls | 545.53 | 83.93 | 979.05 | 702.25 | 702.25 | 797.32 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 994.79 | 1,403.85 | 1,403.85 | 799.64 | 725.30 | 725.30 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **3,140** | **4,400** | **5,950** | **4,480** | **6,100** | **6,190** |

**Table 40. Incremental Cost to Achieve Tier 3 Compared to Tier 2 in Archetype A5 (End-Unit) – Electric Resistance**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 598.32 | 1,960.10 | 653.12 | 653.12 | 653.12 |
| Floors over unheated spaces | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Above-grade walls | 1,737.24 | 1,737.24 | 1,737.24 | 1,737.24 | 2,936.05 | 2,936.05 |
| Foundation walls | 83.93 | 83.93 | 517.45 | 184.80 | 184.80 | 279.87 |
| Unheated floors below frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 390.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HRV/ERV | 200.00 | 200.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance furnace | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric resistance storage-type water heater | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **2,410** | **2,620** | **4,210** | **2,570** | **3,770** | **3,870** |

## Archetype A6 — Row house, stacked 3-storey

**Table 41. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A6 (Lower Mid-Unit)**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 21.38 |
| Foundation walls | 11.28 |
| Ground floor area | 58.07 |
| Window area | 10.12 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 279.54 |

Tier 1 and Tier 2 are identical for archetype A6 as its conditioned volume is ≤ 300$m^3$.

**Table 42. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A6 (Lower Mid-Unit)**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Above-grade walls | –78.81* | –78.81* | –52.85* | –52.85* | 208.95 | 208.95 |
| Foundation walls | 0.00 | 0.00 | 322.60 | 58.67 | 58.67 | 361.65 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 740.83 | 1,045.40 | 1,045.40 | 595.46 | 540.10 | 540.10 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Service water heating equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **860** | **1,170** | **1,510** | **800** | **1,010** | **1,310** |

*See supplemental document Section 3.4.

**Table 43. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A6 (Upper Mid-Unit)**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 44.13 |
| Ground floor area | 58.07 |
| Insulated attic area | 59.85 |
| Window area | 10.80 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 284.13 |

Tier 1 and Tier 2 are identical for archetype A6 as its conditioned volume is ≤ 300$m^3$.

**Table 44. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A6 (Upper Mid-Unit)**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 475.21 | 475.14 | 581.14 | 0.00 | 0.00 |
| Above-grade walls | –162.68* | –162.68* | –109.10* | –109.10* | 431.29 | 431.29 |
| Windows and sliding glass doors | 790.61 | 1,115.65 | 1,115.64 | 635.47 | 576.40 | 576.40 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Service water heating equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **830** | **1,630** | **1,680** | **1,310** | **1,210** | **1,210** |

*See supplemental document Section 3.4.

**Table 45. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A6 (Lower End-Unit)**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 50.32 |
| Foundation walls | 29.43 |
| Ground floor area | 58.07 |
| Window area | 11.91 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 279.54 |

Tier 1 and Tier 2 are identical for archetype A6 as its conditioned volume is ≤ 300$m^3$.

**Table 46. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A6 (Lower End-Unit)**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Above-grade walls | –185.50* | –185.50* | –124.40* | –124.40* | 491.79 | 491.79 |
| Foundation walls | 0.00 | 0.00 | 841.67 | 153.07 | 153.07 | 943.56 |
| Unheated floors above frost line | 0.00 | 0.00 | 0.00 | 0.00 | n/a | n/a |
| Heated and unheated floors on permafrost | n/a | n/a | n/a | n/a | 0.00 | 0.00 |
| Windows and sliding glass doors | 871.86 | 1,230.31 | 1,230.30 | 700.78 | 635.64 | 635.64 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | $200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Service water heating equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **890** | **1,240** | **2,150** | **930** | **1,480** | **2,270** |

*See supplemental document Section 3.4.

**Table 47. Total Area of Building Envelope Components and Total Volume of Conditioned Space of Archetype A6 (Upper End-Unit)**

| Area Part of or Surrounded by Building Envelope | Total Area, $m^2$ |
|---|---|
| Above-grade walls | 110.07 |
| Ground floor area | 58.07 |
| Insulated attic area | 59.85 |
| Window area | 12.59 |
| **Conditioned Space** | **Total Volume, $m^3$** |
| Conditioned space | 284.13 |

Tier 1 and Tier 2 are identical for archetype A6 as its conditioned volume is ≤ 300$m^3$.

**Table 48. Incremental Cost to Achieve Tier 3 Compared to Tier 1 in Archetype A6 (Upper End-Unit)**

| Building Component | Incremental Cost, $ | | | | | |
|---|---|---|---|---|---|---|
| | Climate Zone | | | | | |
| | 4 | 5 | 6 | 7A | 7B | 8 |
| Ceiling below attic | 0.00 | 475.21 | 475.14 | 581.14 | 0.00 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Above-grade walls | –405.75* | –405.75* | –272.11* | –272.11* | 1,075.74 | 1,075.74 |
| Windows and sliding glass doors | 921.64 | 1,300.56 | 360.06 | 740.80 | 671.93 | 671.93 |
| HRV/ERV | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| HVAC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Service water heating equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **720** | **1,570** | **760** | **1,250** | **1,950** | **1,950** |

*See supplemental document Section 3.4.

## Incremental Costing by Archetype by Region

**Table 49. Climate Zones by Region**

| Degree-Days Below 18°C | BC | Alberta | Saskatchewan and Manitoba | Ontario | Quebec | Atlantic Canada | Northern Canada |
|---|---|---|---|---|---|---|---|
| **Zone 4**: HDD < 3000 | Yes | No | No | No | No | No | No |
| **Zone 5**: HDD 3000 to 3999 | Yes | No | No | Yes | No | Yes | No |
| **Zone 6**: HDD 4000 to 4999 | Yes | Yes | Yes | Yes | Yes | Yes | No |
| **Zone 7A**: HDD 5000 to 5999 | Yes | Yes | Yes | Yes | Yes | Yes | No |
| **Zone 7B**: HDD 6000 to 6999 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Zone 8**: HDD ≥ 7000 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 50. Incremental Cost to Achieve Tier 3 Compared to Tier 2 for Each Archetype by Region**

| Archetype | Incremental Cost, $ | | | | | | |
|---|---|---|---|---|---|---|---|
| | BC (Climate Zone 4–8) | AB (Climate Zone 6–8) | SK and MB (Climate Zone 6–8) | ON (Climate Zone 5–8) | QC (Climate Zone 6–8) | Atlantic Canada (Climate Zone 5–8) | Northern Canada (Climate Zone 7B–8) |
| A1 | 300–460 | 300–460 | 300–460 | 300–460 | 300–460 | 300–460 | 460 |
| A2 | 520–2010 | 1440–2010 | 1440–2010 | 1440–2010 | 1440–2010 | 1440–2010 | 2010 |
| A3 | 850–7000 | 920–7000 | 920–7000 | 525–7000 | 920–7000 | 525–7000 | 920–6010 |
| A4 | 830–6720 | 1060–6720 | 1060–6720 | 490–6720 | 1060–6720 | 490–6720 | 1060–6430 |
| A5 (Mid-Unit) | 280–6310 | 460–6310 | 460–6310 | 280–6310 | 460–6310 | 280–6310 | 300–5270 |
| A5 (End-Unit) | 390–5860 | 1070–5860 | 1070–5860 | 390–5860 | 1070–5860 | 390–5860 | 690–5860 |
| A6 (Lower Mid-Unit) | 800–1510 | 800–1510 | 800–1510 | 800–1510 | 800–1510 | 800–1510 | 1010–1310 |
| A6 (Upper Mid-Unit) | 830–1680 | 1210–1680 | 1210–1680 | 1210–1680 | 1210–1680 | 1210–1680 | 1210 |
| A6 (Lower End-Unit) | 890–2270 | 930–2270 | 930–2270 | 930–2270 | 930–2270 | 930–2270 | 1480–2270 |
| A6 (Upper End-Unit) | 720–1950 | 760–1950 | 760–1950 | 760–1950 | 760–1950 | 760–1950 | 1950 |

### Enforcement implications

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

This proposed change facilitates effective enforcement of high-performance energy solutions in jurisdictions where complying with the performance path is problematic.

### Who is affected

Regulators, builders, designers, engineers, architects, contractors and consultants in provinces and territories where Energy Performance Tier 3 for housing and small buildings is adopted.

#### Supporting Document(s)

Incremental Cost Analysis (pcf_2044_supporting_document.pdf)

### OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[9.36.12.1.] -- ([1] --) no attributions**

**[9.36.12.1.] -- ([2] --) no attributions**

[9.36.12.1.] -- ([2] --) [F95,F100-OE1.1]

[9.36.12.2.] -- ([1] --) no attributions

[9.36.12.3.] -- ([1] --) no attributions

[9.36.12.3.] -- ([1] --) [F92-OE1.1]

[9.36.12.3.] -- ([2] --) [F92-OE1.1]

[9.36.12.3.] -- ([3] --) [F92-OE1.1]

[9.36.12.4.] -- ([1] --) [F92-OE1.1]

[9.36.12.4.] -- ([2] --) [F92-OE1.1]

[9.36.12.4.] -- ([3] --) [F92-OE1.1]

[9.36.12.4.] -- ([4] --) [F92-OE1.1]

[9.36.12.4.] -- ([5] --) [F92-OE1.1]

[9.36.12.4.] -- ([6] --) no attributions

[9.36.12.4.] -- ([7] --) [F92-OE1.1]

[9.36.12.4.] -- ([8] --) [F92-OE1.1]

[9.36.12.5.] -- ([1] --) no attributions

[9.36.12.5.] -- ([1] --) no attributions

[9.36.12.5.] -- ([2] --) [F92-OE1.1]

[9.36.12.6.] -- ([1] --)

[9.36.12.6.] -- ([2] --)

[9.36.12.6.] -- ([3] --) [F95,F100-OE1.1]

[9.36.12.6.] -- ([4] --) [F95,F98,F100-OE1.1]

[9.36.12.6.] -- ([5] --) [F95,F98,F100-OE1.1]

[9.36.12.6.] -- ([6] --) [F95,F98,F99-OE1.1]

[9.36.12.6.] -- ([7] --) no attributions

[9.36.12.7.] -- ([1] --) no attributions

[9.36.12.7.] -- ([2] --) no attributions

[9.36.12.7.] -- ([3] --) no attributions

# Proposed Change 2268

| | |
|---|---|
| **Code Reference(s):** | **NECB25 Div.A 1.4.1.2. (first printing)**<br>**NECB25 Div.B 3.1.1.4. (first printing)** |
| Subject: | Defined Terms |
| Title: | "Thermal Bridge" as a Defined Term |
| Description: | This proposed change adds a defined term by moving the definition for the term "thermal bridge" from Div. B to Div. A of the NECB. |

This change could potentially affect the following topic areas:

- [x] 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
- [ ] Housing
- [x] Large Buildings
- [ ] Occupant safety in use
- [ ] Structural Requirements
- [x] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

## Problem

The 2025 edition of the National Energy Code of Canada for Buildings (NECB) introduced the new term “thermal bridge” as part of the Division B requirements. This term was not included in Division A of the NECB within the list of defined terms, but is proposed to be added to this list to avoid inconsistencies in the NECB.

## Justification

Including the term "thermal bridge" in the list of defined terms in Division A would

- standardize terminology,
- reduce confusion,
- enhance clarity,
- ensure consistency,
- facilitate interpretation, and
- facilitate Code compliance.

# PROPOSED CHANGE

**NECB25 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:

*Thermal bridge* means a point, linear area or surface area of a *building envelope* that has a thermal transmittance higher than the nominal thermal transmittance of an adjacent *building envelope* assembly, which results in a higher energy flow through the point, linear area or surface area. (See Note A-1.4.1.2.)

**Note A-1.4.1.2.(1) Defined Terms.**

**Thermal Bridge**

There is a risk of condensation associated with 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.

---

**NECB25 Div.B 3.1.1.4. (first printing)**

**[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] 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 transmittance of an adjacent *building envelope* assembly, which results in a higher energy flow through the point, linear area or surface area. (See Note A-3.1.1.4.(2).)~~

~~**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.~~

## Impact analysis

This proposed change is not expected to result in additional costs for Code users as a defined term would clarify the intended meaning of this term without impacting other terms.

## Enforcement implications

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

## Who is affected

Designers, engineers, architects, builders, building officials, and consultants

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NECB25 Div.A 1.4.1.2. (first printing)**

N/A

**NECB25 Div.B 3.1.1.4. (first printing)**

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

~~**[3.1.1.4.] 3.1.1.4. ([2] 2) no attributions**~~

# Proposed Change 2265

| | |
|---|---|
| **Code Reference(s):** | **NECB25 Div.A 1.4.1.2.(1) (first printing)**<br>**NECB25 Div.B 11.1.1.3. (first printing)**<br>**NBC25 Div.A 1.4.1.2.(1) (first printing)**<br>**NBC25 Div.B 9.36.15.3. (first printing)** |
| Subject: | Defined Terms |
| Title: | Defined Terms related to Operational Greenhouse Gas (GHG) Emissions |
| Description: | This proposed change adds two defined terms to the NBC and NECB by relocating the definitions for the terms “annual operational GHG emissions” and “operational GHG emissions target” from Div. B to Div. A. |

This change could potentially affect the following topic areas:

- [x] 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

The 2025 editions of the National Building Code of Canada (NBC) and National Energy Code of Canada for Buildings (NECB) introduced the new terms “annual operational GHG emissions” and “operational GHG emissions target” as part of the Division B requirements. These terms were not included in Division A of the NBC and NECB within the list of defined terms, but are proposed to be added to this list to avoid confusion for Code users.

## Justification

All occurrences of the terms "annual operational GHG emissions" and "operational GHG emissions target" in the NBC and NECB have the same respective meanings as currently set out in Division B. Including these terms as defined terms in Article 1.4.1.2. of Division A would improve consolidation and ease of reference, with no anticipated issues. Including these terms in the list of defined terms in Division A would

- standardize terminology,
- reduce confusion,
- enhance clarity,
- ensure consistency,
- facilitate interpretation, and
- facilitate Code compliance.

## PROPOSED CHANGE

**NECB25 Div.A 1.4.1.2.(1) (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:

*Annual operational GHG emissions* means the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.

*Operational GHG emissions target* means the *annual operational GHG emissions* of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the *building energy target* or produced off-site in generating the energy sources used to meet the *building energy target*.

**NECB25 Div.B 11.1.1.3. (first printing)**

**[11.1.1.3.] 11.1.1.3. Definitions**

**[1] 1)** Words that appear in italics are defined in Article 1.4.1.2. of Division A.

~~**[2] 2)** For the purpose of this Part, the term "annual operational GHG emissions" shall mean the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.~~

~~**[3] 3)** For the purpose of this Part, the term "operational GHG emissions target" shall mean the annual operational GHG emissions of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the *building energy target* or produced off-site in generating the energy sources used to meet the *building energy target*.~~

**NBC25 Div.A 1.4.1.2.(1) (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:

*Annual operational GHG emissions* means the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.

*Operational GHG emissions target* means the *annual operational GHG emissions* of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the *building energy target* or produced off-site in generating the energy sources used to meet the *building energy target*.

**NBC25 Div.B 9.36.15.3. (first printing)**

**[9.36.15.3.] 9.36.15.3. Definitions**

**[1] 1)** Words that appear in italics are defined in Article 1.4.1.2. of Division A.~~For the purpose of this Subsection, the term "annual operational GHG emissions" shall mean the annual sum of GHG emissions produced on the *building* site in meeting the annual energy demand loads or produced off-site in generating the energy sources used to meet the annual energy demand loads.~~

~~**[2] 2)** For the purpose of this Subsection, the term "operational GHG emissions target" shall mean the annual operational GHG emissions of a hypothetical replica of the proposed *building*, produced on the *building* site in meeting the house energy target or produced off-site in generating the energy sources used to meet the house energy target.~~

## Impact analysis

This proposed change is not expected to result in any additional costs for Code users. This proposed change is expected to clarify the intended meaning and broader application of these terms to improve consistent interpretation of certain NBC and NECB requirements and eliminate potential ambiguity.

## Enforcement implications

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

## Who is affected

Designers, engineers, architects, builders, building officials, and consultants.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NECB25 Div.A 1.4.1.2.(1) (first printing)**

N/A

**NECB25 Div.B 11.1.1.3. (first printing)**

**[11.1.1.3.] 11.1.1.3. ([1] 1) no attributions**

~~**[11.1.1.3.] 11.1.1.3. ([2] 2) no attributions**~~

~~**[11.1.1.3.] 11.1.1.3. ([3] 3) no attributions**~~

**NBC25 Div.A 1.4.1.2.(1) (first printing)**

N/A

**NBC25 Div.B 9.36.15.3. (first printing)**

**[9.36.15.3.] 9.36.15.3. ([1] 1) no attributions**

~~**[9.36.15.3.] 9.36.15.3. ([2] 2) no attributions**~~

# Proposed Change 2195

| | |
|---|---|
| **Code Reference(s):** | **NECB25 Div.B 6.2.6. (first printing)** |
| Subject: | Service Water Heating - Other |
| Title: | Referencing the NPC for Hot Service Water Flow Rates and Shut-off |
| Description: | This proposed change introduces references to the NPC requirements related to maximum water flow rates and automatic shut-off devices. |

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

Both the National Energy Code of Canada for Buildings (NECB) and the National Plumbing Code of Canada (NPC) prescribe maximum water flow rates for lavatory fittings and individual shower heads, and require devices to automatically shut off the flow of water when not in use. In the NECB, these limits are included to promote energy efficiency by reducing hot water consumption; in the NPC, identical requirements are included as part of its plumbing system performance and water conservation objectives.

This duplication of requirements between the two Codes introduces the risk of regulatory overlap and inconsistency. If one Code is updated, the other may not be revised simultaneously, resulting in conflicting requirements for designers, builders and building officials. Furthermore, it is unclear which Code would take precedence if differences arise in test methods or plumbing supply fitting types.

## Justification

By referencing the NPC for requirements related to maximum water flow rates and automatic shut-off of water flow, the NECB could maintain alignment with the NPC and avoid redundancy. The NPC already specifies the design, installation and performance of plumbing supply fittings, including water flow limitations and references to the testing standard, ASME A112.18.1/CSA B125.1, "Plumbing Supply Fittings."

Cross-referencing the NPC would achieve the following:

- ensure consistency and harmonization between energy efficiency and plumbing provisions,
- prevent conflicting requirements,
- clarify which Code applies by keeping the performance and testing of plumbing supply fittings within the scope of the NPC, and
- simplify compliance and enforcement for designers, builders and building officials.

