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Testing. Advising. Assuring.

**PERFORMANCE EVALUATION OF THE  
“FUSION™ NON-COMBUSTIBLE RAINSCREEN SYSTEM”  
IN ACCORDANCE WITH AAMA 508-14 FOR  
VOLUNTARY TEST METHOD AND SPECIFICATION FOR  
PRESSURE EQUALIZED RAIN SCREEN WALL CLADDING SYSTEMS**

Report to:

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New Report No.  
Proposal No.:

18-06-B0193-F2  
18-006-570736  
12 Pages, 1 Appendix

Report Date:

March 25, 2019

## 1.0 INTRODUCTION

Exova was retained to evaluate the "FUSION™ Non-Combustible Rainscreen Systems" exterior wall panel system in accordance with AAMA 508-14 for voluntary test method and specification for pressure equalized rain screen wall cladding systems as outlined in Proposal number 18-006-570736.

Upon receipt, the specimen was assigned the following Exova Specimen Number:

**Client Specimen Description**

FUSION™ Non-Combustible Rainscreen System  
(T-Panel Scheme / 3 panels, not individually pressure isolated)

**Exova Specimen No.**

18-06-B0193-2

## 2.0 PROCEDURE

| Test Description   | Test Method   |
|--|---|
| Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems - Air Leakage Quantification            | AAMA 508-14, Section 5.3 – Referencing ASTM E283-04 (2012)          |
| Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems - Pressure Equalization                 | AAMA 508-14, Section 5.5 – Referencing ASTM E1233-14                |
| Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems - Water Penetration via Static Pressure | AAMA 508-14, Section 5.6 – Referencing ASTM E331-00 (2016)          |
| Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems - Dynamic Water Penetration             | AAMA 508-14, Section 5.7 – Referencing AAMA 501.1-17, Dynamic Water |
| Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems - Structural Performance                | AAMA 508-14, Section 5.8 – Referencing ASTM E330-14                 |

Note: SI units are the primary units of measure.

2.0 PROCEDURE (CONTINUED)

**Test Wall Section Description & Details:**

The back-up test wall section (air / water barrier) was constructed in an Exova test frame as per the detail drawing below in accordance with AAMA 508-14, Section 5.0.

