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Proposed Change 1967

Code Reference(s):	**NBC20 Div.B 3.1.4.2.(1) (first printing)** **NBC20 Div.B 3.1.5.15. (first printing)**
Subject:	Building Fire Safety
Title:	New Standard for Testing of Protective Coverings over Foamed Plastic Insulation
Description:	This proposed change introduces references to CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test."
Related Code Change Request(s):	CCR 943, CCR 944, CCR 1071
Related Proposed Change(s):	PCF 1476, PCF 1969

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) includes requirements for the protection of foamed plastics for both combustible and noncombustible construction. Depending on the application, current acceptable solutions to achieve this protection include a variety of prescriptive options (e.g., interior finishes) or use of a thermal barrier conforming to certain fire test method standards (e.g., CAN/ULC-S124:2018, "Standard Method of Test for the Evaluation of Thermal Barriers for Foamed Plastic" (PCF 1476)).

As demonstrated in CCMC Evaluation Report 14036-R[1], some products that are typically classified as “protective coverings” rather than as “thermal barriers” were found to offer an acceptable level of performance when pursued as an alternative solution to the Code requirements. Intumescent coatings are an example of these products.

As more options for protective coverings enter the market, it becomes more critical to provide manufacturers, regulators and Code users with an additional compliance path that specifies a minimum level of performance for these products to be considered acceptable solutions where incorporated in a tested assembly. Not including these specifications in the Code presents the danger of leaving the door open for the definition of the acceptable minimum level of performance by others and for protective covering products to be applied inappropriately in practice. Either scenario could result in insufficient protection that might lead to harm to building occupants and damage to the building.

Furthermore, if no additional compliance path for assemblies that incorporate protective coverings is offered, regulators and authorities having jurisdiction may continue to struggle to accept such products, which could cause economic hardship to the protective covering industry.

Justification

In the last Code cycle, the Standing Committee on Fire Protection was asked to review CCMC Evaluation Report 14036-R (the CCMC Report)[1], which introduced a new test method to assess the fire performance of a protective covering (DC 315 Intumescent Coating) over foamed plastic insulation. There was a desire to investigate, and potentially introduce in the Code, the room corner test method as an option for evaluating the performance of an entire assembly.

According to the intent statements of the NBC, the current requirements for the protection of foamed plastics aim to limit harm to persons and building damage due to early fire growth and spread.

The fire hazard of foamed plastics is their risk of contributing to the onset of flashover, after which point the chance of safe evacuation is greatly reduced, the potential for greater building damage increases, and the potential to contribute to fire growth and spread significantly increases. To mitigate this hazard, the NBC requires that foamed plastics be protected. The desired level of performance for this protection is to limit the foamed plastics from contributing to the onset of flashover, which is measured by the time to flashover.

Since the last Code cycle, and pursuant to the CCMC Report, a new standard (CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test") was developed for the evaluation of protective coverings over foamed plastic insulation using a test method based on CAN/ULC-9705, "Fire Tests – Full-Scale Room Test for Surface Products." Feedback from many Canadian fire experts indicated that the proposed 10 min and 20

min classifications (representing 100kW and 300kW exposures, respectively) in CAN/ULC-S145 for protective coverings relate more directly to the hazard that the NBC intends to limit (versus existing performance tests).

Performance test options currently in the NBC (including the proposed update of CAN/ULC-S124:2018 (PCF 1476)) use a furnace test to evaluate a thermal barrier's ability to prevent the ignition of the foamed plastics by measuring the temperature transmission performance of the thermal barrier during fire growth in its early stage. The 10 min thermal barrier requirement was intended to limit the contribution of foamed plastic insulation to fire growth. CAN/ULC-S124 was deemed to be a conservative evaluation of that condition.

Alternatively, the new standard, CAN/ULC-S145, offers a room corner test method to evaluate the integrity of an assembly during fire growth and includes performance metrics associated with the onset of flashover. Because their approaches are fundamentally different, the furnace and room corner test methods are difficult to compare and cannot be equated. However, as both test methods support the overall intent of the requirement (including the mitigation of the fire hazard and establishment of a minimum level of performance with related metrics), CAN/ULC-S145 can be introduced as a suitable alternate test option for the protection of foamed plastics.

