Evaluation Report CCMC 14036-R
DC 315 Intumescent Coating

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that the "DC 315 Intumescent Coating", when installed as a thermal barrier over spray polyurethane foam insulation, in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015[(1)]:

- Clause 1.2.1.1.(1)(b) of Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Clause 3.1.4.2.(1)(a), Protection of Foamed Plastics in Combustible Construction
  - Sentence 3.1.5.15.(2), Foamed Plastic Insulation (Protection of Adjacent Space)
  - Clause 9.10.17.10.(1)(a), Protection of Foamed Plastics (one of the interior finishes in Subsections 9.29.4. to 9.29.9.)
  - Sentence 9.25.2.3.(7), Installation of Thermal Insulation (Required Mechanical Protection of Insulation)
  - Subsection 9.29.4., Plastering
  - Subsection 9.29.5., Gypsum Board Finish (Taped Joints)
  - Article 9.29.5.2., Materials (Resist Deterioration/Durability (F80))
  - Subsection 9.29.6., Plywood Finish
  - Subsection 9.29.7., Hardboard Finish
  - Subsection 9.29.8., Insulating Fibreboard Finish
  - Subsection 9.29.9., Particleboard, OSB or Waferboard Finish

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

1. Also complies with NBC 2010 for the same relevant provisions.

2. Description

The product is a proprietary liquid formulation that is delivered in pails and sprayed in the field by licensed installers. The required coating thickness, specifically the wet film thickness (WFT) measured by the manufacturer's certified installer, is specified below based on the performance required to comply with the local building code provisions. The finish coating is white in colour (see Figure 2) which intumesces (i.e., expands) when heated/exposed to fire and provides the required thermal barrier protection.

2.1 Thermal Barrier

The NBC 2015 specifies that foam plastic insulation must be protected from the adjacent space by a thermal barrier. This Report addresses the performance of the product when it is installed as the designated thermal barrier, solely for medium density (MD) spray polyurethane foam insulation as the substrate. The MD spray urethane insulation shall be compliant with CAN/ULC-S705.1, "Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification," shall possess a CCMC Listing and shall be installed in compliance with CAN/ULC-S705.2, "Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application," following the Report Holder's Site Quality Assurance Program (SQAP).

2.1.1 Part 9 and Part 3 Combustible Construction

The interior finishes specified in Subsections 9.29.4. to 9.29.9. of Division B of the NBC 2015 are permitted thermal barrier solutions for use in buildings permitted to be of Combustible Construction. In lieu of these interior finishes, the installer/contractor may have this intumescent coating product installed, to protect combustible spray polyurethane insulation only, in order to satisfy code requirements for the protection of foamed plastic insulation specified in Clauses 9.10.17.10.(1)(a) and 3.1.4.2.(1)(a) allowing for the occupancy of a building. An example where this product may be used could include an unfinished basement, garage or attic space.

2.1.2 Part 3, Non-combustible Construction

As specified in Sentence 3.1.5.15.(2) of Division B of the NBC, a foamed plastic insulation must be protected from the adjacent space by any of five (5) prescribed acceptable solutions, specifically:

a) 12.7-mm gypsum board on framing;
b) plaster and lath mechanically fastener (no thickness given);
c) masonry (no thickness given);
d) concrete (no thickness given), or
e) any thermal barrier that meets Classification B as per CAN/ULC-S124, "Test for the Evaluation of Protective Coverings for Foamed Plastic."

Subsequent to original the Part 9 product evaluation, the proponent sought compliance as an alternative solution to the acceptable solutions outlined in Sentence 3.1.5.15.(2) of Division B of the NBC 2015. The equivalency to Part 3 non-combustible buildings and results are discussed in Section 2.2.2 and outlined in Appendix C whereby this product has demonstrated to provide 'equal or better' performance than the prescribed acceptable solutions in (a) and (e) above.