## PROPOSED CHANGE

### [6.2.6.] 6.2.6. Hot Service Water

#### [6.2.6.1.] 6.2.6.1. Showers

**[1] 1)** Except for emergency eye washes and emergency showers, individual shower heads shall have an integral means of limiting the maximum water flow rate in accordance with Article 2.2.10.6. of Division B of the NPC.~~to 7.6 L/min when tested in accordance with ASME A112.18.1/CSA B125.1, "Plumbing Supply Fittings". (See Note A-6.2.6.1.(1).)~~

**[2] 2)** Where multiple shower heads installed in a public showering facility are served by one temperature control, each shower head shall be equipped with a device capable of automatically shutting off the flow of water in accordance with Article 2.2.10.6. of Division B of the NPC when the shower head is not in use. ~~(See Note A-6.2.6.1.(2) and 6.2.6.2.(2).)~~

#### [6.2.6.2.] 6.2.6.2. Lavatories

**[1] 1)** Except for lavatories in healthcare facilities and emergency eye washes, lavatories shall have an integral means of limiting the maximum water flow rate in accordance with Article 2.2.10.6. of Division B of the NPC.~~to 5.7 L/min for private use and 1.9 L/min for public use, when tested in accordance with ASME A112.18.1/CSA B125.1, "Plumbing Supply Fittings".~~

**[2] 2)** Each lavatory in a public access washroom in a *building* of *assembly occupancy* shall be equipped with a device capable of automatically shutting off the flow of water in accordance with Article 2.2.10.6. of

Division B of the NPC when the lavatory is not in use. ~~(See Note A-6.2.6.1.(2) and 6.2.6.2.(2).)~~

~~**Note A-6.2.6.1.(1) Flow-Restricting Shower Heads.**~~

~~A flow of 7.6 L/min is equivalent to 2.0 US gal./min.~~

~~To address concerns of thermal shock and scalding, refer to Sentence 2.2.10.6.(3) of Division B of the NPC, which deals with the matching of automatic compensating valves and showerheads.~~

~~**Note A-6.2.6.1.(2) and 6.2.6.2.(2) Water Shut-off Devices.**~~

~~Examples of devices meeting the intent of Sentences 6.2.6.1.(2) and 6.2.6.2.(2) include occupant sensors and self-closing valves.~~

## Impact analysis

Referring to the NPC for flow-rate and automatic shut-off provisions would enhance consistency, clarity and regulatory efficiency across the Codes. It would also simplify Code use for designers, builders and regulators by reducing duplication, minimizing interpretation conflicts, and streamlining compliance verification through a single source for plumbing performance requirements.

## Enforcement implications

Referring to the NPC requirements in the NECB would clarify enforcement roles, reduce duplication of effort, and ensure the consistent application of plumbing performance requirements. Provinces and territories that adopt the National Model Codes should align the timing of the adoption of the NPC and NECB to maintain consistency between the Codes.

## Who is affected

Designers and engineers would benefit from the clearer direction provided by using the NPC as the single reference for plumbing performance requirements. This proposed change would eliminate duplication between Codes and streamline compliance verification.

Building officials, when verifying compliance with the NECB, would benefit from the clearly defined enforcement scope, which would lead to more consistent inspections and reduced overlap or ambiguity between the NPC and NECB.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[6.2.6.1.] 6.2.6.1. ([1] 1) [F96-OE1.1]**

**[6.2.6.1.] 6.2.6.1. ([1] 1) no attributions**

**[6.2.6.1.] 6.2.6.1. ([2] 2) [F96-OE1.1]**

**[6.2.6.2.] 6.2.6.2. ([1] 1) [F96-OE1.1]**

**[6.2.6.2.] 6.2.6.2. ([1] 1) no attributions**

**[6.2.6.2.] 6.2.6.2. ([2] 2) [F96-OE1.1]**

# Proposed Change 2263

| | |
|---|---|
| **Code Reference(s):** | **NECB25 Div.B 10.1.1. (first printing)** |
| Subject: | Defined Terms |
| Title: | Adding New Cross-Reference that Points to the Defined Terms |
| Description: | This proposed change adds a new Article to NECB Part 10 to cross-reference the defined terms in Article 1.4.1.2. of Division A, thus aligning Part 10 with the other Parts of the Code. |

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

Currently, Part 10 of the National Energy Code of Canada for Buildings (NECB) does not cross-reference the defined terms in Article 1.4.1.2. of Division A, which may lead to confusion for Code users.

Without such a cross-reference, Part 10 is not harmonized with Parts 3 to 8 and 11, which do include such a cross-reference.

## Justification

The addition of Article 10.1.1.3., and its cross-reference to Article 1.4.1.2. of Division A, would guide Code users to the correct location for defined terms. This proposed change would also align Part 10 with the other Parts of the NECB.

## PROPOSED CHANGE

**NECB25 Div.B 10.1.1. (first printing)**

### [10.1.1.] 10.1.1. General

**[10.1.1.1.] 10.1.1.1. Scope**

**[10.1.1.2.] 10.1.1.2. Application**

**[10.1.1.3.] --- Definitions**

**[1] --)** Words that appear in italics are defined in Article 1.4.1.2. of Division A.

## Impact analysis

This proposed change is not expected to result in additional costs to Code users, as it merely serves as a signpost to direct Code users to the appropriate NECB Article for defined terms.

## Enforcement implications

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

## Who is affected

Designers, engineers, architects, builders, building officials, and consultants.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NECB25 Div.B 10.1.1. (first printing)**

**[10.1.1.1.] 10.1.1.1. ([1] 1) no attributions**

**[10.1.1.2.] 10.1.1.2. ([1] 1) no attributions**

**[10.1.1.2.] 10.1.1.2. ([1] 1) [F99-OE1.1]**

**[10.1.1.2.] 10.1.1.2. ([2] 2) no attributions**

**[10.1.1.2.] 10.1.1.2. ([3] 3) [F99-OE1.1]**

**[10.1.1.2.] 10.1.1.2. ([4] 4) [F99-OE1.1]**

**[10.1.1.2.] 10.1.1.2. ([5] 5) no attributions**

**[10.1.1.3.] -- ([1] --) no attributions**

# Proposed Change 2145

| | |
|---|---|
| **Code Reference(s):** | **NFC25 Div.B 4.1.2.1. (first printing)**<br>**NFC25 Div.B 4.1.2.2. (first printing)** |
| Subject: | Flammable and Combustible Liquids |
| Title: | Classification of Water-Miscible Liquid Mixtures |
| Description: | This proposed change updates the test method for and subsequent fire hazard classification of water-miscible liquid mixtures in the NFC. |
| Related Proposed Change(s): | PCF 2153 |

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
- [ ] Large Buildings
- [ ] Occupant safety in use
- [ ] Structural Requirements
- [ ] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

## Problem

Some fire point data for water-miscible liquid mixtures (WMLMs) that appear in the National Fire Code of Canada (NFC) were taken directly from technical reports or papers, while others were estimated by adding 10°C to the flash point. However, the WMLM classifications in the NFC that are based on estimated fire points may not be accurate. Testing could yield different classifications than those in Table A-4.1.2.2., for example, which may confuse Code users.

The open-cup fire point test indicates the temperature at which vapours sustain continuous combustion for at least five seconds. While the open-cup fire point can be a useful measure, it may not be the best method for classifying WMLMs. Moreover, open-cup fire points are not consistently documented or included in safety data sheets, which makes such data hard to find and less user-friendly.

This proposed change specifies the that WMLMs should be classified in the same manner as other flammable and combustible liquids, using closed-cup flash points rather than the open-cup fire point method previously set out in the NFC.

## Justification

To more accurately assess the fire risk associated with WMLMs and bring the NFC into alignment with other regulations, updates should be made to the test method for classifying these liquids in the NFC. This proposed change would classify them according to their closed-cup flash point.

The closed-cup flash point test is the global standard for fire risk assessment. This test method provides realistic hazard simulation by mimicking confined spaces, such as storage tanks and containers, where flammable vapours build up. The closed-cup flash point is used by the US Occupational Safety and Health Administration (OSHA), the US Department of Transportation (DOT), the National Fire Protection Association (NFPA), the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), and the current NFC for the classification of flammable and combustible liquids. It should also be applied to WMLM classification.

To assess the fire risk posed by flammable WMLMs, closed-cup flash point data based on experiments or reliable literature should be used, avoiding assumptions and estimations.

Of the five WMLMs currently listed in NFC Sentence 4.1.2.2.(1) (mixtures of methanol, ethanol, 2-propanol, acetone and acetic acid and water), none have a boiling point below 37.8°C (see Table 1). This means that none are classified as Class IA flammable liquids. The WMLMs posing the highest risk would be classified as Class IB flammable liquids.

**Table 1. Boiling Point of Solvents**

| Solvent | Boiling Point, °C |
|---|---|
| Methanol | 65[1] |
| Ethanol | 78[2] |
| 2-Propanol | 82.4[1] |
| Acetone | 56[2] |
| Acetic acid | 39[1] |

This proposed change updates the classification of WMLMs in NFC Table 4.1.2.2. based on closed-cup flash point testing. The test data for each WMLM are discussed below.

### 1. Methanol

Sample mixtures of methanol and water were prepared at different concentrations and sent to Health Canada for closed-cup flash point testing. Figure 1 plots the flash points obtained by Health Canada against the literature values.

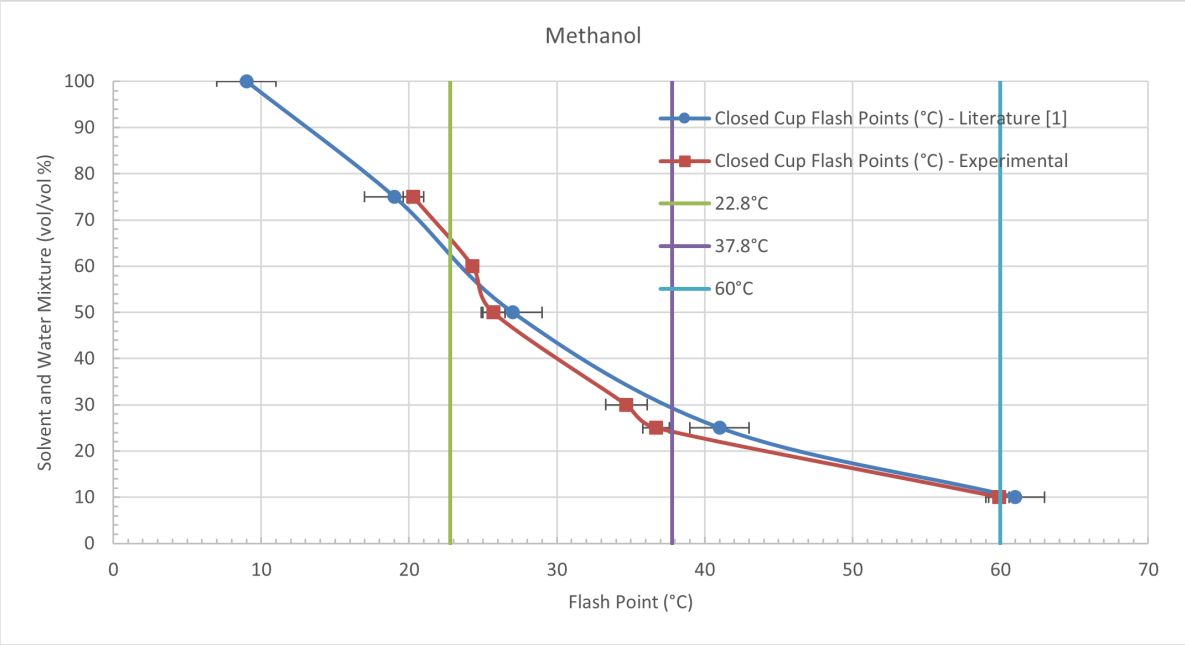



**Figure 1. Closed-cup flash points of methanol-water mixture**

The literature values in Figure 1 can be found in Table 2.

**Table 2. Closed-Cup Flash Points of Methanol-Water Mixture from Literature [1]**

| Methanol, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/-°C |
|---|---|---|
| 100 | 9 | 2 |
| 75 | 19 | 2 |
| 50 | 27 | 2 |
| 25 | 41 | 2 |
| 10 | 61 | 2 |

As demonstrated in Figure 1, the experimental data from Health Canada are in reasonable alignment with the values from the literature.

## 2. Ethanol

Similarly, sample mixtures of ethanol and water at different concentrations were tested by Health Canada to determine their closed-cup flash points, which are cross-referenced with the values based on published literature in Figure 2 [2].

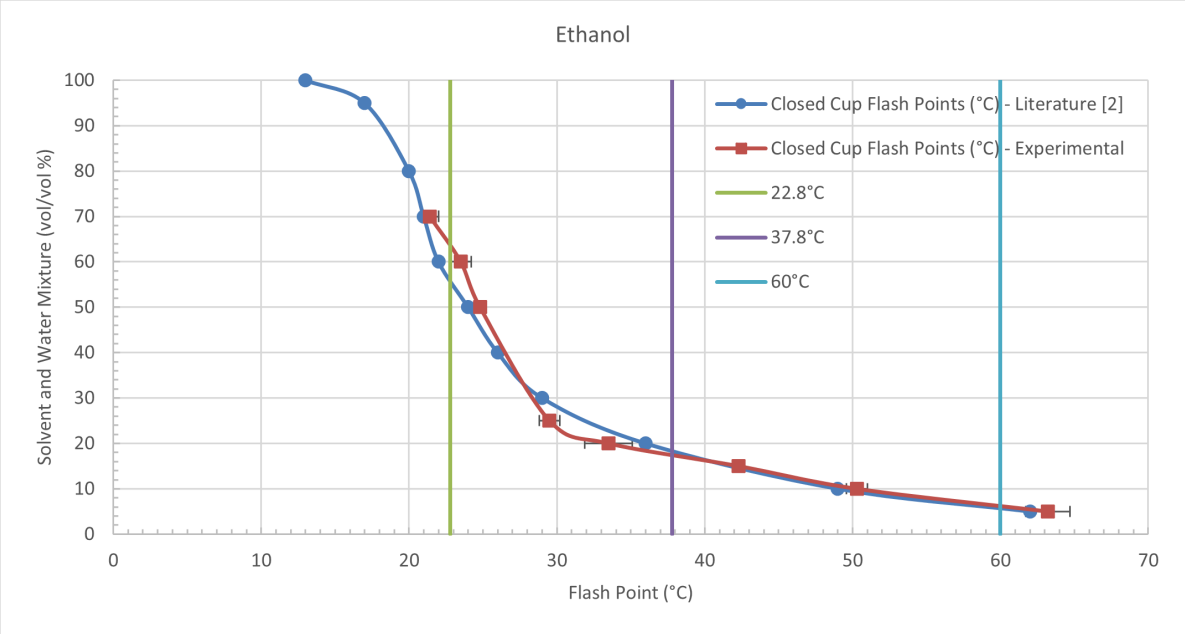



**Figure 2. Closed-cup flash points of ethanol-water mixture**

The literature data in Figure 2 can be found in Table 3.

**Table 3. Closed-Cup Flash Points of Ethanol–Water Mixture from Literature [2]**

| Ethanol, % v/v | Closed-Cup Flash Point, °C |
|---|---|
| 100 | 13 |
| 95 | 17 |
| 80 | 20 |
| 70 | 21 |
| 60 | 22 |
| 50 | 24 |
| 40 | 26 |
| 30 | 29 |
| 20 | 36 |
| 10 | 49 |
| 5 | 62 |

As demonstrated in Figure 2, the experimental data from Health Canada are in close alignment with that from the literature.

## 3. 2-Propanol

Sample mixtures of 2-propanol and water at different concentrations were tested by Health Canada to determine the closed-cup flash points, which are cross-referenced with the values based on published literature in Figure 3 [1].

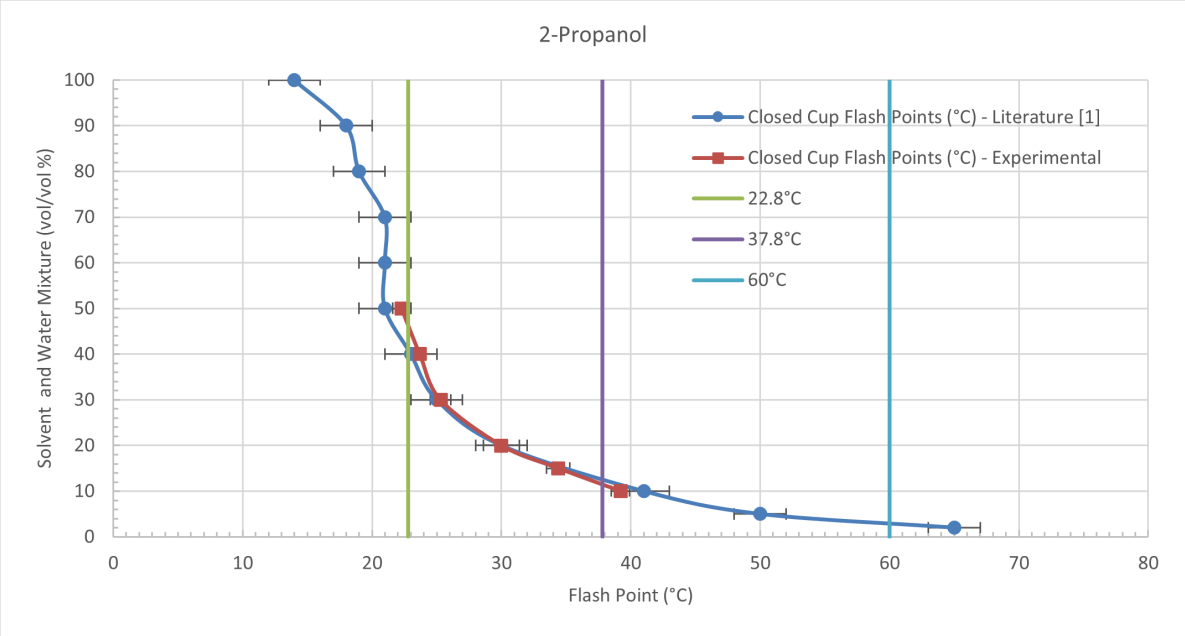



**Figure 3. Closed-cup flash points of 2-propanol–water mixture**

The literature data in Figure 3 can be found in Table 4.

**Table 4. Closed-Cup Flash Points of 2-Propanol–Water Mixture from Literature [1]**

| 2-Propanol, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/-°C |
|---|---|---|
| 100 | 14 | 2 |
| 90 | 18 | 2 |
| 80 | 19 | 2 |
| 70 | 21 | 2 |
| 60 | 21 | 2 |
| 50 | 21 | 2 |
| 40 | 23 | 2 |
| 30 | 25 | 2 |
| 20 | 30 | 2 |
| 10 | 41 | 2 |
| 5 | 50 | 2 |
| 2 | 65 | 2 |

As shown in Figure 3, the experimental data from Health Canada confirm the reliability of the data from the literature [1].

## 4. Acetone

The closed-cup flash points of the acetone–water mixture at different concentrations can be found in Reference [3]. Figure 4 and Table 5 summarize the data.

