

LIV BUILDING PRODUCTS TEST REPORT

SCOPE OF WORK

LOADS ON GUARDS TESTING OF SURFACE MOUNTED INVISIRAIL® GUARD SYSTEM WITH
MINERAL- PVC AND WOOD/HDPE COMPOSITE TOP-RAILS

REPORT NUMBER

103670754-TOR-005A

TEST DATE(S)

12/03/18 - 12/12/18

ISSUE DATE

12/14/18

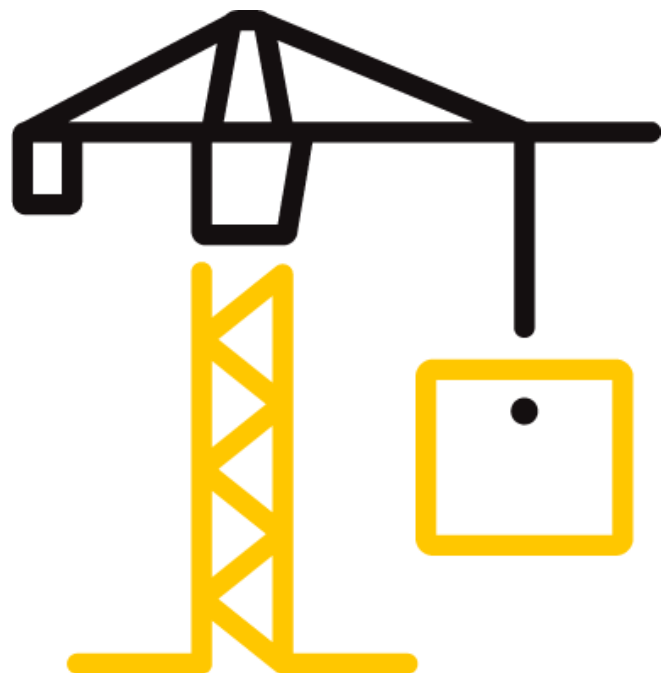
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GFT-OP-10c (AUGUST 27, 2018)

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TEST REPORT FOR LIV BUILDING PRODUCTS

Report No.: 103670754-TOR-005A

Date: 12/14/18

REPORT ISSUED TO

LIV BUILDING PRODUCTS

6050 Owen Road

Uxbridge ON, L6P 1R1

Canada

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by LIV Building Products (LIV), to perform testing in accordance with Table 9.8.8.2 (*all other guards*) of the **2015 National Building Code of Canada (NBC)** and **2012 Ontario Building Code (OBC)**, on the InvisiRail® Guard System with Mineral – PVC and Wood/HDPE Composite top-rails. Results obtained are tested values and were secured by using the designated test method(s).

Testing was conducted at Intertek test facility in Mississauga, ON, from December 3rd, 2018 to December 12th 2018.


This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained for the entire test record retention period.


SECTION 2

SUMMARY OF TEST RESULTS

The LIV InvisiRail® Guard System with Mineral- PVC and Wood/HDPE Composite top-rails achieved the results presented in section 10 of this report.

For INTERTEK B&C:

COMPLETED BY:	Tyrone Williams
TITLE:	Technician Building Products
SIGNATURE:	
DATE:	12/14/18

REVIEWED BY:	Joe DeRose, P. Eng.
TITLE:	Project Engineer, Evaluation Services
SIGNATURE:	
DATE:	12/14/18

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SECTION 3

TEST METHOD(S)

The specimens were tested for resistance to the Loads on Guards specified in the following:

- 2015 National Building Code of Canada (NBC) Table 9.8.8.2, *All other guards*
- 2012 Ontario Building Code(OBC) Table 9.8.8.2, *All other guards*

SECTION 4

MATERIAL SOURCE/INSTALLATION

An assembled guard system installed on an SPF wooden deck frame was submitted to Intertek directly from the client on 2nd October 2018. Samples were not independently selected for testing. Tests were performed at the Intertek laboratory in Mississauga, Ontario.