N.B: This product has not qualified for use in noncombustible buildings, greater than 18m and that are not sprinklered (Sentence 3.1.15.(3))

2.2 Levels of Performance

2.2.1 Part 9 and Part 3, Combustible Construction

As noted in Appendix B of this Report, the provinces and territories have been consulted on what would constitute the Code benchmark performance that should be considered from the list of interior finishes outlined in Subsections 9.29.4. to 9.29.9 of Division B of the NBC 2015. The opinions varied based on whether the minimum performance of the interior finish (i.e., 11-mm fibreboard) is appropriate or whether the minimum performance being currently provided in houses as common practice (i.e., 12.7-mm drywall) should be the benchmark. In addition, the provinces and territories provided an opinion as to whether the spray polyurethane in the cavity 'only' should be protected or whether the lumber studs and/or ceiling joists should also be protected. The recommendations are provided in Appendix B. However, the provincial and territorial regulators acknowledge that the approval rests with the local AHJ. Therefore, the performance-levels provided in Table 2.2.1 and, whether only the cavity insulation needs to be protected, is for decision-making by the local AHJ in their approval process.

The performance of the intumescent coating as an effective thermal barrier was determined based on the "time-to-flashover" within a full-room fire test. Appendix A outlines the test method and time-to-flashover criterion. When the product is to be installed as the designated thermal barrier over MD spray polyurethane, the DC 315 thermal barrier comprises two (2) spray components: a primer and the "DC 315 Intumescent Coating" at a specific thickness based on the target performance being sought by the AHJ (see Table 2.2.1).

Table 2.2.1 Chart for Thickness for Target Performance

Performance Level in CAN/ULC-S9705 Test[(1)]	Equivalence	Primer Thickness[(2)] (wet film thickness [WFT])	DC 315 Thickness (WFT)
10 min. to flashover	Interior finishes described in Subsections 9.29.4. through 9.29.9.	3 mil	20 mil
20 min. to flashover	12.7-mm gypsum board	3 mil	24 mil

Notes to Table 2.2.1:

1. The option of a 10-min or 20-min time-to-flashover is to be decided by the local AHJs to determine the level of performance that is deemed acceptable based on the performance outlined in Table 4.1.3, the full-scale room fire test protocol outlined in Appendix A and the Provincial/Territorial consultation in Appendix B.
2. Sherwin Williams DTM Bonding Primer.

2.2.2 Part 3, Non-combustible Construction

As outlined in Section 2.2.1 of this Report, a second round of consultation was undertaken with the provinces and territories (P/T) with respect to compliance of the product with any of the five (5) acceptable solutions outlined in Sentence 3.1.5.15.(2) of Division B of the NBC 2015 (see 2.1.2. above). Some P/T members considered compliance with Clause 3.1.5.15.(2)(a) was already achieved by the product (at 24 mil thickness), i.e., it demonstrated equivalency to 12.7 mm gypsum board. However, some questions arose concerning the equivalency in performance to other Part 3 acceptable solutions. The acceptable solutions in Clauses 3.1.5.15.(2)(b) to (d) do not specify an explicit material thickness for comparison. Equivalency testing to the acceptable solution in Clause 3.1.5.15.(2)(e) was considered to determine where this product (at 24 mil thickness) lies with respect to more than one acceptable solution, as was done with the Part 9 acceptable solutions covered in Table 4.1.3.

Therefore, in addition to the detailed Part 9 full-scale room testing carried out in accordance with CAN/ULC-S9705 and described below for Part 9, a second phase of testing in a full-scale room fire test was undertaken to determine the benchmark performance of the acceptable solution specified in Sentence 3.1.5.15.(e), which pertains to any thermal barrier that meets Classification B as per CAN/ULC-S124. The intent of testing more than one NBC-specified acceptable solution, following the same full-scale room test, is so that a proper comparison can be made to determine equivalency in performance. Appendix C shows a Summary Table (Table C1) outlining the product's equal or better performance as an alternative solution against the listed NBC-prescribed acceptable solutions for both Part 9 and Part 3.

2.3 Installation

The product is applied by installers approved by the manufacturer, International Fireproof Technology Inc. (IFTI), which follows the IFTI field quality assurance program (FQAP) for their site-manufactured thermal barrier.

Figure 1. Example of application where the product may serve as a thermal barrier over MD spray urethane ceiling cavity insulation (and joists)[(1)] within the ceiling of wood-frame garages. (Photo shows spray foam still to be protected with the DC 315 thermal barrier.)