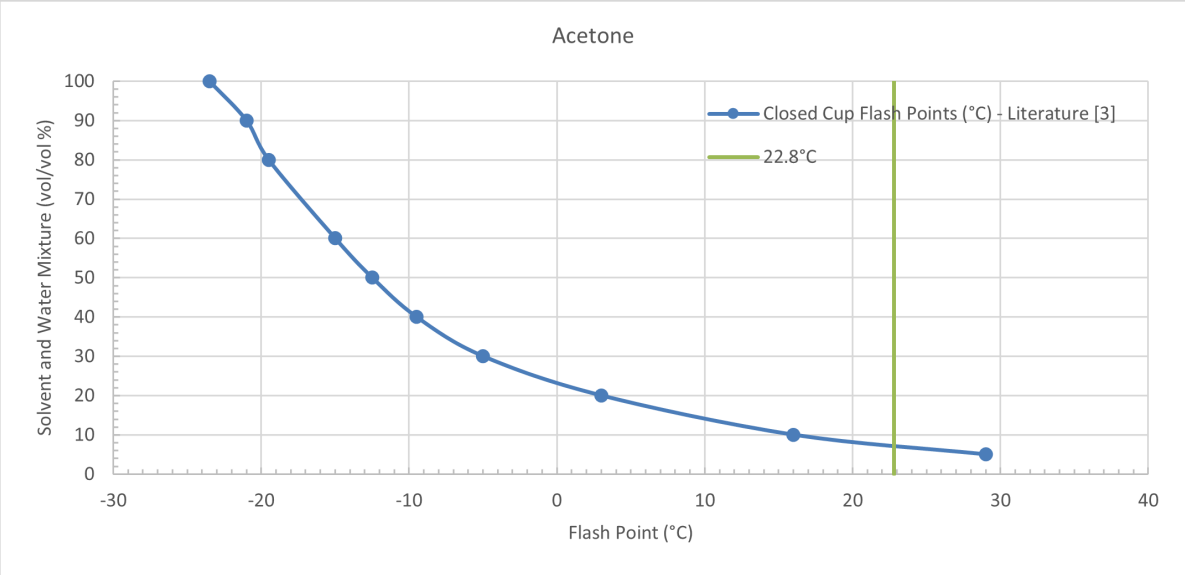



**Figure 4. Closed-cup flash points of acetone–water mixture**

**Table 5. Closed-Cup Flash Points of Acetone–Water Mixture from Literature [3]**

| Acetone, %v/v | Closed-Cup Flash Point, ºC |
|---|---|
| 100 | –23.5 |
| 90 | –21 |
| 80 | –19.5 |
| 60 | –15 |
| 50 | –12.5 |
| 40 | –9.5 |
| 30 | –5 |
| 20 | 3 |
| 10 | 16 |

## 5. Acetic Acid

The 100% acetic acid liquid has a closed-cup flash point of about 39.5°C [1][3], which classifies it as Class II liquid under NFC Subsection 4.1.2. Mixing it with water further lowers the fire risk of the solvent [3]. The current classification of the acetic acid and water mixture as Class IB seems to overestimate the fire risk of this WMLM. Moreover, mixtures of acetic acid and water are not commonly used by industry or commonly

available on the market, except at low acid concentrations in vinegar (at 4% to 30% by volume, depending on the application) and marinades (1% to 2% by volume). None of these uses have raised any fire risk concerns. Therefore, this proposed change would remove the acetic acid and water mixture from the classifications in NFC Article 4.1.2.2. and the explanatory Note A-4.1.2.2.

Based on NFC Subsection 4.1.2. and the data from closed-cup flash point tests in the literature, and by interpolating between the relevant data points, the classification of WMLMs in the NFC (i.e., mixtures of methanol, ethanol, 2-propanol acetone and water) should be updated as shown in the revised Table A-4.1.2.2.-2030.

**References**

[1] Astbur G., Bugand-Bugandet J., Grollet E., and Stell K., "Flash Points of Aqueous Solutions of Flammable Solvents," IChemE Symposium Series No. 150, pp. 1–18, 2004.
[2] National Fire Protection Association, Fire Protection Guide to Hazardous Materials, Eds. Spencer A.B. and Colonna G.R., 2002.
[3] Janès A. and J. Chaineaux, "Experimental Determination of Flash Points of Flammable Liquid Aqueous Solutions," Chemical Engineering Transactions, vol. 31, 2013.

## PROPOSED CHANGE

**[4.1.2.1.] 4.1.2.1. Classification**

**(See Note A-4.1.2.1.)**

**[1] 1)** ~~Except as provided in Article 4.1.2.2., f~~For the purposes of this Part, *flammable liquids* and *combustible liquids* shall be classified in conformance with Sentences (2) and (3).

**[2] 2)** *Flammable liquids* shall be Class I liquids, and shall be subdivided into:

[a] a) Class IA liquids, which shall include those having a closed-cup *flash point* below 22.8°C and a boiling point below 37.8°C,

[b] b) Class IB liquids, which shall include those having a closed-cup *flash point* below 22.8°C and a boiling point at or above 37.8°C, and

[c] c) Class IC liquids, which shall include those having a closed-cup *flash point* at or above 22.8°C and below 37.8°C.

**[3] 3)** *Combustible liquids* shall be Class II or Class IIIA liquids, and shall be subdivided into:

[a] a) Class II liquids, which shall include those having a closed-cup *flash point* at or above 37.8°C and below 60°C, and

[b] b) Class IIIA liquids, which shall include those having a closed-cup *flash point* at or above 60°C and below 93.3°C (see Note A-4.1.2.1.(3)(b)).

**Note A-4.1.2.1.**

The classification system for flammable liquids used by TC SOR/2001-286, "Transportation of Dangerous Goods Regulations (TDGR)", differs from the NFPA classification system used in the NFC. In the NFC, ~~only~~ liquids with a closed-cup flash point below 37.8°C are referred to as "flammable liquids," whil~~e~~ereas liquids having a closed-cup flash point at or above 37.8°C are referred to as "combustible liquids." The TDGR do not include Class IIIA liquids, which have a closed-cup flash point above 60°C.

For the purpose of comparing the TDGR classification system with the NFC system, the difference between 60.5°C (TDGR) and 60°C (NFC) may be ignored. The results of closed-cup flash point tests may vary by as much as 1°C, so nothing is gained by unnecessary precision.

**Note A-4.1.2.1.(3)(b)**

The NFPA classification system for flammable and combustible liquids includes Class IIIB liquids, which have closed-cup flash points at or above 93.3°C. These liquids are not regulated by Part 4 of the NFC because they are deemed to represent no greater fire hazard than other combustibles, such as wood or paper products. However, Article 4.1.2.3. clarifies that such liquids are effectively Class I liquids when heated to their closed-cup flash point temperature.

---

**[4.1.2.2.] 4.1.2.2. Water-Miscible Liquid Mixtures**

**(See Note A-4.1.2.2.)**

**[1] 1)** For the purposes of this Part, mixtures of methanol, ethanol, 2-propanol~~,~~ or acetone ~~or acetic acid~~ and water shall be classified in conformance with Sentences (2) to ~~(6)~~(5).

**[2] 2)** A mixture of methanol and water shall be classified as

[a] a) a Class IB liquid if the concentration of methanol is ~~90~~63% or more by volume,

[b] b) a Class IC liquid if the concentration of methanol is 30% or more but less than ~~90~~63% by volume, or

[c] c) a Class II liquid if the concentration of methanol is ~~20~~10% or more but less than 30% by volume.

**[3] 3)** A mixture of ethanol and water shall be classified as

[a] a) a Class IB liquid if the concentration of ethanol is ~~90~~56% or more by volume,

[b] b) a Class IC liquid if the concentration of ethanol is ~~30~~18% or more but less than ~~90~~56% by volume, or

[c] c) a Class II liquid if the concentration of ethanol is ~~20~~5% or more but less than ~~30~~18% by volume.

**[4] 4)** A mixture of 2-propanol and water shall be classified as ~~a Class IC liquid if the concentration of 2-propanol is 20% or more by volume.~~

[a] --) a Class IB liquid if the concentration of 2-propanol is 41% or more by volume,

[b] --) a Class IC liquid if the concentration of 2-propanol is 12% or more

but less than 41% by volume, or

[c] -- a Class II liquid if the concentration of 2-propanol is 3% or more but less than 12% by volume.

**[5] 5)** A mixture of acetone and water shall be classified as ~~a Class IB liquid if the concentration of acetone is 5% or more by volume.~~

[a] -- a Class IB liquid if the concentration of acetone is 7% or more by volume, or

[b] -- a Class IC liquid if the concentration of acetone is less than 7% by volume.

**~~[6] 6)~~** ~~A mixture of acetic acid and water shall be classified as a Class IB liquid if the concentration of acetic acid is 8% or more by volume.~~

**Note A-4.1.2.2.**

According to research and test results, mixtures containing less than ~~2~~10% by volume methanol, less than 5% by volume ethanol, or less than 3% by volume 2-propanol~~, less than 5% by volume acetone, or less than 8% by volume acetic acid~~ in water are unlikely to present a fire hazard. While these water-miscible liquid mixtures still have closed-cup flash points, they may not be able to develop sustained burning because of the presence of water in the mixtures. Therefore, these mixtures are not classified as flammable or combustible liquids. They may, however, be classified as dangerous goods to which the requirements of Part 3 would apply.

The closed-cup flash points ~~and fire points~~ of water-miscible liquid mixtures depend on the concentration of the water-miscible liquid. The classifications noted in Article 4.1.2.2. for mixtures of methanol, ethanol, 2-propanol~~,~~ or acetone ~~or acetic acid~~ and water, which are summarized in Table A-4.1.2.2., take into account the closed-cup flash points ~~and fire points~~ of the mixtures at various concentrations of the water-miscible liquid, as well as their unique fire and chemical properties.

**Table [4.1.2.2.] A-4.1.2.2.**
**Classification of Mixtures of a Water-Miscible Liquid and Water**
**Forming Part of Note A-4.1.2.2.**

| Solvent~~Volume Concentration of the Water-Miscible Liquid, %~~ | Classification | | |
|---|---|---|---|
| | Class IB | Class IC | Class II |
| | Volume Concentration Range of the Solvent in Water~~-Miscible Liquid~~, % v/v | | |
| Methanol | ≥ 63 | ≥ 30 and < 63 | ≥ 10 and < 30 |
| ~~≥ 90~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| ~~≥ 30 and < 90~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| ~~≥ 20 and < 30~~ | ~~—~~ | ~~—~~ | ~~✓~~ |

| Solvent~~Volume Concentration of the Water-Miscible Liquid, %~~ | Classification | | |
|---|---|---|---|
| | Class IB | Class IC | Class II |
| | Volume Concentration Range of the Solvent in Water~~-Miscible Liquid~~, % v/v | | |
| Ethanol | ≥ 56 | ≥ 18 and < 56 | ≥ 5 and < 18 |
| ~~≥ 90~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| ~~≥ 30 and < 90~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| ~~≥ 20 and < 30~~ | ~~—~~ | ~~—~~ | ~~✓~~ |
| 2-Propanol | ≥ 41 | ≥ 12 and < 41 | ≥ 3 and < 12 |
| ~~≥ 20~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| Acetone | ≥ 7 | < 7 | — |
| ~~≥ 5~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| ~~Acetic acid~~ | | | |
| ~~≥ 8~~ | ~~✓~~ | ~~—~~ | ~~—~~ |

It is impractical for every type and concentration of water-miscible liquid mixture to be classified in the Code. The classification of a mixture not covered in Article 4.1.2.2. can be determined by measuring its ~~fire~~ closed-cup flash point ~~using the open-cup test described in ASTM D92, "Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester",~~ in accordance with Subsection 4.1.3., and then classifying it in accordance with Sentences 4.1.2.1.(2) and (3). ~~by treating the measured fire point as the flash point of the mixture. This procedure should also be followed to determine the classification of a mixture containing multiple water-miscible liquids and water, as the flash point and fire point of the mixture are likely to differ from those of each water-miscible liquid in water. (Note that closed-cup tests are used to determine the flash points of pure liquids.)~~

## Impact analysis

The impact of this proposed change is expected to be minimal.

The deletion of the classification of the acetic acid and water mixture in this proposed change would provide relief for Code users who handle and store acetic acid and water mixtures as currently required by the NFC. For example, a mixture of 10% acetic acid and water is commonly used and sold as “cleaning vinegar” in Canada. Any acetic acid and water mixture with a concentration of acetic acid higher than 8% by volume is currently classified as a Class IB liquid in the NFC, so restrictions regarding maximum

quantities, clearance and storage location have to be followed instead of Part 4 requirements, which could be more stringent than necessary in sprinkler protection, spill containment, etc.

Due to the variety of real-life situations, however, the exact or average compliance cost savings cannot be calculated.

## Enforcement implications

This proposed change can be enforced by the infrastructure currently available. The proposed change simply updates the test method and the classification of WMLMs in the NFC.

## Who is affected

Regulators, engineers, building owners, contractors, fire services, and certain businesses using and storing WMLMs.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[4.1.2.1.] 4.1.2.1. ([1] 1) no attributions**

**[4.1.2.1.] 4.1.2.1. ([2] 2) no attributions**

**[4.1.2.1.] 4.1.2.1. ([3] 3) no attributions**

**[4.1.2.2.] 4.1.2.2. ([1] 1) no attributions**

**[4.1.2.2.] 4.1.2.2. ([2] 2) no attributions**

**[4.1.2.2.] 4.1.2.2. ([3] 3) no attributions**

**[4.1.2.2.] 4.1.2.2. ([4] 4) no attributions**

**[4.1.2.2.] 4.1.2.2. ([5] 5) no attributions**

~~**[4.1.2.2.] 4.1.2.2. ([6] 6) no attributions**~~

# Proposed Change 2153

| | |
|---|---|
| **Code Reference(s):** | **NFC25 Div.B 4.1.2.2. (first printing)** |
| Subject: | Flammable and Combustible Liquids |
| Title: | Classification of Additional Water Miscible Liquid Mixtures |
| Description: | This proposed change provides classification for four additional water-miscible liquid mixtures. |
| Related Proposed Change(s): | PCF 2145 |

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

To manage the risks of water-miscible liquid mixtures (WMLMs), the National Fire Code of Canada (NFC) classifies mixtures of methanol, ethanol, 2-propanol, acetone and acetic acid and water according to their flammability or combustibility.

For other WMLMs, the industry often faces stricter storage and handling requirements based on the hazards associated with the pure solvent. These include flammability and combustibility. While adding water to a hazardous solvent can lower these risks, it does not eliminate them. Therefore, stricter guidelines for the pure solvent are usually followed during storage. This means ensuring proper ventilation, using suitable containers, and implementing fire safety and spill containment measures.

These precautions can add costs that could be avoided if the risk posed by the WMLM were properly assessed and the WMLM classified accordingly.

## Justification

WMLMs are often used in cosmetics (e.g., 1-propanol), cleaning products (e.g., 1,4-dioxane and tert-butanol), household items (e.g., 1,4-dioxane), and arts and crafts (e.g., morpholine).

Diluting pure solvents with water often reduces their hazard level. To enable Code users to assess their flammability or combustibility and regulate storage, this proposed change would add four WMLMs to the flammability and combustibility classifications in Table A-4.1.2.2. of the NFC: mixtures of 1,4-dioxane, 1-propanol, morpholine, and tert-butanol and water.

The four WMLMs proposed for inclusion in the NFC do not have boiling points below 37.8°C (see Table 1 below). This means none would be classified as Class IA flammable liquids. The most hazardous among them would be classified as Class IB flammable liquids [1].

**Table 1. Boiling Point of Solvents Proposed for Inclusion in the NFC**

| Solvent | Boiling Point, °C |
|---|---|
| 1,4-Dioxane | 101.2 [1] |
| 1-Propanol | 97.2 [3] |
| Morpholine | 128 [1] |
| tert-Butanol | 82.3 [1] |

This proposed change classifies the four additional WMLMs based on data from closed-cup flash point tests in the literature. The testing data for each WMLM are provided below.

### 1. 1,4-Dioxane

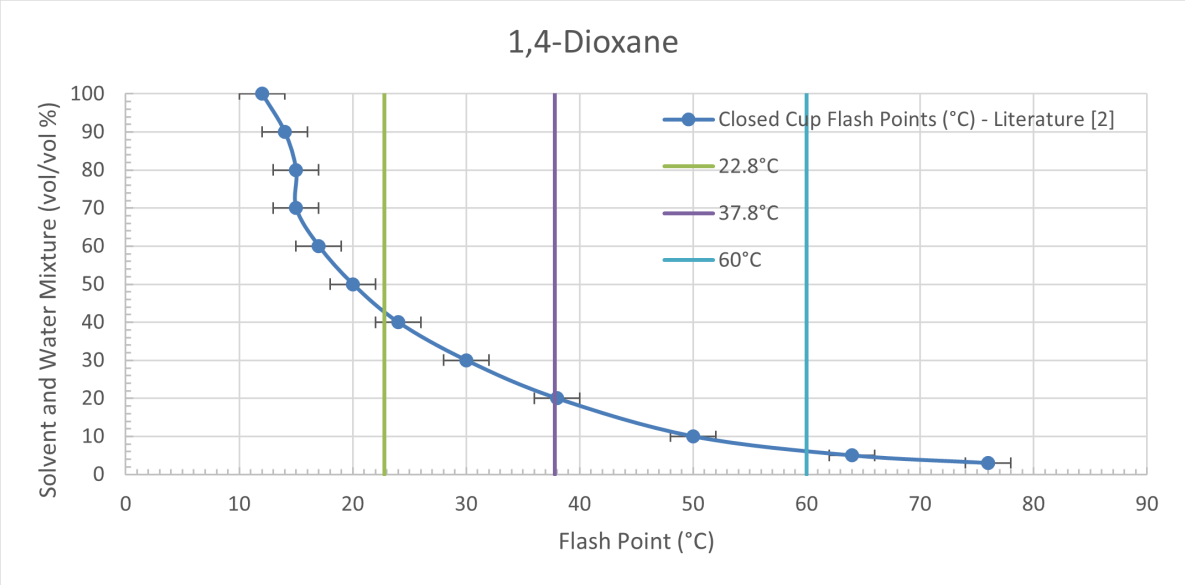



**Figure 1. Closed-cup flash points of 1,4-dioxane–water mixture**

**Table 2. Closed-Cup Flash Points of 1,4-Dioxane–Water Mixture [2]**

| 1,4-Dioxane, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/- °C |
|---|---|---|
| 100 | 12 | 2 |
| 90 | 14 | 2 |
| 80 | 15 | 2 |
| 70 | 15 | 2 |
| 60 | 17 | 2 |
| 50 | 20 | 2 |
| 40 | 24 | 2 |
| 30 | 30 | 2 |
| 20 | 38 | 2 |
| 10 | 50 | 2 |
| 5 | 64 | 2 |
| 3 | 76 | 2 |

## 2. 1-Propanol

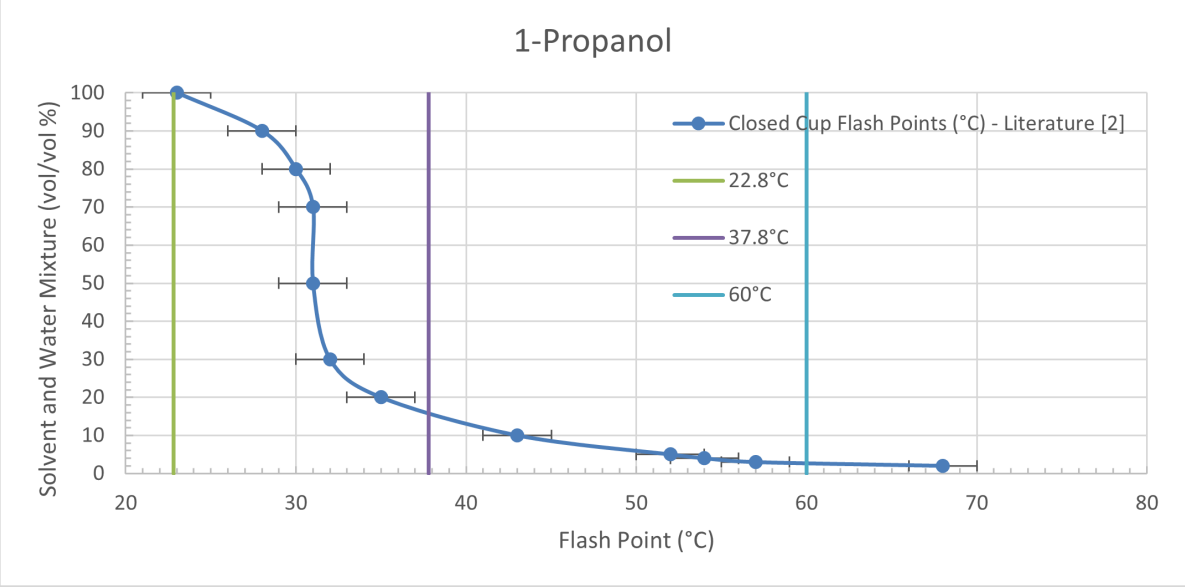



**Figure 2. Closed-cup flash points of 1-propanol–water mixture**

**Table 3. Closed-Cup Flash Points of 1-Propanol–Water Mixture [2]**

| 1-Propanol, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/- °C |
|---|---|---|
| 100 | 23 | 2 |

| | | |
|---|---|---|
| 90 | 28 | 2 |
| 80 | 30 | 2 |
| 70 | 31 | 2 |
| 50 | 31 | 2 |
| 30 | 32 | 2 |
| 20 | 35 | 2 |
| 10 | 43 | 2 |
| 5 | 52 | 2 |
| 4 | 54 | 2 |
| 3 | 57 | 2 |
| 2 | 68 | 2 |