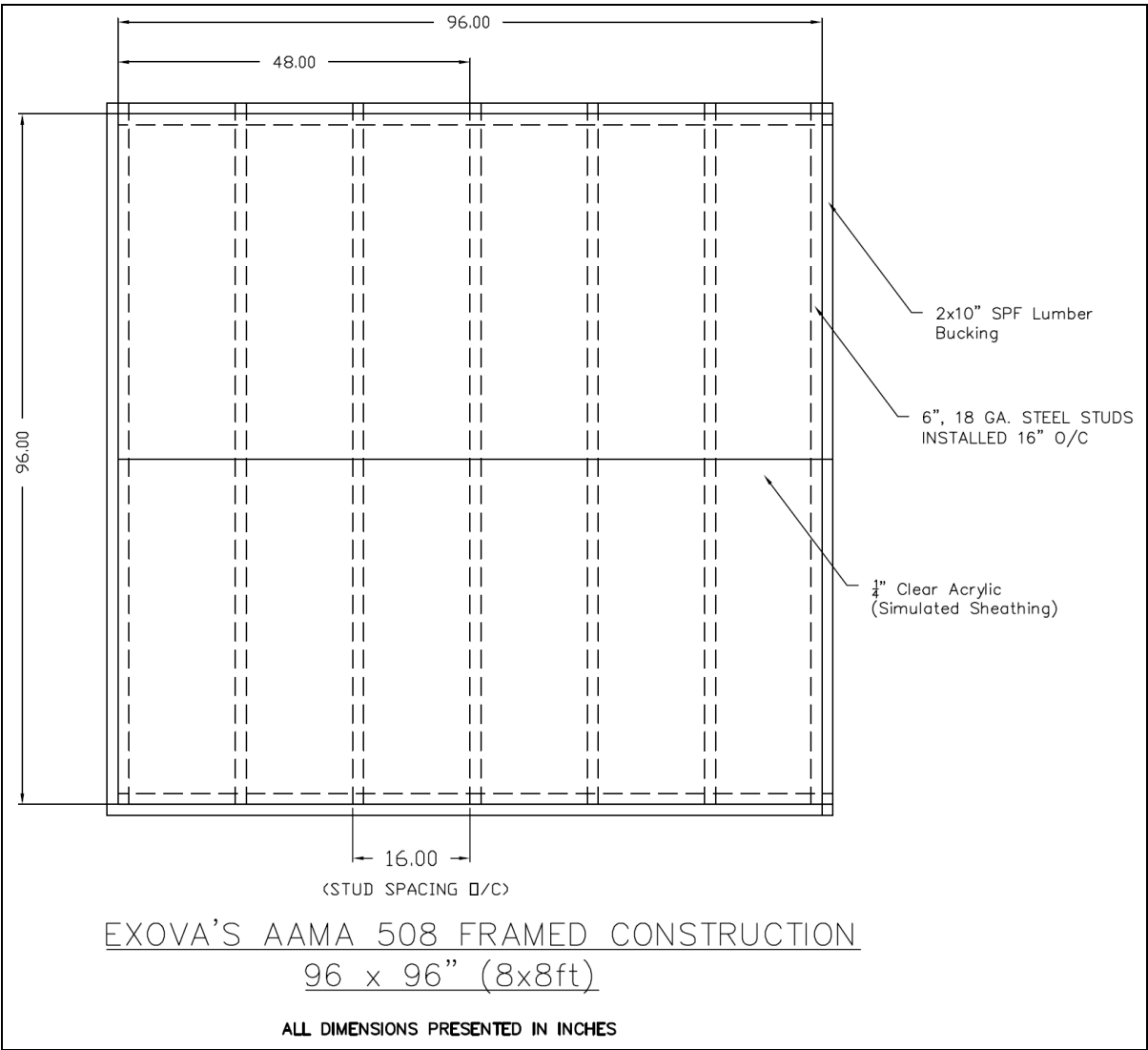


Figure 1 – Back-up Test Wall Framing Construction

## 2.0 PROCEDURE (CONTINUED)

Upon completion of the back-up wall, the Plexiglas joints and screw-heads were sealed to ensure the assembly was air-tight. After the air leakage validation for tightness was completed, as prescribed by AAMA 508-14, Section 5.2.2 & Figure 1A, three (3) mm (1/8") diameter holes were introduced equally spaced 150 mm (5.91") above horizontal seams and above the base of the mock-up in order for the air / water barrier to have an air leakage rate of 0.6 L/s·m<sup>2</sup> (+/- 10%).

The application of the cladding system on the test back-up wall was performed by Carter Fabricating Inc. authorized personnel on November 9<sup>th</sup>, 2018. As permitted by AAMA 508-14, Note 5, the perimeter of the specimen was sealed to the fixture that the wall section was constructed into. No drainage/vent holes or critical areas of the specimen that would be affected by water infiltration / drainage or differential pressure were obstructed.

Using the procedure outlined in AAMA 508-14, Section 5.5, the pressure cycling tests were conducted as specified in ASTM E1233 to a positive pressure from 240 Pa (5.0 PSF) to 1200 Pa (25.06 PSF) to 240 Pa (5.0 PSF) based on a maximum average of three seconds for 100 cycles as per AAMA 508-14. Upon completion of the pressure equalization behavior test, the AAMA 508-14, Section 5.6, water penetration test at 300 Pa (6.24 PSF) for fifteen minutes was conducted.

Upon completion of the static air leakage as outlined in AAMA 508-14, Section 5.6, testing was conducted in accordance with AAMA 508-14, Section 5.7 referencing AAMA 501.1-17 at 300 Pa (6.24 PSF).

