TEST REPORT

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EVALUATION CENTER

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PRODUCT EVALUATED
Sagiwall Panel

EVALUATION PROPERTY
Wind Load Resistance

Report of Testing "Sagiwall Panel" for compliance with a customized Wind Load Resistance test program referencing select sections of ASTM E330/E330M–14 Procedure B.

1 Table of Contents

2 Introduction

Intertek has conducted testing for Sagiper North America (Sagiper), on Sagiwall Panel, to evaluate wind load resistance. Testing was conducted in accordance with a customized wind load resistance test method presented in full in Appendix B of this report. This evaluation began on July 15, 2016 and was completed on July 28, 2016.

3 Test Specimen

3.1 Sampling

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing. Samples arrived at the Evaluation Center on July 10, 2015.

3.2 Specimen and Assembly Description

A mock-up wall conforming to the requirements of the customized wind load resistance test method was constructed by Intertek for the purposes of testing the sample material. Wall studs were spaced 406mm (16 in.) on center for a total of 8 studs. The sheathing board used was OSB at 6.35mm (¼ in.) thickness as per the custom test method. Furring strips measuring 38mm x 25mm (1 ½ in. x 1 in.) were installed between the sheathing board and Sagiwall Panel. For the purposes of applying pressure to the siding material, a sheet of 0.15mm (0.006 in.) polyethylene was installed between the mock-up wall and the Sagiwall Panel. The sample was attached according to the manufacturer's installation manual. The fasteners used were plated steel #10x2" flat socket head screws and were installed with a clearance of 0.8mm (1/32 in.) between the screw head and Sagiwall Panel fastener slot. A bracket supplied by the manufacturer was used as per the installation manual to provide an interlocking surface for the bottom panel.

Figure 1: Sagiwall Panel

Figure 2: Wall Construction & Instrumentation

Mock-up Wall Specifications:
Wall stud size: 51 mm x 102 mm (2 in. x 4 in. nominal)
Framing: Double 51 mm x 203 mm (2 in. x 8 in. nominal)
Overall Wall Dimensions: 2972 mm x 2870 mm (117 in. x 113 in.)

4 Testing and Evaluation Methods

The customized wind load resistance test method appended to this report was provided to Sagiper by Luc Cecire of the Canadian Construction Materials Center (CCMC) in an email dated June 24, 2016. The Intertek testing was performed in general accordance with the requirements of the test method provided.

The testing was performed using Intertek's Fenestration Wall apparatus which incorporates a blower system capable of pressurizing an airspace created by the interface of the wall itself and a wooden frame. The blower builds positive and negative pressure. The wooden frame was hoisted onto the Fenestration Wall and clamped in place. An air tight seal was achieved by means of compression seals and 6mil polyethylene sheet. The polyethylene sheet was installed between the wood frame and sample material to ensure delivery of both positive and negative load by means of pressure differential. The only structural connection provided between the sample material and wood frame is by means of fasteners which insert through the siding slot and penetrate through the polyethylene sheet into furring strips, OSB and studs in that order.

The sample was subject to sustained, cyclic and gust loads as per Structural Wind Loading Schedule in the customized test method. Maximum deflection measurements were recorded at 3.3*P_1. The loads and wind design values are as follows:

Table 1: Maximum Positive & Negative Pressures for Sustained, Cyclic and Gust Loads			
Q_{50} < 0.75 kPa	P_1 = 750 Pa	P_2 = 1090 Pa	P_3 = 1630 Pa

Deflection measurements were taken using string potentiometers at points 1, 4, 6, 8, 18 and 19 as per the customized test method.

Deviations:

Based on blower system capacity and control, durations of 1 second to achieve pressure as required by the test method were not possible. In the attempt to minimize risk of pressure overshoot, the maximum pressure of 3.3 * P_1 (2450 Pa) was achieved in as long as 20 seconds.

A horizontal brace was installed on the back side of the constructed wall for the purposes of limiting excessive deflection of the framing studs under positive cyclic loading. This brace is presented in Figure 3 below.

Figure 3: Wall construction showing horizontal brace at mid-height.

5 Testing and Evaluation Results

Test wind load resistance results are summarized in the tables below along with the performance requirements from the appended test method. Photographs are presented in Appendix A.

