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## Proposed Change 1994

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<b>Code Reference(s):</b>	<b>NBC20 Div.B 3.2.1.4.(1) (first printing)</b>
Subject:	Building Fire Safety
Title:	Exemptions List for Floor Assemblies over Basements
Description:	This proposed change adds Sentences 3.2.2.48.(3) and 3.2.2.51.(3) to the list of exceptions to the requirements for floor assemblies over basements in Sentence 3.2.1.4.(1).

This change could potentially affect the following topic areas:

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|--|---|
| <input type="checkbox"/> Division A                                | <input checked="" type="checkbox"/> Division B              |
| <input type="checkbox"/> Division C                                | <input checked="" type="checkbox"/> Design and Construction |
| <input type="checkbox"/> Building operations                       | <input type="checkbox"/> Housing                            |
| <input type="checkbox"/> Small Buildings                           | <input checked="" type="checkbox"/> Large Buildings         |
| <input checked="" type="checkbox"/> Fire Protection                | <input type="checkbox"/> Occupant safety in use             |
| <input type="checkbox"/> Accessibility                             | <input type="checkbox"/> Structural Requirements            |
| <input type="checkbox"/> Building Envelope                         | <input type="checkbox"/> Energy Efficiency                  |
| <input type="checkbox"/> Heating, Ventilating and Air Conditioning | <input type="checkbox"/> Plumbing                           |
|  | <input type="checkbox"/> Construction and Demolition Sites  |

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## Problem

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Sentence 3.2.1.4.(1) of Division B of the National Building Code of Canada (NBC) provides general requirements for floor assemblies immediately above basements. With the exception of certain assemblies for which specific requirements are provided elsewhere in the Code, such assemblies must

1. be constructed as a fire separation having a fire-resistance rating conforming the requirements of Articles 3.2.2.20. to 3.2.2.92., and
2. have a fire-resistance rating not less than 45 minutes.

To exempt certain assemblies from these general requirements, Sentence 3.2.1.4.(1) also points to seven Articles dealing with Group C major occupancies in which specific requirements for floor assemblies over basements are provided. In such cases, Code users do not need to comply with the requirements of Sentence 3.2.1.4.(1). Instead, the requirements of Sentence (3) of the relevant Article apply.

This proposed change notes that two additional Articles, 3.2.2.48. and 3.2.2.51., also address Group C major occupancies and provide requirements for floor assemblies above basements. However, these assemblies are not currently exempted from the application of Sentence 3.2.1.4.(1), which means they are subject to the requirements of both Sentence 3.2.1.4.(1) and the Article addressing their occupancy type.

Sentences 3.2.2.48.(3) and 3.2.2.51.(3) require floor assemblies over basements within a single dwelling unit to have a fire-resistance rating not less than one hour but do not require them to be constructed as fire separations. While the fire-resistance rating of not less than one hour is consistent with the fire-resistance rating required by Sentence 3.2.1.4.(1), there is a conflict as to whether the floor should be constructed as a fire separation. This inconsistency creates confusion for Code users and may lead to unnecessary expenditures if floors are constructed as fire separations without needing to be. It could also result in inconsistent interpretation of the requirements and challenges enforcing them in practice.

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## Justification

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Sentence 3.2.1.4.(1) includes a list of exemptions from the requirement that a floor assembly immediately above a basement be constructed as a fire separation having a fire-resistance rating conforming to the requirements of Articles 3.2.2.20. to 3.2.2.92. but not less than 45 minutes.

The list of exemptions includes references to the Sentence (3) of seven of the nine Articles in Subsection 3.2.2. that establish requirements for Group C major occupancies:

- Article 3.2.2.47., Group C, Any Height, Any Area, Sprinklered
- Article 3.2.2.49., Group C, up to 6 Storeys, Sprinklered, Noncombustible Construction
- Article 3.2.2.50., Group C, up to 3 Storeys, Noncombustible Construction
- Article 3.2.2.52., Group C, up to 4 Storeys, Sprinklered
- Article 3.2.2.53., Group C, up to 3 Storeys, Increased Area
- Article 3.2.2.54., Group C, up to 3 Storeys
- Article 3.2.2.55., Group C, up to 3 Storeys, Sprinklered

The Articles listed above exempt certain floor assemblies over basements from the requirements of Sentence 3.2.1.4.(1), on the basis that they each possess the following Sentence (3) requirement:

In a building that contains dwelling units that have more than one storey, subject to the requirements of Sentence 3.3.4.2.(3), the floor assemblies, including floors over basements, that are entirely contained within these dwelling units shall have a fire-resistance rating not less than 1 h\* but need not be constructed as fire separations.

\*Note: In Articles 3.2.2.54. and 3.2.2.55., the minimum fire-resistance rating is 45 minutes.

Two other Articles in Subsection 3.2.2. are also applicable to Group C major occupancies and include the same Sentence (3):

- Article 3.2.2.48., Group C, up to 12 Storeys, Sprinklered
- Article 3.2.2.51., Group C, up to 6 Storeys, Sprinklered

To avoid the conflict identified in the problem statement, this proposed change would add Sentences 3.2.2.48.(3) and 3.2.2.51.(3) to the list of provisions exempting certain floor assemblies over basements from the requirements of Sentence 3.2.1.4.(1). This addition would direct Code users to the appropriate Article for requirements for floor assemblies above basements, which was the intent when these two Articles were introduced.

