Genyk Fire Testing and Compliance –

Using Boreal Elite in combustible, non-combustible and fire-rated assemblies

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The Situation

Traditionally, closed-cell spray polyurethane foam (ccSPF) has been restricted to non-combustible construction assemblies, with some limited applications within combustible construction. All ccSPF applications, combustible and non-combustible, require that the ccSPF be protected by a thermal barrier capable of providing a minimum of fifteen or twenty-minutes of thermal protection. Given the time limits of traditionally applied thermal barriers, the building code requirements precluded the use of ccSPF within wall and ceiling systems that require fire-rated assemblies.

The following information is intended to address misconceptions related to the use of spray foam within combustible and non-combustible construction. *Boreal Elite* has been tested in various combustible and non-combustible construction assemblies, and thus, the installation opportunities are far more varied than generally recognized. Not only can *Boreal Elite* be used in typical residential applications, but the product has been tested and approved for various exterior applications. Additionally, *Boreal Elite*, also has been tested within a one-hour rated assembly.

Genyk's dedication to testing has broadened the range of applications available for ccSPF. *Boreal Elite* can be installed beyond traditional applications. When installed in conjunction with correct thermal barrier safeguards, spray foam allows a fire-safe installation. *Boreal* Elite's superior thermal resistance, vapour and air barrier protection and structural strength enhancement are available in a multitude of applications previously unavailable to the design professionals, general contractors and end-users.

ccSPF within a Combustible Installation

The National Building Code is clear – exposed ccSPF requires an adequate thermal barrier when installed within a combustible assembly.

3.1.4.2 Protection of Foamed Plastics

1) Foamed plastics which form part of a wall or ceiling assembly in combustible construction shall be protected…by any thermal barrier that meets 3.1.5.12(2) –

a) not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,
b) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
c) masonry,
d) concrete, or
e) any thermal barrier that meets the requirements of classification B when tested in conformance with CAN4-S124-M, Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic (See Appendix A)

The overwhelming majority of ccSPF within combustible construction occurs within assemblies that include gypsum board or masonry/concrete protection. DC315 spray-applied thermal barrier also qualifies as an acceptable thermal barrier[1]. *Boreal Elite*, when installed in conjunction with DC315 intumescent thermal

[1] DC315 – is manufactured by International Fireproofing Technologies. The product has been deemed code compliant in keeping with CCMC tested protocols.

barrier, can provide 15-minute and 20-minute protection. Thus, there are no applications that would preclude *Boreal Elite* within the requirements of NBC combustible construction assemblies.

ccSPF within Non-Combustible Installation

As per 3.1.5.12A.(1) – Foamed plastic insulation is permitted to be installed…in a building required to be of non-combustible construction. For non-combustible construction with a height that is less than 18 metres, the requirements of a thermal barrier (gypsum board, masonry, S124M etc.) remain the same as that for combustible construction. However, both exterior and interior walls of a building exceeding 18 metres in height, require that the installed ccSPF product has passed the CAN/ULC-S101 Fire Endurance Test. Specifically, when tested to CAN/ULC-S101, the foam cannot "…develop an average temperature rise more than 140^{0}C or a maximum temperature rise more than 180^{0}C at any point on its exposed face within 20 minutes" [3.1.5.12A.(3) and (4)].

Boreal Elite has been tested to the CAN/ULC-S101 standard. As such, when installed with an acceptable thermal barrier, the ccSPF can be installed in non-combustible construction assemblies.

Genyk *Boreal Elite* CAN/ULC-S134 Compliance

Boreal Elite has successfully completed the requirements of the CAN/ULC S134 Standard Fire Test for Exterior Wall Assemblies. This test method is aimed at measuring the external fire spread at exterior wall openings. Typically required in multi-storey residential and commercial construction, the testing measures flame spread distance and heat flux of cladding materials at and around openings during a simulated fire within the structure.

