TEST REPORT

REPORT NUMBER: 102784150TOR-001a
ISSUE DATE: September 6, 2017

EVALUATION CENTER
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RENDERED TO

LIV Building Products
6050 Owen Road
Uxbridge, ON, L6P 1R1

PRODUCT EVALUATED:
InvisiRail® SS

EVALUATION PROPERTY:
Loads on Guards

Report of testing of InvisiRail® SS to assess resistance to Live Loads for exterior guards as prescribed in the 2015 International Residential Code (IRC).

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for LIV Building Products (LIV) on the InvisiRail® SS stainless steel/glass deck mount guard system (InvisiRail SS). The scope of the testing was to assess the ability of the guard system to resist the specified Live Loads as prescribed in the 2015 International Residential Code, Sentence R301.5 d, f, h, and Table R301.5.

Safety factors as outlined in this report were applied to the specified Live Loads. The testing was conducted on May 3 and May 15, 2017.

3 Test Samples

3.1. SAMPLE SELECTION

A guard system, consisting of two posts, a glass in-fill and a continuos top rail, was shipped to the test facility and assembled by the client. Tests were performed at the Intertek laboratory in Mississauga, Ontario.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The guard system tested consisted of three posts with welded stainless steel bases, a top rail , and an infill of 10 mm tempered glass.

When installed, the guard length, inside-to-inside post, measured 1630 mm (64 in.). The posts were spaced 1637 mm (64.25 in.) on center. As installed, the top of the top rial was 1070 mm (42 in.) up from the floor surface.

3.3. GUARD ASSEMBLY DESCRIPTION

The InvisiRail SS guard component descriptions and key dimensions are summarized in Table 1 below.

	Table 1: Guard Assembly Description					
Component	**Part**	**Part Number**	**Part Dimensions (mm)**			**Reported Material**
			Length	**Width**	**Nominal Thickness**	
InvisiPost	42" post welded to 120 x 64 mm 10mm thick Flange (Surface) Mount describe weld	IVP42F-SS	1080	64 to 38 taper	8	Stainless Steel
Continuous Top Rail	Rail		-	41 OD	1.6 Wall Thickness	Stainless Steel
	Rail to Post Bracket (Prototype)		87	48	5	Steel
Glass Light	10mm thick Glass top and bottom height above surface	IVR42-D-62	1588	987	10	Tempered Glass
	Clamp s (4 per section) located 75 mm up from lower edge of glass, and 60 mm down from upper edge of glass on both sides.	IVRCON	64	45	6.3	Stainless Steel
	Glass Clip Sandwich Fasteners (2 each)	-	M6x1.0 Countersink 10mm screw type			Stainless Steel
	Glass Retaining Pin	-	20 by 8 OD			Stainless Steel
	Retaining Pin Bushing	-	8 by 12 OD			Nylon
	Universal Angle Adapter for 90 degrees corner angle	IVRANG				Stainless Steel

4 Testing and Evaluation Methods

4.1. SPECIMEN PREPARATION

The guard specimen was assembled by the client. The Flange (Surface) Mount was secured through composite deck board to a 6 in. x 6 in. pressure treated SPF substrate using "U2 Fasteners™ 2-22-106000" 3/8x6 in. Construction Screw fasteners.

4.2. CONDITIONING

The guard specimens were tested in the laboratory under ambient conditions. No specific conditioning parameters were required before testing.

4.3. TEST PROCEDURES

The IRC specified Live Loads are summarized in Table 2 below:

Table 2 – 2015 IRC Minimum Specified Loads	
Load Applied at any Point and Any direction at the Maximum Height of the Guard	Horizontal Load Applied Elements Within the Guard, Including Solid Panels and Pickets
Concentrated load of 200 lbf (0.89 kN)	Concentrated load of 50 lbf (0.224 kN) applied at any point on infill elements

The applicable test loads to be applied are based on the specified loads in Table 2 increased by the following safety of 4 for the glass infill glazing and 2.5 for steel top rail and post.

The deflections of the guard system components under the specified and factored loads were measured and are detailed in this report.