## 3. Morpholine

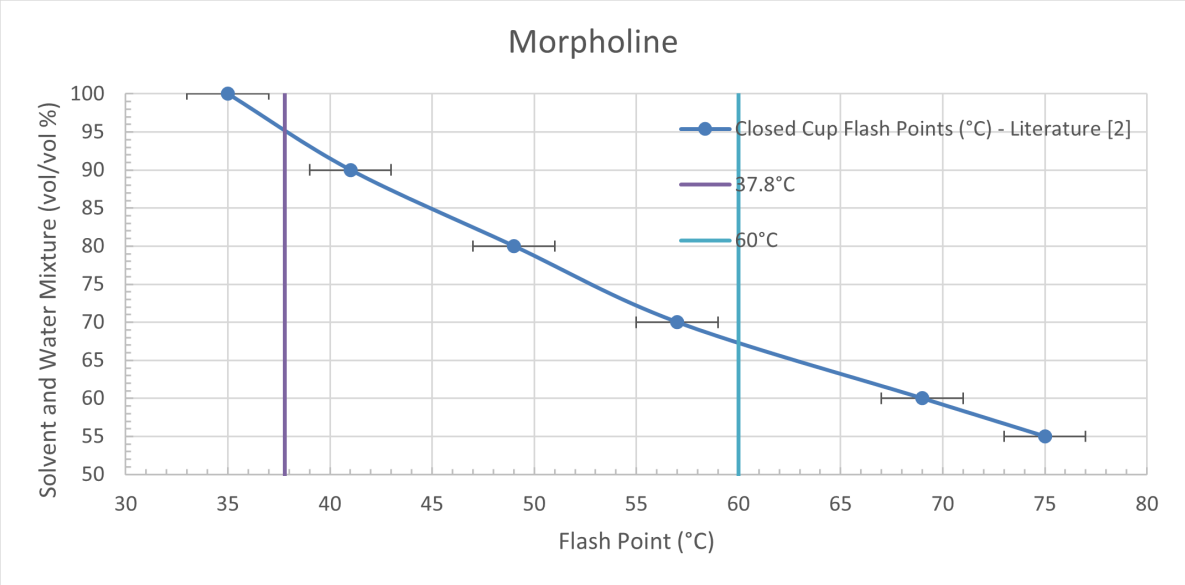



**Figure 3. Closed-cup flash points of morpholine–water mixture**

**Table 4. Closed-Cup Flash Points of Morpholine–Water Mixture [2]**

| Morpholine, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/- °C |
|---|---|---|
| 100 | 35 | 2 |
| 90 | 41 | 2 |
| 80 | 49 | 2 |

| | | |
|---|---|---|
| 70 | 57 | 2 |
| 60 | 69 | 2 |
| 55 | 75 | 2 |

## 4. tert-Butanol

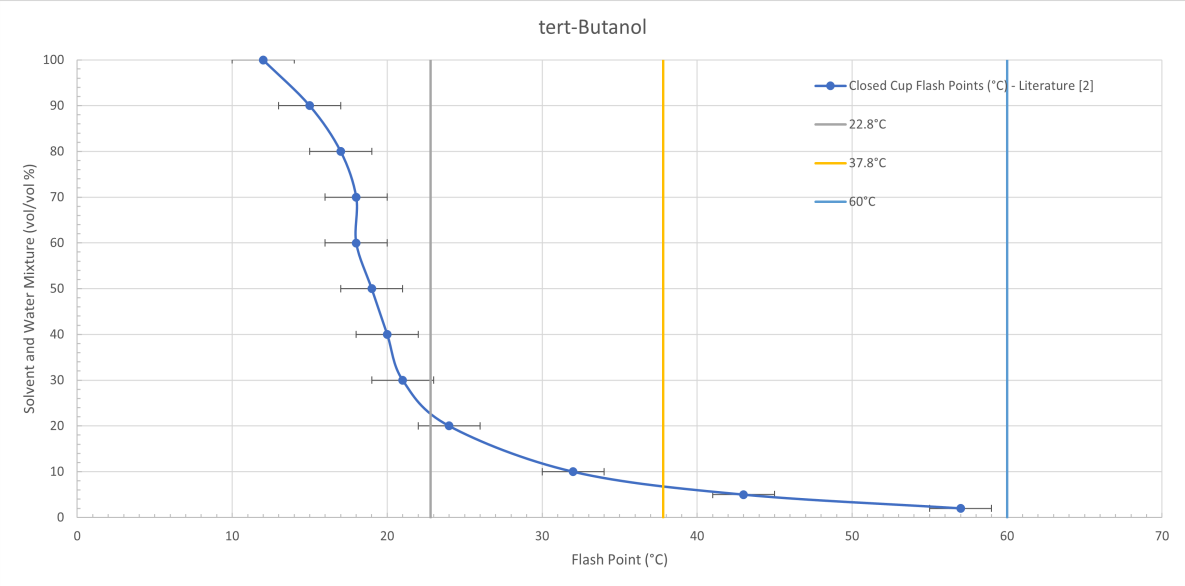



**Figure 4. Closed-cup flash points of tert-butanol–water mixture**

### Table 5. Closed-Cup Flash Points of tert-Butanol–Water Mixture [2]

| tert-Butanol, % v/v | Closed-Cup Flash Point, °C | Uncertainty, +/- °C |
|---|---|---|
| 100 | 12 | 2 |
| 90 | 15 | 2 |
| 80 | 17 | 2 |
| 70 | 18 | 2 |
| 60 | 18 | 2 |
| 50 | 19 | 2 |
| 40 | 20 | 2 |
| 30 | 21 | 2 |
| 20 | 24 | 2 |
| 10 | 32 | 2 |
| 5 | 43 | 2 |
| 2 | 57 | 2 |

Based on NFC Subsection 4.1.2. and the data from closed-cup flash point tests in the literature, and by interpolating between the relevant data points, the classification of the four new WMLMs in the NFC should be as shown in the revised Table A-4.1.2.2.-2030.

**References**

[1] Haynes, W. M., Lide, D. R., and Bruno, T. J., *CRC Handbook of Chemistry and Physics*, 97th Edition, Boca Raton, FL 33487-2742: Taylor & Francis Group, 2016–2017.

[2] Astbury G., Bugand-Bugandet J., Grollet E., and Stell K., "Flash Points of Aqueous Solutions of Flammable Solvents," IChemE Symposium Series No. 150, pp. 1–18, 2004.

[3] National Center for Biotechnology Information, *1-Propanol*. PubChem, National Institutes of Health. https://pubchem.ncbi.nlm.nih.gov/compound/1-Propanol (accessed November 20, 2025)

For more information on these WMLMs, visit the website of the US National Center for Biotechnology Information:

- 1,4-Dioxane: https://pubchem.ncbi.nlm.nih.gov/compound/1_4-Dioxane
- 1-Propanol: https://pubchem.ncbi.nlm.nih.gov/compound/1-Propanol
- Morpholine: https://pubchem.ncbi.nlm.nih.gov/compound/Morpholine
- tert-Butanol: https://pubchem.ncbi.nlm.nih.gov/compound/tert-Butanol

## PROPOSED CHANGE

**[4.1.2.2.] 4.1.2.2. Water-Miscible Liquid Mixtures**

**(See Note A-4.1.2.2.)**

**[1] 1)** For the purposes of this Part, ~~mixtures of methanol, ethanol, 2-propanol, acetone or acetic acid~~water-miscible liquid mixtures of the specified solvents and water shall be classified in conformance with Sentences (2) ~~to (6)~~ to (10).

**[2] 2)** A mixture of methanol and water shall be classified as

[a] a) a Class IB liquid if the concentration of methanol is 90% or more by volume,

[b] b) a Class IC liquid if the concentration of methanol is 30% or more but less than 90% by volume, or

[c] c) a Class II liquid if the concentration of methanol is 20% or more but less than 30% by volume.

**[3] 3)** A mixture of ethanol and water shall be classified as

[a] a) a Class IB liquid if the concentration of ethanol is 90% or more by volume,

[b] b) a Class IC liquid if the concentration of ethanol is 30% or more but less than 90% by volume, or

[c] c) a Class II liquid if the concentration of ethanol is 20% or more but less than 30% by volume.

**[4] --)** A mixture of 1-propanol and water shall be classified as

[a] --) a Class IC liquid if the concentration of 1-propanol is 16% or more by volume, or

[b] --) a Class II liquid if the concentration of 1-propanol is 2% or more but less than 16% by volume.

**[5] 4)** A mixture of 2-propanol and water shall be classified as a Class IC liquid if the concentration of 2-propanol is 20% or more by volume.

**[6] --)** A mixture of 1,4-dioxane and water shall be classified as

[a] --) a Class IB liquid if the concentration of 1,4-dioxane is 43% or more by volume,

[b] --) a Class IC liquid if the concentration of 1,4-dioxane is 20% or more but less than 43% by volume, or

[c] --) a Class II liquid if the concentration of 1,4-dioxane is 6% or more but less than 20% by volume.

**[7] 5)** A mixture of acetone and water shall be classified as a Class IB liquid if the concentration of acetone is 5% or more by volume.

**[8] 6)** A mixture of acetic acid and water shall be classified as a Class IB liquid if the concentration of acetic acid is 8% or more by volume.

**[9] --)** A mixture of morpholine and water shall be classified as

[a] --) a Class IC liquid if the concentration of morpholine is 95% or more by volume, or

[b] --) a Class II liquid if the concentration of morpholine is 67% or more but less than 95% by volume.

**[10] --)** A mixture of tert-butanol and water shall be classified as

[a] --) a Class IB liquid if the concentration of tert-butanol is 24% or more by volume,

[b] --) a Class IC liquid if the concentration of tert-butanol is 7% or more but less than 24% by volume, or

[c] --) a Class II liquid if the concentration of tert-butanol is 1% or more but less than 7% by volume.

**Note A-4.1.2.2.**

According to research and test results, mixtures containing less than 20% by volume methanol, ethanol or 2-propanol, less than 2% by volume 1-propanol, less than 5% by volume acetone, ~~or~~ less than 8% by volume acetic acid, less than 6% by volume 1,4-dioxane, less than 67% by volume morpholine, or less than 1% by volume tert-butanol in water are unlikely to present a fire hazard. While these water-miscible liquid mixtures still have flash points, they may not be able to develop sustained burning because of the presence of water in the mixtures. Therefore, these mixtures are not classified as flammable or combustible liquids. They may, however, be classified as dangerous goods to which the requirements of Part 3 would apply.

The flash points and fire points of water-miscible liquid mixtures depend on the concentration of the water-miscible liquid. The classifications noted in Article 4.1.2.2.

for mixtures of methanol, ethanol, 1- or 2-propanol, acetone, ~~or~~ acetic acid, 1,4-dioxane, morpholine or tert-butanol and water, which are summarized in Table A-4.1.2.2., take into account the flash points and fire points of the mixtures at various concentrations of the water-miscible liquid, as well as their unique fire and chemical properties.

**Table [4.1.2.2.] A-4.1.2.2.**
**Classification of Mixtures of a Water-Miscible Liquid and Water**
**Forming Part of Note A-4.1.2.2.**

| ~~Volume Concentration of the Water-Miscible Liquid, %~~Solvent | Classification | | |
|---|---|---|---|
| | Class IB | Class IC | Class II |
| | Volume Concentration Range of the Solvent in Water, % v/v | | |
| Methanol | ≥ 63 (PCF 2145) | ≥ 30 and < 63 (PCF 2145) | ≥ 10 and < 30 (PCF 2145) |
| ~~≥ 90~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| ~~≥ 30 and < 90~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| ~~≥ 20 and < 30~~ | ~~—~~ | ~~—~~ | ~~✓~~ |
| Ethanol | ≥ 56 (PCF 2145) | ≥ 18 and < 56 (PCF 2145) | ≥ 5 and < 18 (PCF 2145) |
| ~~≥ 90~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| ~~≥ 30 and < 90~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| ~~≥ 20 and < 30~~ | ~~—~~ | ~~—~~ | ~~✓~~ |
| 1-Propanol | — | ≥ 16 | ≥ 2 and < 16 |
| 2-Propanol | ≥ 41 (PCF 2145) | ≥ 12 and < 41 (PCF 2145) | ≥ 3 and < 12 (PCF 2145) |
| ~~≥ 20~~ | ~~—~~ | ~~✓~~ | ~~—~~ |
| 1,4-Dioxane | ≥ 43 | ≥ 20 and < 43 | ≥ 6 and < 20 |
| Acetone | ≥ 7 (PCF 2145) | < 7 (PCF 2145) | — (PCF 2145) |
| ~~≥ 5~~ | ~~✓~~ | ~~—~~ | ~~—~~ |
| Morpholine | — | ≥ 95 | ≥ 67 and < 95 |

| ~~Volume Concentration of the Water-Miscible Liquid, %~~Solvent | Classification | | |
|---|---|---|---|
| | Class IB | Class IC | Class II |
| | Volume Concentration Range of the Solvent in Water, % v/v | | |
| tert-Butanol | ≥ 24 | ≥ 7 and < 24 | ≥ 1 and < 7 |
| ~~Acetic acid~~ (PCF 2145) | | | |
| ~~≥ 8~~ | ~~✓~~ | ~~—~~ | ~~—~~ |

It is impractical for every type and concentration of water-miscible liquid mixture to be classified in the Code. The classification of a mixture not covered in Article 4.1.2.2. can be determined by measuring its fire point using the open-cup test described in ASTM D92, "Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester", and then classifying it in accordance with Sentences 4.1.2.1.(2) and (3) by treating the measured fire point as the flash point of the mixture. This procedure should also be followed to determine the classification of a mixture containing multiple water-miscible liquids and water, as the flash point and fire point of the mixture are likely to differ from those of each water-miscible liquid in water. (Note that closed-cup tests are used to determine the flash points of pure liquids.)

## Impact analysis

This proposed change may ease the compliance burden for Code users who store and handle these WMLMs. It would also save the one-time cost of flammability or combustibility testing to a classification standard.

**Compliance cost savings**

Based on their flammability or combustibility classification, flammable and combustible liquids are subject to different requirements regarding the maximum quantity allowed to be stored, clearance distances and location for storage, installation of fire suppression systems, and installation of storage tanks and ancillary equipment, as well as procedures for safe dispensing, loading and unloading. Thus, the cost of Code-compliant storage and handling could be quite different between a Class I and a Class II liquid.

Mixing a flammable or combustible solvent with water may reduce its fire risk such that the resulting mixture falls into a lower hazard classification than the pure solvent. Because the lower classification requires less stringent storage and handling protocols, proper classification of WMLMs could significantly reduce costs. Due to the variety of real-life situations, however, the exact or average compliance cost savings cannot be calculated.

For example, 1,4-dioxane—which is widely used as a substitute for methylene chloride in paint stripper formulations because of its lower volatility—is classified as a Class IB liquid in its pure form, but when it is diluted with water to less than 20% by volume, the resulting WMLM falls under Class II. According to NFC Sentence 4.2.5.2.(2), the maximum quantity of the diluted 1,4-dioxane and water mixture (Class II) that is allowed to be stored in mercantile occupancies that are not sprinklered is 8 L/$m^2$ of the total area of the suite, up to an absolute maximum 8 000 L, while the maximum quantity of pure 1,4-dioxane (Class IB) permitted to be stored is 0.3 L/$m^2$ of the total area of the suite, up to 300 L. The classification of the 1,4-dioxane and water mixture would therefore allow a greater quantity of less than 20% by volume 1,4-dioxane and water to be stored in a single mercantile suite, which would provide some relief for business owners with limited space who need to store large amounts of diluted 1,4-dioxane.

**Classification testing cost savings**

Currently, the classification of WMLMs not covered in Article 4.1.2.2. can be determined by measuring their closed-cup flash points in accordance with Subsection 4.1.3. and classifying them in accordance with Sentences 4.1.2.1.(2) and (3).

The cost to perform a standardized flash point test in accordance with Subsection 4.1.3. can vary significantly, starting at approximately $150 with the final cost depending on the lab, raw material type, number of samples, and required turnaround time [1][2].

**References**

[1] Petro-Lubricant Testing Laboratories, Inc., ASTM D56: Flash Point by Tag Closed Cup, https://www.petrolube.com/price-list-catalog/astm-d-56a-10927/.

[2] MaTestLab, ASTM D56 Standard Test Method for Flash Point by Tag Closed Cup Tester, https://matestlabs.com/test-standards/astm-d56/.

## Enforcement implications

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

## Who is affected

Regulators, engineers, building owners, contractors, fire services and certain businesses using WMLM.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[4.1.2.2.] 4.1.2.2. ([1] 1) no attributions**

**[4.1.2.2.] 4.1.2.2. ([2] 2) no attributions**

**[4.1.2.2.] 4.1.2.2. ([3] 3) no attributions**

**[4.1.2.2.] -- ([4] --) no attributions**

**[4.1.2.2.] 4.1.2.2. ([5] 4) no attributions**

**[4.1.2.2.] -- ([6] --) no attributions**

**[4.1.2.2.] 4.1.2.2. ([7] 5) no attributions**

**[4.1.2.2.] 4.1.2.2. ([8] 6) no attributions**

**[4.1.2.2.] -- ([9] --) no attributions**

**[4.1.2.2.] -- ([10] --) no attributions**

# Proposed Change 2116

| | |
|---|---|
| **Code Reference(s):** | **NFC25 Div.B 4.3.1.2.(1) (first printing)** |
| Subject: | Storage of Combustible Products and Dangerous Goods |
| Title: | Addition of Reference to ANSI/CAN/UL/ULC 2152:2021 |
| Description: | This proposed change adds reference to ANSI/CAN/UL/ULC 2152:2021, “Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids” to permit the use of special purpose nonmetallic containers and tanks intended for combustible or noncombustible liquids. |
| Related Code Change Request(s): | CCR 1646 |

This change could potentially affect the following topic areas:

- [ ] Division A
- [ ] Division C
- [x] 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
- [x] Occupant safety in use
- [ ] Structural Requirements
- [ ] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

## Problem

Sentence 4.3.1.2.(1) of the National Fire Code of Canada (NFC) outlines the requirements for atmospheric storage tanks that are used for storing flammable liquids and combustible liquids. Some of the tanks covered by this Sentence include shop-fabricated steel tanks and horizontal steel-contained tank assemblies for aboveground use, and steel tanks with external corrosion protection and fibre-reinforced plastic tanks for underground use.

A joint American National Standard and National Standard of Canada, ANSI/CAN/UL/ULC 2152:2021, "Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids," was published recently. This new

standard replaces ULC/ORD-C142.14-2003, "Nonmetallic Bulk Containers for the Storage and Dispensing of Combustible and Non-Combustible Liquids," and allows manufacturers to test and certify their special-purpose nonmetallic containers in accordance with a National Standard of Canada.