The CAN/ULC-S134 acceptance criteria and the subsequent *Boreal Elite* test observations are listed below. *Boreal Elite* exceed the S134 requirements.

Acceptance Criteria	Test Observations	Pass/Fail
Flaming on or in the wall assembly shall not spread more than 5 m above the opening.	During the test, the flame on the wall assembly did not spread beyond five meters above the opening. The maximum height of the flame was 3 meters.	PASS
The heat flux for any one of the heat flow transducers shall not be more than 35 kW/m².	The heat flux did not exceed 35 kW/m² during the test. The maximum heat flux was 31.2 kW/m², recorded by the center radiometer 3.5 m above the opening.	PASS

Given the tested success of Boreal Elite, spray foam is now a viable option for exterior cladded assemblies. The product provides superior thermal resistance and durability properties when compared to conventional fibrous materials. The fire resistance results provide the peace of mind necessary to make performance improvements.

Genyk *Boreal Elite* E84 Flame Spread Compliance

Various installations require a ccSPF product to comply with the E84 designation of a Class One Rating. Being Class One means that the material has a smoke-development index of less than 450 and a flame

spread index of less than 25. *Boreal Elite* has successfully completed the requirements of the E84 testing, and thus, can be considered a 'Class-One' ccSPF.

Applications that require a Class-One designation include residential and commercial buildings higher than 18 meters. In addition to height restrictions, ccSPF has limitations due to non-sprinklered construction. Both obstacles are eliminated when using *Boreal Elite*.

Given *Boreal Elite's* Class One designation, projects that typically required a specific ccSPF material to comply with flame spread requirements, are now accessible with one, CCMC listed material that also includes E84 test compliance. Oil tanks, skid packages and rock shield installations, typically done with designated E84 products can now be done with *Boreal Elite.*

Genyk *Boreal Elite* + DC315 Thermal Barrier = One-hour Rated Wall Assembly

Genyk has achieved the first 'one-hour' fire rated ccSPF assembly. *Boreal Elite*, when used in conjunction with IFTI DC315, has been tested in accordance with CAN/ULC S101 and has met the conditions of acceptance for exterior walls in steel building applications.

The ICC-ES product-certification system includes evaluation of test reports done at accredited testing laboratories. The Boreal Elite/DC315 system was evaluated based on tested non-loadbearing wall assemblies. The ICC Design was tested in accordance with the CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials, ULC Standards.

ICC-ES listing Report #ESL-1577 is based on testing requirements outlined in the National Building Code of Canada – Volume 1-Division B: 3.1.7.1 and 3.1.7.2.

- From 3.1.7.1.(1) …the rating of a material, assembly of materials or a structural member that is required to have a fire-resistance rating, shall be determined on the basis of the results of tests conducted in accordance with CAN/ULC S101…
- From 3.1.7.2.(1) …the limit on the rise of temperature on the unexposed surface of an assembly as required by the tests referred to in Sentence 3.1.7.1.(1) shall not apply to an exterior wall that has a limiting distance of 1.2 meters or more…

The listing report addresses only conformance with the standards and code sections noted above. The approval of the product's use is the sole responsibility of the local building official.

Associated Fire-Rating Research

Genyk has confirmed several systems to assist with combustible design considerations. First, *Boreal Elite* was tested in accordance with the requirements of the National Building Code – 3.2.3.8.(2) – Protection of Exterior Face. The wall assembly containing *Boreal Elite* with steel face met the requirements of NBC Article 3.2.3.8.(2) when exposed to the time temperature curve of CAN/ULC S101 for fifteen-minutes duration. The test was conducted with the steel face orientated towards the exterior.

In conjunction with the CAN/ULC S101 steel face test, at the request of Genyk, QAI Laboratories similarly tested *Boreal Elite* with cement board and a stucco finish. This assembly also met the requirements of NBC Article 3.2.3.8.(2).