For combustible construction, an option is introduced in Sentence 3.1.4.2.(1) for assemblies incorporating protective coverings to meet the 10 min classification of CAN/ULC-S145. For noncombustible construction, the 20 min classification of CAN/ULC-S145 is introduced in Sentences 3.1.5.15.(2) and (3). This proposed change follows the hierarchical structure of the existing Code requirements, which considers a building's use, construction type, height and whether or not it is sprinklered when stipulating the level of protection needed.

Furthermore, this proposed change is consistent with the existing NBC intent statements. Performance-based room corner tests provide a clear indication of the onset of flashover, which impacts both the time available for egress and the potential contribution of a material to fire growth and spread. These tests are recognized and relied on worldwide in building code regulations to determine the contribution of room linings to the onset of flashover.

References

[1] Canadian Construction Materials Centre. "CCMC 14036-R: CCMC Canadian code compliance evaluation". National Research Council of Canada. Ottawa, Canada; June 2016.
https://nrc.canada.ca/en/certifications-evaluations-standards/canadian- construction-materials-centre/ccmc-publications/document.html?id=14036-R&type=cert (as of December 2022).

PROPOSED CHANGE

[3.1.4.2.] 3.1.4.2. Protection of Foamed Plastics

[1] 1) Except as permitted in Sentence (2), foamed plastics that form part of a

wall or ceiling assembly in *combustible construction* shall be protected from adjacent spaces in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall and ceiling assemblies,

[a] a) by one of the interior finishes described in Subsections 9.29.4. to 9.29.9.,

[b] b) provided the *building* does not contain a Group A, Group B or Group C *major occupancy*, by sheet metal

[i] i) mechanically fastened to the supporting assembly independent of the insulation,

[ii] ii) not less than 0.38 mm thick, and

[iii] iii) with a melting point not below 650°C, ~~or~~

[c] c) by any ~~thermal barrier~~protection method that meets the requirements of Sentence 3.1.5.15.(2) (see Note A-3.1.4.2.(1)(c))~~.~~, or

[d] --) by a protective covering, incorporated in the assembly, that meets the requirements of classification 10 min when tested in conformance with CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test," and is installed as tested (see Note A-3.1.4.2.(1)(d)).

(See Note A-3.1.4.2.(1).)

Note A-3.1.4.2.(1)(c) ~~Thermal Barrier~~Protection Method in Combustible Construction.

Any ~~thermal barrier~~protection method that is accepted under the requirements of Sentence 3.1.5.15.(2) for noncombustible construction is also acceptable for combustible construction.

Note A-3.1.4.2.(1)(d) Testing of Protective Coverings as an Assembly.

Unlike a protective covering conforming to CAN/ULC-S124:2018, "Standard Method of Test for the Evaluation of Thermal Barriers for Foamed Plastic," a protective covering conforming to CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test," may only be used in the individual assemblies in which it was tested.

The test assembly, including the foamed plastic, the protective covering and its method of attachment, joints and adhesives, must be representative of the construction for which classification is required. Note that the protective covering may be field- or factory-applied.

If the thickness of the foamed plastic insulation within the test assembly does not exceed 100 mm, then the thickness tested is the maximum allowable thickness. If the thickness of the foamed plastic insulation within the assembly for which classification is required exceeds 100 mm, tests need not be conducted with a thickness of foamed plastic insulation that

exceeds 100 mm (i.e., testing with a thickness of 100 mm is acceptable in this case).

[3.1.5.15.] 3.1.5.15. Foamed Plastic Insulation

(See Notes A-3.1.4.2. and A-3.1.4.2.(1).)

[1] 1) Foamed plastic insulation is permitted to be installed above roof decks, outside of *foundation* walls below ground level, and beneath concrete slabs-on-ground of a *building* required to be of *noncombustible construction*.

[2] 2) Except as provided in Sentences (3), (4) and 3.1.5.7.(1), foamed plastic insulation with a *flame-spread rating* not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in a *building* required to be of *noncombustible construction*, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by ~~a thermal barrier consisting of~~

[a] a) not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,

[b] b) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,

[c] c) masonry,

[d] d) concrete, ~~or~~

[e] e) any thermal barrier that meets the requirements of classification B when tested in conformance with CAN/ULC-S124:2018, "Standard Method of Test for the Evaluation of Thermal Barriers~~Protective Coverings~~ for Foamed Plastic~~.~~," or

[f] --) a protective covering, incorporated in the assembly, that meets the requirements of classification 20 min when tested in conformance with CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test," and is installed as tested (see Note A-3.1.4.2.(1)(d)).