## 3.0 RESULTS

| Table 1 – Custom Air Leakage Results per Client Request <sup>(1)</sup><br>ASTM E283-04 (2012)<br>Exova Specimen No.: 18-06-B0193-2 (Test Date: November 13, 2018) |   |   |
|---|---|---|
| Test Pressure Differential (Pa)   | Infiltration  | Exfiltration  |
| 75 Pa (1.57 PSF)  | 0.01 L/s m <sup>2</sup> (0.003 CFM/ft <sup>2</sup> ) <sup>(1)</sup> | 0.02 L/s m <sup>2</sup> (0.003 CFM/ft <sup>2</sup> ) <sup>(1)</sup> |
| 300 Pa (6.24 PSF)   | 0.03 L/s m <sup>2</sup> (0.006 CFM/ft <sup>2</sup> ) <sup>(1)</sup> | 0.03 L/s m <sup>2</sup> (0.006 CFM/ft <sup>2</sup> ) <sup>(1)</sup> |

<sup>(1)</sup> As per client request, the assembly was initially tested with an uncompromised simulated air-tight air / water resistive barrier on sheathing (*Plexiglas sheathing intact / as delivered to Exova*). The air-tight Plexiglas substrate was employed to simulate an air / water resistive barrier sheathing membrane in conjunction with the rainscreen system attached through the Plexiglas to the interior supporting studs.

| Table 2 – AAMA 508-14, Section 5.3,<br>Referencing ASTM E283-04 (2012) Summarized Air Leakage Results <sup>(2)</sup><br>Exova Specimen No.: 18-06-B0193-2 (Test Date: November 13, 2018) |   |
|--|---|
| Test Pressure Differential (Pa)  | Infiltration  |
| 75 Pa (1.57 PSF)   | 0.56 L/s m <sup>2</sup> (0.110 CFM/ft <sup>2</sup> ) <sup>(2)</sup> |

<sup>(2)</sup> Forty-eight (48) 3 mm diameter holes were drilled through the Plexiglas substrate, equally spaced, 6" above the drainage tracks. These penetrations were employed to simulate an air / water resistive barrier sheathing membrane imperfections in general accordance with AAMA 508-14, Section 5.2.2.

### 3.0 RESULTS (CONTIUNED)

| Table 3 – AAMA 508-14, Section 5.5, Referencing ASTM E1233-14<br>Pressure Equalization Behavior Analysis<br>Exova Specimen No.: 18-06-B0193-2 (Test Date: November 13, 2018) |   |                                  |  |                             |                   |
|--|---|----------------------------------|--|-----------------------------|-------------------|
| Compartment Tested   | Maximum External Gust Pressure of Pulse | Maximum Cavity Pressure of Pulse | Requirements   |                             | Comments          |
|  |   |                                  | Pressure Differential  | Maximum Time Shift of Pulse |                   |
| Primary Compartment  | 1188 Pa<br>(24.81 PSF)                  | 1011 Pa<br>(21.12 PSF)           | Pressure differential on rain screen cladding shall not exceed 50% of maximum wind gust pressure | < 0.08 seconds              | Meets Requirement |

- Air Leakage of Back-Up Wall (air / water barrier): **0.56 L/s m<sup>2</sup>** (0.110 CFM/ft<sup>2</sup>)
- Ratio of cavity volume to vent area (Upper Panels): **636 m<sup>3</sup> / m<sup>2</sup>**
- Ratio of cavity volume to vent area (Lower Panel): **763 m<sup>3</sup> / m<sup>2</sup>**