Finally, QAI Laboratories ran CAN/ULC S101 testing with Boreal Elite and a steel facing using thicker gauge steel on the exterior cladding, corrugated steel skin in lieu of the flat steel skins originally tested and using a range of *Boreal Elite* thicknesses up to a maximum of what was used in previous tests.

All tests were run with the exterior face of the assembly exposed to the fire. In all cases, *Boreal Elite* and the various facings met the temperature curve requirements of CAN/ULC S101 for fifteen-minute duration.

Unprotected ccSPF applications

There are installations when ccSPF is not required to have thermal barrier or rated protection.

NBC 3.1.4.2 Protection of Foamed Plastics requires thermal protection whenever ccSPF is exposed to the potential of fire. However, there are construction assemblies that do not require additional thermal barriers. Specifically, "…concealed spaces within attic or roof spaces and crawl spaces".

A crawl space is considered a basement (requires thermal barrier) if it is –

- ✓ More than 1.8 meters in height
- ✓ Used for any occupancy
- ✓ Used for the passage of flue pipes
- ✓ Used as a plenum in combustible construction

A floor assembly immediately above a crawl space is not required to be constructed as a fire separation provided the crawl space does not meet any of the criteria that would be considered a basement.

When, Where and How Much

Installation	Standard	Protection Type	Protection Provided
Residential combustible construction	NBC 3.4.1.2	½" Drywall	15-minute
Residential combustible construction	NBC 3.4.1.2	20 WFT DC315	15-minute
Residential combustible construction	NBC 3.4.1.2	24 WFT DC315	20-minute
Residential non-combustible construction	NBC 3.1.5.12A + S101	Type X Drywall	20-minute
Residential non-combustible construction	NBC 3.1.5.12A + S101	24 WFT DC315	20-minute
Multi-Storey non-combustible construction	NBC 3.1.5.12A + S101 + **E84**	Type X Drywall	20-minute
Multi-Storey non-combustible construction	NBC 3.1.5.12A + S101 + **E84**	24 WFT DC315	20-minute
Exterior rated cladding application	NBC 3.2.3.8 + **S134** + **E84**	Rated cladding	20-minute
Exterior metal un-rated cladding application	NBC 3.2.3.8 + S101	Stand alone	15-minute
Exterior cement board stucco application	NBC 3.2.3.8 + S101D	Stand alone	15-minute
One-hour fire-rated wall assembly	NBC 3.1.7.1/2 + ESL-1577	34 WFT DC315	One-hour

Conclusions

Combustible and non-combustible construction assemblies require the protection of ccSPF from the potential of fire. Most construction applications provide the required thermal protection of *Boreal Elite* with drywall. However, there are various materials and methods that can satisfy the building code requirements.

Genyk, in conjunction with International Fireproof Technology Inc. and QAI Laboratories has verified that *Boreal Elite* will meet various requirements of the National Building Code. Further, additional testing has demonstrated that *Boreal Elite* meets the rated requirements of exterior cladding applications.

The ICC-ES Listing – ESL-1577 confirms compliance with the requirements of NBC 3.1.7.1 and 3.1.7.2. At thirty-four wet mils, Boreal Elite and DC315 provide the necessary protection to provide a one-hour rating for compliant wall assemblies.

Boreal Elite has successfully demonstrated compliance with the requirements of NBC 3.2.3.8.(2) Protection of Exterior Face – fifteen-minute Stay-In-Place test. Additionally, conformance to CAN/ULC-S134 verifies the suitability of *Boreal Elite* as an exterior insulation option.

Genyk is committed to further fire-rating testing. The goal is to provide design professionals, building officials and spray foam partners with confirmation that *Boreal Elite*, and all spray foam products, can be compliantly installed in various construction assemblies – some designs never before recognized as spray foam suitable.