Figure 2. Example of application where the product (white) serves as the thermal barrier over MD spray urethane cavity insulation (and overexposed studs/joists)[1] in wood-frame basement walls and ceiling.

Note to Figures 1 and 2:

1. Currently, panel products installed as the designated thermal barrier protect both the foam plastic within the cavity and the wood stud or joist. The protection of the studs is not required by Code. As noted below, some regulators opined that in some cases both the foam plastic and the stud or joist should be protected. In particular, in the case of prefabricated I-joists as supporting floors above the garage, it was considered appropriate to protect the exposed I-joist web and flange as well as the MD spray polyurethane within the joist space.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "DC 315 Intumescent Coating" being used in accordance with the conditions and limitations set out below:

- The "DC 315 Intumescent Coating" may serve as a thermal barrier over MD spray polyurethane foam insulation in Part 9 and Part 3 Buildings as outlined below.
- Where the NBC Part 9 interior finishes (Clause 9.10.17.10.(1)(a) of the NBC 2010/2015) will be deemed acceptable by the AHJ, as the performance benchmark for this alternative solution, the DC315 protection which prevents the foamed plastic from reaching flashover in the first 10 min following CAN/ULC-S9705 shall be installed.
- For Part 9 or Part 3 buildings permitted to be of combustible construction, where the 12.7-mm gypsum board will be deemed acceptable by the AHJ as the performance benchmark for this alternative solution, the DC315 protection which prevents the foam plastic from reaching flashover in the first 20 min following CAN/ULC-S9705 shall be installed.
- For Part 3 buildings required to be on non-combustible construction, where acceptable solutions of 12.7-mm gypsum board (Clause 3.1.5.15.(2)(a)) or Classification B, ULC S124-compliant product (Clause 3.1.5.15.(2)(e)) are deemed acceptable by the AHJ as the performance benchmark for this alternative solution, the DC315 protection which prevents the foam plastic from reaching flashover in the first 20 min following CAN/ULC-S9705, shall be installed.
- In New Brunswick, the Fire Prevention Act requires that foamed plastic insulation must be protected by one of the following: a thermal barrier which provides 15 minutes of protection when tested in accordance with ULC s101, 16-mm thick gypsum board, or any other material which the fire marshal approves. Determining equivalent performance of the DC315 to these acceptable solutions was outside the scope of this evaluation.
- When the spray polyurethane is installed as a cavity insulation, the insulation shall be protected and the exposed portion of wall studs or ceiling joists shall also be protected by the DC 315 coating when required by the local AHJ.
- The installation shall be carried out by IFTI-approved installers carrying an IFTI licensing card and following the IFTI field quality control procedures.

- The product must be clearly identified with the phrase “CCMC 14036-R” on the DC 315 container label.

4. Technical Evidence

CCMC’s Technical Guide for “Intumescent Coating as a Thermal Barrier over Spray Urethane Insulation” sets out the nature of the technical evidence required by CCMC to enable it to evaluate a product as an alternative solution in compliance with the NBC 2015. The Report Holder has submitted test results and other data for CCMC’s evaluation. Testing was conducted at an independent laboratory recognized by CCMC. The corresponding test results for the “DC 315 Intumescent Coating” are summarized below.

4.1 Performance Requirements

4.1.1 Characteristic Properties – Paint/Coatings

Table 4.1.1 Results of Testing the Material Properties of the Product

Property	Unit	Test Method[1]	Requirement	Result
Flashpoint (Pensky-Martens closed cup)	°C	As per Section 3.1 of CGSB 1-GP-71 (uses apparatus of ASTM D 93)	Min. 35	> 100°C
Consistency	Kerbs	As per Section 4.5 of CGSB 1-GP-71 (uses apparatus of ASTM D 562)	Min. 85	850 – 1 700
Drying time	–	As per Section 5.1 of CGSB 1-GP-71 or ASTM D 7488	Report value	To recoat: Up to 6 h Dry through: 24 h
Solid content	%	As per Section 2.2 of CGSB 1-GP-71 or ASTM D 2697	Min. 40%	67%
Lead content	ppm	Health Canada Method C02	< 100	Pass[(1)]
Phthalates content	ppm	Health Canada Method C34	< 1%	Pass[(1)]
Volatile organic compound (VOC)	g/l	ASTM D 2369	< 50	47

