

May 29, 2019

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Subject: InvisiRail™ Wind Load Testing

Mr. Bertato,

This letter summarizes the witnessing of wind load testing conducted at the ACE Climatic Wind Tunnel facility located at the University of Ontario Institute of Technology in Oshawa, Ontario. The facility has a rated fan capacity of 2.5-megawatt producing wind speeds up to 250 km/hour (Category 4 Hurricane). The testing was conducted on March 26, 2018 and was witness by the undersigned.

The following LIV Building Products guardrail systems were tested:

InvisiRail™ with InvisiPost

Four post inline assembly with 70 in. centre 10mm tempered glass infill panel and two side 10mm tempered glass infill panels. Continuous 42mm O.D. stainless steel tuber top rail secured to each post.

InvisiRail™ with ALX Aluminum Post

Four post inline assembly with 70 in. centre 10mm tempered glass infill panel and two side 10mm tempered glass infill panels. Continuous 42mm O.D. stainless steel tuber top rail secured to each post.

For each system, the windspeed was increased to 60, 80, 100, 110, 120, 130, 140 and 150 mph where it was maintained for a minimum of one minute. The guard systems were observed after the wind load testing for any indications of component failures.

The guard systems withstood the attained windspeed of 150 mph (240 km/hr) without any permanent deformation of componetns or the guard assembly.



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If you have any questions regarding this letter report, please do not hesitate to contact the undersigned.

Sincerely,
INTERTEK TESTING SERVICES NA, INC.

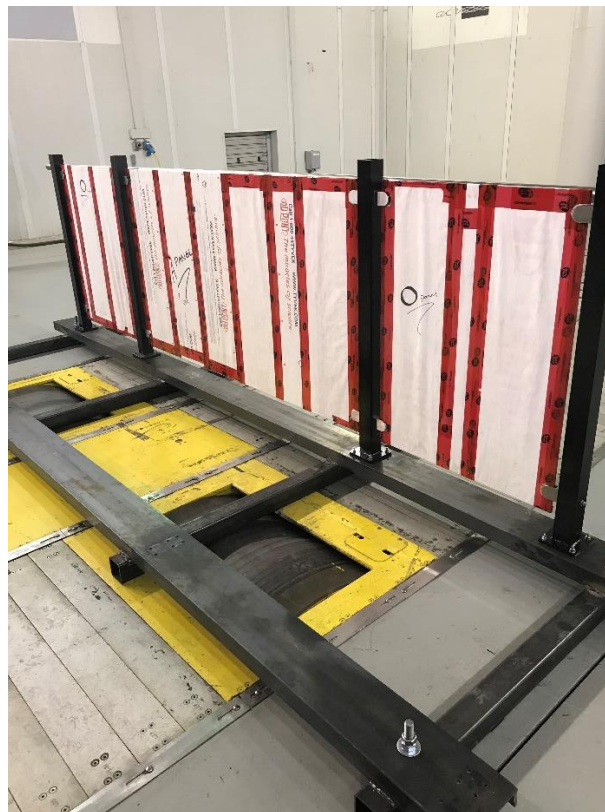
Reported by:

Joe DeRose, P. Eng.
Project Engineer, Building and Construction



Witnessed Testing

InvisiRail™ with ALX Aluminum Post Test Assembly



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Report No. 2019-UOIT-04-01

16 Apr 2019



Report on Wind Loading Test in Climatic Wind Tunnel

Issued to: Liv Building Products Inc

Test date: 26-03-2018

Report No. 2019-UOIT-04-01

Revision No: A

Date: 16 April 2019

<i>Prepared:</i>	Gary Elfstrom Consultant & Adjunct Prof		16-Apr-2019
		Signature	date
<i>Approved:</i>	John Komar Director Engineering & Operations		16-Apr-2019
		Signature	date

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RECORD OF REVISIONS

REV	DESCRIPTION	DATE	REVISED BY
A	Initial Release	16 April 2019	GE



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- I Data Files and Plots



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1. INTRODUCTION

Liv Building Products Inc. (Liv) has issued a request for high speed wind load testing of a glass paneled rail system in the UOIT Climatic Wind Tunnel. The scope of work and test overview were provided in UOIT proposal 2016-03-UOIT-391 (Ref. 2).

This report summarizes the test objective, equipment, test method and results, issued at the request of Liv on 27 March 2019.

This report serves to document the results of the specific testing performed under the specific conditions requested for this test campaign. The data contained in this report were gathered from the wind tunnel facility control system. This report is not an endorsement or certification of the tested product. The results of the testing are indicative of only the performance of the samples tested, under the specific conditions described herein.

