

[Submit a comment](#)

Proposed Change 1872

Code Reference(s):	NFC20 Div.B 2.8.2.11. (first printing) NFC20 Div.B 5.6.4. (first printing)
Subject:	Encapsulated Mass Timber Construction
Title:	Revisions to Protection Requirements for EMTC During Construction
Description:	This proposed change revises the minimum requirements for and exceptions to the encapsulation of mass timber elements.
Related Code Change Request(s):	CCR 1381
Related Proposed Change(s):	PCF 1870, PCF 1879, PCF 1963

This change could potentially affect the following topic areas:

- | | |
|--|---|
| <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 checked="" type="checkbox"/> Construction and Demolition Sites |

Problem

Article 5.6.4.3. of Division B of the 2020 edition of the National Fire Code of Canada (NFC) provides requirements related to the type and degree of encapsulation protection of mass timber elements necessary in encapsulated mass timber construction (EMTC) while the building is under construction. In particular, these requirements mandate that at least 80% of the underside of mass timber floor assemblies be protected by some minimum level of encapsulation (e.g., using one layer of 12.7 mm thick Type X gypsum board).

This proposed change is related to PCFs 1870 and 1963 from the national public review of proposed changes to the 2020 National Model Codes (which ran from October 24, 2023 until December 18, 2023), which described proposed changes to Articles 3.1.6.4.

and 3.1.6.6., respectively, of Division B of the 2020 edition of the National Building Code of Canada (NBC). These NBC Articles address the requirements for and exceptions to the encapsulation of mass timber elements in finished buildings of EMTC. In particular, the Articles permit from 10% to 25% of the surface of mass timber ceilings to be left exposed within a suite.

PCFs 1870 and 1963 included proposed changes, based on several research studies involving mass timber compartment fire scenarios, to allow 100% of the surface of mass timber ceilings within a suite to be exposed.

After considering the comments from the public on PCFs 1870 and 1963, it was recommended that these proposed changes, with some minor modifications, be included in the NBC 2025.

Consequently, there is a need to propose the alignment of the requirements for mass timber protection for ceilings during construction in NFC Article 5.6.4.3. and allow ceilings to be left exposed where no such encapsulation is required in the finished building.

Further, during current EMTC projects, difficulties have been encountered when reconciling the requirements of NFC Article 5.6.4.3. during construction with measures to control moisture and mould affecting the encapsulated wood elements, as well as the materials used for encapsulation.

In aligning the provisions of the NBC and NFC to permit 100% exposed mass timber ceilings during construction, the following impacts of not encapsulating the ceilings must be considered:

- the risk of fire spread to more than one storey during a fire, and
- the need to ensure emergency responders and firefighters can access the fire floor.

Critical elements for reducing and limiting these impacts include:

- development of and compliance with a construction fire safety plan, which may include:
 - managing combustible materials on site,
 - maintaining access to exit routes from and ingress routes to the fire floor, and
 - providing site security (e.g., to reduce the threat of arson) and monitoring of fire hazards.
- reducing or protecting the physical pathways along which fire spreads within a storey or between storeys.

Experience has shown that light wood-frame buildings under construction constructed are highly susceptible to significant loss or collapse in a fire, especially when the passive and active fire protection measures that have been planned for the finished building are not in place. Recent fire research on mass timber buildings using both compartment and construction fire scenarios indicates that mass timber buildings are more structurally resistant to the effect of fire and more difficult to ignite and sustain combustion, especially given the reduced fuel load on a construction site.

Justification

PCFs 1870 and 1963 include proposed changes, based on the most recent fire research, to allow 100% of the underside of each mass timber floor assembly within a suite to be left exposed in the finished building, expanding the NBC provisions related to encapsulation of mass timber elements within buildings permitted to be of EMTC.

The rationales supporting both PCFs 1870 and 1963 explain how recent fire research was performed that supports the proposed changes to the permitted percentage exposure of mass timber elements. With that, this proposed change revises the degree of protection of mass timber ceiling elements in EMTC while a building is under construction. This proposed change would harmonize the NFC requirements with those of the NBC for finished buildings of EMTC.

The NRC report titled, "Large-Scale Fire Tests of a Mass Timber Building Structure for MTDFTP" [1], describes a total of five mass timber compartment fire tests in a large two-storey structure that included varying amounts of exposed mass timber wall, ceiling, floor, beam and column surfaces. Two of the five fire tests used construction site fire scenarios with different levels of fuel loads. Test 3 was conducted in a small (3.2 m × 7.0 m × 3.0 m) compartment on the second storey with a metal garbage can containing a wood crib fuel load, while Test 4 was run in a larger compartment (7.1 m × 7.5 m × 3.0 m), again on the second storey with a more severe moveable fuel load of wood cribs and unprotected light wood-frame partition walls. These relatively small compartments represented a severe fire scenario from the point of view of heat re-radiation between mass timber surfaces and other combustible surfaces, which is a critical aspect for the continued burn of the mass timber surfaces once the movable fuel load is consumed. The window openings of the compartments, located within the protected light frame steel exterior walls, provided a ventilation condition in which a longer fire duration and confinement led to higher plumes being ejected through the openings. This ventilation condition represented a more severe fire scenario compared to an open floor area undergoing construction. Table 1 provides a summary of the tests.

Table 1. Summary of Mass Timber Demonstration Fire Test Program (MTDFTP) Construction Site Fire Compartment Test Configurations

Test No.	Description	Exposed Mass Timber Surfaces	Percent of Exposed Mass Timber	Results
3	Construction site: Garbage bin fire source	CLT floor	100%	The garbage bin fire grew slowly, causing a flashover at 23 min. The fire plumes exiting from the window were short lived for only 1 min, reaching a peak height of 6 m for only a few seconds. No flames were visible on the CLT ceiling, wall or floor by 25 min. By 30 min, the temperatures in the compartment dropped to below 160°C. The remaining debris in the garbage bin was completely consumed by 35 min.
		CLT ceiling	100%	
		CLT exit stair wall	16% of total perimeter wall area	

4	Construction site: Wood crib and light wood-framing fire source	CLT floor	100%	The fire took approximately 8 min to fully involve the compartment, followed by a 10-min period of fully developed burning with plumes exiting from the windows, reaching over 6 m high. The fire started to decay at 18 min when most of the added fuel was consumed or had fallen onto the floor. The flaming combustion was quickly reduced on the mass timber elements and the fire plumes ceased to exit from the openings by 19 min. As the fire continued to decay, visible flaming on the mass timber elements mostly ceased after 30 min. The compartment temperatures decreased to 300–400°C at 60 min. However, the fire did not reach full extinguishment: the floor remained glowing, the mass timber elements exhibited intermittent small flames in the joints and junctions, and the compartment temperatures ascended to 400–600°C by the end of the test. Due to the smoke being blown towards the occupied buildings on the campus, the test had to be terminated at 148 min.
		DLT ceiling	100%	
		Glulam beams and columns	25% of total perimeter wall area	

Both fire test scenarios had 100% of the ceilings exposed, yet both design fires reached the decay phase within 60 min with no fire department intervention which, in a real construction scenario, would occur following site personnel detection. These results could suggest that other fire safety measures may be an option to encapsulation during construction while appropriately reducing the risk of fire spread to more than one storey.