Failure to reference the new standard may result in the exclusion of nonmetallic containers and tanks intended for special purpose storage of specific combustible or noncombustible liquids.

## Justification

The primary purpose of ANSI/CAN/UL/ULC 2152 is to outline the minimum material properties, performance criteria, and design standards for nonmetallic containers intended for storing and dispensing combustible or noncombustible liquids.

The scope of ANSI/CAN/UL/ULC 2152 includes nonmetallic, special-purpose containers for bulk storing and dispensing liquids such as liquid chemicals, cooking oils, lube oils and vehicle fluids.

This standard does not cover other nonmetallic containers such as bulk shipping containers intended for commercial transportation, consumer portable fuel cans, portable containers and tanks for flammable and/or combustible liquids, commercial safety cans, or oil burner tanks.

ANSI/CAN/UL/ULC 2152 sets the minimum material properties and performance criteria for nonmetallic, non-pressure type containers intended to bulk store and dispense both combustible liquids and noncombustible liquids. The requirements apply to both single-wall containers and those with secondary containment, which dispense liquids through gravity or a non-pressure type pump, whether hand-operated or air-operated. The standard provides guidelines for the design, fabrication, inspection and testing of these containers to ensure they meet safety requirements before they are put into use. Additionally, containers must undergo leakage testing and be inspected for durability, strength and suitability for their intended applications before shipment. These requirements apply to containers used in stationary installations inside buildings, specifically in automotive repair and service centers or shops.

By broadening the range of approved storage solutions, the proposed change enhances flexibility in selecting materials for the storage of hazardous liquids, while ensuring that safety and performance requirements are rigorously met. In conclusion, referencing ANSI/CAN/UL/ULC 2152 would allow the use of nonmetallic containers for the storage and dispensing of specific liquids, emphasizing adherence to safety, performance and certification protocols, while providing a viable alternative to conventional metallic containers.

## PROPOSED CHANGE

**[4.3.1.2.] 4.3.1.2. Atmospheric Storage Tanks**

**[1] 1)** Except as permitted in Sentence (3) and in Section 4.10., *atmospheric storage tanks* shall be built in conformance with the following:

[a] a) except as provided in Sentence (2), API SPEC 12B, "Specification for Bolted Tanks for Storage of Production Liquids",

[b] b) except as provided in Sentence (2), API SPEC 12D, "Specification for Field Welded Tanks for Storage of Production Liquids",

[c] c) except as provided in Sentence (2), API SPEC 12F, "Specification for Shop Welded Tanks for Storage of Production Liquids",

[d] d) API STD 650, "Welded Tanks for Oil Storage",

[e] e) CAN/ULC 652, "Standard for Tank Assemblies for the Collection, Storage and Removal of Used Oil",

[f] f) CAN/ULC 653, "Standard for Aboveground Horizontal Steel Contained Tank Assemblies for Flammable and Combustible Liquids",

[g] g) CAN/ULC 655, "Standard for Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids",

[h] h) CAN/ULC 677, "Standard for Fire Tested Aboveground Tank Assemblies for Flammable and Combustible Liquids",

[i] --) ANSI/CAN/UL/ULC 2152:2021, "Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids,"

[j] i) ANSI/CAN/UL/ULC 2258, "Standard for Aboveground Nonmetallic Tanks for Fuel Oil and Other Combustible Liquids",

[k] j) CAN/ULC-S601, "Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids",

[l] k) CAN/ULC-S602, "Standard for Steel Aboveground Tanks for Fuel Oil and Lubricating Oil",

[m] l) CAN/ULC-S603, "Standard for Steel Underground Tanks for Flammable and Combustible Liquids",

[n] m) CAN/ULC-S603.1, "Standard for External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids", or

[o] n) CAN/ULC-S615, "Standard for Fibre Reinforced Plastic Underground Tanks for Flammable and Combustible Liquids".

(See Note A-4.3.1.2.(1).)

**Note A-4.3.1.2.(1) Atmospheric Storage Tanks.**

Sentence 4.3.1.2.(1) provides requirements for atmospheric storage tanks to be built in conformance with referenced standards, which address the construction and performance of the tanks. Fire safety considerations related to the

installation and use of these tanks within buildings are addressed in the Code, as applicable. While certain referenced standards, such as ANSI/CAN/UL/ULC 2152:2021, "Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids," establish detailed product requirements within their defined scope, these standards may not address all fire protection considerations related to installation where containers or tanks are installed within buildings. In such cases, additional fire protection measures, such as the provision of an automatic sprinkler system, may be necessary depending on the type of liquid, tank and installation.

## Impact analysis

This proposed change would not modify the existing allowances; rather, it would expand the options by adding a standard that permits the use of nonmetallic containers for specific combustible and noncombustible liquids. The existing Code provision would still allow the use of various atmospheric storage tanks that are constructed from both metallic and nonmetallic materials.

No additional costs are anticipated as a result of this proposed change. In fact, potential cost savings could arise, as the inclusion of a broader range of atmospheric storage tanks offers more flexibility, which may lower the cost of the design, construction and use of storage tanks.

## Enforcement implications

No additional enforcement resources are expected to be required as a result of this proposed change. The proposed change would simply expand the range of containers and tanks acceptable for use, without impacting the enforcement process or the responsibility of authorities having jurisdiction to verify that atmospheric storage tanks comply with the applicable referenced standards for their intended applications.

## Who is affected

This proposed Code change could affect a wide range of stakeholders involved in the design, specification, manufacture, approval, construction and operation of facilities for the storage of combustible products and dangerous goods, including designers, specifiers, manufacturers, building owners, contractors and building officials.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[4.3.1.2.] 4.3.1.2. ([1] 1) [F20,F80,F43,F81,F01-OS1.1]**

**[4.3.1.2.] 4.3.1.2. ([1] 1) [F20,F80,F43,F81-OH5]**

# Proposed Change 2112

| | |
|---|---|
| **Code Reference(s):** | **NFC25 Div.B 4.5.2.1.(3) (first printing)** |
| Subject: | Piping and Transfer Systems |
| Title: | Introduction of a New Standard for Aboveground Piping Systems |
| Description: | This proposed change adds a reference to ANSI/CAN/UL/ULC 1369:2020, "Standard for Aboveground Piping for Flammable and Combustible Liquids," to ensure conformance of metallic and non-metallic piping systems used in aboveground installations. |
| Related Code Change Request(s): | CCR 1541 |

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

Materials for piping systems, including piping, valves and fittings used for flammable or combustible liquids, must be suitable for the maximum anticipated working pressures, operating temperatures, and chemical properties of the contained liquid. These requirements are outlined in Article 4.5.2.1. of the National Fire Code of Canada (NFC).

The NFC allows the use of non-metallic, combustible piping systems in underground installations only, in accordance with CAN/ULC-S679, “Standard for Metallic and Nonmetallic Underground Piping for Flammable and Combustible Liquids,” as specified in Sentence 4.5.2.1.(3). However, non-metallic piping systems are not permitted for aboveground installations because Clause 4.5.2.1.(2)(b) limits the use of non-metallic materials, except as allowed by Sentence 4.5.2.1.(3).

Typical piping systems designed to convey flammable or combustible liquids for aboveground applications consist of a metallic inner pipe that serves as the primary carrier pipe with a non-metallic outer jacket that provides protection from external exposure. Regardless of the material properties (metallic, non-metallic or composite), all aboveground piping systems must meet the requirements set out in ANSI/CAN/UL/ULC 1369, “Standard for Aboveground Piping for Flammable and Combustible Liquids,” which governs their installation.

Restricting the use of non-metallic piping materials for aboveground installations may unintentionally limit the use of non-metallic piping systems that have demonstrated compliance with the performance requirements of ANSI/CAN/UL/ULC 1369 for aboveground applications, so this proposed change introduces this standard in Article 4.5.2.1.

## Justification

While NFPA 30, “Flammable and Combustible Liquids Code,” establishes safety objectives for aboveground piping systems conveying flammable and combustible liquids, ANSI/CAN/UL/ULC 1369, "Standard for Aboveground Piping for Flammable and Combustible Liquids," provides the detailed performance and fire-test criteria necessary to demonstrate compliance with those objectives. ANSI/CAN/UL/ULC 1369, “Standard for Aboveground Piping for Flammable and Combustible Liquids,” is a bi-national standard first published in 2018.  NFPA 30 is the authoritative standard for safe storage, handling and use of flammable and combustible liquids. This standard is referenced within the NFC as a guide for good engineering practice, both in the body of the Code and in the explanatory Notes. NFPA 30 is also cited in ANSI/CAN/UL/ULC 1369.

ANSI/CAN/UL/ULC 1369 provides the minimum requirements for primary, secondary and coaxial types of aboveground piping used for the transfer and containment of specific flammable and combustible liquids, fuels, fuel components, and associated vapours. These include piping systems used in manufacturing, processing and distribution facilities; commercial or fleet motor vehicle fueling stations; and similar fuel-dispensing applications; as well as for fueling generators, burners or similar equipment.

The piping materials that conform with this standard may be flexible or rigid and constructed from metallic, non-metallic or composite materials. The pipes are available in single-continuous or multiple-joined lengths with integral end fittings and they range in pipe sizes from 12.7 mm to 152.4 mm (from 0.5 in. to 6.0 in.). They are generally intended for aboveground use, either directly on or suspended above the ground, and can also be used for special aboveground applications that require additional evaluation for a specific purpose.

Allowing non-metallic piping materials for aboveground installations, provided these materials meet performance requirements intended to achieve an equivalent level of safety and performance to those specified for metallic materials in ANSI/CAN/UL/ULC 1369, would not diminish overall safety or system performance. This proposed change

would enhance flexibility for Code users by allowing piping materials to be selected based on installation conditions, without compromising health or safety. The inclusion of additional options for piping materials would provide a broader range of choices for Code users, encourage innovation, and maintain the integrity of the intended piping system.

## PROPOSED CHANGE

**[4.5.2.1.] 4.5.2.1. Materials**

**[1] 3)** Metallic and non-metallic piping systems are permitted to be used ~~for~~ in

[a] --) underground ~~installations~~ piping systems, provided they conform to CAN/ULC-S679, "Standard for Metallic and Nonmetallic Underground Piping for Flammable and Combustible Liquids", and

[b] --) aboveground piping systems, provided they conform to ANSI/CAN/UL/ULC 1369, “Standard for Aboveground Piping for Flammable and Combustible Liquids.”

## Impact analysis

This proposed change would not alter the requirements for underground piping systems for flammable or combustible liquids; in fact, it expands the options, by permitting non-metallic piping materials for aboveground systems. Since the Code would still provide the option to use the piping materials already referenced, such as metallic piping, no additional costs are expected as a result of this proposed change.

Potential cost savings might arise from expanding the range of acceptable piping materials, including non-metallic options, which could provide greater flexibility and potentially lower costs for aboveground installations. Savings might be realized through lower material costs, reduced labour (due to lighter weight and simplified installation methods), and a decreased need for corrosion protection measures. Broadening the range of acceptable materials might also enhance design flexibility.

The proposed change is not expected to negatively affect other Code objectives, provided that the piping materials comply with the referenced standards and applicable manufacturer’s instructions, and are installed in accordance with the Code. All existing Code objectives would continue to apply to piping materials that meet the referenced standards, such as objectives related to reducing the likelihood of fire occurrence or spread, limiting risk to occupants, protecting property, and minimizing health impacts associated with fire events. These referenced standards specify the intended limits to application for both metallic or non-metallic piping systems, thereby maintaining the required level of protection intended by the Code objectives, while ensuring the intended level of performance.

## Enforcement implications

This proposed change could be enforced without additional resources. Authorities having jurisdiction would continue to verify compliance of the piping materials, whether metallic or non-metallic, with the applicable referenced standards for aboveground applications.

## Who is affected

This proposed change might affect a wide range of stakeholders involved in the design, specification, manufacture, approval, construction or operation of facilities for the storage of combustible products and dangerous goods; including, but not limited to, designers, specifiers, manufacturers, building owners, contractors and building officials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[4.5.2.1.] 4.5.2.1. ([1] 3) [F20,F80-OS1.1]**

**[4.5.2.1.] 4.5.2.1. ([1] 3) [F20,F80-OP1.1]**

**[4.5.2.1.] 4.5.2.1. ([1] 3) [F20,F80-OH5]**

# Proposed Change 2161

| | |
|---|---|
| **Code Reference(s):** | **NFC25 Div.B 5.6.1.9. (first printing)** |
| Subject: | Hazardous Processes and Operations |
| Title: | Addition of Reference to CAN/CSA-B138.1-17/CAN/CSA-B138.2-17 |
| Description: | This proposed change adds a reference to CAN/CSA-B138.1-17/CAN/CSA-B138.2-17, "Portable oil-burning equipment - Packaged equipment requirements/Installation requirements." |
| Related Code Change Request(s): | CCR 1581 |

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

Section 5.6. of the National Fire Code of Canada (NFC) provides requirements for construction and demolition sites. Sentence 5.6.1.9.(1) references CSA B139 Series, “Installation code for oil-burning equipment,” and CSA B149.1, “Natural gas and propane installation code,” as acceptable means of conformance for the installation of fuel supplies for heating equipment and internal combustion engines used on such sites.

Under the existing NFC reference, CSA B139 Series covers the installation of stationary oil-burning equipment, such as fixed heating appliances, fuel tanks, piping and control systems serving buildings or industrial facilities. CSA B149.1 covers the installation of natural gas and propane, including appliances, piping and venting systems.

The existing NFC provisions ensure that fuel-fired equipment installed on construction and demolition sites is designed, installed and operated in a manner consistent with recognized safety standards. The requirements aim to prevent fire hazards related to improper installation, fuel storage or operation of such equipment by requiring conformance to CSA B139 Series or CSA B149.1, as applicable.

However, the existing NFC provisions are limited in scope, as both CSA B139 Series and CSA B149.1 were developed primarily for permanent installations and do not specifically address portable or temporary fuel-burning equipment commonly used on construction or demolition sites. In fact, CSA B139 Series specifically excludes portable oil-burning equipment from its scope.

Consequently, the NFC does not currently include explicit requirements or referenced standards that address portable oil-burning heaters and associated temporary fuel equipment used on construction and demolition sites. This gap means the existing conformance options may not adequately reflect the operational conditions and safety considerations for portable and temporary equipment.

## Justification

This proposed change would add a reference to CAN/CSA-B138.1-17/CAN/CSA-B138.2-17, "Portable oil-burning equipment - Packaged equipment requirements/Installation requirements," alongside the existing references to CSA B139 Series and CSA B149.1. CAN/CSA-B138.1/CAN/CSA-B138.2 is a newly developed standard that explicitly addresses the requirements for the installation, operation and maintenance of such equipment, including considerations unique to temporary site conditions.

Adding a reference to this standard would maintain the current level of safety and performance while enhancing clarity and consistency by ensuring that portable oil-burning equipment is regulated under a standard specifically developed for that purpose.

While NFC Section 5.6. does not directly address non-portable or permanent oil-burning equipment, facilities adjacent or related to a construction or demolition site may contain such equipment. As a result, the reference to CSA B139 Series remains necessary to ensure that these installations are covered in the NFC.

Currently, products associated with portable oil-burning equipment are certified in accordance with or have proof of compliance with CAN/CSA-B138.1/CAN/CSA-B138.2, reflecting this standard's applicability and recognition in industry practice.

This proposed change would also improve alignment with recognized national standards, provide clear guidance to users on applicable requirements, and support uniform application of safety provisions across jurisdictions.

## PROPOSED CHANGE

**[5.6.1.9.] 5.6.1.9. Fuel Supply Installation**

**[1] 1)** Fuel supplies for heating equipment and internal combustion engines shall conform to

[a] --) CAN/CSA-B138.1/CAN/CSA-B138.2, "Portable oil-burning equipment–Packaged equipment requirements/Installation requirements",

[b] a) CSA B139 Series, "Installation code for oil-burning equipment", or

[c] b) CSA B149.1, "Natural gas and propane installation code".

## Impact analysis

The proposed change would not affect the existing intent or structure of NFC Section 5.6. Rather, it would supplement the list of referenced documents by adding CAN/CSA-B138.1/CAN/CSA-B138.2. This addition would provide clearer guidance to Code users by distinguishing the applicable requirements for portable equipment from those for stationary installations already covered under CSA B139 Series.

The overall level of safety and performance would remain consistent with current Code objectives. In fact, the inclusion of CAN/CSA-B138.1/CAN/CSA-B138.2 would enhance regulatory certainty by ensuring that portable oil-burning equipment used on construction and demolition sites conforms to a standard specifically developed to address such applications. The inclusion of this standard would reduce ambiguity and support consistent enforcement without increasing risk or lowering safety outcomes.

The proposed change is not expected to result in new compliance costs for the industry or regulators. The portable oil-burning products that are currently available on the Canadian market have already been certified or evaluated for compliance with CAN/CSA-B138.1/CAN/CSA-B138.2. As a result, the manufacturers, installers and certification bodies are already familiar with this standard. As such, this proposed change would formalize existing practice rather than introduce new requirements. Over time, this proposed change may reduce administrative or design-related costs by eliminating uncertainty regarding which standard applies.

## Enforcement implications

This proposed change is not expected to pose enforcement challenges and is anticipated to have minimal procedural impact, while providing greater clarity, consistency and confidence in applying the appropriate standard for portable oil-burning equipment on construction and demolition sites.

## Who is affected

This proposed Code change may affect a wide range of stakeholders involved in design, specification, manufacture, approval and construction, including designers, specifiers, manufacturers, building owners, contractors and building officials.

For Code users and authorities having jurisdiction, the addition of CAN/CSA-B138.1/CAN/CSA-B138.2 would improve usability and alignment between the NFC and recognized industry standards. Contractors, inspectors and designers would benefit from clearer direction on applying the appropriate standard for portable systems, which would support consistent interpretation, improved compliance efficiency, and enhanced safety outcomes on construction and demolition sites.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[5.6.1.9.] 5.6.1.9. ([1] 1) [F81,F43-OS1.1]**

# Proposed Change 2243

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.2.2. (first printing)** |
| Subject: | Plumbing |
| Title: | Installation of Emergency Eye Wash and Shower Fixtures |
| Description: | This proposed change adds a new provision and reference to ANSI/ISEA Z358.1-2014, "American National Standard for Emergency Eyewash and Shower Equipment," to the NPC. |
| Related Code Change Request(s): | CCR 1379 |

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
- [ ] Energy Efficiency
- [x] Plumbing
- [ ] Construction and Demolition Sites

## Problem

The National Plumbing Code of Canada (NPC) currently contains limited requirements for the installation and performance of emergency fixtures, such as eye wash and shower fixtures. Where these fixtures are required for health and safety purposes, there is no consistent reference in the NPC to a national standard that governs their design, installation, testing and maintenance. This omission could lead to inconsistent installation of these fixtures and uncertainty for designers, installers, regulators and building owners.

## Justification

Emergency eye wash and shower fixtures are critical safety devices intended to provide immediate decontamination when a person is exposed to hazardous materials or chemicals. Referencing ANSI/ISEA Z358.1-2014, "American National Standard for Emergency Eyewash and Shower Equipment," would provide a recognized and widely used technical standard that defines requirements for the installation, performance, maintenance and testing of these fixtures. The reference in the NPC would promote consistent design practices, improve occupant safety, and align the requirements for Canadian building practice with established international safety standards.