[3] 3) Foamed plastic insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the exterior walls of a *building* required to be of *noncombustible construction* that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by ~~a thermal barrier consisting of~~

[a] a) gypsum board not less than 12.7 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,

[b] b) lath and plaster, mechanically fastened to a supporting assembly

independent of the insulation,

[c] c) masonry or concrete not less than 25 mm thick, ~~or~~

[d] d) any thermal barrier that, when tested in conformance with CAN/ULC-S101, "Standard Method of Fire Endurance Tests of Building Construction and Materials", does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 10 min (see Note A-3.1.5.14.(5)(d)) (see also Article 3.2.3.7.)~~.~~, or

[e] --) a protective covering, incorporated in the assembly, that meets the requirements of classification 20 min when tested in conformance with CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test," and is installed as tested (see Note A-3.1.4.2.(1)(d)).

[4] 4) Foamed plastic insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the interior walls, within ceilings and within roof assemblies of a *building* required to be of *noncombustible construction* that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by ~~a thermal barrier consisting of~~

[a] a) Type X gypsum board not less than 15.9 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled, conforming to

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

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

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

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

[b] b) non-*loadbearing* masonry or concrete not less than 50 mm thick,

[c] c) *loadbearing* masonry or concrete not less than 75 mm thick, or

[d] d) any thermal barrier that, when tested in conformance with CAN/ULC-S101, "Standard Method of Fire Endurance Tests of Building Construction and Materials",

[i] i) does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 20 min, and

[ii] ii) remains in place for not less than 40 min.

Impact analysis

This proposed change provides an additional option for compliance through testing, which would allow for a broader range of material to be used for the protection of foamed plastics. This proposed change provides flexibility to designers and fosters innovation without compromising safety.

The proposed change benefits manufacturers and Code users by clarifying the minimum level of performance required for assemblies incorporating a protective covering, which facilitates enforcement for regulators and authorities having jurisdiction.

Because the introduction of CAN/ULC-S145:2018, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic Insulation – Full-Scale Room Test," is not meant to replace the existing options for acceptable solutions, there are no new forced costs to builders with respect to meeting the requirements for the protection of foamed plastics.

Also, any additional costs associated with the testing of materials when using this proposed option could be offset by avoiding the time and expense of needing to pursue this option as an alternative solution.

Enforcement implications

This proposed change could be enforced by the current enforcement infrastructure for the Code.

Regulators are familiar with assessing compliance through product testing in accordance with referenced standards. Having a performance-based requirement in the Code facilitates the interpretation and enforcement of the requirement and ensures consistency of the application throughout the country.

Furthermore, in jurisdictions where alternative solutions have been sought for protective covering products, it is anticipated that there is already familiarity with these types of products.

Who is affected

This proposed change would affect:

- regulators and authorities having jurisdiction, who would need to be aware of the new standard,
- builders, architects, engineers and building owners, who would be able to consider additional products that are allowed for their projects, and
- manufacturers, who should consider further developing new and existing products to comply with the new requirements.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[3.1.4.2.] 3.1.4.2. ([1] 1) [F01-OS1.1] [F02-OS1.2] [F05-OS1.5]

[3.1.4.2.] 3.1.4.2. ([1] 1) [F01-OP1.1] [F02-OP1.2]

[3.1.5.15.] 3.1.5.15. ([1] 1) no attributions

[3.1.5.15.] 3.1.5.15. ([2] 2) no attributions

[3.1.5.15.] 3.1.5.15. ([2] 2) [F01-OS1.1] [F02-OS1.2] [F05-OS1.5]

[3.1.5.15.] 3.1.5.15. ([2] 2) [F01-OP1.1] [F02-OP1.2]

[3.1.5.15.] 3.1.5.15. ([3] 3) no attributions

[3.1.5.15.] 3.1.5.15. ([3] 3) [F01-OS1.1] [F02-OS1.2] [F05-OS1.5]

[3.1.5.15.] 3.1.5.15. ([3] 3) [F01-OP1.1] [F02-OP1.2]

[3.1.5.15.] 3.1.5.15. ([4] 4) no attributions

[3.1.5.15.] 3.1.5.15. ([4] 4) [F01-OS1.1] [F02-OS1.2] [F05-OS1.5]

[3.1.5.15.] 3.1.5.15. ([4] 4) [F01-OP1.1] [F02-OP1.2]