Consideration of the Fire Safety Concepts Tree

The new fire safety strategies proposed in PCF 1872 for EMTC buildings are built upon, supplement, or provide options to the existing fire safety strategies in NFC Subsections 5.6.1., 5.6.3. and 5.6.4. Overall, these combined fire protection strategies for construction and demolition sites provide a holistic and reliability-structured approach to limit the escalation of fire and have generally been developed in the context of the Fire Safety Concepts Tree (FSCT) described in NFPA 550, "Guide to the Fire Safety Concepts Tree." The FSCT provides a structured means to examine fire safety strategies in a risk reduction context, and in consideration of the reliability of sets of measures (for more details, see Figure 4.3 in NFPA 550).

Two key objectives of the FSCT are:

1. Prevent fire ignition: reduce the probability of fire occurring
2. Manage fire impact: reduce the consequence of the fire

Table 2 categorizes and annotates select NFC provisions relative to the objectives and sub-objectives of the FSCT.

Table 2. NFC Provisions (Existing and Proposed) Relative to the Fire Safety Concepts Tree

FSCT Objective and Sub-objective(s), as applicable	Mitigation Strategy Proposed to be Examined (NFC provision, existing or proposed)⁽¹⁾
1. Prevent Fire Ignition	

Control Heat Energy Sources	5.6.1.7. Hot Surface Applications 5.6.1.8. Ignition Sources 5.6.1.9. Building Services at Demolition Sites 5.6.1.14. Watch 5.6.1.15. Smoking Restrictions 5.6.3.2. Smoking Restrictions (MR+MT) 5.6.3.8. Site Security (MR+MT)
Control Source-Fuel Interactions	5.6.1.3. Fire Safety Plan 5.6.1.8. Ignition Sources 5.6.1.10. Fuel Supply Installation 5.6.1.14. Watch 5.6.1.18. Storage and Use of Dangerous Goods 5.6.1.19. Temporary Enclosures 5.6.3.8. Site Security (MR+MT)
Control Fuel	5.6.1.18. Storage and Use of Dangerous Goods 5.6.1.20. Disposal of Combustible Refuse 5.6.3.4. Disposal of Combustible Refuse (MR+MT) 5.6.4.7.-2025 Indoor Storage of Combustible Materials (MT-p)
2. Manage Fire Impact	
Manage Fire — Control Combustion Process	5.6.4.7.-2025 Indoor Storage of Combustible Materials (MT-p)
Manage Fire — Suppress Fire	5.6.1.4. Access for Firefighting 5.6.1.5. Portable Extinguishers 5.6.1.6. Standpipe Systems 5.6.3.3. Site Identification (MR+MT) 5.6.3.5. Water Supply (MR+MT) 5.6.3.6. Hydrant Access (MR+MT) 5.6.4.2. Standpipe Installation (MT-e) 5.6.4.6.-2025 Progressive Sprinklering (MT-p)
Manage Fire — Control Fire by Construction	5.6.4.4.-2025 Protective Encapsulation (MT-e) 5.6.4.5.-2025 Alternative Protection Measures (MT-p)
Manage Exposed — Limit Amount Exposed	5.6.1.2. Measures to Mitigate Fire Spread to Adjacent Buildings
Manage Exposed — Safeguard Exposed	5.6.1.12. Fire Separations in Partly Occupied Buildings 5.6.1.13. Protection during Shutdown 5.6.1.16. Provision for Egress 5.6.1.17. Fire Warning 5.6.3.7. Construction Access (MR+MT) 5.6.4.3.-2025 Measures to Reduce the Risk of Fire Spread Between Storeys (MT-p)

Note to Table 2:

(1) The abbreviations used in the table have the following meanings:

MR+MT = midrise and mass timber

MT-e = mass timber — existing

MT-p = mass timber — proposed

Organization of mitigation strategies based on the FSCT allows for consideration of the holistic approach to control fire initiation (ignition), growth and spread. These strategies can also be considered in the context of degrees of reliability in limiting fire escalation. For example, certain strategies limit the probability of fire initiation; however, where ignition occurs, additional measures then limit early fire growth. The probability of fire escalation is reduced at each stage of fire development by individual or groups of strategies. The proposed requirements build upon or provide options to the existing strategies to more specifically address the fire hazards associated with mass timber building construction and demolition sites.

Proposed Article 5.6.4.3.-2025 on Measures to Reduce the Risk of Fire Spread Between Storeys

This proposed Article addresses the reduction of risk of fire spread to more than one storey and includes a reference to both prescriptive and performance-based approaches applicable to all EMTC buildings under construction.

This proposed Article is analogous to the current NFC Article 5.6.1.2. for measures to mitigate fire spread to adjacent buildings, but includes an explicit prescriptive path as well. This proposed Article allows for the protection and hazard management approaches in Articles 5.6.4.4. to 5.6.4.7.-2025, while also allowing for the option of a fire risk assessment being conducted to determine the level of fire protection required on the site.

The proposed accompanying Note provides recommendations related to the professionals conducting the risk assessment.

Proposed Revision to Sentence 5.6.4.3.(2) (Now 5.6.4.4.(2)-2025) on Contiguous Storeys

A minor editorial revision is also proposed to clarify the intent of the existing requirement in Sentence 5.6.4.4.(2)-2025 regarding the four uppermost storeys.