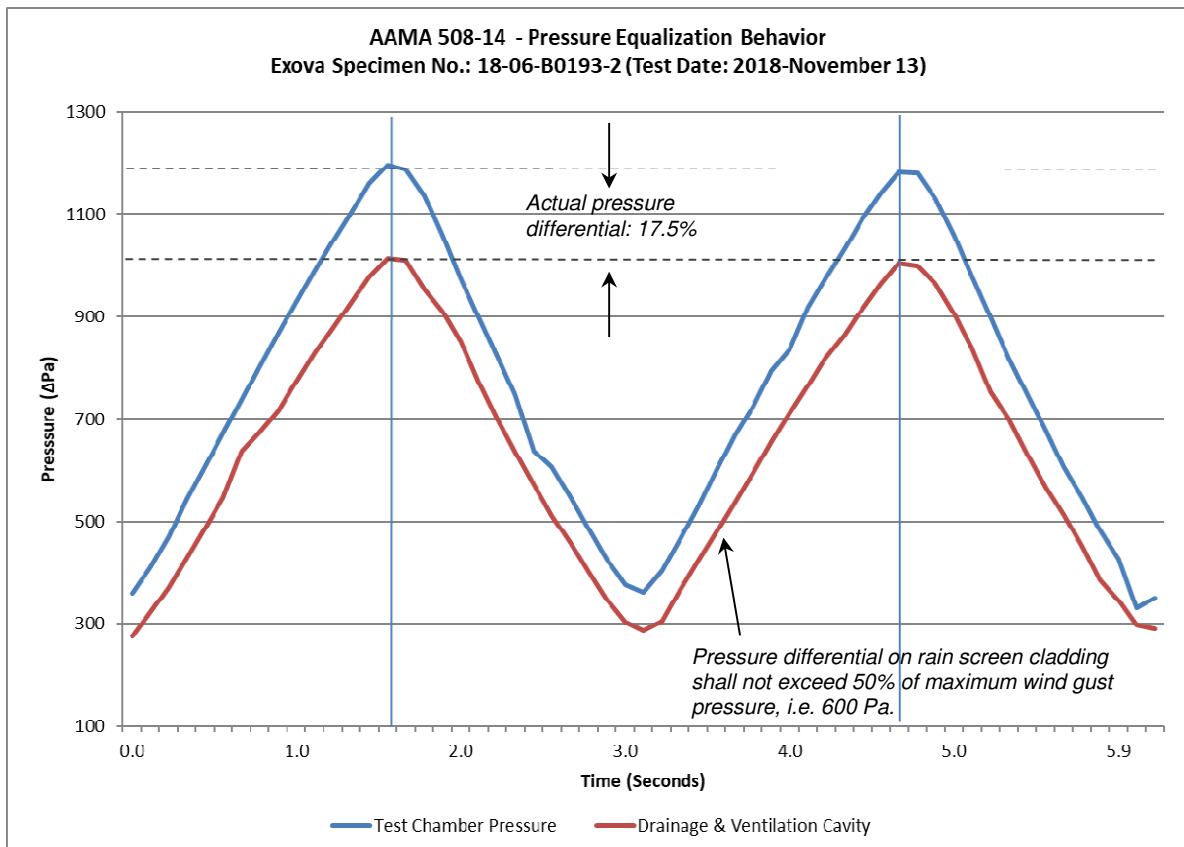


Figure 2 – Pressure Equalization Behavior

### 3.0 RESULTS (CONTIUNED)

| <b>Table 4 – AAMA 508-14, Section 5.6, Referencing ASTM E331-00 (2016)</b><br><b>Water Penetration Resistance</b><br><b>Exova Specimen Number: 18-06-B0193-2 (Test Date: November 14, 2018)</b> |   |  |                          |
|---|---|--|--------------------------|
| <b>Test Pressure (Pa)</b>   | <b>Requirements</b>   | <b>Results</b>   | <b>Comments</b>          |
| 300 Pa <sup>(2)</sup><br>(6.24 PSF)<br>(15-Minutes)   | <p>All water that penetrates the exterior rain screen cladding shall be controlled and drained to the exterior. All water that contacts the air / water barrier shall be visually observed and recorded:</p> <p>a) Water mist or droplets on the air/water barrier surface; and/or</p> <p>b) Water in continuous stream on the air/water barrier surface.</p> <p>Failure shall be defined as water mist or water droplets appearing in excess of 5% of the air/water barrier surface, or continuous streaming at any location on the air/water barrier.</p> | <p>Water mist and/or droplets were observed. No continuous streaming was observed.</p> <p>3.2 % of air/water barrier surface area had water misting and / or water droplets.</p> | <b>Meets Requirement</b> |
| 720 Pa <sup>(3)</sup><br>(15.04 PSF)<br>(15-Minutes)  | <p>All water that penetrates the exterior rain screen cladding shall be controlled and drained to the exterior. All water that contacts the air / water barrier shall be visually observed and recorded:</p> <p>c) Water mist or droplets on the air/water barrier surface; and/or</p> <p>d) Water in continuous stream on the air/water barrier surface.</p> <p>Failure shall be defined as water mist or water droplets appearing in excess of 5% of the air/water barrier surface, or continuous streaming at any location on the air/water barrier.</p> | <p>Water mist and/or droplets were observed. No continuous streaming was observed.</p> <p>4.9 % of air/water barrier surface area had water misting and / or water droplets.</p> | <b>Meets Requirement</b> |

<sup>(2)</sup> 300 Pa = 22.1 m/s (or 49.4 mph / 79.6 km/h).