2. OBJECTIVE

The test objective of this test is to demonstrate the ability of a glass paneled rail system to withstand very high wind speeds.

3. TEST METHOD

3.1 Precursor Tests by Others

A static loading test of the glass panel rail system was conducted by Intertek as a safety assurance prior to testing in the ACE CWT.

3.2 Test Set-Up and Method

The test property were two LIV-provided glass panel rail systems, complete with a support stand anchored to the T-slot system in the CWT chassis dymo. No video or other instrumentation were provided by ACE, as this was the responsibility of Liv.

The nozzle setting of 13m² was used for this test.

The first part of the test was a shake-down at gradually increasing wind speed, to insure safe operation.

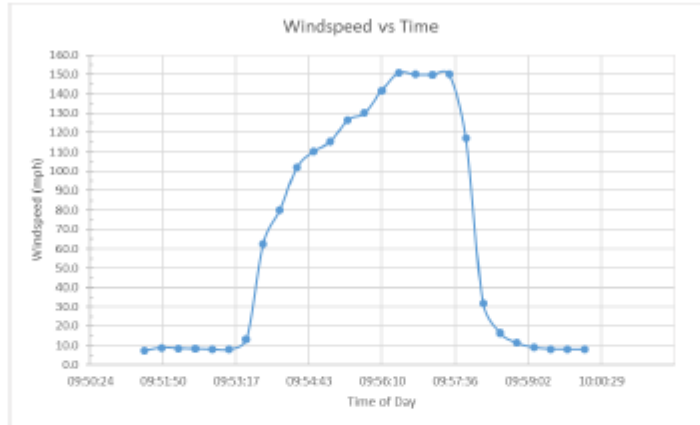
The second part was a ramp up to 150mph wind speed for each of two panel configurations.





4.3 Panel No.2 Test

A plot of wind speed vs time for Panel No.2 is shown in the figure below. No obvious signs of damage were apparent during this test.



5. REFERENCES

- Ref. 1 ACE website inquiry and telecom 9 March 2016
- Ref. 2 Budget Cost for Panel Wind Load Testing in CWT, ACE proposal 2016-03-UOIT-391



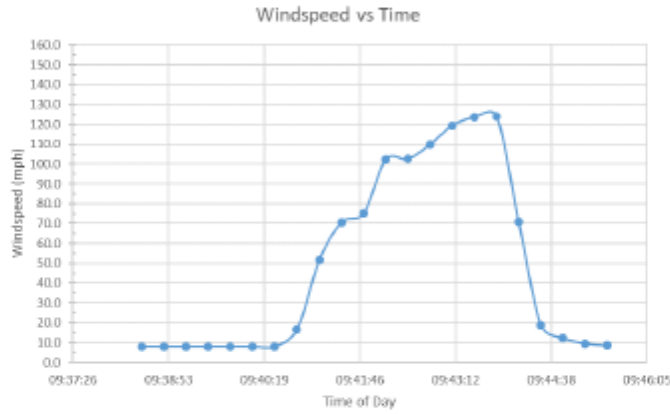


4. TEST RESULTS

The wind tunnel data log for the test has been recovered and is appended to this report.

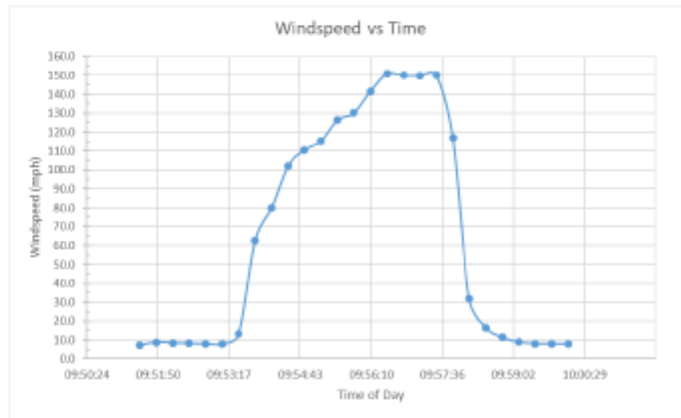
4.1 Shake-Down Test on Panel No.1

A plot of the wind speed vs time is shown in the figure below. There were no obvious signs of damage, so the test proceeded as planned.



4.2 Panel No.1 Test

A plot of the wind speed vs time is shown in the figure below. No obvious signs of damage were apparent during this test.





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