APPENDIX A – CAN/ULC-S134 – Conditions of Acceptance

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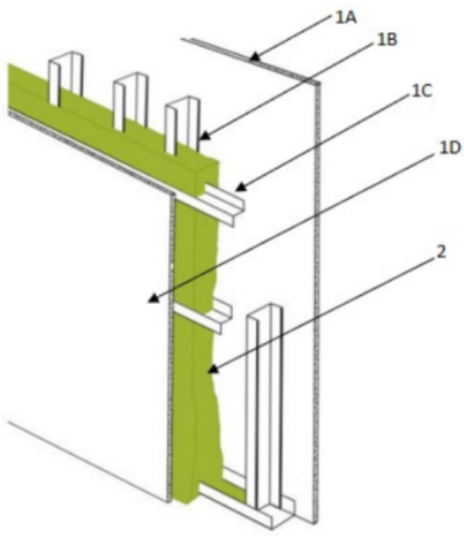
Total Quality. Assured.

Division 07 – Thermal and Moisture Protection
07 21 00 Thermal Insulation
07 21 29 Spray Insulation

Solutions Genyk Inc.
Design No. SGI/SI 25-01
Spray Foam Insulation
Boreal Nature Elite
CAN/ULC S134
Rating: Meets Conditions of Acceptance



1. NON-LOADBEARING WALL ASSEMBLY:

A. INTERIOR GYPSUM – Install one layer of 5/8 in. (15 mm) thick, Type X gypsum board vertically to the interior side of the steel framing using #8 x 1-1/4 in. (32 mm) long self-drilling screws, at nominal spacing of 8 in. (203 mm) around the board perimeter and in the field.

B. STEEL FRAMING – Install min. 3-5/8 in. (92.07 mm) 20 GA metal studs, spaced 16 in. (406 mm) on center (oc) vertically, inside min. 3-5/8 in. (92.07 mm) 20 GA perimeter steel tracks, using #8 x 1-1/4 in. (32 mm) long self-drilling fasteners per stud flange.

C. Z-BARS – Attach min. 18 GA 57 mm continuous Z-bars using #14 x 1 in. long self-drilling screws at each stud, spaced max. 24 in. oc horizontally.

D. EXTERIOR SHEATHING – Install one layer of 5/8 in. (15 mm) thick, Type X, ASTM C1177-compliant glass-mat gypsum board sheathing (GlassRoc) to the supporting Z-bars using #8 x 1-1/4 in. (32 mm) long self-drilling screws, at nominal spacing of 8 in. (203 mm) oc horizontally. All joints are to be taped with 3M 3015 NP tape, centered over the joint and installed following the manufacturer's instruction.

Date Issued: August 20, 2024 Page 1 of 2 Spec ID: 79907

Version: 9 June 2021 SFT-BC-OP-19i

Division 07 – Thermal and Moisture Protection
07 21 00 Thermal Insulation
07 21 29 Spray Insulation

2. **INSULATION:**

   CERTIFIED PRODUCTS: Boreal Nature Elite Spray Foam Insulation

   Up to 6 in. (152 mm) of insulation is permitted when spray-applied on the interior surface of the exterior sheathing between the Z-bar and metal studs. Spray-apply insulation per manufacturer's instructions.

3. **EXTERIOR WALL CLADDING (Not Shown):** Code-compliant, non-combustible exterior cladding is attached to the min. 18 GA Z-bar. Wall cladding materials and installation must conform to applicable standards and methods of installation prescribed by the National Building Code of Canada.

4. **OPENING FLASHING (Not Shown):** The inside perimeter of opening in the wall assembly shall be continuously enclosed with min. 20 GA steel flashing.

Consult the listing report on the Directory of Building Products (https://bpdirectory.intertek.com) for the edition of the standard(s) evaluated.

Compliance of the assembly described in this Design Listing with the referenced standard relies on verification that the assembly constructed in the field is consistent with that described herein. Intertek certified products may be verified by the approved Intertek label; other products must be verified by the Authority Having Jurisdiction as meeting the specifications stated herein.

