Exova
2395 Speakman Dr.
Mississauga
Ontario
Canada
L5K 1B3

T: +1 (905) 822-4111
F: +1 (905) 823-1446
E: sales@exova.com
W: www.exova.com

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PERFORMANCE EVALUATION OF THE CONSOLAID INC. FLEX-FENCE® LOUVERED HARDWARE SYSTEM IN ACCORDANCE WITH ASTM E330-02 (2010)

Report to:	Consolaid Inc. 112 Basaltic Road, Unit 4 Concord, ON. L4K 1G6
Attention:	Mr. Joel Meyers
Telephone: **Fax:**	(905) 669-0861 (905) 669-0860
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1.0 INTRODUCTION

At the request of Consolaid Inc., Exova was retained to conduct a performance evaluation of a louvered infill system identified as the "Flex-Fence® Louvered Hardware" system in accordance with ASTM E330-02(2010) as outlined in Proposal No. 11-006-06269.

Consolaid Inc. provided six baluster or awning slat specimens installed within a wood perimeter "buck" which had an opening of 1140 mm high x 1220 mm wide and was designed to simulate the top/bottom rails or overhead awning joist framing sections of an assembled guard or awning. The infill area of the "buck" contained the FLEX-Fence ® louvered fencing hardware system. Details of the specimens tested can be found below:

Upon receipt, the sample was assigned the following Exova sample number:

Exova Sample No.	11-06-M0337
Type	Wood Louvers with PVC Hardware
Model	FLEX-Fence ® Louvered Hardware
Infill Slat (Louver) Dimensions	16 mm (thick) x 135 mm (wide) x 1108 mm (length)
Infill Slat (Louver) Material	Pressure Treated Lumber

Note: Detail drawings for the above guard system which include the installation method were submitted by the client and can be located in Appendix A.

2.0 PROCEDURE

Each specimen was installed in a 2"x 6" test "buck" and secured to the perimeter of the simulated top/bottom rails and post or overhead awning joist framing section designed to represent and fully supported system.

A plastic film (6-mil thick) was draped on the exterior side of the specimen and incorporated extra overlap to allow for free expansion of the film as the infill sections displaced due to increasing pressure differences.

The specimen's infill slats with the attached louver system were subjected to pressure differences applied through the plastic film. String gauges mounted on a gauging rack apparatus recorded the incremental deflections at specific gauging locations.

Each specimen fastened to the "test buck" was mounted onto a window/wall test rig located at Exova's Systems Laboratory. The plastic film was draped on the inside of the set-up and displacement gauges were set-up on the outside. The gauges were attached at the locations shown in Figure 1 utilizing 9/16" brass cup hooks mounted on ¼" square oak blocks, which were adhered in place. The resultant displacement and differential pressure was recorded at three-second intervals.

The uniform load testing was conducted with the infill louvers in the closed and open position. Each louver orientation was tested in triplicate. The open louvers were tested with each louver blocked open with wood blocking. The wood blocking was held in place to only one louver in the center location as to not transfer load or specimen movement through the blocking to the adjacent louver.

Note: SI units were the primary units of measure.

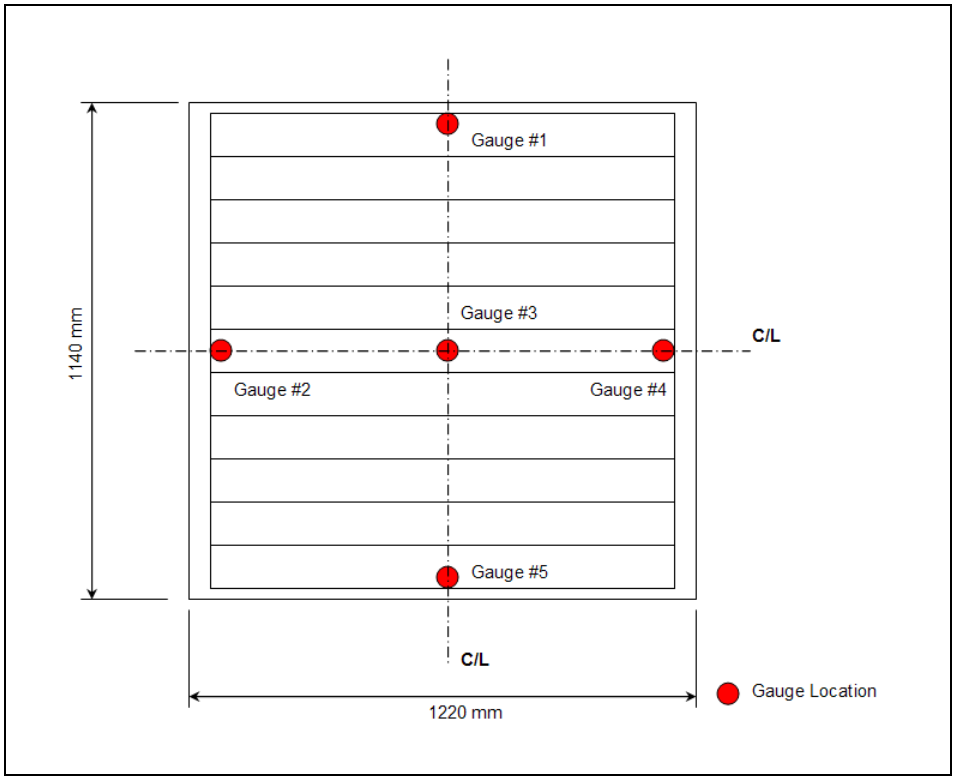

Figure 1 – Deflection Gauge Locations

Test Pressurization Sequence:

Using the procedures outlined in ASTM E330-02 (2010), the plastic film was inflated to the client-requested pressures below:

Requested Test Pressures	
Load Case	**ΔP (kPa / PSF)**
Pre-Load	2.59 / 54.09
Target Load	5.17 / 107.98

Test Date: July 25, 2011
Temperature Prior and During Testing: 25.5 ℃

3.0 RESULTS

Table 1 – Loading Summary in Accordance with ASTM E330-02 (2010), SI Units
Exova Sample No.: 11-06-M0337 (Louvers in Closed Position)

Test Specimen No.	Differential Pressure (kPa)	Deflection Measurements at Locations (mm)					Comment
		1	2	3	4	5	
1	5.17	-36.0	-3.5	-6.3	-22.5	-26.4	Pass
	Residual	-0.4	3.2	0.4	4.3	0.4	
2	5.17	-35.0	-12.8	-11.2	-33.4	-32.2	Pass
	Residual	-0.7	-1.9	-0.4	-1.9	-0.7	
3	5.17	-33.7	-2.7	-9.1	-19.2	-26.7	Pass
	Residual	-0.6	6.7	0.3	7.9	0.4	

Pass: No failure, nor any evidence of disengagement, nor visible cracks in any component.

Table 2 – Loading Summary in Accordance with ASTM E330-02 (2010), US Customary Units for Reference
Exova Sample No.: 11-06-M0337 (Louvers in Closed Position)

Test Specimen No.	Differential Pressure (PSF)	Deflection Measurements at Locations (in)					Comment
		1	2	3	4	5	
1	107.98	-1.419	-0.139	-0.247	-0.886	-1.040	Pass
	Residual	-0.015	0.126	0.017	0.169	0.016	
2	107.98	-1.377	-0.503	-0.443	-1.316	-1.269	Pass
	Residual	-0.027	-0.075	-0.015	-0.075	-0.028	
3	107.98	-1.326	-0.105	-0.357	-0.754	-1.052	Pass
	Residual	-0.024	0.264	0.011	0.313	0.016	

Pass: No failure, nor any evidence of disengagement, nor visible cracks in any component.

Note: Load vs. Deflection curves for each specimen are located in Appendix B

Table 3 – Loading Summary in Accordance with ASTM E330-02 (2010) Exova Sample No.: 11-06-M0337 (Louvers in Open Position)

Test Specimen No.	Differential Pressure (kPa)	Deflection Measurements at Locations (mm)					Comment
		1	2	3	4	5	
4	5.17	-4.9	-5.3	-4.3	-5.9	-5.3	Pass
	Residual	-0.3	-1.1	-0.2	-1.0	-0.5	
5	5.17	-4.0	-5.6	-5.2	-6.2	-5.8	Pass
	Residual	-0.7	-1.3	-0.9	-1.3	-0.9	
6	5.17	-4.1	-5.3	-5.8	-6.2	-6.1	Pass
	Residual	-0.4	-0.2	-0.7	-0.3	-0.2	

Pass: No failure, nor any evidence of disengagement, nor visible cracks in any component.

Table 4 – Loading Summary in Accordance with ASTM E330-02 (2010), US Customary Units for Reference Exova Sample No.: 11-06-M0337 (Louvers in Open Position)

Test Specimen No.	Differential Pressure (PSF)	Deflection Measurements at Locations (in)					Comment
		1	2	3	4	5	
4	107.98	-0.191	-0.207	-0.170	-0.231	-0.208	Pass
	Residual	-0.013	-0.044	-0.006	-0.041	-0.018	
5	107.98	-0.157	-0.220	-0.204	-0.245	-0.228	Pass
	Residual	-0.027	-0.050	-0.034	-0.053	-0.036	
6	107.98	-0.161	-0.207	-0.228	-0.245	-0.240	Pass
	Residual	-0.016	-0.007	-0.027	-0.012	-0.007	

Pass: No failure, nor any evidence of disengagement, nor visible cracks in any component.

Note: Load vs. Deflection curves for each specimen are located in Appendix B

4.0 CONCLUSION:

Based on the results of the testing, the Consolaid Inc. FLEX-Fence ® Louvered Hardware infill system sustained a load application of 5.17 kPa (107.98 psf) applied in accordance with ASTM E330-02(2010)

Reported by:

Sunny Ling, Ext 311
Lab Technologist, Systems Laboratory
Building Performance Centre

Reviewed & Authorized by:

Jordan Church, 416-455-2831
Supervisor, Fenestration / Walls / Solar Thermal
Building Performance Centre

Reviewed & Authorized by:

David W. Bailey, P.Eng, Ext. 307
Technical Director
Product Testing Group

REGISTERED PROFESSIONAL ENGINEER
D. W. BAILEY
PROVINCE OF ONTARIO