SECTION 5

EQUIPMENT

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

Equipment Calibration		
Instrument/Equipment	Asset #	Calibration Due Date
2K Load Cell with Digital Indicator	280-01-0774	Jan-15-2019
2K Load Cell with Digital Indicator	280-01-0773	Jan-15-2019
Stop Watch	273-01-1201	Apr-13-2019
Digimatic indicator	280-01-0836	Mar-26-2019
Tape Measure	280-01-1222	Aug-7-2019
Powerfist 24" stroke Hydraulic Ram	N/A	N/A
Electric Hydraulic Pump	N/A	N/A

SECTION 6

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Joe DeRose	Intertek B&C

Note: The above observer(s) witnessed a portion of the test program.

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SECTION 7**TEST PROCEDURE**

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

Infill Load Test

Test Loads were applied over a 100 mm x 100 mm square platen normal to the in-fill at the intersection of the top edge and horizontal center line of the in-fill. Specified and factored loads were applied and held for one (1) minute, whereupon deflection of the in-fill at the point of maximum deflection was recorded. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

Uniform Load Test

The top rail was subjected to vertical and horizontal quarter point loads applied by means of a load distributing steel bar. Specified and factored loads were applied and held for one (1) minute, whereupon deflection of the top rail at mid-span was recorded. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

Concentrated Load Test

Concentrated test loads were applied separately and sequentially at the following three critical locations: *vertically at the top rail at mid-span between posts, horizontally on the top rail adjacent to a post, and horizontally at the corner and top of a single post*. Specified and factored loads were applied over a 100 mm x 100 mm square platen and held for one (1) minute, whereupon deflection was recorded at the point of application of the load. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

SECTION 8**TEST CALCULATIONS**

Factored loads were determined as the NBC/OBC specified load with a safety factor of 2.5 applied.

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TEST SPECIMEN DESCRIPTION

The “L” shaped guard assembly consisted of three (3) surface mounted InvisiRail® stainless steel posts, two (2) tempered glass infill and top rails. Posts were spaced 1870 mm along the length and 1297 mm on the shorter 90° return section. The post installed at the 90° corner, was installed at a 45° angle.

The guard assembly was installed on a wooden frame constructed with 2 in. x 6 in. headers and 6 in. x 6 in. SPF wood joists, the overall deck frame measured 1520 mm x 3123 mm.

Posts were anchored through a 21.5mm thick composite deck board over 6 in. x 6 in SPF wood joists using six (6) 3/8 in. x 6 in. U2 Construction Screw™. The height of the guard measured 1100 mm from the surface of the composite deck board to the top of the rails.

Tests were conducted with Mineral – PVC Deck Board and Wood/HDPE Composite deck board top-rails.

The InvisiRail Guard System component descriptions and key dimensions are summarized in the table below.

Guard Assembly Description						
Drawing Number	Drawing Title	Part Description/Function	Part Dimensions (mm)			Reported Material
			Length	Width	Nominal Thickness	
1406.0793	SS Post with Flange Mount in 1080 mm	Post fitted inside and perimeter welded ¹ to 121 mm x 64 mm x 10mm thick SS plate with six(6) 12 mm dia. holes	1245	85 to 38 taper	8	Stainless Steel
1804.2390	SS Holder for Top Rail	Supports the top rail and is bolted to SS Post using a single M8x1.5x25. socket head bolt with nut.	See Drawing for Dimensions			Stainless Steel
N/A	N/A	Top Rails-Secured to “SS Holder for Top Rail” using four (4) #8 x 1.25 in. screws	1420	139	21	Mineral – PVC ²
N/A	N/A		1960	139	21	
N/A	N/A		1420	139	21	Wood/HDPE ² Composite
N/A	N/A		1960	139	21	
N/A	InvisiRail Glass Panel	Tempered glass Supported by four(4) SS clamp Notch 10 mm with a glass retaining Pin, retaining Pin Bushing	1773	984	10	Tempered Glass ³
			1202	984	10	
1110.3096	SS clamp Notch 10 mm	Clamps (4 per glass infill) located 70 mm up from lower edge of glass, and 61 mm down from upper edge of glass on both sides. Held together by two (2) M6x1.0x10 Countersink screw type.	64	45	6.3	Stainless Steel

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Guard Assembly Description						
Drawing Number	Drawing Title	Part Description/Function	Part Dimensions (mm)			Reported Material
			Length	Width	Nominal Thickness	
1707.1962	SS angled Block Spacer	Bolted to the SS Post installed at the corner, using a single M8x1.25x37 socket head bolt.	See Drawings for Dimensions			Stainless Steel
N/A	N/A	Retaining Pin Bushing	8 by 12 OD			Plastic

Notes to Guard Assembly Description:

1. Welding of the posts to base plates must conform to the applicable CSA standard including the qualification of welding operators and procedures.
2. Mineral-PVC and Wood/HDPE Composite are not referenced in NBC/OBC as acceptable solutions for guard systems.
3. Glass for guard systems subject to OBC/NBC requirements must comply with CAN/CGSB-12.1-M90 and must be marked with the manufacturer's name and the characters "CAN/CGSB-12.1-M90."