## PROPOSED CHANGE

**NPC25 Div.B 2.2.2. (first printing)**

### [2.2.2.] 2.2.2. Plumbing Fixtures

**[2.2.2.1.] 2.2.2.1. Surface Requirements**

**[2.2.2.2.] 2.2.2.2. Conformance to Standards**

**[2.2.2.3.] 2.2.2.3. Showers**

**[2.2.2.4.] 2.2.2.4. Concealed Overflows**

**[2.2.2.5.] 2.2.2.5. Water Closets in Public Washrooms**

**[2.2.2.6.] 2.2.2.6. Wall Carriers for Water Closets**

**[2.2.2.7.] --- Emergency Fixtures**

**[1] --)** Emergency fixtures shall conform to ANSI/ISEA Z358.1-2014, "American National Standard for Emergency Eyewash and Shower Equipment."

**[2] --)** The installation of emergency fixtures shall conform to Appendix B of ANSI/ISEA Z358.1-2014, "American National Standard for Emergency Eyewash and Shower Equipment."

## Impact analysis

This proposed change is expected to have minimal cost impact because emergency eye wash and shower fixtures are already commonly installed in facilities where hazardous materials are present. This proposed change would primarily describe the applicable

performance and installation requirements by referencing an established standard. Designers, installers and regulators would benefit from clearer guidance, and improved consistency would enhance safety outcomes.

## Enforcement implications

This proposed change would simplify enforcement by providing building officials with a clear referenced standard for evaluating emergency eye wash and shower installations. Compliance could be verified by confirming that the installations meet the requirements of ANSI/ISEA Z358.1. This proposed change would reduce interpretation challenges and promote consistent enforcement across jurisdictions.

## Who is affected

Designers and specification writers would need to reference ANSI/ISEA Z358.1 when specifying emergency eye wash and shower fixtures.

Contractors and installers would need to ensure these fixtures are installed in accordance with the referenced standard.

Manufacturers and suppliers would need to ensure their products meet the requirements of ANSI/ISEA Z358.1.

Building officials and regulators would apply the referenced standard when reviewing designs and inspecting installations.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NPC25 Div.B 2.2.2. (first printing)**

**[2.2.2.1.] 2.2.2.1. ([1] 1) [F41-OH2.4]**

**[2.2.2.2.] 2.2.2.2. ([1] 1) [F80-OH2.1,OH2.4]**

**[2.2.2.2.] 2.2.2.2. ([1] 1) [F80-OS3.1,OS3.2]**

**[2.2.2.3.] 2.2.2.3. ([1] 1) [F80-OH2.1]**

**[2.2.2.3.] 2.2.2.3. ([1] 1) [F80-OP5]**

**[2.2.2.3.] 2.2.2.3. ([2] 2) [F80-OH2.1]**

**[2.2.2.3.] 2.2.2.3. ([2] 2) [F40-OP5]**

**[2.2.2.3.] 2.2.2.3. ([3] 3) [F45-OH2.1]**

**[2.2.2.3.] 2.2.2.3. ([4] 4) [F45-OH2.1]**

**[2.2.2.3.] 2.2.2.3. ([4] 4) no attributions**

**[2.2.2.4.] 2.2.2.4. ([1] 1) [F41,F81-OH2.1,OH2.4]**

**[2.2.2.5.] 2.2.2.5. ([1] 1) [F30-OH2.1,OH2.4]**

**[2.2.2.6.] 2.2.2.6. ([1] 1) [F30-OH2.1,OH2.4]**

**[2.2.2.6.] 2.2.2.6. ([1] 1) [F80-OS3.1]**

**[2.2.2.7.] -- ([1] --) [F40,F71-OH2.3,OH2.4]**

**[2.2.2.7.] -- ([2] --) [F40,F71-OH2.3,OH2.4]**

# Proposed Change 2241

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.2.2.2.(1) (first printing)** |
| Subject: | Plumbing |
| Title: | Deletion of a Withdrawn CSA Standard and Introduction of Requirements for Additional Plumbing Fixtures |
| Description: | This proposed change deletes the withdrawn CAN/CSA-B45 Series, "Plumbing Fixtures," from the NPC and introduces references to CSA B45.8:23/IAPMO Z403-2023, "Terrazzo, concrete, composite stone, and natural stone plumbing fixtures," CSA B45.11:17/IAPMO Z401-2017, "Glass plumbing fixtures," and CSA B45.12:23/IAPMO Z402-2023, "Aluminum and copper plumbing fixtures." |
| Related Code Change Request(s): | CCR 773, CCR 789, CCR 1055, CCR 1066, CCR 2179 |

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, Sentence 2.2.2.2.(1) of the National Plumbing Code of Canada (NPC) references CAN/CSA-B45 Series-02, "Plumbing Fixtures," which CSA Group has withdrawn. Continuing to reference the 2002 edition of the series would create an enforcement gap because more recent editions of the standards within this series are available. The NPC should require that designers and contractors demonstrate, and building officials verify, the compliance of plumbing fixtures with more recent material standards.

In addition, since the 2002 edition, the standards within this series have been updated or new standards have been developed to cover additional materials used in plumbing fixtures. As a result, this proposed change updates Article 2.2.2.2. to reflect these developments.

## Justification

To ensure that the Code remains aligned with current industry practice, and to facilitate Code enforcement, this proposed change:

- deletes CAN/CSA-B45-02 Series, which also contained CAN/CSA B45.8-02, "Terrazzo Plumbing Fixtures"
- updates to CSA B45.8:23/IAPMO Z403-2023, "Terrazzo, concrete, composite stone, and natural stone plumbing fixtures"
- introduces CSA B45.11:17/IAPMO Z401-2017, "Glass plumbing fixtures," and CSA B45.12:23/IAPMO Z402-2023, "Aluminum and copper plumbing fixtures," to cover additional materials used in plumbing fixtures.

These three standards are widely recognized, are currently used by manufacturers, and provide reliable and verifiable information. By adding references to these standards and deleting the reference to the 2002 edition, this proposed change ensures that performance data for plumbing fixtures made of concrete, composite stone, natural stone, glass, aluminum and copper can be consistently verified, which would avoid creating confusion for designers, contractors, manufacturers and building officials.

## PROPOSED CHANGE

**NPC25 Div.B 2.2.2.2.(1) (first printing)**

**[2.2.2.2.] 2.2.2.2. Conformance to Standards**

**[1] 1)** Except as provided in Article 2.2.2.3.,

[a] a) ~~*plumbing fixtures* shall conform to CAN/CSA-B45 Series, "Plumbing Fixtures",~~

[b] b) vitreous china *plumbing fixtures* shall conform to ASME A112.19.2/CSA B45.1, "Ceramic Plumbing Fixtures",

[c] c) enamelled cast-iron *plumbing fixtures* shall conform to ASME A112.19.1/CSA B45.2, "Enamelled cast iron and enamelled steel plumbing fixtures",

[d] d) porcelain-enamelled steel *plumbing fixtures* shall conform to ASME A112.19.1/CSA B45.2, "Enamelled cast iron and enamelled steel plumbing fixtures",

[e] e) stainless steel *plumbing fixtures* shall conform to ASME A112.19.3/CSA B45.4, "Stainless steel plumbing fixtures",

[f] f) plastic *plumbing fixtures* shall conform to CSA B45.5/IAPMO Z124,

"Plastic plumbing fixtures",

[g] --) terrazzo, concrete, composite stone and natural stone *plumbing fixtures* shall conform to CSA B45.8:23/IAPMO Z403-2023, "Terrazzo, concrete, composite stone, and natural stone plumbing fixtures",

[h] h) *macerating toilet systems* shall conform to ASME A112.3.4/CSA B45.9, "Macerating Toilet Systems and Waste-Pumping Systems for Plumbing Fixtures", ~~and~~

[i] g) hydromassage bathtubs shall conform to ASME A112.19.7/CSA B45.10, "Hydromassage bathtub systems",

[j] --) glass *plumbing fixtures* shall conform to CSA B45.11:17/IAPMO Z401-2017, "Glass plumbing fixtures",

[k] --) aluminum and copper *plumbing fixtures* shall conform to CSA B45.12:23/IAPMO Z402-2023, "Aluminum and copper plumbing fixtures", and

[l] i) personal hygiene devices for water closets shall conform to ASME A112.4.2/CSA B45.16, "Personal hygiene devices for water closets".

## Impact analysis

This proposed change has minimal cost implications for the industry and regulators. Manufacturers already adhere to these standards, which are internationally recognized and widely applied in the North American market.

Overall, this proposed change modernizes the NPC with little to no cost impact on stakeholders.

## Enforcement implications

Building officials would be able to verify that plumbing fixtures comply with active standards referenced in the NPC, which would avoid referring to a withdrawn CSA standard and improve consistency in enforcement.

## Who is affected

Designers and specification writers would reference updated and available standards when selecting and documenting plumbing fixtures.

Contractors and installers would be assured that specified products conform to current standards and are readily available in the market.

Manufacturers and suppliers already use the proposed standards, so no additional burden is expected.

Building officials would be able to refer to clear, enforceable standards when verifying the performance and Code compliance of plumbing fixtures. This would also improve consistency in compliance verification and avoid disputes related to unavailable or obsolete standards.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NPC25 Div.B 2.2.2.2.(1) (first printing)**

**[2.2.2.2.] 2.2.2.2. ([1] 1) [F80-OH2.1,OH2.4]**

**[2.2.2.2.] 2.2.2.2. ([1] 1) [F80-OS3.1,OS3.2]**

# Proposed Change 2242

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.2.7. (first printing)** |
| Subject: | Plumbing |
| Title: | Adds Requirements for Press-Connect Water Fittings |
| Description: | This proposed change introduces references to IAPMO/ANSI/CAN Z1117-2022, "Standard for Press Connections," ASME B16.51-2021, "Copper and Copper Alloy Press-Connect Pressure Fittings," and ASTM F3226/F3226M-19, "Standard Specification for Metallic Press-Connect Fittings for Pipe and Tubing Systems," in the NPC. |
| Related Code Change Request(s): | CCR 1273, CCR 1274, CCR 1275, CCR 1276, CCR 1796 |

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

Press-connect water fitting systems are widely used in plumbing and mechanical installations due to their demonstrated performance and installation efficiency. However, the current edition of the National Plumbing Code of Canada (NPC) does not explicitly allow press-connect fittings to be used as a joining method, nor does it directly reference nationally recognized product standards for press-connect technology.

In the absence of explicit references to standards for press-connect water fittings in the NPC, Code users must depend on indirect references, product listings, or alternative solutions to use this technology. This situation results in inconsistent interpretation and enforcement of the requirements for press-connect water fittings across jurisdictions and creates uncertainty for designers, installers and building officials.

The lack of a clear compliance path for the use of press-connect water fittings limits the uniform application of the Code and complicates plan review and inspection, despite the availability of established consensus standards that evaluate press-connect water fittings for their performance, durability and suitability for use in potable water systems.

## Justification

Press-connect water fittings have been successfully used in potable water systems in Canada and internationally for more than two decades.

Press-connect water fittings are manufactured by multiple suppliers and are subject to rigorous third-party testing and certification to national and international consensus standards. These standards specifically establish requirements for the pressure resistance, joint integrity, mechanical strength, and long-term performance of press-connect water fittings. These standards also provide a level of assurance that is equivalent to that required for other joining methods that the NPC currently allows.

Press-connect technology is already referenced or accepted in other Canadian plumbing codes and provincial regulatory frameworks, which sets a regulatory precedent and demonstrates familiarity with press-connect water fittings in the industry. This proposed change would align the NPC with current industry practice while continuing to meet the NPC's public health and safety objectives.

## PROPOSED CHANGE

**NPC25 Div.B 2.2.7. (first printing)**

### [2.2.7.] 2.2.7. Non-Ferrous Pipe and Fittings

(For a summary of pipe applications, see Note A-2.2.5. to 2.2.8.)

**[2.2.7.1.] 2.2.7.1. Copper and Brass Pipe**

**[2.2.7.2.] 2.2.7.2. Brass or Bronze Pipe Flanges and Flanged Fittings**

**[2.2.7.3.] 2.2.7.3. Brass or Bronze Threaded Water Fittings**

**[2.2.7.4.] 2.2.7.4. Copper Tube**

**[2.2.7.5.] 2.2.7.5. Solder-Joint Drainage Fittings**

**[2.2.7.6.] 2.2.7.6. Solder-Joint Water Fittings**

**[2.2.7.7.] 2.2.7.7. Flared-Joint Fittings used in a Copper Water System**

**[2.2.7.8.] 2.2.7.8. Lead Waste Pipe and Fittings**

**[2.2.7.9.] --- Press-Connect Water Fittings**

**[1] --)** Press-connect water fittings made from an acceptable material for a *plumbing system* shall conform to

[a] --) ASME B16.51-2021, "Copper and Copper Alloy Press-Connect Pressure Fittings,"

[b] --) ASTM F3226/F3226M-19, "Standard Specification for Metallic Press-Connect Fittings for Pipe and Tubing Systems," or

[c] --) IAPMO/ANSI/CAN Z1117-2022, "Standard for Press Connections."

## Impact analysis

This proposed change is not expected to result in additional costs for contractors or building owners, and may reduce costs. One benefit of using press-connect water fittings is flameless installation, meaning that the installation does not require a hot work permit or a fire watch. Although press-connect water fittings cost slightly more than traditional solder fittings, the labour costs for installation are lower because the installation is faster and does not use consumables such as flux and torch fuel.

## Enforcement implications

This proposed change could facilitate Code enforcement by providing inspectors and plan reviewers with explicit, nationally recognized performance standards against which press-connect water fittings can be assessed.

Clearly referencing standards in the NPC reduces the need for discretionary approvals and reviews of alternative solutions, and improves consistency in enforcement across jurisdictions. This proposed change would not require new inspection procedures or specialized enforcement training, thus the proposed change could be seamlessly enforced using existing plumbing inspection practices.

## Who is affected

Designers would benefit from using a clearly defined joining method that is permitted by the NPC and can be specified without needing project-specific approvals. This proposed change would improve design clarity, reduce ambiguity related to permits and align Code requirements with current installation practices while maintaining Code objectives.

Contractors would gain certainty that press-connect water fittings are acceptable for use without requiring additional approvals. This proposed change would reduce administrative burden, shorten installation timelines, and support safer practices on the jobsite by minimizing the use of open-flame joining methods.

Manufacturers and suppliers would benefit from a level, transparent regulatory framework that establishes clear performance and compliance requirements for press-connect water fittings. Including these fittings in the NPC would encourage innovation while ensuring that products are evaluated against recognized standards. This proposed change would also improve supply chain planning and market access by reducing inconsistencies across jurisdictions, which would allow manufacturers to support designers and contractors by offering compliant, readily accepted solutions nationwide.

For building officials and regulators, including press-connect water fittings in the NPC would provide clarity and consistency in enforcement. Including references to established standards for these products in the NPC would make building officials and regulators less reliant on discretionary approvals and reviews of alternative solutions. This proposed change would support more efficient plan review and inspections while ensuring that public safety objectives are met through standardized, performance-based criteria that are uniformly applied across jurisdictions.

Building owners and facility operators could be affected by improving the reliability of the plumbing system and reducing the risk of leaks associated with improperly installed joints. This proposed change would support consistent quality of installation, which could reduce maintenance issues and lifecycle costs over the service life of the plumbing system.

Maintenance personnel would benefit from using press-connect water fittings that are familiar, documented, recognized by the NPC and compliant with nationally recognized standards. This proposed change would reduce uncertainty when repairing or modifying existing plumbing systems and supports safer maintenance practices by reducing the need for hot work in occupied buildings.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

## NPC25 Div.B 2.2.7. (first printing)

[2.2.7.1.] **2.2.7.1. ([1] 1) [F80-OH2.1,OH2.3]** Applies to *drainage systems* and *venting systems*.**[F46-OH2.2]** Applies to *water systems*.

[2.2.7.1.] **2.2.7.1. ([1] 1) [F80-OP5]**

[2.2.7.1.] **2.2.7.1. ([2] 2) [F80-OH2.1,OH2.3]** Applies to *drainage systems* and *venting systems*. **[F46-OH2.2]** Applies to *water systems*.

[2.2.7.1.] **2.2.7.1. ([2] 2) [F80-OP5]**

[2.2.7.1.] **2.2.7.1. ([3] 3) [F46-OH2.2]**

[2.2.7.2.] **2.2.7.2. ([1] 1) [F80-OH2.1,OH2.3]** Applies to *drainage systems* and *venting systems*.**[F46-OH2.2]** Applies to *water systems*.

[2.2.7.2.] **2.2.7.2. ([1] 1) [F80-OP5]**

[2.2.7.2.] **2.2.7.2. ([2] 2) [F46-OH2.2]**

[2.2.7.3.] **2.2.7.3. ([1] 1) [F80-OP5]**

[2.2.7.3.] **2.2.7.3. ([2] 2) [F46-OH2.2]**

[2.2.7.3.] **2.2.7.3. ([3] 3) [F80-OH2.1,OH2.3]**

[2.2.7.4.] **2.2.7.4. ([1] 1) [F80-OH2.1,OH2.3]** Applies to *drainage systems* and *venting systems*.**[F46-OH2.2]** Applies to *water systems*.

[2.2.7.4.] **2.2.7.4. ([1] 1) [F80-OP5]**

[2.2.7.4.] **2.2.7.4. ([2] 2) [F80-OH2.1,OH2.2,OH2.3]**

[2.2.7.4.] **2.2.7.4. ([3] 3) [F46-OH2.2]**

[2.2.7.4.] **2.2.7.4. ([4] 4) [F80-OH2.1,OH2.3,OH2.4]**

[2.2.7.5.] **2.2.7.5. ([1] 1) [F80-OH2.1,OH2.4]**

[2.2.7.5.] **2.2.7.5. ([2] 2) [F20-OP5]**

[2.2.7.6.] **2.2.7.6. ([1] 1) [F20-OP5]**

[2.2.7.6.] **2.2.7.6. ([2] 2) [F20-OP5]**

[2.2.7.6.] **2.2.7.6. ([3] 3) [F46-OH2.2]**

[2.2.7.7.] **2.2.7.7. ([1] 1) [F20-OP5]**

[2.2.7.7.] **2.2.7.7. ([2] 2) [F20-OP5]**

[2.2.7.7.] **2.2.7.7. ([3] 3) [F46-OH2.2]**

[2.2.7.8.] **2.2.7.8. ([1] 1) [F46,F20-OH2.2,OH2.3]**

**[2.2.7.8.] 2.2.7.8. ([2] 2) [F81-OH2.1,OH2.3,OH2.4]**

**[2.2.7.9.] -- ([1] --) [F80,F46,F20-OH2.2,OH2.4]**

**[2.2.7.9.] -- ([1] --) [F80,F46,F20-OP5]**

# Proposed Change 2244

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.2.10.5. (first printing)** |
| Subject: | Plumbing |
| Title: | Addition of Requirements for Mechanical Tee Fittings |
| Description: | This proposed change adds requirements for mechanical tee fittings to be used in potable water systems and introduces a reference to NSF/ANSI/CAN 372-2024, "Drinking Water System Components – Lead Content." |
| Related Code Change Request(s): | CCR 1365, CCR 1364, CCR 1366, CCR 1367 |

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

Mechanical tee fittings are commonly used in plumbing and mechanical installations due to their proven performance and efficient installation. However, the National Plumbing Code of Canada (NPC) does not currently identify mechanical tee fittings as a distinct type of fitting from saddle fittings. Because the NPC does not distinguish between these two types of fittings and does not permit saddle fittings to be used in certain applications, the NPC is often misinterpreted as not permitting the use of mechanical tee fittings. Consequently, despite the widespread use of mechanical tee fittings in Canada, approvals for project-specific alternative solutions are required, which results in added cost, administrative burden and project delays.