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APPENDIX B – ESL-1577 – Genyk *Boreal Elite* + DC315 One Hour Fire Rated Wall Assembly

ES ICC EVALUATION SERVICE®

ICC Design No. IFRM-1577-01 **ESL-1577**

Issued April 2024

This listing is subject to renewal April 2025.

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Applicant: INTERNATIONAL FIREPROOF TECHNOLOGY INC.

Product: DC315 INTUMESCENT COATING

Code Section: Sections 3.1.7.1. and 3.1.7.2. of Volume 1-Division B of the *National Building Code of Canada®* 2020 and 2015

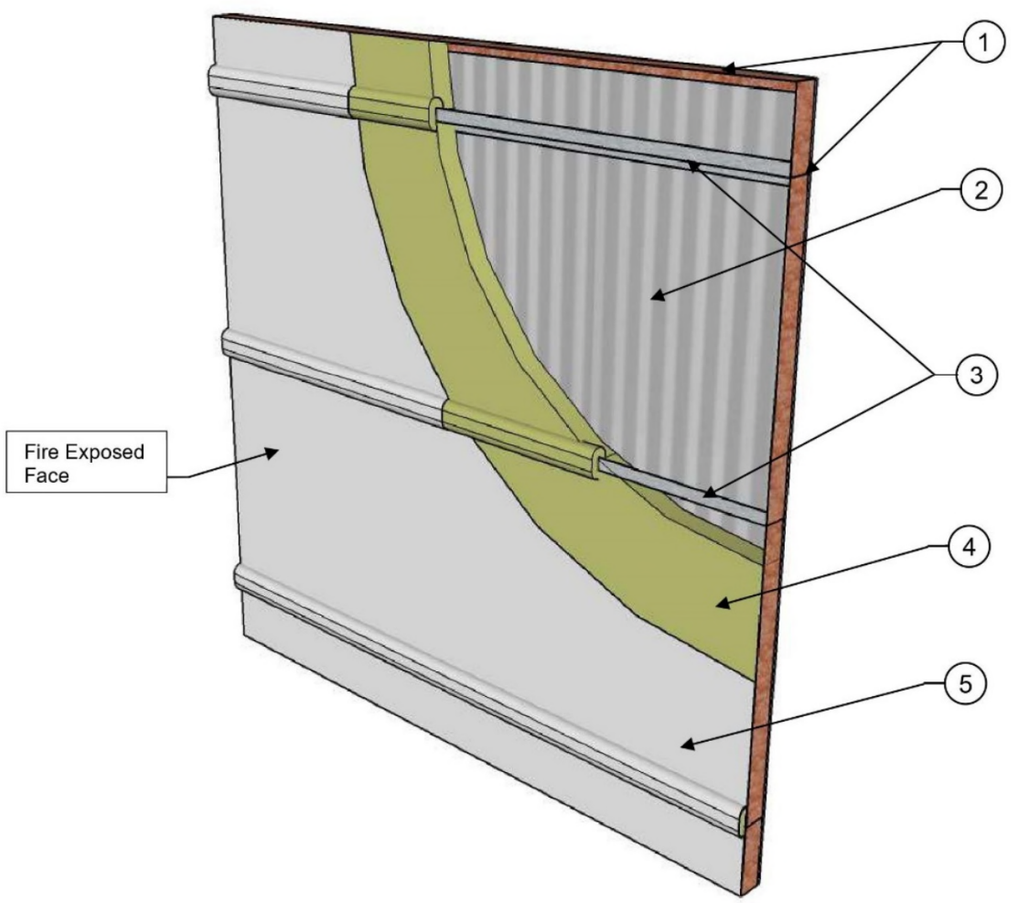
Assembly Rating: 45-minutes from the Fire Exposed Face (Asymmetrical Wall Assembly) where F_{EO} = 0.019,

1-Hour from the Fire Exposed Face (Asymmetrical Wall Assembly) where F_{EO} = 0.034,