Notes to Table 4.1.1:

1. The lead content falls under the *Consumer Product Safety Act*. Testing by ITS has confirmed that the DC 315 is not classified for WHMIS or for *Consumer Chemicals and Containers Regulations* (CCCR), as DC 315 contains no hazardous material in excess of 1%. Chemically, lead is not a component in the DC 315 formulation.
2. The phthalates, which are contained in polyvinyl chloride (PVC), fall under the *Consumer Product Safety Act* intended for children’s toys and furniture. Per Table Note 1, the DC 315 is not classified under WHMIS or CCCR because the formulation has no hazardous material in excess of 1%. Therefore, phthalates, if present are < 1%.

4.1.2 Resistance to Deterioration - Paint/Coatings

Table 4.1.2 Results of Testing the Material and Environmental Conditioning/Aging of the Product

Property	Test Method	Requirement	Result
Flexibility	ASTM D 522	No cracking or peeling on a 12.5-mm mandrel	Pass 9.5 mm (3/8 in.)
Self-lifting	As per Section 132.1 of CGSB 1-GP-71	No blistering, wrinkling, loosening, softening or other defects due to the application of a second similar coat	N/A DC 315 is applied in one coat
Adhesion to substrate at specified thickness (with primer)	ASTM D 3359, Method A	Min. adhesion rating: 4A	5A
Adhesion to substrate – resistance to high humidity	ASTM D 3359, Method A after conditioning	Min. adhesion rating: 4A	5B
Adhesion – pulloff strength	ASTM D 4541	Report value	50 psi
Impact resistance, 7-days dry	ASTM D 2794	Direct: 30 in./lb Indirect: 10 in./lb	(1)
Moisture resistance	ASTM D 4585 Moisture Protocol	No blistering, wrinkling or loss of adhesion (Adhesion ASTM D 3359)	Pass
Fungal/mildew resistance	ASTM C 1338	No more fungal growth than control specimen	Pass(2)
Water vapour permeance (WVP)	ASTM E 96/E 96 M (Desiccant Method)	Report value	977 ng/(Pa·s·m^2)

Notes to Table 4.1.2:

1. The small-scale impact tests are superseded by the full-scale tests in Table 4.1.4.
2. The fungal testing was conducted at a recognized lab following a similar test method for fungal defacement (ASTM D 5590). No defacement (i.e., no microorganisms) was found after four (4) weeks at 28°C and 90% relative humidity (RH).

4.1.3 Thermal Barrier Fire Performance – Contribution to Fire Growth (Flashover)

See Appendix A in this Report for performance-based ISO/CAN/ULC-S9705 full-room test to evaluate the time-to-flashover of the thermal barrier.

Table 4.1.3 Results of Thermal Barrier Performance Fire Testing − Acceptable and Alternative Solutions

Property	Test Method	Result Time to Flashover (minutes:seconds)
NBC Acceptable Solutions – Benchmark Performance		
11.7-mm oriented strand board (OSB)	ISO/CAN/ULC-S9705 Full-scale room test	2:15
13-mm oak-veneered plywood/13-mm spruce - plywood/11.9 DF plywood		1:18 to 3:03
13-mm particleboard		2:20 to 2:36
Insulating wood fibreboard		0:59
9.5-mm gypsum board		N/A[(1)]
Cementitious ULC-listed Classification B, CAN/ULC-S124 compliant thermal barrier		14:10
Common Practice (as-built environment)		
12.5-mm regular gypsum (MD spray urethane cavity insulation and studs also protected)	ISO/CAN/ULC-S9705 Full-scale room test	20:00[(2)]
Alternative Solutions		
IFTI – DC 315: Two Alternative Thermal Barrier Applications		
3 mil (WFT) primer and 20 mil (WFT) DC 315 – over MD SPUF (no exposed wood studs)[(3)]	ISO/CAN/ULC-S9705 Full-scale room test Target 10 minutes[(4)] for equivalency to minimum of NBC-acceptable solutions	11:00
3 mil (WFT) primer and 24 mil (WFT) DC 315 – over MD SPUF (no exposed wood studs)[(3)]	Target 20 minutes[(5)] for equivalency to 12.7-mm regular gypsum	20:00[(2)]
IFTI – DC 315: Thermal Barrier Fire Testing with Mechanical Damage to Coating[(6)]		
35 mil WFT with damage/exposed MD SPUF over burner area[(6)]	ISO/CAN/ULC-S9705 Full-scale room test	20:00[(2)]
IFTI – DC 315: Thermal Barrier Performance over Various CAN/ULC-S705.1-compliant MD SPUF		
Benchmark SPUF (CCMC-evaluated): **3 mil (WFT) primer and 20 mil (WFT) DC 315**	ISO/CAN/ULC-S9705 Full-scale room test	10:00
3 mil (WFT) primer and 24 mil (WFT) DC 315		20:00
9 medium density CAN/ULC-S705.1-compliant foams tested	Full-scale room tests[(7)]	Equivalent performance has been demonstrated for CAN/ULC-S705.1-compliant MD spray urethane insulation.