Because this proposed change to the NFC aligns the requirements with the proposed changes to the NBC in PCFs 1870 and 1963, builders would not need to encapsulate the underside of floors during construction, only to remove the encapsulation when the building is finished, as would be permitted in the NBC as a result of PCFs 1870 and 1963.

Proposed Revision to Sentence 5.6.4.3.(3) (Now 5.6.4.4.(3)-2025) on Encapsulation Material

This minor revision aligns the existing provision on expanding the application methods for gypsum board encapsulation materials with the proposed changes to the NBC as a result of PCF 1963.

Proposed Article 5.6.4.5.-2025 on Alternative Protection Measures

Proposed Article 5.6.4.5.-2025 introduces an alternative to the requirements described in Clause 5.6.4.4.(1)(a)-2025, for protective encapsulation, and in Article 5.6.4.6.-2025, for progressive sprinklering. Article 5.6.4.5.-2025 introduces new fire protection measures to address safety during construction. These new measures are included in the following provisions:

- Sentence (2): the proposed measures for the protection of openings through

floor assemblies intend to limit the potential for fire spread through the openings to upper storeys for a minimum of 30 min. This 30-min value aligns with the 15-min fire performance required of fire block materials (see NBC Article 3.1.11.7.), wherein a 12.7 mm thick gypsum board and a 12.5 mm thick phenolic bonded plywood board are each deemed to remain in place and prevent the passage of flames for at least 15 min under standard fire exposure. The accompanying Note also explains that large openings may require additional fire protection.

- Sentence (3): the protection of perimeter joints between the edge of floor assemblies and exterior walls to limit the potential for fire spread through the joint to upper storeys.
- Sentences (4) and (5): the installation of hose stations with hose lines on standpipe systems for use in extinguishing or controlling any fires that may occur.
- Sentences (6) and (7): a person to conduct a fire watch on all storeys at certain times during the workday and afterwards to ensure the exits are kept clear and ensure the fire safety plan is followed. An explanatory Note provides recommendations regarding the knowledge and skill level of the person conducting the watch and considerations to be addressed by the construction fire safety plan, if necessary, such as the scheduled intervals of supervision of the site and the overall construction works during nonworking hours.

Proposed Sentence 5.6.4.5.(8)-2025 on Sequence of Implementation of Alternative Fire Protection Measures

Proposed Sentence 5.6.4.5.(8)-2025 is intended to be applied in conjunction with the other proposed requirements for protection described in that Article.

This involves a different approach than the current permission that allows the upper four unprotected contiguous storeys, in Article 5.6.4.4.-2025 and proposed Article 5.6.4.6.-2025. With that, once the fifth storey ceiling is installed, all storeys, including the first four storeys would then be required to use the alternative protection measures.

Proposed Article 5.6.4.6.-2025 on Progressive Sprinklering

Proposed Article 5.6.4.6.-2025 introduces an alternative to the requirements described in Clauses 5.6.4.4.(1)(a), (c) and (d)-2025 for protective encapsulation and in Article 5.6.4.5.-2025 for alternative protection measures. Proposed Article 5.6.4.6.-2025 introduces an alternative approach to the passive fire protection requirements by providing for an operational automatic sprinkler system that is installed progressively during construction in buildings of EMTC.

Proposed Article 5.6.4.7.-2025 on Indoor Storage of Combustible Materials

This proposed Article aims to manage the amount of combustible materials in discrete piles of limited sizes, as well as place restrictions on the relative locations of these piles. This provision aims to reduce the potential for fire spreading to multiple piles or from other ignition sources, without affecting the safe egress of occupants and while allowing for safe firefighting staging tactics.

Sentence (1): In line with current practices, the proposed limit on footprint area of an individual pile of combustible materials is representative of a standard wooden crate size (1.2 m × 2.4 m) used to transport materials.

Clause (2)(a): The proposed 3 m clearance between storage of combustible materials on a storey and the outer edge of the floor assembly has been established based on a study involving a radiant heat transfer analysis from the flame extension of the fire plume from a fire on the storey directly below the storey containing the storage.

The analysis assumed a vertical exposing plane on the upper storey, perpendicular to the slab edge, 20 m in length and extending the full 4 m storey height to represent the plume flame extension from below, reaching to and beyond the next storey above. Testing and studies of flame extension from openings in a compartment enclosure has shown a reduction of flame temperature away from the opening as a function of the horizontal distance, as well as a reduced emissivity as a function of the flame depth measured from the plane of the wall. A sensitivity study was conducted examining the radiant heat emissive power of the 20 m × 4 m plane as a function of temperature and emissivity, and the results from this study were then used to determine acceptable distances at which a critical heat flux of 30 kW/m² (approximate autoignition heat flux for wood) would not be reached.

In establishing an acceptable distance, the study considered heat flux measurements of 30 kW/m² in one of the construction site tests as part of the NRC report [1], as well as the acceptance and calibration criteria (35 kW/m² and 45 kW/m², respectively) used with respect to the NBC referenced standard CAN/ULC-S134, "Standard Method of Fire Test of Exterior Wall Assemblies," for exterior flame exposure.

This information is supportive of an upper emissive heat flux of approximately 50 kW/m² to establish acceptable corresponding distances from the sensitivity study. These distances ranged from 0 m to 2.6 m. Therefore, based on these results, 3 m has been identified as an acceptable distance for clearance between storage of combustible materials and the outer edge of the floor assembly.

Clauses (2)(b), (c) and (d): The proposed 3 m separation distance between individual piles is somewhat analogous to a similar provision for controlling the effects of fuels in proposed Sentence 3.1.6.4.(4)-2025 (PCF 1870), which would permit two facing or adjacent exposed mass timber walls within a suite provided a 4.5 m horizontal distance is maintained between them. A distance of 3 m between storage piles as well as between piles and exits is considered to provide a reasonable level of protection in this situation and maintains access to exits to facilitate the safe egress of occupants as well as staging for firefighting operations. The 3 m dimension is also applied elsewhere in the NFC and NBC where limits are placed on the distance between storage and other elements (e.g., wall openings, flammable liquid storage and exits) in occupied buildings.

Sentence (3): A clearance of 1.5 m is proposed to be maintained between the top of storage and the underside of the lowest plane of any beam, floor or roof assembly above the storage to permit hose streams to be directed onto the top of storage, which is 50% greater than the NFC provision (Sentence 3.2.2.3.(2)) for 1 m clearance above the indoor storage in a building that is not sprinklered.