Note: See Conditions of Listing Item 4 of ESL-1577

Load: Non-loadbearing

IFRM = Intumescent Fire-Resistive Materials



COMPONENTS OF CONSTRUCTION:

1. **Perimeter Framing Members –** Minimum 16-gauge thick steel members with minimum 101.6 mm by 50.8 mm (4-inch by 2-inch) legs are used as perimeter framing for the wall assembly. The perimeter framing members are oriented to allow for wall sheathing attachment and secured to each other using minimum two 12.7 mm ($^1/_2$-inch) long No. 8 pan head self-drilling screws at each corner.
2. **Wall Sheathing (Unexposed Face) –** Minimum 26-gauge thick and 914.4 mm (36-inch) wide commercial grade steel R-panels with 31.8 mm ($1^1/_4$-inch) deep ribs must be installed vertically with panel seams overlapping in accordance with the manufacturer's published installation instructions. Panels must be secured to each other along the vertical overlapping seam using 25.4 mm (1-inch) long No. 12 external hex washer head self-drilling screws spaced at a maximum of 406.4 mm (16-inches) on center vertically. Panels are secured to the perimeter framing members using 25.4 mm (1-inch) long No. 12 external hex washer head self-drilling screws spaced at a maximum of 406.4 mm (16-inches) on center around the perimeter of the wall assembly. Panels must be secured to the intermediate support framing using 38.1 mm ($1^1/_2$-inch) long No. 12-14 external hex washer head self-drilling screws spaced at a maximum of 304.8 mm (12-inches) on center horizontally along each intermediate support framing member.
3. **Intermediate Support Framing –** Intermediate wall framing members consist of minimum 16-gauge thick, 101.6 mm (4-inch) deep Z- or C-girts with 50.8 mm (2-inch) legs installed horizontally and spaced at a maximum of 1219.2 mm (48-inches) on center. The intermediate support framing members are secured to the perimeter framing members using minimum two 12.7 mm ($^1/_2$-inch) long No. 8 pan head self-drilling screws at each end.
4. **Insulation –** GENYK Boreal Nature Elite (Closed-Cell) spray-applied polyurethane foam (SPF) insulation, with a reported density of 32.04 kg/m^3 (2.0 lbs./ft^3), must be applied at a nominal thickness of 101.6 mm (4-inches) between the intermediate support framing members, applied directly to the fire exposed face of the wall sheathing. SPF insulation must also be applied to the intermediate support framing members at a nominal thickness of 38.1 mm ($1^1/_2$-inch) matching the contour of the Z- or C-girts. Application must be in accordance with the manufacturer's published instructions.
5. **Intumescent Coating (Exposed Face) –** International Fireproof Technology Inc. DC315 intumescent coating must be applied over the exposed surface of the spray foam insulation at a minimum 0.61 mm (24 mils) dry film thickness (DFT) on the fire exposed face of the wall assembly. Application must be in accordance with the manufacturer's published instructions.

CAN/ULC S101 – NBC 3.2.3.8 Compliant Assemblies

Genyk had QAI Laboratories test *Boreal Elite* at different thicknesses and with different exterior wall assemblies. All testing was aimed at demonstrating that *Boreal Elite* is NBC 3.2.3.8 compliant.

To that end –

"it is QAI's opinion based on the rational noted in this report the following systems will meet the requirements of NBC Article 3.2.3.8. sentence 2 when exposed to the time temperature curve of CAN/ULC S101 for 15 minutes duration."