Table 1. Wind Load Resistance at Q_{50} <0.75kPa

LOAD CYCLE	REQUIREMENT	RESULT	PASS/FAIL
Sustained	No detachment, fracture or deformation	No detachment, fracture or deformation	Pass
Cyclic			Pass
Gust			Pass
3.3 x Sustained			Pass

Table 2. Wind Load Resistance – Maximum Deflections at Q_{50} <0.75kPa

Maximum Deflections, mm						
Location[1]	**1**	**4**	**6**	**8**	**18**	**19**
Measurement	23.43	9.33	23.43	5.72	21.50	23.43

[1] Locations as per the custom test method.

6 Conclusion

The Sagiper Sagiwall Panel evaluated in this report has been tested in accordance with the customized wind load resistance test method appended to this report. The test sample was tested at a wind load resistance design value of Q_{50} < 0.75 kPa and achieved the performance results summarized in Section 5 of this report.

INTERTEK TESTING SERVICES NA LTD.

Reported by: _____
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Technical Analyst, Building Products

Reviewed by: _____
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7 Appendix A: Photographs

Figure A1 – Mock-Up Wall Construction

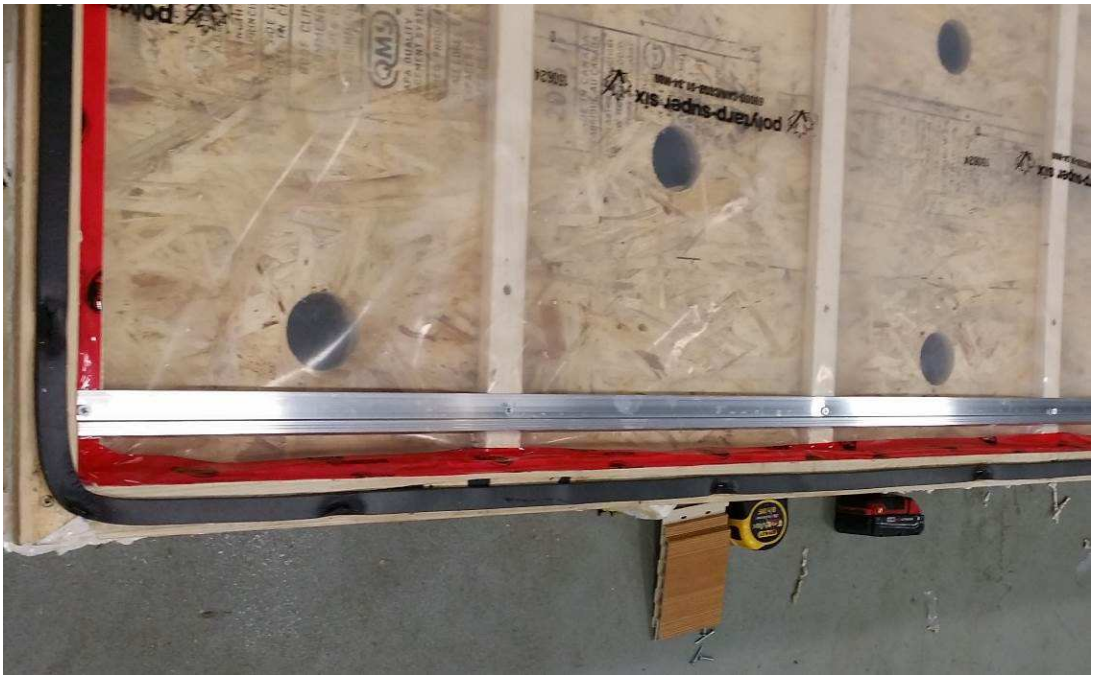

Figure A2 – Bracket Installation

Figure A3 – Installed Siding with String Potentiometers Installed

Figure A4 – Assembly Under Load

Figure A5 – Connection Point After Loading

8 Appendix B: Customized Test Method (Provided by CCMC)

Appendix A – Wind Load Resistance Test

The wind load resistance test must be conducted according to ASTM E 330/E 330M, Procedure B.

The height of the wall test specimen must not be less than one storey. The width of the wall test specimen must not be less than 3.0 m. The specimen must comprise the number of components necessary to accurately represent the supporting structure, the anchorage and all the devices in current use for fixing the elements on the cladding onto the structure and onto adjacent components. The test specimen must be constructed following the manufacturer's installation procedures, and using materials representative of those on site.