Explanatory Note: Proposed Note A-5.6.4.6.-2025 provides further insight into the accumulation of short-term transient storage which may be necessary for daily construction activities and connects the management of combustible materials to the existing NFC provisions.

Reference

[1] J. Su, E. Gibbs, M. Weinfurter, P.-S. Lafrance, K. Gratton, A. Frade, and P. Leroux. "Large-scale fire tests of a mass timber building structure for MTDFTP". National Research Council of Canada. Report No: A1-018329.1/A1-018487.1 (Ottawa, Canada; May 2023).

PROPOSED CHANGE AS SUBMITTED TO FALL 2023 PUBLIC REVIEW

[2.8.2.11.] 2.8.2.11. Construction and Demolition Sites

[5.6.4.] 5.6.4. Additional Requirements for Buildings of Encapsulated Mass Timber Construction

[5.6.4.1.] 5.6.4.1. Application

[5.6.4.2.] 5.6.4.2. Standpipe Installation

[5.6.4.3.] 5.6.4.3. Protective Encapsulation and Fire Protection

- [1] 1) Except as provided in ~~Sentences (2) and (3)~~Sentences (2) to (4) and (6)-2025, to address safety during construction, a protective encapsulation material or an assembly of materials providing an *encapsulation rating* of not less than 25 min, as determined in accordance with Sentence 3.1.6.5.(1) of Division B of the NBC, shall be installed
- [a] a) such that not more than 20% of the area of the underside of each mass timber floor assembly on each *storey* is exposed during construction,
 - [b] b) on the interior side of stairways required by Sentence 5.6.3.7.(3) and of *vertical service spaces* where the enclosures are constructed of mass timber elements,
 - [c] c) on each face of solid lumber or mass timber *partitions* not less than 38 mm thick and on each face of *partitions* containing wood framing as permitted by Article 3.1.6.15. of Division B of the NBC, and
 - [d] d) such that not more than 35% of the total area of structural mass timber walls within the *storey* is exposed during construction.

(See Note A-5.6.4.3.(1).)

[2] --) Except as provided in Sentence (5)-2025, a protective encapsulation material or assembly of materials need not be installed as described in

Clause (1)(a), provided

- [a] --) penetrations or openings through the floor assembly on any storey are
 - [i] --) protected with a firestop conforming to Sentence 3.1.9.1.(1) of Division B of the NBC,
 - [ii] --) filled with noncombustible insulation that is supported in place, or
 - [iii] --) protected, from the top of the floor assembly, with a single layer of not less than 12.7 mm thick Type X gypsum board mechanically fastened to not less than 12.7 mm thick plywood or OSB with the gypsum board facing the penetration (see Note A-5.6.4.3.(2)(a)-2025),
- [b] --) joints located in a horizontal plane between the floor and an exterior wall on any storey are
 - [i] --) protected with a firestop conforming to Sentence 3.1.8.3.(4) of Division B of the NBC, or
 - [ii] --) filled with noncombustible insulation that is supported in place,
- [c] --) a standpipe system is installed in accordance with Articles 5.6.1.6. and 5.6.4.2., and is provided with hose stations for occupant use that are equipped with a hose line having
 - [i] --) a diameter of either 25 mm or 38 mm, and
 - [ii] --) a length sufficient to cover all parts of the storey with a hose stream of not less than 5 m (see Note A-5.6.4.3.(2)(c)-2025), and
- [d] --) a fire watch is conducted on all storeys
 - [i] --) at intervals of not more than 1 h when workers are present in the building, and
 - [ii] --) not less than 1 h after workers leave the building (see Note A-5.6.4.3.(2)(d)-2025).

[3] --) Except as provided in Sentence (4)-2025, a protective encapsulation material or assembly of materials need not be installed as described in Clauses (1)(a), (c) and (d), provided an automatic sprinkler system

- [a] --) is progressively installed during construction in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems" (see Note A-5.6.4.3.(3)(a)), and
- [b] --) is in an operable condition at all times on any storey where it is not actively being worked on, until the automatic sprinkler system is completed.

[4] 2) ~~Not more than 4~~ The four uppermost contiguous storeys are permitted to be unprotected as required by ~~need not conform to the requirements of Sentence (1) or the conditions of Sentence (3)-2025~~ during construction.

[5] --) The first four storeys need not conform to the conditions of Sentence (2)-2025 during construction, until the ceiling assembly of the fifth storey is installed. (See Note A-5.6.4.3.(5)-2025.)

- [6] 3)** The encapsulation material or assembly of materials used to meet the requirements of Sentence (1) is permitted to consist of a single layer of Type X gypsum board not less than 12.7 mm thick conforming to Clauses 3.1.6.6.(4)(a) and (c)-2025 of Division B of the NBC (PCF 1963). ~~Clauses 3.1.6.6.(2)(a), (c) and (d) of Division B of the NBC.~~

Note A-5.6.4.3.(2)(a)-2025

Until permanent protection is provided, the fire protection of any penetrations or openings through the floor assembly can be temporary. Beyond those described in Clause 5.6.4.3.(2)(a)-2025, other forms of protection should have a noncombustible or other protective layer that will resist fire for a minimum of 30 min. Furthermore, any such protective layer should be structurally adequate over the penetrations or openings for the safety of occupants.

The fire protection of large penetrations or openings through floor assemblies, such as openings associated with convenience stairs, elevators or interconnected floor spaces, should address additional fire protection considerations, including structural support.

Note A-5.6.4.3.(2)(c)-2025

The length of hose should be sufficient to allow for adequate nozzle pressure and will depend on the chosen hose diameter. Typically, 38 mm diameter hose should have a length of not more than 30.5 m.

If construction reaches a height at which the public waterworks system can no longer provide the required flow and pressure, a temporary or permanent fire pump must be installed to adequately protect the uppermost storey of the building, unless the fire safety plan specifies an alternative approach that is permitted by the authority having jurisdiction.

Note A-5.6.4.3.(2)(d)-2025

The person conducting the fire watch should be familiar with all fire safety features of the building, including the fire safety plan, as provided in conformance with Section 2.8.

Note A-5.6.4.3.(3)(a)-2025

Even though NFPA 13, "Standard for the Installation of Sprinkler Systems", does not include specific provisions for installation of sprinklers during construction, it is expected that the requirements of NFPA 13 will be fully implemented as appropriate for the conditions that exist in the building under construction.