Assembly	Framing	Sheathing	Exterior Insulation	Cladding
1	Steel Stud	Minimum 13 (1/2 inch) exterior gypsum	≤ 102 mm (4 inches) Boreal Nature Elite medium density Spray-applied polyurethane foam insulation	≥ 24 Gauge galvanized sheet steel, with 51 mm (2 inch) joint overlap, self-drilling screws spaced at 305 mm (12 inch) on center maximum.
2	Steel Stud	Minimum 13 (1/2 inch) exterior gypsum	102 mm (4 inches) Boreal Nature Elite medium density Spray-applied polyurethane foam insulation	≥ 24 Gauge galvanized corrugated steel, with 51 mm (2 inch) joint overlap, self-drilling screws spaced at 305 mm (12 inch) on center maximum.
3	Steel Stud	Minimum 13 (1/2 inch) exterior gypsum	≤ 102 mm (4 inches) Boreal Nature Elite medium density Spray-applied polyurethane foam insulation	51 mm (1/2 inch) Cement Board with stucco finish of 4 mm thickness.

APPENDIX C– CAN/ULC S101 – NBC 3.2.3.8 Compliant Assemblies

The two construction assemblies testing to ensure NBC 3.2.3.8 compliance.

Thicknesses and assembly construction was altered to anticipate various construction models.

CAN/ULC S101 – Steel Faced Assembly

Component	Description – See QAI Test Report T1296-5 Dated December 7, 2020	
Wall Assembly	Size	3.05 m (10 ft.) wide by 3.05 m (10 ft.) high by 152 mm (6 in.) thickness.
	Type	Exterior Insulated wall system.
	Framing	25 Gauge 92 mm by 32 mm (3.625 in. by 1.25 in.) steel stud.
	Sheathing	13 mm (0.5 in.) DenseGlass Gold fiberglass mat gypsum.
	Insulation	102 mm (4 in.) Boreal Nature Type 2 spray-applied polyurethane foam insulation.
	Exterior Perimeter Channel	20 Gauge galvanized steel C-channel with dimensions of 127 mm (5 in.) depth, one 38 mm (1.5 in.) leg and one 25 mm (1 in.) leg.
	Exterior Z-Bar	20 Gauge galvanized steel Z-Bar with dimensions of 127 mm (5 in.) depth and 38 mm (1.5 in.) legs mounted horizontally spaced 406 mm (16 in.) on center.
	Exterior Panel	24 Gauge galvanized sheet steel with 51 mm (2 in.) overlap at the joints. The sheet was fastened with self-drilling sheet metal screws spaced 305 mm (12 in.) on center.

CAN/ULC S101 – Cement Board/Stucco Faced Assembly

COMPONENT	DESCRIPTION – See QAI Test Report T1296-5 dated December 7, 2020	
Wall Assembly	Size	3.05 m (10 ft.) wide by 3.05 m (10 ft.) high by 152 mm (6 in.) thickness.
	Type	Exterior Insulated wall system.
	Framing	25 Gauge 92 mm by 32 mm (3.625 in. by 1.25 in.) steel stud.
	Sheathing	13 mm (0.5 in.) DenseGlass Gold fiberglass mat gypsum.
	Insulation	102 mm (4 in.) Boreal Nature Type 2 spray-applied polyurethane foam insulation.
	Exterior Perimeter Channel	20 Gauge galvanized steel C-channel with dimensions of 127 mm (5 in.) depth, one 38 mm (1.5 in.) leg and one 25 mm (1 in.) leg.
	Exterior Z-Bar	20 Gauge galvanized steel Z-Bar with dimensions of 127 mm (5 in.) depth and 38 mm (1.5 in.) legs mounted horizontally spaced 406 mm (16 in.) on center.
	Exterior Panel	51 mm (0.5 in.) thick PermaBase cement board fastened to the perimeter C-Channel and Z-bar using no. 8 by 32 mm (1.25 in.) self-drilling cement board screws spaced 305 mm (12 in.) on center. The board was mounted horizontally and included horizontal and vertical joints.
	Stucco Finish	Base coat was applied using ADEX Drymix basecoat applied to an approx. thickness of 4 mm with ADEX standard 4.5 oz glass fiber-reinforced mesh embedded. The finish coat was applied to coverage of approx.. 0.4 m^2/kg with ADEX Elasticoat Fine Regular.