intertek
Total Quality. Assured.

LIV BUILDING PRODUCTS TEST REPORT

SCOPE OF WORK
TESTING OF INVISIRAIL® SS TO ASSESS RESISTANCE TO LOADS ON GUARDS FOR EXTERIOR GUARDS AS PRESCRIBED IN THE 2015 NATIONAL BUILDING CODE OF CANADA (NBC), AND 2012 ONTARIO BUILDING CODE (OBC)

REPORT NUMBER
103287266TOR-001B

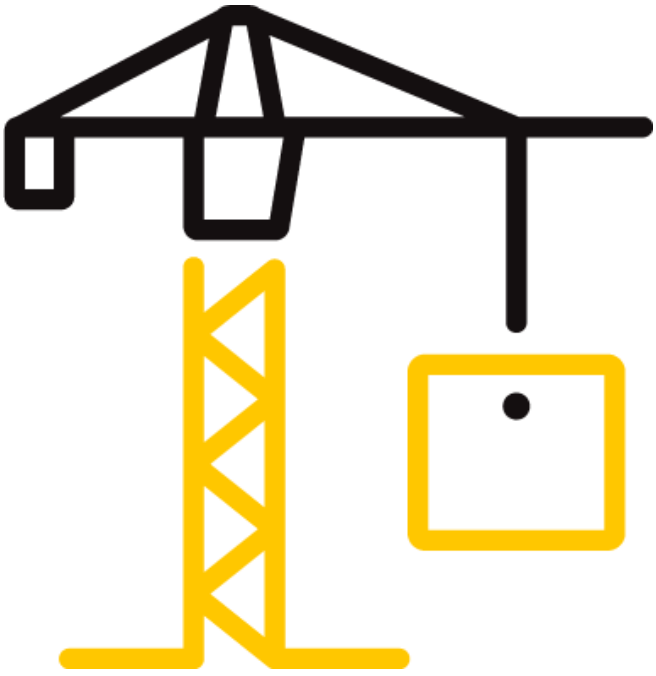
TEST DATE(S)
05/03/17 - 05/15/17

ISSUE DATE
02/28/18

RECORD RETENTION END DATE
02/28/23

PAGES
8

DOCUMENT CONTROL NUMBER
GFT-OP-10C (DRAFT)



6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

TEST REPORT FOR LIV BUILDING PRODUCTS

Report No.: 103287266TOR-001b
Date: 02/28/18

REPORT ISSUED TO

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

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by LIV Building Products (LIV) to perform testing of the e InvisiRail® SS stainless steel/glass surface mount guard system. The scope of the testing was to assess the ability of the guard system to resist the specified Loads on Guards as prescribed in the following codes:

2015 National Building Code of Canada Article 4.1.5.14, Sentence (1)(b) and (c), (2), (3), (4), and (6)

2012 Ontario Building Code Article 4.1.5.14, Sentence (1)(b) and (c), (2), (3), (4), and (6)

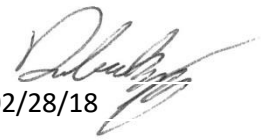
This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2

SUMMARY OF TEST RESULTS

The LIV Building Products (LIV) InvisiRail® SS stainless steel/glass surface mount guard system evaluated in this report demonstrated resistance to Loads on Guards as presented in Section 6 of this report.

For INTERTEK B&C:

COMPLETED BY:	Daniel Dubeckyj	**REVIEWED BY:**	Joe DeRose, P.Eng.
TITLE:	Technical Analyst Building Products	**TITLE:**	Project Engineer Building Products
SIGNATURE:		**SIGNATURE:**	
DATE:	02/28/18	**DATE:**	02/28/18

intertek
Total Quality. Assured.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

SECTION 3
EQUIPMENT

Calibration of test equipment was performed by Intertek B&C in accordance with ISO 17025 requirements.

Table 1 – Equipment		
Instrument/Equipment	**Asset #**	**Calibration Due Date**
Powerfist 24 in. stroke hydraulic ram	n/a	n/a
Electric Hydraulic Pump	n/a	n/a
Load Cell with Display	280-01-0774	Dec 23, 2017
600 mm Scale	280-01-1234	Feb 13, 2018
Mitutoyo Digital Indicator	280-01-0585	Mar 28, 2018

SECTION 4
TEST PROCEDURE

The NBC/OBC specified Live Loads are summarized in Table 2 below:

Table 2 - OBC 2012, NBC 2010 and NBC 2015 Minimum Specified Loads		
Horizontal Load Applied at any Point at the Minimum Required Height of the Guard	**Horizontal Load Applied Elements Within the Guard, Including Solid Panels and Pickets**	**Evenly Distributed Vertical Load Applied at the Top of the Guard**
0.75 kN/m or concentrated load of 1.0 kN applied at any point, whichever governs	Concentrated load of 0.5 kN applied at any point on individual elements	1.5 kN/m uniform load

The applicable test loads to be applied are based on the specified loads in Table 1 increased by the following safety factors:

- specified loads multiplied by 1.5/ø, where ø=0.90 resistance factor for bearing stress on steel members resulting in plastic yielding failure, resulting safety factor was 1.67,
- specified loads multiplied by 1.5/ø, where ø=0.67 resistance factor for fasteners, for testing of steel connections the resulting safety factor was 2.24,
- specified loads multiplied by 1.5/ø, where ø=0.60 resistance factor for glass, for testing of glass infill panels the resulting safety factor was 2.5.