<sup>(3)</sup> 720 Pa = 34.3 m/s (or 76.7 mph / 123.5 km/h).

Calculation based on the Enswiler formula, where  $P = 0.613 \cdot V^2$ , V is m/s & P is N/m<sup>2</sup>

### 3.0 RESULTS (CONTIUNED)

| <b>Table 5 – AAMA 508-14, Section 5.7, Referencing AAMA 501.1-17</b><br><b>Dynamic Water Penetration test</b><br><b>Exova Specimen Number: 18-06-B0193-2 (Test Date: November 14, 2018)</b> |   |  |                                 |
|---|---|--|---------------------------------|
| Test Pressure (Pa)  | Requirements  | Results  | Comments                        |
| 300 Pa <sup>(2)</sup><br>(6.24 PSF)<br>(15-Minutes)   | <p>All water that penetrates the exterior rain screen cladding shall be controlled and drained to the exterior. All water that contacts the air / water barrier shall be visually observed and recorded:</p> <p>e) Water mist or droplets on the air/water barrier surface; and/or</p> <p>f) Water in continuous stream on the air/water barrier surface.</p> <p>Failure shall be defined as water mist or water droplets appearing in excess of 5% of the air/water barrier surface, or continuous streaming at any location on the air/water barrier.</p> | <p>Water mist and/or droplets were observed. No continuous streaming was observed.</p> <p>3.1 % of air/water barrier surface area had water misting and / or water droplets.</p> | <p><b>Meets Requirement</b></p> |
| 720 Pa <sup>(3)</sup><br>(15.04 PSF)<br>(15-Minutes)  | <p>All water that penetrates the exterior rain screen cladding shall be controlled and drained to the exterior. All water that contacts the air / water barrier shall be visually observed and recorded:</p> <p>g) Water mist or droplets on the air/water barrier surface; and/or</p> <p>h) Water in continuous stream on the air/water barrier surface.</p> <p>Failure shall be defined as water mist or water droplets appearing in excess of 5% of the air/water barrier surface, or continuous streaming at any location on the air/water barrier.</p> | <p>Water mist and/or droplets were observed. No continuous streaming was observed.</p> <p>3.8 % of air/water barrier surface area had water misting and / or water droplets.</p> | <p><b>Meets Requirement</b></p> |

<sup>(2)</sup> 300 Pa = 22.1 m/s (or 49.4 mph / 79.6 km/h).

<sup>(3)</sup> 720 Pa = 34.3 m/s (or 76.7 mph / 123.5 km/h).

Calculation based on the Enswiler formula, where  $P = 0.613 \cdot V^2$ , V is m/s & P is N/m<sup>2</sup>



**Outdoor Conditions during Test:**

Temperature: 3.2 °C  
Relative Humidity: 42 %RH  
Barometric Pressure: 29.8 inHg



Figure 3 – AAMA 501.1, Dynamic Water Penetration Test



### 3.0 RESULTS (CONTIUNED)

| Table 6 – AAMA 508-14, Section 5.8, Referencing ASTM E330-14<br>Static Structural Performance (Preload and Design Pressure) <sup>(5)</sup><br>Exova Specimen Number: 18-06-B0193-2 (March 11, 2019) |  |   |  |
|---|--|---|--|
| Test  | Requirements   | Test Results  | Comment                                |
| Static Structural Performance<br>(Section 5.8)  | <b>ASTM E330-14</b><br>Preload<br>(0.5 x Design Pressure)<br><br>+/- 1,795 Pa (37.5 PSF)<br><br><b>Requirements:</b><br>- No permanent damage-       | No Permanent Damage Observed  | No visual damage or buckling observed  |
|   | <b>ASTM E330-14</b><br>Design Pressure<br><br>+/- 3,591 Pa (75.0 PSF) <sup>(4)</sup><br><br><b>Requirements:</b><br>- Report Support Wall Deflection | Stud Length (L) =<br>2,438 mm (96.0 inches)<br>Allowable (L/180) =<br>13.54 mm (0.533 inches)<br><br><b>Vertical Net Deflection at Design Pressure:</b><br><br>+ 3,591 Pa (75.0 PSF) =<br>-1.37 mm (0.05 inches)<br><br>- 3,591 Pa (75.0 PSF) =<br>5.33 mm (0.21 inches)<br><br><b>Horizontal Net Deflection at Design Pressure:</b><br><br>+ 3,591 Pa (75.0 PSF) =<br>-1.30 mm (0.05 inches)<br><br>- 3,591 Pa (75.0 PSF) =<br>2.59 mm (0.10 inches)<br><br>- No Permanent Damage Observed | <b>Meets Requirements</b><br><br>L/180 |