The size and spacing of the studs should represent the worst-case scenario of the minimum requirements of Table 9.23.10.1., Size and Spacing of Studs, of Division B of the NBC 2010. The sheathing board must have the minimum thickness allowed in the NBC 2010 or the minimum thickness specified by the proponent, and as allowed in the manufacturer's installation manual for the cladding system. The sheathing board must be installed in accordance with Figure 2.

It is recommended to measure the deflections, along the horizontal and vertical centreline at the different location points indicated in Figure 2. However, as a minimum, the deflection at the location points [1, 4, 8 (framing system)], and 6, 18 and 19 (unsupported sheathing edge)] must be reported.

Note: The deflection must be measured at midspan of intermediate studs relative to their ends, and at midspan of the sheathing relative to the intermediate studs. Measurements for the displacement of the studs and the sheathing must be taken at all measuring points.

The sample must be subjected to full-scale positive and negative test loads as described in ISO 7895, "Facades made of components – Tests for resistance to positive and negative static pressure generated by wind."

Note: The testing organization must take the necessary measures to ensure that the pressure loads are transferred to the cladding. Proper sealing of the test specimen is very important as some cladding may allow airflow through the specimen that is in excess of the blower equipment capacity. A single membrane may be installed behind the cladding to prevent air leakage. However, means to stop air leakage must not restrict any relative movement between specimen components.

The ISO 7895 test protocol specifies three maximum pressure levels for three different modes of wind pressure application: sustained, cyclic and gust loads.

i) Deformation test (sustained pressure)

The facade is submitted to increasing pressure in increasing stages for a minimum period of 10 seconds at each stage, up to the maximum pressure (P_1) required for the test. P_1 must be taken as the reference velocity pressure for the design of the cladding as per Sentence 4.1.7.1.(4), Specified Wind Load, of Division B of the NBC 2010. This reference velocity pressure is based on a probability of being exceeded in any one year of 1 in 10, and is based on climatic data in conformance with the NBC 2010. The reference pressure (P_1) and the cyclic (P_2) and gust pressures (P_3) indicated in Table 3 of this Guide cover applications on buildings that are three storeys high or fewer, falling under the scope of Part 9 of the NBC 2010.

Proponents wishing to evaluate their cladding systems to wind pressure loads (P_1, P_2 and P_3) that are different (smaller or greater) than the ones indicated in Table 3 must notify the CCMC for review.

ii) Repeated positive and negative pressure test (cyclic pressure)

The facade must be submitted to the required number of positive pressure impulses between 0 and the value of P_2 indicated in Table 3.

iii) Safety test (gust wind)

The facade must be submitted to the maximum required gust pressure (P_3) indicated in Table 3. P_3 must be reached as quickly as possible, but not in less than 1 s, and held for 3 s. The value of P_3 must be at least 2.0 times the design value of P_1.

The sample must be subjected to the maximum positive and negative test loads contained in Table 3 and according to the loading schedule outlined in Figure 1.

Table 3. Table 3. Maximum Positive and Negative Pressures for Sustained, Cyclic and Gust Loads

For geographical areas where wind design value is:	P_1, P_1' (1) sustained for 1 hr (Pa)	P_2, P_2' (1) 2000 cycles(2) (Pa)	P_3, P_3' (1) gust wind (Pa)
Q_{50} < 0.45 kPa	450	660	980
Q_{50} < 0.55 kPa	550	800	1200
Q_{50} < 0.65 kPa	650	950	1410
Q_{50} < 0.75 kPa	750	1090	1630
Q_{50} < 0.85 kPa	850	1240	1850
Q_{50} < 1.00 kPa	1000	1460	2180

Notes to Table 3:

(1) See Figure 1 for references to P_1, P_1', P_2, P_2', P_3, P_3'.

(2) The 2000 cyclic loads can be applied in four stages of 500 cycles or two stages of 1000 cycles reversing from positive to negative pressures.

Deflection Measurements

At the end of the wind loading, deflection measurements must be taken according to the following criteria:

Maximum deflections must be recorded at 3.3* times the 1 in 10 hourly wind pressure (Q_{50}), as outlined in Table 4 of this Guide, for both positive and negative pressures. The measurements must be taken subsequent to the sustained, cyclic and gust wind pressure loading program in Figure 1 of this Guide.