Note A-5.6.4.3.(5)-2025

It is intended that all storeys meet the conditions of Sentence 5.6.4.3.(2)-2025 once the ceiling assembly of the fifth storey has been installed.

REVISED PROPOSED CHANGE FOLLOWING FALL 2023 PUBLIC REVIEW

[2.8.2.11.] 2.8.2.11. Construction and Demolition Sites

(See Note A-5.6.4.7.)

- [1] 1) Except as required in Sentence (2), prior to the commencement of construction, alteration or demolition operations, a fire safety plan shall be prepared for the site that includes
- [a] a) the designation and organization of site personnel to carry out fire safety duties, including a fire watch service if applicable (see also Sentences 5.6.4.5.(6) and (7)),
 - [b] b) the emergency procedures to be followed in the event of a fire, including
 - [i] i) initiating a fire warning,
 - [ii] ii) notifying the fire department,
 - [iii] iii) instructing site personnel on the procedures to be followed once the warning has been initiated, and
 - [iv] iv) confining, controlling and extinguishing the fire,
 - [c] c) measures for controlling fire hazards in and around the *building* (see Note A-2.8.2.11.(1)(c)), and
 - [d] d) a maintenance procedure for firefighting measures required in Section 5.6.
- [2] 2) Where construction, alteration or demolition operations are carried out in an existing *building* that is required to have a fire safety plan conforming to this Section, the fire safety plan shall take into account the changes occurring to the *building*.

[5.6.4.] 5.6.4. Additional Requirements for Buildings of Encapsulated Mass Timber Construction

[5.6.4.1.] 5.6.4.1. Application

[5.6.4.2.] 5.6.4.2. Standpipe Installation

[5.6.4.3.] --- Measures to Reduce the Risk of Fire Spread Between Storeys (See Note A-5.6.4.3.-2025.)

- [1] --) To reduce the risk of fire spread to more than one storey of a building or part of a building undergoing construction, alteration or demolition operations, measures shall be taken that
- [a] --) conform to Articles 5.6.4.4. to 5.6.4.7., or
 - [b] --) employ the methods and materials that are deemed necessary following a risk assessment as part of a fire safety plan.

[5.6.4.4.] 5.6.4.3. Protective Encapsulation ~~and Fire Protection~~

- [1] 1)** Except as provided in Sentences (2) ~~to~~ ~~and~~ (4) ~~3~~ and Articles 5.6.4.5. and 5.6.4.6.(6)-2025, to address safety during construction, a protective encapsulation material or an assembly of materials providing an *encapsulation rating* of not less than 25 min, as determined in accordance with Sentence 3.1.6.5.(1) of Division B of the NBC, shall be installed
- [a] a) such that not more than 20% of the area of the underside of each mass timber floor assembly on each *storey* is exposed during construction,
 - [b] b) on the interior side of stairways required by Sentence 5.6.3.7.(3) and of *vertical service spaces* where the enclosures are constructed of mass timber elements,
 - [c] c) on each face of solid lumber or mass timber *partitions* not less than 38 mm thick and on each face of *partitions* containing wood framing as permitted by Article 3.1.6.15. of Division B of the NBC, and
 - [d] d) such that not more than 35% of the total area of structural mass timber walls within the *storey* is exposed during construction.
- (See Note A-5.6.4.34.(1).)
- [2] 2)** The four uppermost *storeys* need not conform to the requirements of Sentence (1) ~~or the conditions of Sentence (3)-2025~~ during construction.
- [3] 3)** The encapsulation material or assembly of materials used to meet the requirements of Sentence (1) is permitted to consist of a single layer of Type X gypsum board not less than 12.7 mm thick conforming to Clauses 3.1.6.6.(4)(a) and (c)-2025 of Division B of the NBC (PCF 1963).

[5.6.4.5.] --- Alternative Protection Measures

- [1] --)** Except as provided in Sentence (5) ~~8~~, ~~the~~ protective encapsulation material or assembly of materials ~~need not be installed as~~ described in Clause 5.6.4.4.(1)(a) ~~7~~, and the progressive sprinklering described in Article 5.6.4.6. need not be provided where the conditions of Sentences (2) to (7) are met.
- [2] --)** ~~p~~Penetrations or openings through the floor assembly on any *storey* ~~are~~ shall be
- [a] --) protected with a firestop conforming to Sentence 3.1.9.1.(1) of Division B of the NBC,
 - [b] --) filled with noncombustible insulation that is supported in place, or
 - [c] --) protected, from the top of the floor assembly, with a single layer of not less than 12.7 mm thick Type X gypsum board mechanically fastened to not less than 12.7 mm thick plywood or OSB with the gypsum board facing the penetration.
- (~~s~~See Note A-5.6.4.35.(2)(a).)
- [3] --)** ~~j~~oints located in a horizontal plane between the floor and an exterior wall on any *storey* ~~are~~ shall be
- [a] --) protected with a firestop conforming to Sentence 3.1.8.3.(4) of

Division B of the NBC, or

[b] --) filled with noncombustible insulation that is supported in place.

[4] --) ~~a~~ A standpipe system ~~is~~ shall be installed in accordance with Articles 5.6.1.6. and 5.6.4.2.,

[5] --) The standpipe system described in Sentence (4) shall be ~~and is~~ provided with hose stations ~~for occupant use~~ that are equipped with a hose line having

[a] --) a diameter of either 25 mm or 38 mm, and

[b] --) a length sufficient to cover all parts of the storey with a hose stream of not less than 5 m.

~~(See Note A-5.6.4.35.(25)(c).), and~~

[6] --) A person shall be employed to conduct a fire watch ~~is conducted~~ on all storeys with tours

[a] --) at intervals of not more than 1 h when workers are present in the building, and

[b] --) not less than 1 h and no more than 2 h after ~~workers leave the building~~ daily work is complete.

~~(see Note A-5.6.4.3.(2)(d)-2025).~~

[7] --) The person employed to conduct the fire watch described in Sentence (6) shall be familiar with all fire safety features, including

[a] --) the fire safety plan as provided in conformance with Section 2.8., and

[b] --) the location and condition of exits.

~~(See Note A-5.6.4.5.(7).)~~

[8] --) The first four storeys need not conform to the conditions of Sentences ~~(2) to (7)~~ during construction, until the ~~ceiling~~ structural floor assembly ~~of above~~ the fifth storey ~~is~~ has been installed ~~constructed~~. (See Note A-5.6.4.35.(58)-2025.)