<sup>(4)</sup> 3,591 Pa = 76.6 m/s (or 171 mph / 275 km/h). Calculation based on the Enswiler formula, where  $P = 0.613 \cdot V^2$ , V is m/s & P is N/m<sup>2</sup>

<sup>(5)</sup> AAMA 508-14, Section 5.8 states: "When testing the actual air/water barrier for a project specific system, perform static structural performance test ASTM E330 at 0.5, 1.0 and 1.5 times the specified positive and negative design pressures." As the testing outlined in this report was not for a project specific system, a design pressure was not outlined. However, Exova performed structural testing of the AAMA 508-14 system in accordance with ASTM E330-14 with an assumption Design Pressure of ±3,591 Pa (171 mph / 275 km/h) for informational purposes.

### 3.0 RESULTS (CONTIUNED)

| Table 7 – AAMA 508-14, Section 5.8, Referencing ASTM E330-14<br>Static Structural Performance (Structural Pressure) <sup>(7)</sup><br>Exova Specimen Number: 18-06-B0193-2 (March 11, 2019) |  |  |                              |
|---|--|--|------------------------------|
| Test  | Requirements   | Test Results   | Comment                      |
| Static Structural Performance<br>(Section 5.8)  | <p><b>ASTM E330-14</b></p> <p>Structural Test Pressure<br/>(1.5 x Design Pressure)</p> <p>+/- 5,386 Pa (112.5 PSF)<sup>(6)</sup></p> <p><b>Requirements:</b></p> <ul style="list-style-type: none"> <li>- No permanent damage</li> <li>- Report Support Wall Deflection</li> </ul> | <p><b>Vertical Net Deflection at Design Pressure:</b></p> <p>+ 5,386 Pa (112.5 PSF) =<br/>-2.10 mm (0.082 inches)</p> <p><i>Residual Deflection</i><br/>-1.33 mm (0.05 inches)</p> <p>- 5,386 Pa (112.5 PSF) =<br/>2.74 mm (0.11 inches)</p> <p><i>Residual Deflection</i><br/>0.24 mm (0.01 inches)</p> <p><b>Horizontal Net Deflection at Design Pressure:</b></p> <p>+ 5,386 Pa (112.5 PSF) =<br/>-2.18 mm (0.08 inches)</p> <p><i>Residual Deflection</i><br/>-0.64 mm (0.03 inches)</p> <p>- 5,386 Pa (112.5 PSF) =<br/>4.48 mm (0.18 inches)</p> <p><i>Residual Deflection</i><br/>1.84 mm (0.07 inches)</p> <p>- No Permanent Damage Observed</p> | No Permanent Damage Observed |

<sup>(6)</sup> 5,386 Pa = 93.7 m/s (or 209 mph / 337 km/h). Calculation based on the Enswiler formula, where  $P = 0.613 \cdot V^2$ , V is m/s & P is N/m<sup>2</sup>

<sup>(7)</sup> AAMA 508-14, Section 5.8 states: "When testing the actual air/water barrier for a project specific system, perform static structural performance test ASTM E330 at 0.5, 1.0 and 1.5 times the specified positive and negative design pressures." As the testing outlined in this report was not for a project specific system, a design pressure was not outlined. However, Exova performed structural testing of the AAMA 508-14 system in accordance with ASTM E330-14 with an assumption Design Pressure of ±5,386 Pa (209 mph / 337 km/h) for informational purposes.