* The design wind load value is based on the Q_{50} value and three factors, namely, Cp, the exposure factor, Ce, the gust factor, and Cg, the external pressure coefficient. The 3.3 amplification factor is derived assuming Ce = 1.0, Cg = 2.5 and Cp = 1.3. Thus 1.0 × 2.5 × 1.3 = 3.25 rounded to 3.3. It should be noted that this generalized case for low-rise buildings is applicable to buildings within urban and suburban areas and does not apply to peripheral buildings adjacent to open and exposed areas.

Table 4. Maximum Wind Pressures for Deflection Measurements

For geographical areas where wind design value is:	Record maximum deflection(s) after completion of wind pressure loading at following load(1)
Q_{10} < 0.40 kPa	$D_{0.40}$ @ 1320 Pa
Q_{10} < 0.60 kPa	$D_{0.60}$ @ 1980 Pa
Q_{10} < 0.80 kPa	$D_{0.80}$ @ 2640 Pa

Note to Table 4:

(1) The wind pressure loading must be maintained for a minimum of 10 s and the maximum deflection, at any point on the specimen, from the supporting member of the cladding system must be determined for both positive and negative pressures.

Note: The proponent of the system may request that the testing agency measure the deflection of the system at various stages during the wind loading. This additional information may assist the proponent in understanding the system performance during the sustained, cyclic and gust loadings.

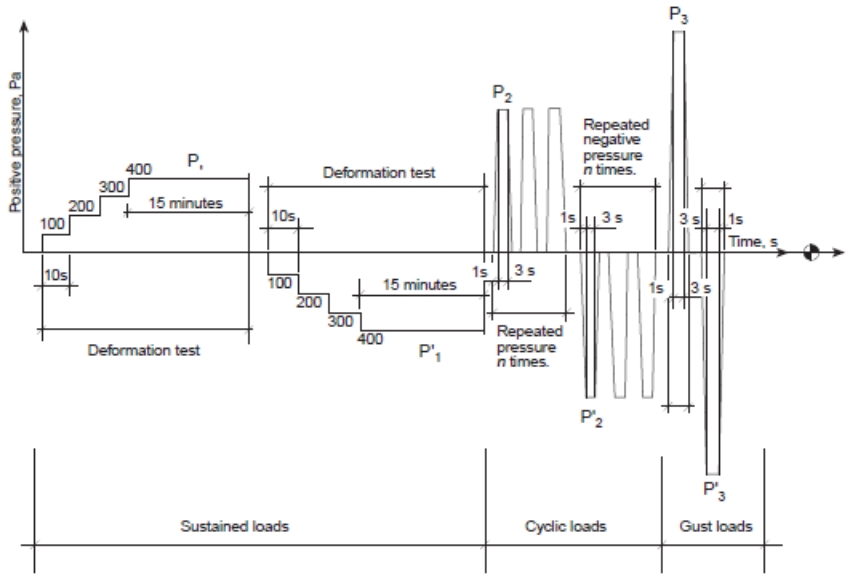

Figure 1. Structural (wind) loading schedule

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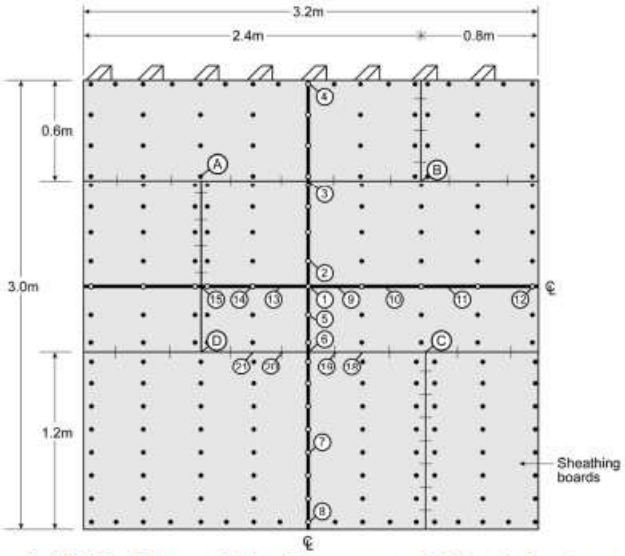

Figure 2. Wind load test panel (sheathing pattern and deflection location points)

Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	July 28, 2016	First issue	Igor Radovic	Joseph DeRose

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