[5.6.4.6.] --- Progressive Sprinklering

[1] --) Except as provided in Sentence ~~(42)~~-2025, ~~at~~ the protective encapsulation material or assembly of materials ~~need not be installed as~~ described in Clauses 5.6.4.4.(1)(a), (c) and (d), ~~and the alternative protection measures described in Article 5.6.4.5. need not be~~ provided where an automatic sprinkler system

[a] --) is progressively installed during construction in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems" (see Note A-5.6.4.36.(31)(a)), and

[b] --) is in an operable condition at all times on any storey where it is not actively being worked on, until the permanent automatic sprinkler system is completed.

[2] **2)** The four uppermost storeys need not conform to the requirements of Sentence (1) ~~or the conditions of Sentence (3)-2025~~ during construction.

[5.6.4.7.] --- Indoor Storage of Combustible Materials**(See Note A-5.6.4.7.)**

- [1] --)** Combustible materials that are stored indoors shall be arranged in individual piles not exceeding 1.2 m in width and 2.4 m in length.
- [2] --)** A clearance of not less than 3 m shall be maintained between an individual pile of combustible materials described in Sentence (1) and
- [a] --) the outer edge of the floor assembly,
 - [b] --) any exit serving the storey,
 - [c] --) any individual pile of combustible materials, and
 - [d] --) any ignition source.
- [3] --)** A clearance of not less than 1.5 m shall be maintained between the top of an individual pile of combustible materials described in Sentence (1) and the underside of the lowest plane of any beam, floor or roof assembly.

Note A-5.6.4.3.-2025

As part of a fire safety plan, the methods and materials deemed necessary following a risk assessment can be used to reduce the risk of fire spread between storeys. Articles 5.6.4.4. to 5.6.4.7., together, provide solutions deemed acceptable for reducing this risk.

The risk assessment performed as part of the fire safety plan should be carried out by an experienced practitioner who is qualified in developing, selecting and using fire risk assessment methodologies. A qualified practitioner may be a registered professional engineer, certified fire protection specialist, or other suitably qualified and experienced professional.

Note A-5.6.4.34.(1)

The extent to which the structure under construction may need to be protected in accordance with Sentence 5.6.4.3.(1) may vary based on the fire safety plan. The protective encapsulation material or assembly of materials is intended to limit the potential for fire spread within the storey as well as to limit the potential for fire spread to upper storeys, thereby also limiting the potential exposure of adjacent structures to fire.

Note A-5.6.4.35.(2)(a)

Until permanent protection is provided, the fire protection of any penetrations or openings through the floor assembly can be temporary. Beyond those described in ~~Sentence~~Clause 5.6.4.35.(2)(a), other forms of protection should have a noncombustible or other ~~protective~~ layer that will ~~resist~~provide protection from fire for a minimum of 30 min. Furthermore, any such protective layer should be structurally adequate over the penetrations or openings for the safety of occupants.

~~The fire protection of~~ Large penetrations or openings through floor assemblies, such as openings associated with convenience stairs, elevators or interconnected floor spaces, should address may require additional fire protection ~~considerations~~, including structural support.

Note A-5.6.4.35.(25)(e)

The length of hose should be sufficient to allow for adequate nozzle pressure and will depend on the chosen hose diameter. Typically, 38 mm diameter hose should have a length of not more than 30.5 m.

If construction reaches a height at which the public waterworks system can no longer provide the required flow and pressure, a temporary or permanent fire pump must be installed to adequately protect the uppermost storey of the building, unless the fire safety plan specifies an alternative approach that is permitted by the authority having jurisdiction.

The fire safety plan is intended to address any temporary provisions implemented during construction, including connections to water supplies and fire department connection locations.

Note A-5.6.4.35.(27)(d)

~~The person conducting the fire watch should be familiar with all fire safety features of the building, including the fire safety plan, as provided in conformance with Section 2.8.~~

The person employed to conduct the fire watch should be trained in the use of fire extinguishing equipment, as established in the fire safety plan conforming to Section 2.8.

The need for supervision of the site and overall construction works at scheduled intervals during non-working hours, including weekends, should be determined as part of the fire safety plan, taking into consideration factors such as site security and local conditions.

Note A-5.6.4.35.(58)

It is intended that all storeys meet the conditions of Sentences 5.6.4.35.(2) ~~to (7)~~ once the ~~ceiling~~structural floor assembly ~~of above~~ the fifth storey has been ~~installed~~constructed.

Note A-5.6.4.36.(31)(a)

Even though NFPA 13, "Standard for the Installation of Sprinkler Systems", does not include specific provisions for installation of sprinklers during construction, it is expected that the requirements of NFPA 13 will be fully implemented as appropriate for the conditions that exist in the building under construction.

Note A-5.6.4.7.

The short-term and transient accumulation and storage of combustible materials that are necessary for day-to-day construction activities may not constitute an undue fire hazard with respect to the placement of the materials. Nevertheless, the management of combustible materials and refuse, including their removal and disposal, must be carried out in accordance with Subsection 2.4.1. and Articles 5.6.1.20. and 5.6.3.4.

Impact analysis

This proposed change would introduce an option to allow 100% of the surface of the underside of each mass timber floor assembly to be exposed during construction. As noted above, Article 5.6.4.3. of Division B of the NFC 2020 mandates that at least 80% of the underside of mass timber floor assemblies be protected by a minimum level of encapsulation (e.g., using one layer of 12.7 mm thick Type X gypsum board).

As a result of the proposed increase in exposed ceiling construction, risk of fire growth and extended duration of flaming combustion also increases, which can contribute to spread within the storey and between storeys.

A more holistic approach is warranted and is being proposed in these changes with respect to addressing such risks from both a performance- and prescriptive-based perspective. This approach is somewhat analogous to what is already intended by NFC Article 5.6.1.2. with respect to addressing fire spread from construction sites to adjacent properties.

Table 3 provides a list of the proposed changes to the NFC, including the intent of the changes as related to managing/reducing the risk of fire during construction.