The deflection of the guard system components under the specified and factored loads was measured and is detailed in this report.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

TEST REPORT FOR LIV BUILDING PRODUCTS
Report No.: 103287266TOR-001b
Date: 02/28/18

Vertical Uniform Load on Top Rail

Quarter-point loading was applied to the top surface of the glass in a vertical direction by means of the loading system comprised of a calibrated load cell/single ram/pump system and load distributing steel bar. An applied test load corresponding to 1.5 kN/m was applied to the top rail and held for 1 minute. 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 of Upper Glass at Mid-span

The initial position of the top of the glass (at mid span) was measured. A concentrated horizontal load of 1.0 kN (delivered with a 100 mm by 100 mm platen) was applied to mid span of the top of the glass by means of a calibrated load cell/single ram/pump system and held for 1 minute, whereupon the position of the glass was measured. The load was then released and the residual position of the top of the glass was again measured. The factored load indicated in Section 5.1 was applied and the glass deflection was measured at full load and after removal of the test load. After release of the load, the system was evaluated for residual deflection, failure, evidence of disengagement of any component and visible cracks in any component.

Horizontal Concentrated Load at End Connection

A section of guard was installed at a perpendicular angle. A concentrated horizontal load of 1.0 kN (delivered with a 100 mm by 100 mm platen) was applied to the top of the glass adjacent the corner post by means of the loading system comprised of a calibrated load cell/single ram/pump system and held for 1 minute. The factored load indicated in Section 5.1 was applied and the glass deflection was measured at full load and after removal of the test load. 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 on Post

The initial position of the post was measured. A concentrated horizontal load of 1.0 kN (delivered with a 100 mm by 100 mm platen) was applied to top of the post by means of a calibrated load cell/single ram/pump system and held for 1 minute, whereupon the position of post was measured. The load was then released and the residual position of the post was again measured. The factored load indicated in Section 5.1 was applied and the rail deflection was measured at full load and after removal of the test load. After release of the load, the system was evaluated for residual deflection, failure, evidence of disengagement of any component and visible cracks in any component.

Horizontal Load on Infill

An outward concentrated horizontal test load of 0.5 kN (delivered with a 100 mm by 100 mm platen) was applied to the middle of the glass light by means of a calibrated load cell/single ram/pump system and held for 1 minute. The factored load indicated in Section 5.1 was applied and the glass deflection was measured at full load and after removal of the test load. After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component.

intertek
Total Quality. Assured.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

SECTION 5
TEST SPECIMEN DESCRIPTION

The guard system tested consisted of three stainless steel InvisiPosts with welded stainless steel bases, 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 rail was 1070 mm (42 in.) up from the floor surface.

GUARD ASSEMBLY DESCRIPTION

The InvisiRail™ SS guard component descriptions and key dimensions are summarized in Table 3 below.

Table 3: Guard Assembly Description

Component	Part	Part Number	Part Dimensions (in./mm)			Reported Material
			Length	Width	Nominal Thickness	
InvisiPost	Post welded to 4.75 in. (121mm) x 2.5 in. (64 mm) x 0.375 in. (9.5mm) surface mount base.	IVP42F-SS	42.5 (1080)	2.5 (64) to 1.50 (38) taper	0.315 (8)	Stainless Steel
Glass Light	10mm thick Glass top and bottom height above surface	IVR42-D-62	67.9 (1588)	38.9 (987)	0.394 (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	2.52 (64)	1.77 (45)	0.25 (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 45 degrees corner angle	IVRANG				Stainless Steel

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.

intertek
Total Quality. Assured.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

CONDITIONING

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

SECTION 6
TEST RESULTS

Table 4: Resistance to Loads, Deflections, and Failure Observations

Load Type	OBC Specified Load	Applicable Safety Factor	Required Factored Load	Outward Load Deflection (mm)	Inward Load Deflection (mm)	Resistance of Guard Assemblies to Factored Loads Required to Meet OBC and NBC4.1.5.14
In-fill Load	0.5 kN (112 lbf)	2.5	1.25 kN (280 lbf)	21	13	Pass
Vertical Uniform Load of Upper Glass	1.5 kN/m (103 plf)	2.5	3.75 kN/m (257 plf)	7		Pass
Mid-span Concentrated Load of Upper Glass	1.0 kN (225 lbf)	2.5	2.5 kN (562 lbf)	95	93	Pass
Horizontal Concentrated Load at End Connection	1.0 kN (225 lbf)	2.5	2.5 kN (562 lbf)	36		Pass
Adjacent to Post Connection Concentrated Load	1.0 kN (225 lbf)	2.5	2.5 kN (562 lbf)	93	70	Pass
Top of Post Concentrated Load	1.0 kN (225 lbf)	1.67	1.67 kN (450 lbf)	107		Pass

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

intertek
Total Quality. Assured.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

SECTION 7
CONCLUSION

The LIV Building Products (LIV) InvisiRail® SS stainless steel/glass surface mount guard system evaluated in this report demonstrated resistance to Loads on Guards as prescribed in the following codes:

2015 National Building Code of Canada Article 4.1.5.14, Sentence (1)(b) and (c), (2), (3), (4), and (6)

2012 Ontario Building Code Article 4.1.5.14, Sentence (1)(b) and (c), (2), (3), (4), and (6)

Load adjustment factors as outlined in this report were applied to the specified loads.

6225 Kenway Drive
Mississauga, ON, L5T 2L3

Telephone: 905-678-7820
Facsimile: 905-678-7131
www.intertek.com/building

TEST REPORT FOR LIV BUILDING PRODUCTS
Report No.: 103287266TOR-001b
Date: 02/28/18

SECTION 8
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	02/28/18	8	Original Report Issue