### 3.0 RESULTS (CONTIUNED)

| <b>Table 8 – Client Specific (Requested) Testing</b><br><b>Test to Failure in the Negative Wind Load Direction</b><br><b>ASTM E330-14 – SI &amp; IP Units</b><br><b>Static Structural Performance</b><br><b>Exova Specimen Number: 18-06-B0193-2 (March 11, 2019)</b> |  |
|---|--|
| Maximum Pressure Achieved   | Comments   |
| 8,524 Pa <sup>(8)</sup>   | Cladding System did not disengage from wall assembly. However, vertical supporting steel studs buckled in the center |
| 178 lbs. /ft <sup>2</sup>   |  |

<sup>(8)</sup> 8,524 Pa = 117.9 m/s (or 263 mph / 424 km/h). Load  
Calculation based on the Enswiler formula, where  $P = 0.613 \cdot V^2$ ,  $V$  is m/s &  $P$  is N/m<sup>2</sup>

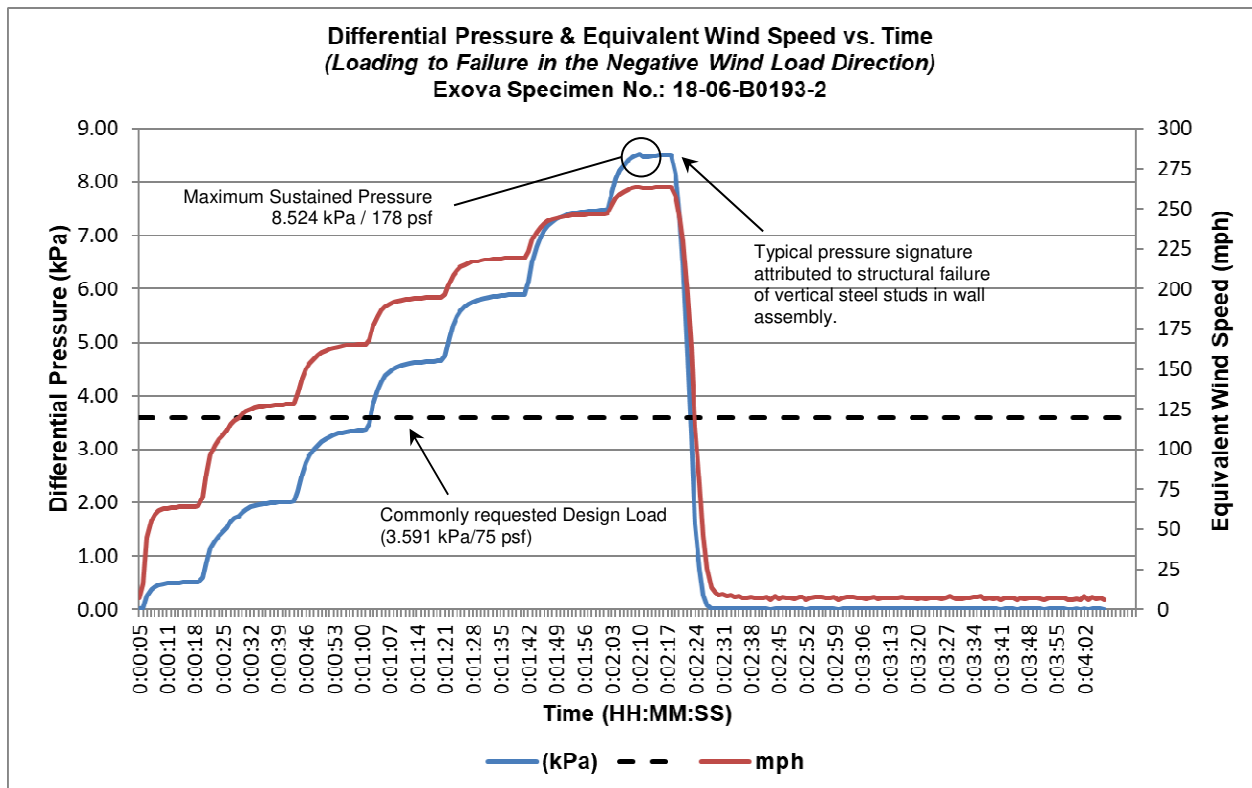


Figure 4 – Differential Pressure & Equivalent Wind Speed vs. Time (during testing to failure)

\*Note: Design loads are building and location specific. Please refer to architect or design engineer for specific building load requirements.

#### 4.0 SYSTEM MODIFICATIONS

No modifications were made to the system as shown respectively in Appendix A.