Table 3. Proposed Changes Related to Course of Construction Fires in EMTC

Proposed Change	Intent
Holistic requirement for performance-based fire risk assessment or use of prescriptive acceptable solutions to limit fire spread between storeys	Establish a fundamental approach to risk assessment and deemed-to-comply solutions
Fire blocking/firestopping of floor openings or joints between assemblies	Reduce fire spread between storeys
Installation of standpipe hoselines	Reduce fire spread Facilitate emergency operations
Fire watch/site security	Reduce/manage sources of ignition Ensure compliance with fire safety plan during construction
Progressive sprinkler protection	Reduce fire growth Facilitate emergency operations
Rules for storage of combustible materials	Reduce initial fuel package Reduce fire spread within a storey and between storeys Maintain clear and unobstructed exit/ingress paths for occupants and emergency responders

This proposed change provides additional options for fire protection during building construction, which may reduce costs in some instances as well as the need for extensive oversight from the authority having jurisdiction. As the existing compliance options (protective encapsulation) remain in the NFC, this proposed change would not entail any additional costs should that option be used.

By aligning the NFC requirements for the protection of mass timber elements during construction with those proposed for the NBC 2025 for the finished building, the expectation is that costs would either remain the same or be reduced due to the harmonization of requirements.

As the installation of encapsulation materials during the construction process can be physically challenging, having the option not to install encapsulation materials could help avoid issues related to:

- moisture and mould,
- costs of fixing moisture-related damage, and
- creation of waste,

while maintaining an acceptable level of fire safety.

Enforcement implications

There are no anticipated enforcement implications as this proposed change could be enforced by the existing Code enforcement infrastructure.

Who is affected

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

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

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[2.8.2.11.] 2.8.2.11. ([1] 1)
[F11,F13,F12-OS1.2,OS1.5] [F01,F82-OS1.1] [F02,F82-OS1.2]

[2.8.2.11.] 2.8.2.11. ([1] 1)
[F13,F12-OP1.2] [F01,F82-OP1.1] [F02,F82-OP1.2]

[2.8.2.11.] 2.8.2.11. ([2] 2) no attributions

[5.6.4.1.] 5.6.4.1. ([1] 1) no attributions

[5.6.4.2.] 5.6.4.2. ([1] 1) [F02,F12-OS1.2]

[5.6.4.2.] 5.6.4.2. ([1] 1) [F02,F12-OP1.2]

[5.6.4.2.] 5.6.4.2. ([2] 2) [F02,F12-OS1.2]

[5.6.4.2.] 5.6.4.2. ([2] 2) [F02,F12-OP1.2]

[5.6.4.2.] 5.6.4.2. ([3] 3) [F02,F12-OS1.2]

[5.6.4.2.] 5.6.4.2. ([3] 3) [F02,F12-OP1.2]

[5.6.4.2.] 5.6.4.2. ([4] 4) [F02,F12-OS1.2]

[5.6.4.2.] 5.6.4.2. ([4] 4) [F02,F12-OP1.2]

[5.6.4.2.] 5.6.4.2. ([5] 5) no attributions

[5.6.4.3.] -- ([1] --) [F02,F03-OS1.2]

Intent 1:

To limit the probability that, as a result of the construction or alteration of the building on a floor area, a fire would grow uncontrolled and spread to upper storeys of the building, which could lead to harm to persons.

[5.6.4.3.] -- ([1] --) [F05-OS1.5]

Intent 1:

To limit the probability that, as a result of the construction or alteration of the building on a floor area, a fire would grow uncontrolled and spread to upper storeys of the building, which could lead to persons being delayed in or impeded from moving to a safe place during an emergency.

[5.6.4.3.] -- ([1] --) [F02,F03-OP1.2]

Intent 1:

To limit the probability that, as a result of the construction or alteration of the building on a floor area, a fire would grow uncontrolled and spread to upper storeys of the building, which could lead to damage to the building.

[5.6.4.3.] -- ([1] --) (a)

Intent 1:

To direct Code users to Articles 5.6.4.4. to 5.6.4.7. for additional protection requirements for buildings of encapsulated mass timber construction undergoing construction, alteration or demolition operations.

[5.6.4.3.] -- ([1] --) (b)

Intent 1:

To clarify that a fire risk assessment is to be undertaken and measures identified to minimize the risks as part of the fire safety plan.

[5.6.4.4.] 5.6.4.3. ([1] 1) [F02-OS1.2]

[5.6.4.4.] 5.6.4.3. ([1] 1) [F02-OP1.2]~~**[5.6.4.4.] 5.6.4.3. ([1] 1) [F02-OP3.1]**~~

~~Intent 1:-~~

~~To limit the probability that mass timber elements will contribute to a fire, which could lead to the spread of fire from the building to an adjacent building or facility, which could lead to damage to adjacent buildings or facilities.~~

[5.6.4.4. 5.6.4.6.] 5.6.4.3. ([2 2] 2) no attributions

Intent 1:

To exempt ~~certain floors~~ the four uppermost storeys of the building under construction from the application of Sentence 5.6.4.3.(1), on the basis that it is impractical to ~~apply Sentence 5.6.4.3.(1) to all floors of a building during~~ install such protection on the uppermost storeys in the early stage of construction.

[5.6.4.4.] 5.6.4.3. ([3] 3) no attributions

Intent 1:

To ~~permit~~ exempt not less than 12.7 mm Type X gypsum board ~~to be used as the encapsulation material~~ from the application of Sentence 5.6.4.4.(1), if certain conditions are met, on the basis that its performance is considered equivalent to the encapsulation rating ~~required by Sentence 5.6.4.3.(1).~~

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

Intent 1:

To limit the probability that mass timber elements will contribute to a fire, which could lead to the spread of fire, which could lead to harm to persons.

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

Intent 1:

To limit the probability that mass timber elements will contribute to a fire, which could lead to the spread of fire, which could lead to damage to the building or facility.

[5.6.4.5.] -- (--) no attributions

Intent 1:

To exempt the underside of a mass timber floor assembly from the ~~requirements described in Clause 5.6.4.3.(1)(a)~~ installation of a protective encapsulation material or an assembly of materials providing an encapsulation rating, and to provide an exemption from the progressive sprinklering requirements of Article 5.6.4.6., if certain conditions are met, on the basis that the ~~performance~~ fire protection measures

are considered equivalent to the encapsulation rating ~~required by Sentence 5.6.4.3.(1)~~.

[5.6.4.5.] -- ([2] --) [F03-OS1.2]

Intent 1:

To limit the probability that a fire will spread through penetrations or openings through the floor assembly to upper storeys, which could lead to the spread of fire in the building, which could lead to harm to persons.