Notes to Table 4.1.3:

1. Test data for 9.5-mm gypsum board is not available as it does not represent the minimum performance or common practice solution.
2. The full-room test procedure, ULC/ISO 9705 terminates the test at the 20-minute (NFPA 286 terminates at the 15-minute mark) if flashover is not reached as this is the target performance for the 12.7 mm gypsum board as a thermal barrier. In cases where the fire test was not terminated, the time-to-flashover could vary from 22-28 minutes. Both 12.7 mm gypsum board and the DC315 did not reach flashover conditions during the 20 minute exposure to fire.
3. The majority of room tests were conducted primarily to compare thermal barrier performance over the foam plastic, without exposed studs, so that direct comparison could be achieved. For AHJs that plan to specify that exposed studs or exposed ceiling joists also be protected by the intumescent coating, as is the case with panel products, then the equivalent thickness (primer and DC 315) shall be sprayed over the exposed stud and/or joist member.
4. Where the minimum performance of the NBC interior finishes will be deemed acceptable by the AHJ, it is proposed that protection which prevents the foamed plastic from reaching flashover in the first 10 minutes following CAN/ULC-S9705 be accepted. This is viewed as a conservative solution given many of the acceptable thermal barriers would lead to flashover after only 1 to 3 minutes.
5. As this performance is equivalent to 12.7 mm, it is proposed that this method of protection which prevents the foamed plastic from reaching flashover during the entire 20-minute CAN/ULC-S9705 test method be considered as equivalent to a Class B panel-type thermal barrier when tested in accordance with CAN/ULC-S124.
6. Based on existing test data where no primer was used, some MD SPUF became exposed to the flame. Due to the close contact of the intumescent coating to the SPUF insulation, the expansion of the coating controlled the fire spread. In comparison to a panel-type thermal barrier which becomes damaged, in a fire the entire cavity of the foam plastic would contribute to the fire spread.
7. The Report Holder has conducted multiple full-scale room tests on the MD SPUF. The analysis of the thermal barrier performance of the nine (9) MD SPUF provides confidence that the specified primer and DC 315 coating thicknesses could be assigned the time-to-flashover for all CCMC-evaluated CAN/ULC-S705.1-compliant MD SPUF.
8. Cementitious thermal barrier conforming to ULC-listed Classification B, CAN/ULC-S124-compliant. Classification B,. ULC-Listed S124-compliant thermal barrier was tested over 100 mm CCMC-Listed listed CAN/ULC ULC-S705.1-compliant MD spray polyurethane foam insulation.

Resistance to Mechanical Damage

Table 4.1.4 Results of Testing the Insulation for Resistance to Mechanical Damage