Vertical Concentrated Load -Continuos Top Rail

A downward concentrated load of 2.22 kN (500 lbf) was applied to the stainless steel top rail by means of a loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

Vertical Concentrated Load - Top of Glass

A downward concentrated load of 3.56 kN (800 lbf) was applied to the stainless steel top rail by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

Horizontal Concentrated Load - Continuos Top Rail

A concentrated horizontal load of 2.22 kN (500 lbf) was applied to the stainless steel top rail at the midspan, and separately centered over the post, by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

Horizontal Concentrated Load - Top of Glass

A concentrated horizontal load of 3.56 kN (800 lbf) was applied at midspan of the glass infill by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

Horizontal Concentrated Load - Continuos Top Rail End Connection (Corner Condition)

For the testing of a corner condition an InvisiPost and 1588mm glass in-fill panel and a return continuous top rail was added perpendicular to the guard assembly. An outward concentrated horizontal load of 2.22 kN (500 lbf)) was applied to the continuous top rail adjacent to the corner by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component.

Note: Testing of the Corner Condition with a single return continuous top rail section does not represent the performance of the corner with multiple sections of return continuous top rail.

Horizontal Concentrated Load - Post

A concentrated horizontal load of 2.22 kN (500 lbf) was applied to continuous the top rail at the post location by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

Horizontal Load on Infill

An outward concentrated horizontal test load of 0.89 kN (200 lbf) was applied to the center of the glass light by means of the loading system comprised of a calibrated load cell/single ram/pump system and a 100 mm by 100 mm platen. After release of the load, the system was evaluated for failure, evidence of disengagement of any component, and visible cracks in any component.

5 Testing and Evaluation Results

5.1 Deflections and Failure Observations

Load Type	IRC Specified Load	Applicable Safety Factor	Required/Applied Factored Load	Outward Load Deflection (mm)	Inward Load Deflection (mm)	Live Load Resistance
In-fill Load	0.224 kN (50 lbf)	4	0.89 kN (200 lbf)	14	15	Pass
Vertical Concentrated Load at Continuous Top Rail	0.89 kN (200 lbf)	2.5	2.22 kN (500 lbf)	235		Pass
Vertical Concentrated Load at Top of Glass	0.89 kN (200 lbf)	4	3.56 kN (800 lbf)	0		Pass
Midspan Concentrated Load at Continuous Top Rail	0.89 kN (200 lbf)	2.5	2.22 kN (500 lbf)	71	69	Pass
Midspan Concentrated Load at Top of Glass	0.89 kN (200 lbf)	4	3.56 kN (800 lbf)	135	131	Pass
Adjacent to Post Concentrated Load at Continuous Top Rail	0.89 kN (200 lbf)	2.5	2.22 kN (500 lbf)	63	59	Pass
Corner Condition Adjacent to Post Conentrated Load at Continuous Top Rail	0.89 kN (200 lbf)	2.5	2.22 kN (500 lbf)	15	15	Pass

No evidence of disengagement or visible cracks were observed in any component of the guard system

6 Test Equipment

Description	Inventory Number
Powerfist 24” stroke hydraulic ram	--
Electric Hydraulic Pump	--
Load Cell with Display	280-01-0774 Cal Due Nov 22/17
Tape Measure	273-01-1210 Cal Due August 16, 2017

7 Conclusion

Intertek has conducted testing for LIV Building Products on the InvisiRail® SS Guard System. The scope of the testing was to assess the ability of the guard system to resist the specified Live Loads as prescribed in the 2015 International Residential Code, Sentence R301.5 d, f, h, and Table R301.5. Safety factors as outlined in this report were applied to the specified Live Loads.

The LIV InvisiRail SS Guard System demonstrated resistance to the Live Loads, prescribed in the 2015 International Residential Code, as documented in this report.

INTERTEK TESTING SERVICES NA LTD.

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8 REVISIONS PAGE

Revision No.	Date	Changes	Author	Reviewer
0	September 6, 2017	First issue	Daniel Dubeckyj	Joseph DeRose

END OF DOCUMENT