[5.6.4.5.] -- ([2] --) [F03-OP1.2]

Intent 1:

To limit the probability that a fire will spread through penetrations or openings through the floor assembly to upper storeys, which could lead to the spread of fire in the building, which could lead to damage to the building or facility.

[5.6.4.5.] -- ([3] --) [F03-OS1.2]

Intent 1:

To limit the probability that a fire will spread through the joints between the floor and an exterior wall, which could lead to the spread of fire to upper storeys, which could lead to harm to persons.

[5.6.4.5.] -- ([3] --) [F03-OP1.2]

Intent 1:

To limit the probability that a fire will spread through the joints between the floor and an exterior wall, which could lead to the spread of fire to upper storeys, which could lead to damage to the building or facility.

[5.6.4.5.] -- ([4] --) no attributions

Intent 1:

To direct Code users to Articles 5.6.1.6. and 5.6.4.2. for the installation of a standpipe system.

[5.6.4.5.] -- ([5] --) [F02-OS1.2]

Intent 1:

To limit the probability that a fire involving mass timber elements will grow uncontrolled, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.5.] -- ([5] --) [F02-OP1.2]

Intent 1:

To limit the probability that a fire involving mass timber elements will grow uncontrolled, which could lead to the spread of fire, which could lead to damage to the building or facility.

[5.6.4.5.] -- ([6] --) [F02-OS1.2]

Intent 1:

To limit the probability that a fire will grow unnoticed, which could ignite mass timber elements and contribute to a fire, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.5.] -- ([6] --) [F02-OP1.2]

Intent 1:

To limit the probability that a fire will grow unnoticed, which could ignite mass timber elements and contribute to a fire, which could lead to the spread of fire, which could lead to damage to the building or facility.

[5.6.4.5.] -- ([7] --) [F11-OS1.5]

Intent 1:

To limit the probability that a person employed to conduct a fire watch is not familiar with the fire safety plan, including the location of exits, which could lead to undue delays in notifying people in a fire emergency, which could lead to persons being delayed in or impeded from moving to a safe place during a fire emergency, which could lead to harm to persons.

[5.6.4.5.] -- ([8] --) no attributions

Intent 1:

To exempt the first four storeys of the building from the conditions of requirements described in Sentences (2) to (7) if certain conditions are met, until a certain amount of the building has been constructed on the basis that having the first four storeys unprotected does not pose an undue fire safety risk to persons or the building.

[5.6.4.6.] -- ([1] --) [F02-OS1.2]

Intent 1:

To limit the probability that mass timber elements will contribute to a fire, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.6.] -- ([1] --) [F02-OP1.2]

Intent 1:

To limit the probability that mass timber elements will contribute to a fire, which could lead to the spread of fire, which could lead to damage to the building or facility.

[5.6.4.6.] -- ([1] --) no attributions

Intent 1:

To exempt the certain mass timber elements from the installation of a protective encapsulation material or an assembly of materials providing an encapsulation rating, and to provide an exemption from the alternative protection measures listed in Article 5.6.4.5., if certain conditions are met, on the basis that the operation of an automatic sprinkler system is considered equivalent to the encapsulation rating.

[5.6.4.6.] -- ([1] --) (b) [F03-OS1.2]

Intent 1:

To limit the probability that the automatic sprinkler system will not operate as intended in case of a fire, which could ignite the mass timber elements, which could contribute to a fire, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.6.] -- ([1] --) (b) [F03-OP1.2]

Intent 1:

To limit the probability that the automatic sprinkler system will not operate as intended in case of a fire, which could ignite the mass timber elements, which could contribute to a fire, which could lead to the spread of fire, which could lead to damage to the building or facility.

[5.6.4.4. 5.6.4.6.] 5.6.4.3. ([2 2] 2) no attributions

Intent 1:

To exempt ~~certain floors~~ the four uppermost storeys of the building under construction from the application of Sentence 5.6.4.3.(1), on the basis that it is impractical to ~~apply Sentence 5.6.4.3.(1) to all floors of a building~~ install such protection on the uppermost storeys in the early stage of ~~during~~ construction.

[5.6.4.7.] -- ([1] --) [F02-OS1.2]

Intent 1:

To limit the probability that the size of individual piles for indoor storage of combustible materials lead to an uncontrolled fire, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.7.] -- ([1] --) [F02-OP1.2]

Intent 1:

To limit the probability that the size of individual piles for indoor storage of combustibile materials lead to an uncontrolled fire, which could lead to the spread of fire, which could lead to damage to the building.

[5.6.4.7.] -- ([2] --) (a) [F02,F03-OP1.2]

Intent 1:

To limit the probability that a fire involving an individual pile of stored combustibile materials will spread between storeys, which could lead to damage to the building.

[5.6.4.7.] -- ([2] --) (c) [F02,F03-OS1.2]

Intent 1:

To limit the probability that a fire involving an individual pile of stored combustibile materials will spread to other piles, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.7.] -- ([2] --) (b) [F05-OS1.5]

Intent 1:

To limit the probability that a fire involving an individual pile of stored combustibile materials will impede access to an exit in case of a fire, which could lead to persons being delayed in or impeded form moving to a safe place during a fire emergency, which could lead to harm to persons.

[5.6.4.7.] -- ([2] --) (d) [F01-OS1.1]

Intent 1:

To limit the probability that an individual pile of stored combustibile materials will be exposed to ignition sources, which could lead to ignition of the combustibile materials, which could lead to a fire, which could lead to harm to persons.

[5.6.4.7.] -- ([2] --) (d) [F01-OP1.1]

Intent 1:

To limit the probability that an individual pile of stored combustibile materials will be exposed to ignition sources, which could lead to ignition of the combustibile materials, which could lead to a fire, which could lead to damage to the building.

[5.6.4.7.] -- ([3] --) [F12-OS1.2]

Intent 1:

To limit the probability that firefighting operations will be delayed or ineffective on a

fire involving a pile of stored combustible materials, which could lead to the spread of fire, which could lead to harm to persons.

[5.6.4.7.] -- ([3] --) [F12-OP1.2]

Intent 1:

To limit the probability that firefighting operations will be delayed or ineffective on a fire involving a pile of stored combustible materials, which could lead to the spread of fire, which could lead to damage to the building.