Property	Test Method	Result
Concentrated Load		
	ASTM E 661[(1)]	
Benchmark (9.5-mm gypsum board)	Full-scale floor panel test procedure Ultimate load applied with a 75-mm (3-in.) disc.	154 lb.
Benchmark (12.7-mm gypsum board)		183 lb.
DC 315 over MD SPUF (18 mil WFT)		376 lb.
DC 315 over MD SPUF (24 mil WFT)		423 lb.
		DC 315 with SPUF > Benchmark
Concentrated Load following Impact Load[(2)]		
	ASTM E 661	
Benchmark (9.5-mm gypsum board)	150 mm impact, 77 lb. proof load	Fracture
Benchmark (12.5-mm gypsum board)	300 mm impact, 92 lb. proof load	Fracture
DC 315 over MD SPUF (18 mil WFT)	450 mm impact, 182 lb.[(3)]	Small chips (12.5 mm diameter)
DC 315 over MD SPUF (24 mil WFT)	450 mm impact, 182 lb.[(3)]	Small chips (5 mm diameter)
		DC 315 with SPUF[(5)] > Benchmark
Falling Ball Impact[(4)]		
	ASTM D 5420	
Benchmark (9.5-mm gypsum board)	30 in.	Cracking at back
	42 in.	Cracking at front
	72 in.	Penetration foam exposed
Benchmark (12.7-mm gypsum board)	24 in.	Cracking at back
	42 in.	Cracking at front

	78 in.	Penetration foam exposed
DC 315 over MD SPUF (18 mil WFT)	48 in.	Cracking
	> 48 in.	No complete exposure of foam
DC 315 over MD SPUF (24 mil WFT)	48 in.	Cracking
	> 48 in.	No complete exposure of foam
		DC 315 with SPUF[5] > Benchmark

Notes to Table 4.1.4:

1. The ASTM E 661 test protocol is a large-scale impact and load test procedure for floor panels. This protocol was used to evaluate the equivalency to gypsum board as the minimum Code-specified mechanical damage protection (i.e., 9.5 mm) and thicker (i.e., 12.7 mm) for the AHJs seeking a higher protection level.
2. Ultimate load applied following increased impact loading (30 lb. bag at increasing height). A measure of toughness or strength retention after successive impact energy.
3. The same failure load as that applied to 12.5-mm gypsum board was used to evaluate equivalent or better performance.
4. A 62.5-mm diameter steel ball is dropped at increasing heights in 150 mm intervals.
5. The full-room fire test was conducted with damaged DC 315. The exposed foam was protected by the expanding intumescent coating (see **Table 4.1.3**, No. 6.)

4.2 Additional Performance Data Requested by the Report Holder

Data in this section does not form part of CCMC's opinion in Section 1.

- Flame-spread rating as per ULC S102: over MD SPUF = 25, over cement board = 0.
- DC 315 meets regulations related to contact with food (i.e., potato sheds, etc.)

4.3 Additional Health and Safety Data Identified by Third Parties

A provincial and territorial consultation was conducted to determine the expected scenarios for minimum benchmark performance for both thermal barriers over MD SPUF and minimum mechanical protection of insulation. The consultation findings are outlined in Appendix B and are intended to provide the necessary technical information for decision making by the local AHJ.

Report Holder

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Disclaimer

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Appendix A – Thermal Barrier Performance in Fire

For combustible construction, the NBC 2015 requires foamed plastic insulation that forms part of a wall or ceiling assembly be protected from adjacent spaces other than concealed spaces in attic or roof spaces, crawl spaces and wall assemblies. The intent of this requirement is to limit the probability that foamed plastic insulation will become exposed to a fire or subjected to high temperatures, which could lead to its ignition and contribution to early fire growth and spread and could in turn negatively affect the ability of persons to escape from a fire and cause them harm. The role of the thermal barrier is to retard the contribution of the foam plastic insulation to the fire growth to allow for occupants to evacuate before flashover. The benchmark time-to-flashover is based on the current known performing thermal barriers providing acceptable performance (i.e., acceptable solution).

The CAN/ULC-S124 is a test procedure with a pass or fail assigned, which is prescriptive, with respect to the temperature rise behind the designated thermal barrier. The prescriptive criterion of temperature rise is based on measurements of traditional panel products. However, an intumescent coating requires initial heating before it intumesces. During this initial period, the temperature rises at the interface between the intumescent coating and the foam plastic and may exceed those specified in CAN/ULC-S124 for Classification B.

A more complete assessment of a fire situation is through a performance-based approach as with full-scale room tests. A performance-based full-room test method, CAN/ULC- 9705, which is similar to NFPA 286, was recently promulgated in Canada. Although this test method is similar to the NFPA test method, CAN/ULC- 9705 is considered more severe and, as such, there are differences that make it impossible to directly compare test results. In particular, the ignition source and its heat output prescribed in the Canadian test method are different than in the NFPA 286 test method.