Because the NPC does not explicitly permit the use of mechanical tee fittings, designers and installers must rely on indirect references to mechanical tee fittings (e.g., in standards or other reference documents) or discretionary approvals, which leads to inconsistent interpretation and enforcement across jurisdictions and uncertainty for designers, installers and authorities having jurisdiction.

The absence of a clear compliance pathway for the use of mechanical tee fittings limits the consistent application of the NPC and complicates plan review and inspection activities, despite the availability of established consensus standards that evaluate mechanical tee fittings for performance, durability and suitability for use in potable water systems.

## Justification

This proposed change addresses the absence of an NPC provision that explicitly covers the use of mechanical tee fittings in potable water systems.

Since these plumbing fittings are widely used in Canada and have demonstrated satisfactory performance when evaluated against nationally recognized consensus standards for water systems, the NPC should prevent their misclassification as saddle fittings, thus avoiding the need for approvals for project-specific alternative solutions. This proposed change would prevent inconsistent enforcement, increased administrative burden, and avoidable project delays.

Covering the use of mechanical tee fittings that are compliant with applicable standards for performance and potable water in the NPC would also provide Code users with a clear compliance pathway and facilitate consistent enforcement of the NPC by simplifying plan review and inspection activities. This proposed change also supports the NPC's public health and safety objectives without introducing new inspection or training requirements for enforcement agencies.

## PROPOSED CHANGE

**NPC25 Div.B 2.2.10.5. (first printing)**

**[2.2.10.5.] 2.2.10.5. Mechanical Tee and Saddle ~~Hubs~~Fittings**

**[1] --)** Mechanical tee fittings are permitted to be used in a *potable water system*. (See Note A-2.2.10.5.(1)-2030.)

**[2] --)** The mechanical tee fittings referred to in Sentence (1) shall conform to NSF/ANSI/CAN 61, "Drinking Water System Components - Health Effects," and NSF/ANSI/CAN 372-2024, "Drinking Water System Components – Lead Content."

**[3] 1)** A saddle ~~hub or~~ fitting or hub shall not be installed in *drainage*, *venting* or *water systems.* (See Note A-2.2.10.5.(~~1~~3).)

**Note A-2.2.10.5.(1)-2030 Mechanical Tee Fittings.**

A mechanical tee provides a direct branch connection where a hole is cut in a pipe according to the manufacturer's instructions with regard to dimension requirements. The mechanical tee includes an internal gasket seal and a lower housing that rigidly secures the fitting to the pipe. A locating collar that is integral to the upper housing provides a mechanical interlock with the pipe, thereby supporting the expected loads and securing the mechanical tee fitting in place. A mechanical tee fitting should meet the bending test requirements of ANSI/CAN/UL 213:2023, "Rubber Gasketed Fittings for Fire-Protection Service."

**Note A-2.2.10.5.(~~1~~3) Saddle ~~Hubs or~~ Fittings or Hubs.**

Saddle ~~hubs or~~ fittings or hubs may have proven acceptable on the basis of past performance in some localities and their acceptance under this Code may be warranted.

## Impact analysis

This proposed change would not impose additional costs on contractors or building owners. This proposed change could reduce overall costs by simplifying installation through a reduction in the joint count, which would use fewer materials, create labour savings, and reduce the risk of joint-related failure.

## Enforcement implications

This proposed change could be enforced by the existing infrastructure. No additional resources, new inspection methods, or specialized enforcement training would be required. This proposed change aligns with existing plumbing inspection practices.

Clearly identifying reference standards in the Code would reduce Code users' reliance on discretionary approvals and reviews of alternative solutions, and thereby improve consistency and predictability of enforcement across jurisdictions.

## Who is affected

Designers and specification writers would benefit from the addition of clearly identified reference standards to the Code, which would reduce their reliance on discretionary approvals and reviews of alternative solutions.

Contractors and installers would benefit from a clear option for Code-compliant installation without needing additional approvals.

Manufacturers and suppliers would benefit from a clear and consistent regulatory framework that defines the performance and compliance requirements for mechanical tee fittings.

Building officials and regulators would benefit from a clear and consistent enforcement framework that would eliminate differing interpretations among authorities having jurisdiction and establish a concise compliance pathway.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**NPC25 Div.B 2.2.10.5. (first printing)**

**[2.2.10.5.] -- ([1] --) no attributions**

**[2.2.10.5.] -- ([2] --) [F20,F46-OH2.2]**

**[2.2.10.5.] -- ([2] --) [F20-OP5]**

**[2.2.10.5.] 2.2.10.5. ([3] 1) [F81-OH2.1,OH2.3]**

**[2.2.10.5.] 2.2.10.5. ([3] 1) [F81-OP5]**

# Proposed Change 2133

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.3.4.5.(1) (first printing)** |
| Subject: | Drainage Systems |
| Title: | Installation of Drainage Piping Without Depressions |
| Description: | This proposed change introduces requirements for the installation of drainage piping to prevent sagging and depression. |
| Related Code Change Request(s): | CCR 1942 |

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
- [ ] Energy Efficiency
- [x] Plumbing
- [ ] Construction and Demolition Sites

## Problem

Article 2.3.4.5. of Division B of the National Plumbing Code of Canada (NPC) requires that nominally horizontal piping inside a building be braced to prevent swaying and buckling, and to control the effects of thrust. The intent of this provision is to ensure structural stability and maintain the functional performance of piping systems.

Sentence 2.5.6.1.(1) requires vent piping to be installed without depressions in which moisture can collect. While this requirement is explicitly for vent systems, drainage piping is subject to comparable installation conditions, material properties, and long-term structural influences. As with vent piping, improper support spacing, inadequate bracing, long-term pipe deflection, and building settlement can all result in sagging or depression in horizontal drainage piping.

Depressions in drainage piping systems may create unintended low points, or stagnant zones, where solids and wastewater can accumulate, potentially reducing flow and hydraulic efficiency and increasing the likelihood of blockage, foul odours and

unsanitary conditions. Over time, such conditions can lead to more frequent maintenance requirements and, in severe cases, lead to surcharge or backflow into occupied spaces.

This proposed change adds sagging and depression avoidance to the required installation practices for drainage piping in Article 2.3.4.5. It clarifies the connection between the intended piping installation and the long-term performance of the drainage system, reduces maintenance risks, and aligns drainage installation practices with the established intent of the structural support requirements.

## Justification

Article 2.3.4.5. is primarily framed as a structural support requirement. It does not currently explicitly link the presence of sagging or depression to drainage system performance; however, the intent of the provision is to prevent the failure of the drainage piping system, which would include the prevention of sagging and depression in addition to swaying and buckling.

The proposed change to Article 2.3.4.5. is intended to clarify that the prevention of sagging or depression is not solely a structural consideration but also essential to maintaining proper drainage performance. Further, since vent and drainage systems commonly use similar piping materials and support methods, reinforcing the requirement for horizontal drainage piping to be installed to prevent depression would promote consistency across system types and align installation practices.

This proposed change would maintain flow, reduce the likelihood of localized buildup, and enhance long-term drainage system efficiency. It would also reduce the risk of high maintenance frequency and service disruption and protect occupants from foul odours and the potential health concerns associated with waste retention.

## PROPOSED CHANGE

**[2.3.4.5.] 2.3.4.5. Support for Horizontal Piping**

**[1] 1)** *Nominally horizontal* piping that is inside a *building* shall be braced to prevent swaying, ~~and~~ buckling, sagging and depression and to control the effects of thrust.

## Impact analysis

The proposed clarification would not introduce new materials, technologies or system components. Rather, it would reinforce established system design and installation practices to ensure that the drainage piping referred to in Article 2.3.4.5. is installed in a way that maintains continuous flow in the direction of drainage, without sagging or depression.

The required slope of drainage piping, including minimum gradients based on pipe size, is already referenced in the NPC. In addition, maximum spacing for supports for aboveground horizontal piping is specified in Article 2.3.4.5., and requirements for underground piping support are addressed in Article 2.3.4.6.

Adequate support spacing, including hangers installed at prescribed intervals and near fittings, helps maintain proper alignment and prevents sagging over time. The use of approved piping materials, avoidance of excessive unsupported spans, and proper coordination during installation further reduce the likelihood of low points forming. For underground piping, proper bedding, backfill placement, and compaction are essential to prevent post-installation settlement that could result in depressions.

In aboveground installations, compliance may require careful verification of support spacing and slope during rough-in. In some cases, minor adjustments to hanger placement or additional supports may be necessary to maintain alignment, particularly for longer horizontal runs or larger pipe sizes. However, pipe supports are already required under existing Code provisions; therefore, any additional cost would generally be limited to incremental labour for alignment verification or minor support adjustments, which would be necessary to achieve compliance with the existing Code requirements regardless.

In residential construction, compliance may require minor additional fasteners or hanger adjustments during installation. In commercial applications, coordination of pipe supports within ceiling spaces or service corridors may require some additional attention to maintain grade and prevent deflection. These measures are consistent with, and would already be necessary to meet, existing Code provisions; therefore, the impacts are expected to be limited and installation-specific.

Verification during installation, such as confirming slope and alignment prior to concealment, supports the consistent enforcement of the requirement. Where minor deviations are identified, corrective action during construction, such as adjusting hangers or regrading short sections, is typically less costly than addressing performance issues after occupancy.

Overall, the incremental impacts associated with this proposed change are primarily related to installation quality and inspection verification rather than material costs. By reinforcing proper support and slope control, the proposed change is expected to improve long-term drainage performance, reduce the likelihood of the accumulation of solids or wastewater, reduce the likelihood of blockages, and decrease maintenance interventions over the service life of the system, resulting in a net positive lifecycle impact.

## Enforcement implications

This proposed change is expected to require limited need for additional Code enforcement resources.

## Who is affected

This proposed code change may affect a broad range of stakeholders involved in the design, specification, manufacture, approval, construction, and operation of drainage systems, including but not limited to designers, specifiers, manufacturers, building owners, contractors and building officials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[2.3.4.5.] 2.3.4.5. ([1] 1) [F20-OS3.1]**

**[2.3.4.5.] 2.3.4.5. ([1] 1) [F20-OH2.1,OH2.3]**

**[2.3.4.5.] 2.3.4.5. ([1] 1) [F20-OP5]**

# Proposed Change 2130

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.4.2.1.(2) (first printing)** |
| Subject: | Drainage Systems |
| Title: | Device Connections to Sanitary Drainage Systems |
| Description: | This proposed change clarifies the termination requirements for the connection of certain devices to the sanitary drainage system by explicitly requiring air breaks for indirect drainage in order to prevent backflow and protect potable water. |
| Related Code Change Request(s): | CCR 1821 |

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

Sentence 2.4.2.1.(2) of the National Plumbing Code of Canada (NPC) requires certain plumbing devices to be indirectly connected to a drainage system; however, it does not clearly specify that this indirect connection must form an air break. As a result, the intended level of separation between the device and the drainage system may be unclear or the requirement may be applied inconsistently.

Article 2.3.3.11. establishes the requirements for an air break used for indirect connections to a drainage system. However, Sentence 2.4.2.1.(2) does not explicitly reference this Article, which may lead to uncertainty regarding the applicable requirements for the installation of different devices.

Without a clear reference to Article 2.3.3.11. in Sentence 2.4.2.1.(2), Code users could misinterpret the air break requirement or enforcement agencies could inconsistently

enforce the requirement. As a result, installations of certain plumbing devices might not meet the intended air break configuration. This ambiguity might increase the risk of improper installation and compromise the effectiveness of the indirect connection to prevent backflow and protect potable water systems.

## Justification

The NPC requires an indirect connection for plumbing devices connected to a drainage system where there is a risk of backflow that could result in contamination of the potable water system. Indirect connections are an established method of cross-connection control and are widely used to protect public health by preventing backflow under both normal and abnormal operating conditions.

This proposed change clarifies the existing requirement by explicitly referencing the air break as an acceptable form of indirect connection within Sentence 2.4.2.1.(2). The clarification improves consistency in Code interpretation and enforcement by clearly identifying a commonly accepted method of achieving separation between the potable water system and drainage systems where backflow risk is present. As the Code already requires indirect connection, and indirect connection inherently involves separation from the drainage system, this proposed change is primarily a clarification of intent rather than the introduction of a new technical requirement.

This proposed change would explicitly require these plumbing devices to be indirectly connected to a drainage system through an air break in accordance with Article 2.3.3.11. This clarification is expected to support consistent design, installation and enforcement practices while helping to ensure that the intended level of protection from backflow and of the potable water system is maintained.

By clearly referencing the applicable Article, the proposed change would also reduce the potential for misinterpretation or non-compliant installations. The clarification may also reduce the potential for inconsistent enforcement or unnecessary retrofits, resulting in indirect cost savings while maintaining the intended level of public health protection.

## PROPOSED CHANGE

**[2.4.2.1.] 2.4.2.1. Connections to Sanitary Drainage Systems**

**[1] 2)** Except as provided in Sentences 2.4.2.3.(2) and (3), the following devices shall be *indirectly connected* to a *drainage system* to form an *air break* in accordance with Article 2.3.3.11.:

[a] a) a device for the display, storage, preparation or processing of food or drink,

[b] b) a sterilizer,

[c] c) a device that uses water as a cooling or heating medium,

[d] d) a water-operated device,
[e] e) a water treatment device,
[f] f) a drain or overflow from a *water system* or heating system,
[g] g) a device that produces *clear-water waste* as condensate, and
[h] h) a device that produces condensate from a combustion process.
(See Note A-2.4.2.1.(1)(a)(ii) and (2).)

## Impact analysis

In many cases, hangers or supports are already required by the NPC, or would otherwise be provided, for the installation of approved methods of achieving an indirect connection; therefore, no significant additional cost impacts are anticipated with this proposed change.

The explicit requirement for an air break does not normally require additional hangers or structural supports. An air break is typically provided where an indirect waste pipe discharges into a waste receptor. In common configurations, the piping is already required to be installed with support; support for vertical and horizontal piping is covered in Articles 2.3.4.4. and 2.3.4.5. Small-diameter tubing (e.g., condensate drains or water treatment discharge lines) and equipment tailpieces are lightweight and are normally clipped or supported as standard installation practice.

Limited costs may be incurred in some installations where additional hangers or supports are required to maintain the required separation for an air break. These costs would generally be installation-specific and are expected to be limited to situations where existing support arrangements are insufficient.

For example, perforated galvanized metallic hanger strap typically costs approximately $10 to $25 per 7.6 m (25 ft.) roll. Where one additional support uses approximately 300 mm (1 ft.) of strap, the material cost would be approximately $0.40 to $1.00 per support. Small diameter clevis hangers or pipe rings generally range from about $3 to $10 per unit, depending on size and load rating. Where more substantial supports such as trapeze hangers or bracket assemblies are required, material costs typically range from $15 to $40 per support, depending on the configuration and hardware used. Labour to install an additional hanger for substantial support may range from approximately $20 to $60, depending on site conditions and accessibility.

These estimated costs are based on typical pricing from various online suppliers and retailers in Canada. These figures are intended to provide a general indication of potential incremental material and labour costs and may vary depending on supplier, location, quantity, site conditions and specific product selection.

This proposed change would have a cost impact for few residential and typical commercial buildings, as indirect connections are already commonly installed in these buildings in a manner consistent with the formation of an air break. Larger facilities

with numerous indirectly connected plumbing devices (e.g., commercial kitchens, laboratories and healthcare facilities) may be affected more; however, only a subset of the installations in those facilities would be expected to require additional hangers solely as a result of this proposed change.

## Enforcement implications

This proposed change is expected to require limited additional enforcement resources.

## Who is affected

This proposed code change could affect a broad range of stakeholders involved in the design, specification, manufacture, approval, construction and operation of drainage systems, including but not limited to designers, specifiers, manufacturers, building owners, contractors and building officials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

N/A

# Proposed Change 2132

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.4.7.1.(7) (first printing)**<br>**NPC25 Div.B 2.4.7.2. (first printing)** |
| Subject: | Drainage Systems |
| Title: | Spacing of Cleanouts in Vertical Drainage Pipes |
| Description: | This proposed change introduces a requirement for the spacing of cleanouts in stacks serving sinks, where provided. |
| Related Code Change Request(s): | CCR 1941 |

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 2.4.7.2. of the National Plumbing Code of Canada (NPC) outlines requirements for the nominal pipe size and spacing of cleanouts in nominally horizontal drainage pipes, as well as other requirements for manholes, developed length of building sewers, and rodding. Table 2.4.7.2., specifically, addresses the spacing of cleanouts for horizontal drainage pipes.

The installation of cleanouts in horizontal drainage pipes at a maximum interval spacing, as required by the Code, is considered more important than that in vertical pipes because horizontal pipes are more prone to buildup. Grease, debris or sediment can build up in these pipes due to the slower flow where they gradually slope. As a result, these cleanouts need to be more accessible and closely spaced to allow for rodding when blockages occur.

Cleanout spacing in vertical drainage pipes has been considered less critical, as gravity facilitates flow, reducing the likelihood of blockages in vertical stacks. However, modern plumbing systems often use high-efficiency fixtures, which reduce the flow of water

through drainage pipes. While this reduced flow helps conserve water, it also means there is less force to carry solids through stacks, which increases the risk of buildup and blockages over time.

While the NPC currently includes a requirement for cleanout fittings in vertical stacks in Sentence 2.4.7.1.(7), this proposed change specifies the maximum spacing where cleanouts are installed in vertical drainage stacks serving sinks.

## Justification

Failure to specify a maximum spacing for cleanouts in vertical drainage stacks serving sinks could lead to limited access for maintenance and result in the need for costly cleanup and repairs, as blockages are more difficult to remove without proper entry points. The intent of this proposed change is to reduce the likelihood that improper design or placement of these cleanouts (or access covers) would limit access for maintenance or increase the risk of drainage system blockages and surcharge, which can lead to unsanitary conditions and harm to building occupants.

In some cases, limited access to the vertical drainage system may be attempted through a sink drain by removal of the trap and insertion of rodding equipment. While this approach may provide a more affordable and less invasive option for minor or localized blockages, it is not always feasible for blockages located deeper within a vertical stack and may not provide sufficient access for effective maintenance. Also, this method is not prescribed by the Code and should not be considered a substitute for properly installed cleanouts.

By establishing a maximum spacing interval of 15 m for cleanouts in certain drainage stacks, this proposed change would update the NPC to provide a requirement that addresses the risk of blockages and facilitates maintenance. This proposed change aligns with the capabilities of common maintenance equipment, creates consistency with horizontal cleanout spacing provisions, ensures vertical systems remain efficient and reliable, and provides a reasonable balance between the constructability and long-term maintainability of drainage systems. The interval of 15 m is sufficiently frequent to limit invasive repair work in the event of a blockage while avoiding an unnecessary installation burden.

## PROPOSED CHANGE

**[2.4.7.1.] 2.4.7.1. Cleanouts for Drainage Systems**

**[1] 7)** *Stacks* shall be provided with

[a] a) a *cleanout* fitting

[i] -- at the bottom of the stack,

[ii] -- not more than 3 m upstream of the bottom of the stack, or

[iii] -- on a Y fitting connecting the stack to the *building drain* or *branch*, and

[b] b) additional *cleanouts* in accordance with Sentence 2.4.7.2.(6).-2030.

**[2.4.7.2.] 2.4.7.2. Size and Spacing of Cleanouts**

**[1] 1)** Except as provided in Sentences (2), (3) and 2.4.7.1.(6), the *nominal pipe size* and spacing of *cleanouts* in *nominally horizontal* pipes of a *drainage system* shall conform to Table 2.4.7.2.