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SECTION 10

TEST RESULTS

TEST		SPECIFIED LOAD kN (lbf)	DEFLECTION AT SPECIFIED LOAD mm (in.)	SAFETY FACTOR	FACTORED LOAD APPLIED kN (lbf)	PASS/FAIL
MINERAL – PVC TOP RAIL						
Infill Load Test- Applied to the infill area of a baluster or panel railing system, distributed 100 mm x 100 mm area.		0.5 (112)	15.48 (0.61)	2.5	1.25 (281)	Pass
Evenly Distributed Vertical load Applied at the Top of the Guard as <i>Quarter Point Equivalent load</i> .		1.5kN/m (103lbf/ft)	1.91 (0.07)	2.5	3.75kN/m (258 lbf/ft.)	Pass
Evenly Distributed Horizontal load Applied at the Top of the Guard as <i>Quarter Point Equivalent load</i>		0.75kN/m (51lbf/ft.)	22.53 (0.89)	2.5	1.88kN/m (128 lbf/ft.)	Pass
Horizontal load applied at the minimum required height of the guard	Adjacent to corner Post, Return corner Restrained	1.0 (225)	2.45 (0.10)	2.5	2.5 (563)	Pass
	Adjacent to corner Post, return corner Unrestrained	1.0 (225)	3.82 (0.15)	2.5	2.5 (563)	Pass
	Adjacent to Post End post of the largest span	1.0 (225)	25.02 (0.99)	2.5	2.5 (563)	Pass
	Top of post -End post of the largest span	1.0 (225)	15.51 (0.61)	2.5	2.5 (563)	Pass
WOOD/HDPE COMPOSITE TOP RAIL						
Infill Load Test- Applied to the infill area of a baluster or panel railing system, distributed 100 mm x 100 mm area.		0.5 (112)	18.17 (0.71)	2.5	1.25 (281)	Pass
Evenly Distributed Vertical load Applied at the Top of the Guard as <i>Quarter Point Equivalent load</i> .		0.75kN/m (51lbf/ft.)	28.3 (1.12)	2.5	1.88kN/m (128 lbf/ft.)	Pass
Horizontal load applied at the minimum required height of the guard	Adjacent to corner Post, Return corner Restrained	1.0 (225)	2.1 (0.08)	2.5	2.5 (563)	Pass
	Adjacent to corner Post, return corner Unrestrained	1.0 (225)	3.5 (0.18)	2.5	2.5 (563)	Pass
	Adjacent to Post End post of the largest span	1.0 (225)	30.01 (1.18)	2.5	2.5 (563)	Pass
	Top of post -End post of the largest span	1.0 (225)	30.02 (1.18)	2.5	2.5 (563)	Pass

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SECTION 11

CONCLUSION

Intertek has conducted testing for LIV Building Products, to assess resistance of the InvisiRail® Guard System with Mineral – PVC and Wood/HDPE Composite top-rails, to Loads on Guards in accordance with Table 9.8.8.2 (*all other guards*) of the **2015 National Building Code of Canada (NBC)** and the **2012 Ontario Building Code (OBC)**.

The LIV InvisiRail® Guard System, using the components detailed in Section 10 of this report, has demonstrated resistance to the required Loads on Guards. Applicable load safety factors were applied as detailed in this report.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