In this evaluation, tests are conducted in conformance with the CAN/ULC- 9705 test method to determine the potential effect of a MD spray polyurethane foam protected using an intumescent coating on the fire growth and fire characteristics. The criterion used in these full-room tests is the 'time-to-flashover'. Flashover is the near-simultaneous ignition of most of the directly exposed combustible material in an enclosed area. The time-to-flashover indicates the time at which fire will spread to other objects in the room remote from the ignition source. In standard room tests such as CAN/ULC-S9705, the time at which flashover occurs is determined by the earliest time at which two of the following criteria occur:

1. Heat release rate including burner $\geq$ 1 MW.
2. Incident heat flux at the floor $\geq$ 20 kW/m^2.
3. Flames through doorway.
4. Crumpled paper on floor ignites.
5. Average temperature at ceiling in the room exceeds 600ºC.

In addition, similar testing must be undertaken for benchmarking of the NBC-specified acceptable solutions **or** the acceptable solutions specified by the provincial and territorial regulators. Based on the provincial and territorial consultation, the proponent in consultation with the CCMC evaluation officer determined the tests and criteria to be met for the decision making by the local AHJs across Canada.

Appendix B – Provincial and Territorial Consultation

B1 Background

The consultation of the provinces and territories was conducted from October 2015 to January 2016. Discussions were done on the SPUF applications for single-family house basements and attached garages.

Other applications within Part 9, Buildings could be permitted and other Code provisions may apply (i.e., fire-resistance rating of assembly).

Tables B1, B2 and B3 show compiled responses for benchmark thermal barrier protection based on: (i) the Code minimum (whether it reflects current practice or not); (ii) the current practice and continued performance based on current practice; or (iii) a combination of both.

B2 Proponent Decision Making – Rationalizing Benchmarks

Based on this survey, the proponent has sought to demonstrate equal or better performance of one or more of the jurisdictions by qualifying to the different benchmark levels.

IFTI has sought to qualify their DC 315 product to a benchmark that would capture as many jurisdictions' benchmark performances as possible. The benchmark acceptable solution is 12.7-mm (1/2 in.) gypsum wallboard, which covers all jurisdictions except for: (i) New Brunswick (NB), which requires a higher level of performance for foam plastic; and (ii) Alberta (AB), for attached garage applications whereby they specify explicit Code requirements for a 12.7-mm (1/2 in.) gypsum board as an interior finish, beyond the thermal barrier performance requirement.

Table B2.1 Thermal Barrier Protection of Basement SPUF Applications

Province or Territory[1]	Thermal Barrier Benchmark for Basements	Intumescent Coating to Cover/Protect SPUF Cavity Insulation Only	Intumescent Coating to Cover/Protect SPUF Cavity Insulation and Stud Framing
Nunavut (NU), British Columbia (BC), Nova Scotia (NS), Northwest Territories (NWT), Manitoba (MB), Alberta (AB)	Fibreboard – 11.1 mm (7/16 in.)	NU, BC, NWT, MB, AB	NS
Yukon Territory (YT), Saskatchewan (SK) Ontario(ON)	Drywall – 12.7 mm (1/2 in.)	ON	YT, SK[2]
Québec (QC)	Drywall – 9.5 mm (3/8 in.)	QC	–
New Brunswick (NB)	Drywall – 15.9 mm (5/8 in.) or 15 min/S101 thermal barrier	NB	–

Notes to Table B2.1:

1. The province or territory that is not covered here is expected to base their decision-making on one of the solutions covered within this matrix.
2. The basement studs need to be protected by the intumescent coating only if the basement studs are loadbearing (e.g., permanent wood foundations (PWFs)).

Table B2.2 Thermal Barrier Protection of Attached Garage SPUF Applications

Province or Territory[(1)]	Thermal Barrier Benchmark for Attached Garages	Intumescent Coating to Cover/Protect SPUF Cavity Insulation Only	Intumescent Coating to Cover/Protect SPUF Cavity Insulation and Studs and Ceiling Joists
NU, BC, NS, NWT, MB	Fibreboard – 11.1 mm (7/16 in.)	NU, BC, NWT, MB	NS
YT, SK, ON	Drywall – 12.7 mm (1/2 in.)	ON	YT, SK[(2)]
QC	Drywall – 9.5 mm (3/8 in.)	QC	–
NB	Drywall – 15.8 mm (5/8 in.) or 15 min/S101 thermal barrier	NB	–
AB	Interior finish mandated – 12.7 mm (1/2 in.) gypsum or 15 min/S101	–	Interior finish over studs, joists, trusses, etc.