#### 5.0 DISCUSSION

The Carter Architectural Panels Inc., "FUSION™ Non-Combustible Rainscreen" (Exova Specimen No.: 18-06-B0193-2) identified in this report met the requirements of AAMA 508-14 for cavity pressure differential, time shift of pulse and water penetration.

The system has a cavity volume to vent area ratio of **636 m<sup>3</sup> / m<sup>2</sup>** (2,087 ft<sup>3</sup>/ft<sup>2</sup>) on the upper panels and **763 m<sup>3</sup> / m<sup>2</sup>** (2,503 ft<sup>3</sup>/ft<sup>2</sup>) on the lower panels with a total of eight (8) 0.375" diameter vent holes.

This report is not indented as a comprehensive evaluation of the system regarding performance and application to specific buildings.

#### 6.0 REVISION HISTORY

**Report No:**  
18-06-B0193-F2

**Date:**  
2019-03-25

**Description of Revisions:**  
Original Document

**Reviewed by:**



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This report and service are covered under Exova Canada Inc's. Standard Terms and Conditions of Contract which may be found on our company's website [www.exova.com](http://www.exova.com), or by calling 1-866-263-9268

## **APPENDIX A**

Specimen Bill of Materials and Drawings

(5 Pages)

## 2mm EVOPlate FUSION Testing Bill of Materials

### Framework:

6 pcs 1.5" x 1.5" x 2" x 1.5" x 1.5" Pre-punched Top Hat 18 Gauge G-90 Galvanized profile

4 pcs 2" x 1.5" x 2" Pre-punched U-channel 18 Gauge G-90 Galvanized profile

100 pcs #12 x 1.5" self-drilling screws

### Panel Assemblies

1 pc 47" X 94.5625" 2MM EVOPlate FUSION Panel assembly

2 pcs Patented FUSION DRILL FREE perimeter extrusion square cut @ 43.75" 6061-T6

2 pcs Patented FUSION DRILL FREE perimeter extrusion square cut @ 91.375" 6061-T6

4 pcs FUSION 2mm 60 Durometer High Temp Silicon Corner blocks

10 pcs EVO Aluminum Corner reinforcement bracket 3003 Alloy

4 pcs FUSION corner bracket 303 Alloy

2mm EVOPlate coil coated 5052-H32 solid aluminum skin

30 EVO Torxalig zinc coated screws

30 domed head FUSION DRILL FREE RIVETS

5 pcs Patented EVO Integrated stiffener square cut to 43.5" 6061-T6

2 tubes of Dymonic FC adhesive

5 pcs 1" x .5" bug screen to cover weep holes

1 pc 47" X 47" 2MM EVOPlate FUSION Panel assembly (2 assemblies used in test)

4 pcs Patented FUSION DRILL FREE perimeter extrusion square cut @ 43.75" 6061-T6

4 pcs EVO 2mm 60 Durometer High Temp Silicon Corner block

4 pcs EVO Aluminum Corner reinforcement bracket 3003 Alloy

4 pcs FUSION corner bracket 303 Alloy

2mm EVOPlate coil coated 5052-H32 solid aluminum skin

16 EVO Torxalig zinc coated screws

20 domed head FUSION DRILL FREE RIVETS

2 pcs Patented EVO Integrated stiffener square cut to 43.5" 6061-T6

.5 tube of Dymonic FC adhesive

3 pcs 1" x .5" bug screen to cover weep holes

### Wall assembly

1 pc Patented FUSION DRILL FREE Starter Strip 6061-T6 profile square cut to 94"

15 pc Patented FUSION DRILL FREE Mid-Clip 6061-T6 profile square cut to 3" with pre-punched slot (Mounted on 16" maximum centre distance)

20 pc Patented FUSION DRILL FREE Half-Clip 6061-T6 profile square cut to 3" with pre-punched slot (Mounted on 16" maximum centre distance)

1 pc 2mm EVOPlate solid aluminum plate cut to 2" wide x 95" long (Horizontal Centre)

2 pc 2mm EVOPlate solid aluminum plate cut to 1.25" wide x 95" long (Top and bottom)

2 pc 2mm EVOPlate solid aluminum plate cut to 1.25" wide x 94" long (Sides)

1 pc 2mm EVOPlate solid aluminum plate cut to 47" (Vertical centre)