**Table [2.4.7.2.] 2.4.7.2.**
**Permitted Size and Spacing of Cleanouts in Nominally Horizontal Pipes**
**Forming Part of Sentence [2.4.7.2.] 2.4.7.2.([1] 1)**

| ***Nominal Pipe Size* of Drainage Pipe, *NPS*** | **Minimum *Nominal Pipe Size* of *Cleanout*, *NPS*** | **Maximum Spacing, m** | |
|---|---|---|---|
| | | **One-Way Rodding** | **Two-Way Rodding** |
| less than 3 | Same *NPS* as drainage pipe | 7.5 | 15 |
| 3 and 4 | 3 | 15 | 30 |
| over 4 | 4 | 26 | 52 |

**[2] 2)** The spacing between manholes serving a *building sewer*
[a] a) of *NPS* 24 or less shall not exceed 90 m, and
[b] b) over *NPS* 24 shall not exceed 150 m.

**[3] 3)** The *developed length* of a *building sewer* between the *building* and the first manhole to which the *building sewer* connects shall not exceed 75 m.

**[4] 4)** Where a *building sewer* connects to another *building sewer* other than by a manhole, the *developed length* between the *building* and the *building sewer* to which it connects shall not exceed 30 m.

**[5] 5)** *Cleanouts* that allow rodding in one direction only shall be installed to permit rodding in the direction of flow.

**[6] --)** Where *cleanouts* are provided on a vertical sink waste *stack*, they shall be installed at intervals not exceeding 15 m, measured from the base of the *stack*.

## Impact analysis

Tables 1 and 2 present the estimated costs for cleanout installation and blockage removal, respectively, which have been evaluated to determine the financial implications of the proposed change.

**Table 1. Estimated Cost of Cleanout Installation**

| Category | Estimated Cost [1] (CAD) | Description |
|---|---|---|
| Labour costs | $180–$300 | 1.5 to 2 hours at $120 to $150 per hour |
| Material costs | $40–$80 | Cleanout fittings and associated materials, depending on pipe size and material |
| Total | $220–$380 | Combined estimated labour and materials |

**Note to Table 1:**

1 Exact costs are difficult to estimate, as the required parts may vary significantly depending on site conditions. The estimates provided in this table are based on scenarios involving a limited section of piping and are intended to represent realistic conditions.

The estimated cost of installing a cleanout in a vertical drainage stack is approximately $250 to $380 per cleanout. This cost includes the labour and materials required to install the cleanout to help ensure proper access for maintenance over the service life of the drainage system. Although this estimate is presented on a per-cleanout basis, where multiple cleanouts are installed at the same time, the associated labour and initial costs related to site preparation and access may be distributed across the installations. As a result, the average cost per cleanout may be lower when several cleanouts are installed concurrently during construction.

**Table 2. Estimated Cost of Blockage Removal Where No Cleanout Is Provided**

| Category | Estimated Cost [1] (CAD) | Description |
|---|---|---|
| Labour costs | $720–$1 500 | 6 to 10 hours at $120 to $150 per hour |
| Material costs | $150–$1 000+ | Cleanout fittings, replacement piping and materials for wall or floor repairs |
| Total | $870–$2 500+ | Combined estimated labour and materials, depending on the extent of blockage and existing wall and floor finish materials |

**Note to Table 2:**

1 Exact costs are difficult to estimate, as the required parts and the extent of the blockage may vary significantly depending on site conditions. The estimates provided in this table are based on scenarios involving a limited section of piping and are intended to represent realistic conditions.

The estimated total cost of removing a blockage that cannot be accessed from a cleanout point ranges from $870 to over $2 500, as shown in Table 2. This total includes the labour required to locate and access the blockage, which often involves cutting and later repairing walls or floors, along with rodding, snaking or hydro-jetting the piping. In addition, the removal process may require the installation of a new cleanout to restore appropriate access, further increasing the total cost. These expenses highlight the importance of ensuring cleanouts are properly installed during construction to avoid significantly higher long-term maintenance costs.

As demonstrated by the cost comparison, the cost of installing cleanouts during construction is significantly lower than the cost of resolving blockages where adequate access is not provided. Depending on how many additional cleanouts must be installed to meet the requirement, compared to existing practices where maximum spacing may not be clearly defined, the proposed change may result in higher initial installation costs due to the provision of additional cleanouts. However, in the event of a blockage, the cost of investigation, access and repair is typically significantly higher than the upfront installation cost.

Blockages can occur in any drainage system; however, the proposed change is primarily relevant to buildings that contain long vertical drainage stacks, such as multi-unit residential buildings, mixed-use buildings, and other multi-storey buildings where drainage stacks serve multiple storeys or multiple dwelling units. The proposed 15 m spacing is intended to address vertical runs where access for maintenance may otherwise be limited over a significant height of stack. It is not expected to have the same level of impact on typical single-family dwelling units, where vertical drainage runs are generally shorter and more readily accessible.

The proposed change would not require a cleanout to be installed for every dwelling unit in a multi-unit building, except in the rare case that the units each have their own dedicated stack exceeding 15 m. Rather, the number and location of cleanouts would depend on the configuration of the drainage system, including stack height, offsets, changes in direction, and available access points. For example, where a vertical run is less than 15 m but includes a significant offset or change in direction, the applicable cleanout requirements for changes in direction and accessible maintenance points would continue to apply.

Similarly, where a vertical stack serves multiple units, the intent is to provide practical access to the stack for maintenance, not to require a separate cleanout for each unit unless needed by the layout of the system. While the frequency of blockages can vary depending on building type, occupancy, system design, and maintenance practices, blockages remain a foreseeable maintenance event over the service life of a drainage system.

The cost impact of additional cleanouts, if necessary, is expected to vary by building type and drainage system configuration. In larger buildings, the cost may be less significant when considered as part of the overall drainage system and distributed across multiple units or storeys. In smaller buildings, particularly single-family dwellings, the proposed change is expected to have limited application unless the building contains unusually long vertical drainage runs. However, where cleanouts are not readily accessible, even infrequent blockages can result in disproportionately high

costs due to invasive repair work, service disruption and potential water damage. Ensuring proper installation from the outset helps mitigate these lifecycle risks, improves the maintainability of the drainage system, and supports long-term performance and reliability.

## Enforcement implications

This proposed change is expected to require limited additional resources for enforcement.

## Who is affected

This proposed change may affect a broad range of stakeholders involved in the design, specification, manufacture, approval, construction and operation of drainage systems, including but not limited to designers, specifiers, manufacturers, building owners, contractors and building officials.

## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[2.4.7.1.] 2.4.7.1. ([1] 7) [F81-OH2.1]**

**[2.4.7.2.] 2.4.7.2. ([1] 1) [F81-OH2.1]**

**[2.4.7.2.] 2.4.7.2. ([2] 2) [F81-OH2.1]**

**[2.4.7.2.] 2.4.7.2. ([3] 3) [F81-OH2.1]**

**[2.4.7.2.] 2.4.7.2. ([4] 4) [F81-OH2.1]**

**[2.4.7.2.] 2.4.7.2. ([5] 5) [F81-OH2.1]**

**[2.4.7.2.] -- ([6] --) [F81-OH2.1]**

# Proposed Change 2174

| | |
|---|---|
| **Code Reference(s):** | **NPC25 Div.B 2.6.3.1.(2) (first printing)** |
| Subject: | Potable Water Systems |
| Title: | Use of the IAPMO Water Demand Calculator in the Design of Potable Water Systems |
| Description: | This proposed change adds the IAPMO Water Demand Calculator as an acceptable tool in the design of potable water systems. |
| Related Code Change Request(s): | CCR 2052 |

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

According to Sentence 2.6.3.1.(2) of Division B of the National Plumbing Code of Canada (NPC), potable water systems must be designed, fabricated and installed using good engineering practice, as described in the handbooks of the American Society of Heating and Air-Conditioning Engineers (ASHRAE) and the American Society of Plumbing Engineers (ASPE). While these documents are recognized as providing reliable guidance for the design of potable water systems, they may not reflect modern fixture performance or incorporate data from more recent field studies. As a result, designers may have limited options for estimating peak demand flow in a manner that is nationally recognized and aligns with the performance of modern plumbing systems while remaining consistent with Code objectives.

In the ASPE handbooks, for example, the primary method for estimating peak water demand for potable water systems is based on the conversion of fixture units (FU) into the probable peak demand flow in gallons per minute (gpm) using Hunter’s Curve, a

probabilistic method developed in the 1940s to estimate peak demand flow in buildings. This method assumed higher individual flow rates for plumbing fixtures, which reflected the performance of plumbing fixtures at the time of its development.

Modern plumbing fixtures are generally designed to operate at lower flow rates as a result of advancements in technology, water-efficiency standards, and regulatory requirements. Applying the FU-to-gpm conversion to modern plumbing fixtures may lead to a higher probable peak demand flow, since the FU values originally defined in the 1940s have not been revised to consider newer, high-efficiency flow fixtures. This, in turn, may have a direct impact on how designers size piping for potable water systems, which may result in these pipes being sized larger than is necessary for actual operating conditions. Oversized potable water piping may result in lower water velocities and greater water volumes, which can increase water residence times under typical use conditions.

Larger water volumes and lower flow velocities are associated with longer water residence times in piping in potable water systems, depending on the building type, occupancy and usage frequency. Longer residence times can contribute to increased water age, greater heat loss in hot water systems, and increased material and construction costs, depending on building type and usage characteristics. Extended residence times and associated thermal losses are recognized factors that can adversely influence water quality in building water systems and as potential contributors to *Legionella* growth. In residential buildings in particular, where demand may be intermittent or lower than assumed peak conditions, oversized piping may result in a greater volume of water being retained within the system relative to actual use, which may undermine effective strategies for *Legionella* risk mitigation.

In practice, the absence of a nationally recognized methodology for estimating probable system flow demand for modern plumbing fixtures has led to variability in application among jurisdictions and design professionals. Some jurisdictions, such as the City of Vancouver, have permitted the use of alternative demand-based sizing approaches, including the International Association of Plumbing and Mechanical Officials (IAPMO) Water Demand Calculator (WDC)*, to estimate peak demand and address potential oversizing of potable water piping. However, without inclusion of such approaches within the NPC, the use of these alternative demand-based sizing methodologies remains inconsistent across Canada.

By introducing the WDC as an additional optional method for calculating the probable peak demand flow, which is supported by field studies and already adopted by jurisdictions in Canada, this proposed change would provide designers with another tool that reflects the performance of modern plumbing fixtures without impacting existing methods for calculating peak demand flow. This proposed change also would support a more consistent application of the Code and align the design of potable water systems with modern water efficiency and water quality.

### Reference

[1] IAPMO WDC downloadable calculator is available at https://iapmo.org/we-stand/water-demand-calculator.

## Justification

Analytical studies submitted in support of this proposed change, including construction cost assessments and engineering evaluations, indicate that the WDC provides a method of estimating peak demand flow that reflects the performance of modern plumbing fixtures. These studies demonstrate that, when applied within its validated scope, the WDC generally estimates lower probable peak demand flow, which in turn helps ensure that piping in potable water systems is sized considering the reduced water consumption of modern plumbing fixtures. Documented outcomes include reductions in pipe size and hot water distribution volumes, which may result in reduced water use, energy consumption, and associated labour requirements. Experience from jurisdictions that permit the use of the WDC, including the City of Vancouver, indicates that the method is practical to apply and enforce within a regulatory framework.

The WDC calculates demand estimates for potable water systems serving houses and multi-unit residential buildings and is based on probabilistic demand modeling derived from empirical residential water use data. It is intended to estimate peak demand flow under higher-use conditions within this validated scope. This proposed change would support more consistent demand-based sizing across jurisdictions and align with NPC objectives related to health and sanitation, environmental protection, and water efficiency, without mandating a change in design practice.

## PROPOSED CHANGE

**[2.6.3.1.] 2.6.3.1. Design, Fabrication and Installation**

**[1] 2)** *Potable water systems* shall be designed, fabricated and installed in accordance with good engineering practice, such as that described in the ASHRAE Handbooks and ASPE Plumbing Engineering Design Handbooks, and that using tools such as the IAPMO Water Demand Calculator. (See Note A-2.6.3.1.(2).)

**Note A-2.6.3.1.(2) Potable Water Systems.**

The ~~design procedures contained in the~~ following ~~documents~~ are considered examples of documents and tools that support good engineering practice in the field of potable water system~~s~~ design:

a. "ASHRAE Handbook – HVAC Applications", chapter on Service Water Heating,
b. "ASHRAE Handbook – Fundamentals", chapter on Pipe Sizing,
c. ASPE "Plumbing Engineering Design Handbook, Volume 2",chapter on Cold Water Systems, ~~and~~
d. ASPE "Plumbing Engineering Design Handbook, Volume 2", chapter on Domestic Water Heating Systems~~.~~, and
e. the IAPMO Water Demand Calculator.

The reference to the IAPMO Water Demand Calculator in Sentence 2.6.3.1.(2) is

intended to provide designers with an optional method for estimating peak demand flow for the potable water distribution system in houses and multi-unit residential buildings. The use of the Water Demand Calculator does not relieve designers of the responsibility to ensure that potable water systems meet the applicable pressure, flow and performance requirements stated elsewhere in this Code.

Alternatively, the following methods, which apply to both public and private water supplies, may be used in determining the size of each section of the water system using Table A-2.6.3.1.(2)-A (Small Building Method) and Table A-2.6.3.1.(2)-F (Average Pressure Loss Method). Where these methods are considered an alternative to a detailed engineering design method, the hydraulic loads shall be the sum of the total fixture units given in Tables 2.6.3.2.-A, 2.6.3.2.-B, 2.6.3.2.-C and 2.6.3.2.-D.

## Impact analysis

The statistical and performance values referenced in this impact analysis are drawn from publicly available studies commissioned or developed by IAPMO, including construction cost analyses, meter-size and connection-fee research, water and energy performance modeling, sustainability reporting, and adoption and technical background materials [1] to [4]. Collectively, these sources evaluate the technical and economic implications of sizing pipes based on the probable peak demand flow calculated using the IAPMO Water Demand Calculator (WDC), as compared with traditional FU-based sizing approaches referenced in the NPC.

The current pipe sizing method in the NPC estimates probable system flow demand using a method similar to Hunter’s Curve, which converts fixture units to gallons per minute or the volumetric flow rate. Since the development of the original Hunter’s Curve method, plumbing fixtures and appliances have been designed to achieve substantial water efficiency improvements, which vary depending on fixture type [4]. Where flow demand assumptions do not reflect these changes, potable water piping—particularly in residential buildings—may be larger than that required for typical operating conditions.

ASHRAE Guideline 12, “Minimizing the Risk of Legionellosis Associated with Building Water Systems,” which is referenced in the National Building Code of Canada, recognizes water age, temperature loss, and system complexity as factors contributing to *Legionella* risk. Larger piping system water volumes may contribute to increased water residence time, delayed hot-water delivery, and greater heat loss, resulting in conditions less favourable to effective *Legionella* control in building water systems. This proposed change does not introduce new requirements or modify existing sizing provisions. It clarifies that the WDC may be used as an optional engineering method for determining peak demand flow based on modern fixture performance.

Studies indicate that sizing pipes using the WDC may result in lower estimations of peak demand, which may result in lower construction costs through the use of smaller pipe diameters and associated fittings. A Stantec analysis [1] identified material and

labour cost reductions across multiple residential building types, ranging from modest savings in single-family dwelling units to tens of thousands of dollars in larger multifamily buildings. These savings result from cumulative reductions in pipe sizes and installation effort throughout the system.

**Construction cost implications**

Arup's modeling [3] indicates that reduced water volumes in pipes associated with WDC sizing may decrease water waste during hot-water draw periods, with estimated annual savings of

- 1 710 litres per year (~451 gallons) for single-family dwelling units;
- 11 280 litres per year (~2 980 gallons) for 6-unit multifamily buildings; and
- 269 700 litres per year (~71 258 gallons) for 45-unit multifamily buildings.

These reductions occur without changes to occupant behaviour and are attributable to shorter time-to-tap performance.

**Energy savings implications**

Arup's analysis [3] found that smaller pipe diameters reduce conductive heat loss in potable hot-water systems and may significantly reduce booster-pump energy use in high-rise residential buildings. Consistent with these findings, systems designed using reduced pipe diameters and lower internal water volumes experience improved water-heating efficiency.

Reducing nominal pipe size (NPS) from 3/4 to 1/2 may result in internal water-volume reductions of approximately 40% to 50% per unit length, depending on the specific geometry of the piping material. Reduced system water volume lowers thermal mass, decreases water residence time and reduces the volume of water requiring reheating, thereby further improving overall energy performance. The exact energy cost savings associated with the reduced water volume can be calculated by considering factors such as hot-water demand profiles, supply and return water temperatures, water-heater efficiency, distribution heat-loss characteristics, local energy utility rates and other specific operating conditions.

**Embodied carbon implications**

Smaller pipe sizes and reduced system component sizing are associated with lower embodied carbon. Arup's analysis [3] identified embodied carbon reductions of approximately 20% for high-rise copper piping systems, with additional reductions resulting from smaller meters, valves and backflow preventers. While embodied carbon is not directly regulated by the NPC, these outcomes support broader sustainability objectives.

The following assessment is based on the geometric structure of the piping materials. While exact cost savings from pipe downsizing depend on material type, market pricing and project scope, reducing NPS from 3/4 to 1/2 is generally associated with material reductions of approximately 35% for Type L copper and 55% for standard dimension ratio (SDR) 9 crosslinked polyethylene (PEX) piping, which are commonly used in building water systems. Although the resulting cost savings may not directly or

proportionally match these material reduction percentages, the savings associated with pipe downsizing would generally be expected to be of a similar order of magnitude and follow the same overall trend.

**Water meter and utility connection fee implications**

In summary, the referenced studies indicate that the WDC method for calculating the estimated probable system flow demand may contribute to lower installation costs, decrease water and energy use, reduce material-related environmental impacts, and lower long-term utility charges.

Introducing the WDC as an additional, optional method for estimating the probable system flow demand would provide designers with an evidence-informed tool that reflects modern plumbing fixture performance while maintaining the acceptability of existing calculation methods and without introducing mandatory provisions or new enforcement obligations.

**References**

[1] Stantec (2021). Water Demand Calculator Construction Cost Savings Summary Report. https://iapmo.org/research/whitepapers-and-studies/stantec-cost-report
[2] Alliance for Water Efficiency (2021). A Review of Connection Fees and Service Charges by Meter Size. https://allianceforwaterefficiency.org/resource/review-connection-fees-and-service-charges-meter-size/
[3] Arup (2023). Energy and Carbon Savings Opportunities: Water Demand Calculator. https://iapmo.org/media/lvooslfg/iapmo_energy_savings_arup_report.pdf
[4] IAPMO (2023). IAPMO's Water Demand Calculator™ Can Help You Save Water, Energy, and Reduce Embodied Carbon.
https://iapmo.org/media/l4ehsqxq/arup_summary_report.pdf

## Enforcement implications

This proposed change is not expected to require significant additional enforcement resources. Existing plan review and inspection processes would continue to apply, with appropriate guidance or training provided to plan examiners and inspectors where necessary during the initial adoption of the proposed change.

## Who is affected

This proposed change may affect a broad range of stakeholders involved in the design, specification, manufacture, approval, construction and operation of potable water systems, including but not limited to designers, specifiers, manufacturers, building owners, contractors and building officials.

# OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

**[2.6.3.1.] 2.6.3.1. ([1] 2) [F72-OH2.1] [F70-OH2.2] [F71-OH2.3]**