Notes to Table B2.2:

1. The province or territory not covered here is expected to base their decision-making on one of the solutions covered within this matrix.
2. The garage ceiling/floor joists need to be protected by the intumescent coating only if the joists are loadbearing and of engineered wood (e.g., I-joists). Solid-sawn lumber joists do not need to be protected. Loadbearing studs are to be protected.

Table B2.3 Protection of Insulation from Mechanical Damage (When Protection Required)

Province or Territory[1]	Mechanical Damage Protection for Insulation – Benchmark	Attached Garages	Basement Areas
AB, YT, NU, BC, MB, ON	Any Code-specified panel – gypsum board, plywood/OSB, hardboard, particleboard	YT, NU, BC, MB, ON	AB, YT, NU, BC, MB, ON
YT, SK, AB	Drywall – 12.7 mm (1/2 in.)	AB, SK	SK
NWT, QC	Drywall – 9.5 mm (3/8 in.)	NWT, QC	NWT, QC
NB	Code-specified panels	NB	NB

Note to Table B2.3:

1. Any province or territory that is not covered here is expected to base their decision-making on one of the solutions covered within this matrix.

Appendix C – Alternative Solution for Part 9 and Part 3: Summary Table

Table C1. Summary Table of DC 315 Performance versus Part 9 and Part 3 Acceptable Solutions

<table>
<tr><th colspan="4">NBC Part 9</th></tr>
<tr><th>NBC-Specified Thermal Barrier</th><th>Test Method</th><th colspan="2">Result
Time to Flashover
(minutes:seconds)</th></tr>
<tr><th colspan="3">Acceptable Solutions</th><th>Alternative Solution</th></tr>
<tr><td>Interior finishes in Subsections 9.29.4 to 9.29.9</td><td>ISO/CAN/ULC-S9705 Full-scale room test</td><td>1:00-3:00

(N.B. CCMC-specified 10 minute minimum to be met)</td><td>20 mil DC 315
w/3 mil primer

11:00 minutes
(See Note 2)</td></tr>
<tr><th colspan="3">Common Practice (As-Built Environment)</th><td rowspan="2">24 mil DC 315
w/3 mil primer

20:00 minutes
(See Note 3)</td></tr>
<tr><td>(See Note 1)</td><td>ISO/CAN/ULC-S9705
Full-scale room test</td><td>20:00</td></tr>
<tr><th colspan="4">NBC Part 3</th></tr>
<tr><th colspan="3">Acceptable Solutions
Sentence 3.1.5.15.(2)</th><th>Alternative Solution</th></tr>
<tr><td>Clause 3.1.5.15.(2)(a)
(See Note 1)</td><td rowspan="2">ISO/CAN/ULC-9705
Full-scale room test</td><td>20:00</td><td rowspan="2">24 mil DC315
w/3 mil primer

20:00 minutes
(see Note 3)</td></tr>
<tr><td>Clause 3.1.5.15.(2)(e)
(See Note 4)</td><td>14:10</td></tr>
</table>

Notes to Table C1:

1. 12.7-mm regular gypsum on framing and MD spray urethane cavity insulation.
2. Intumescent coating, 20 mils over 100 mm of CCMC-listed CAN/ULC-S705.1-compliant spray urethane foam insulation. Passed requirement to meet minimum 10-min specified by CCMC.
3. Intumescent coating, 24 mils over 100 mm of CCMC-listed CAN/ULC-S705.1-compliant spray urethane foam insulation. Passed requirement of equal or better performance than acceptable solution.
4. Cementitious thermal barrier conforming to ULC-listed Classification B, CAN/ULC-S124-compliant thermal barrier was tested over 100 mm CCMC-listed CAN/ULC-S705.1-compliant MD spray polyurethane foam insulation. DC315 passed requirement of equal or better performance than acceptable solution.