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## PROPOSED CHANGE

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### **[3.2.1.4.] 3.2.1.4. Floor Assembly over Basement**

- [1] 1)** Except as permitted by Sentence 3.2.2.47.(3), ~~3.2.2.48.(3)~~, 3.2.2.49.(3), 3.2.2.50.(3), ~~3.2.2.51.(3)~~, 3.2.2.52.(3), 3.2.2.53.(3), 3.2.2.54.(3) or 3.2.2.55.(3), a floor assembly immediately above a *basement* shall be constructed as a *fire separation* having a *fire-resistance rating* conforming to the requirements of Articles 3.2.2.20. to 3.2.2.92. for a floor assembly, but not less than 45 min.

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## Impact analysis

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The proposed change to Sentence 3.2.1.4.(1) would clarify the existing requirements for floor assemblies over basements by adding references to two exemptions. This clarification would not change the existing requirements in the Code.

To reflect the different requirements of Sentence 3.2.1.4.(1) and Sentences 3.2.2.48.(3) and 3.2.2.51.(3), the subject of the cost analysis is assumed to be a six-storey, Group C (residential) building of encapsulated mass timber construction (EMTC), equipped with a sprinkler system. Each dwelling unit within the building offers a floor area of 100 m<sup>2</sup>, with floor perimeters measuring 40 m. The subfloor and structural systems are assumed to be the same in each.

Table 1 below provides a construction cost comparison of the fireproofing components of the two options for a floor assembly:

1. Having a fire-resistance rating (FRR) of 45 minutes and constructed as a fire separation (FS).
2. Having an FRR of one hour and not constructed as an FS.

These two options differ in their fire-resistance rating and construction as a fire separation, with the first conforming to the general requirements in Sentence 3.2.1.4.(1) and the second conforming to the more specific requirements in Sentences

3.2.2.48.(3) and 3.2.2.51.(3). The comparison focuses on the cost difference associated with the different fire-resistance ratings and the use of protective materials for the fire separation.

The NBC defines a fire separation as “a construction assembly that acts as a barrier against the spread of fire.” Note A-1.4.1.2.(1) in Division A additionally explains that “fire” refers to all products of combustion, including heat and smoke. While a fire separation may not always require a fire-resistance rating, its purpose is to serve as a barrier to the spread of fire, including heat and smoke, until an appropriate response is initiated. Furthermore, if the fire-resistance rating of a fire separation is permitted to be waived based on the presence of an automatic sprinkler system, it remains the intent of the Code that the fire separation be constructed such that it stays in place and functions as a barrier against the spread of smoke until the sprinklers are activated.

In the NBC, the term “firestop” refers to measures required to maintain the integrity of fire separations required in a building: “Firestop means a system consisting of a material, component and means of support used to fill gaps between fire separations or between fire separations and other assemblies, or used around items that wholly or partially penetrate a fire separation.”

**Table 1. Cost Comparison of Fireproofing Components of the Two Types of Floor Assembly**

Type of floor assembly	Floor assembly description	Cost (materials and labour) <sup>(1)(2)(3)</sup>	Total cost per 100 m <sup>2</sup>
Minimum 45 min FRR and constructed as an FS, in accordance with Sentence 3.2.1.4.(1)	Two layers of 12.7 mm thick Type X gypsum board with firestop sealant	Gypsum board: \$3,206.50/100 m <sup>2</sup> × 2  Firestop sealant: \$874/40 m	\$7,287
Minimum 1 h FRR, not constructed as an FS, in accordance with Sentences 3.2.2.48.(3) and 3.2.2.51.(3)	Two layers of 15.9 mm thick Type X gypsum board with acoustical sealant	Gypsum board: \$3,066.60/100 m <sup>2</sup> × 2  Acoustical sealant: \$225/40 m	\$6,358
Cost difference per 100 m <sup>2</sup>			\$929

#### Notes to Table 1

(1) Labour rate based on RSMeans data.

(2) Material costs based on RSMeans data and pricing from <https://www.rona.ca/>.

(3) Caulk requirements calculated using The Caulkulator<sup>®</sup> chart from <http://www.phenoseal.com/Caulkulator.aspx>.

#### Cost comparison conclusion

The total cost for the floor assembly conforming to the requirements of Sentence 3.2.1.4.(1) (i.e., having a fire-resistance rating of 45 minutes and constructed as a fire separation) is \$7,287 for 100 m<sup>2</sup>, while the total cost for the assembly conforming to the requirements of Sentences 3.2.2.48.(3) and 3.2.2.51.(3) (i.e., having a fire-resistance rating of one hour and not constructed as a fire separation) is \$6,358 for 100 m<sup>2</sup>, representing a cost difference of \$929 per 100 m<sup>2</sup>. Therefore, the proposed change could potentially save \$929 per 100 m<sup>2</sup> and have a significant impact on project budgets, especially in larger construction projects.

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## Enforcement implications

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The proposed change would enable consistent interpretation and enforcement of Code requirements, which would contribute to the harmonization of fire safety measures and more consistent levels of fire safety performance.

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## Who is affected

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The proposed change would have an impact on Code users (including designers and regulators), as it would affect Code interpretation, building design and Code enforcement work.

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## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

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[\[3.2.1.4.\] 3.2.1.4. \(\[1\] 1\) \[F03-OS1.2\] \[F04-OS1.3\]](#)

[\[3.2.1.4.\] 3.2.1.4. \(\[1\] 1\) \[F03-OP1.2\] \[F04-OP1.3\]](#)