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PHOTOGRAPHS

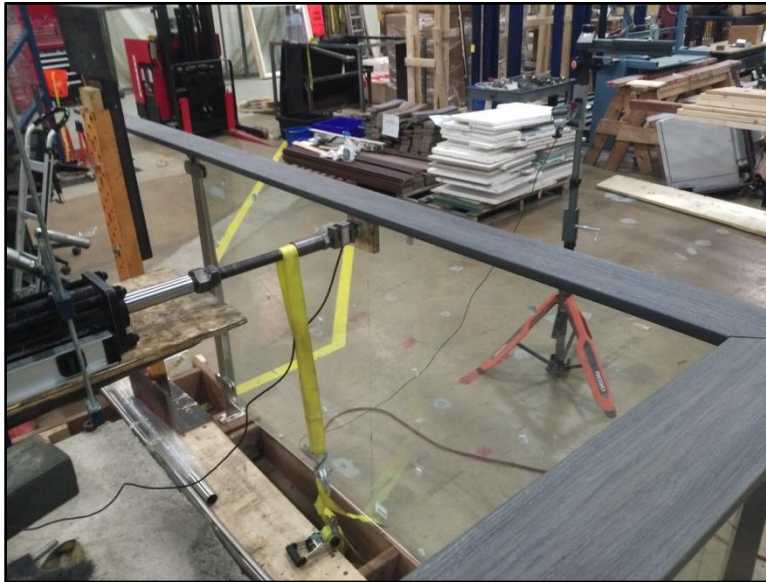


Photo No. 1
Infill Load Test

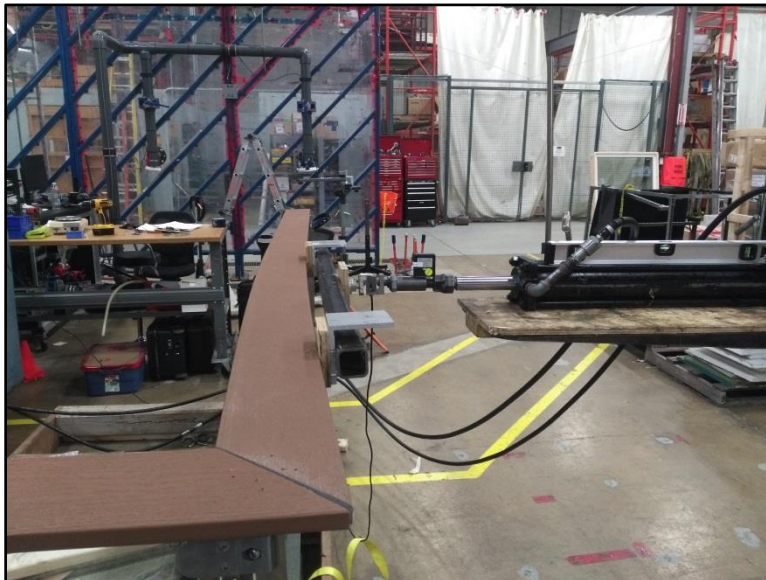


Photo No. 2
Horizontal Top Rail 1/4 Point Load Test

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Photo No. 3
Vertical Top Rail 1/4 Point Load Test



Photo No. 4
Adjacent to Corner Post

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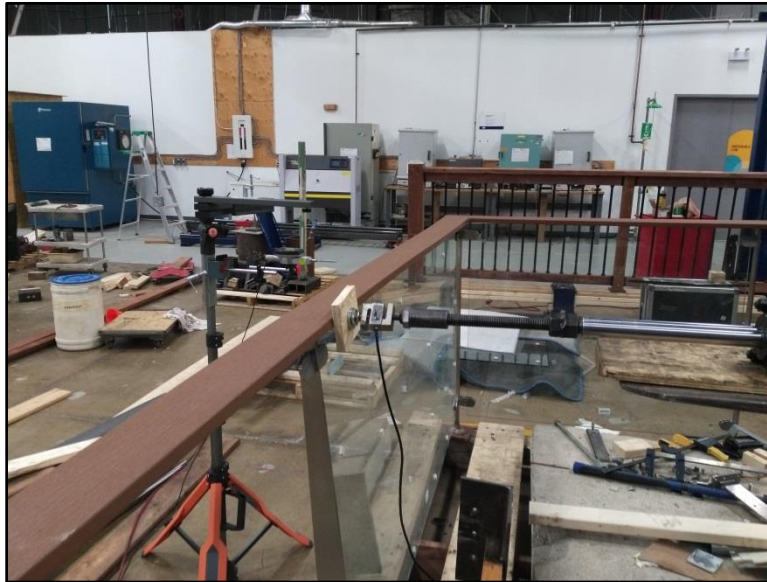


Photo No. 5
Adjacent to End Post



Photo No. 6
Top of the End-Post

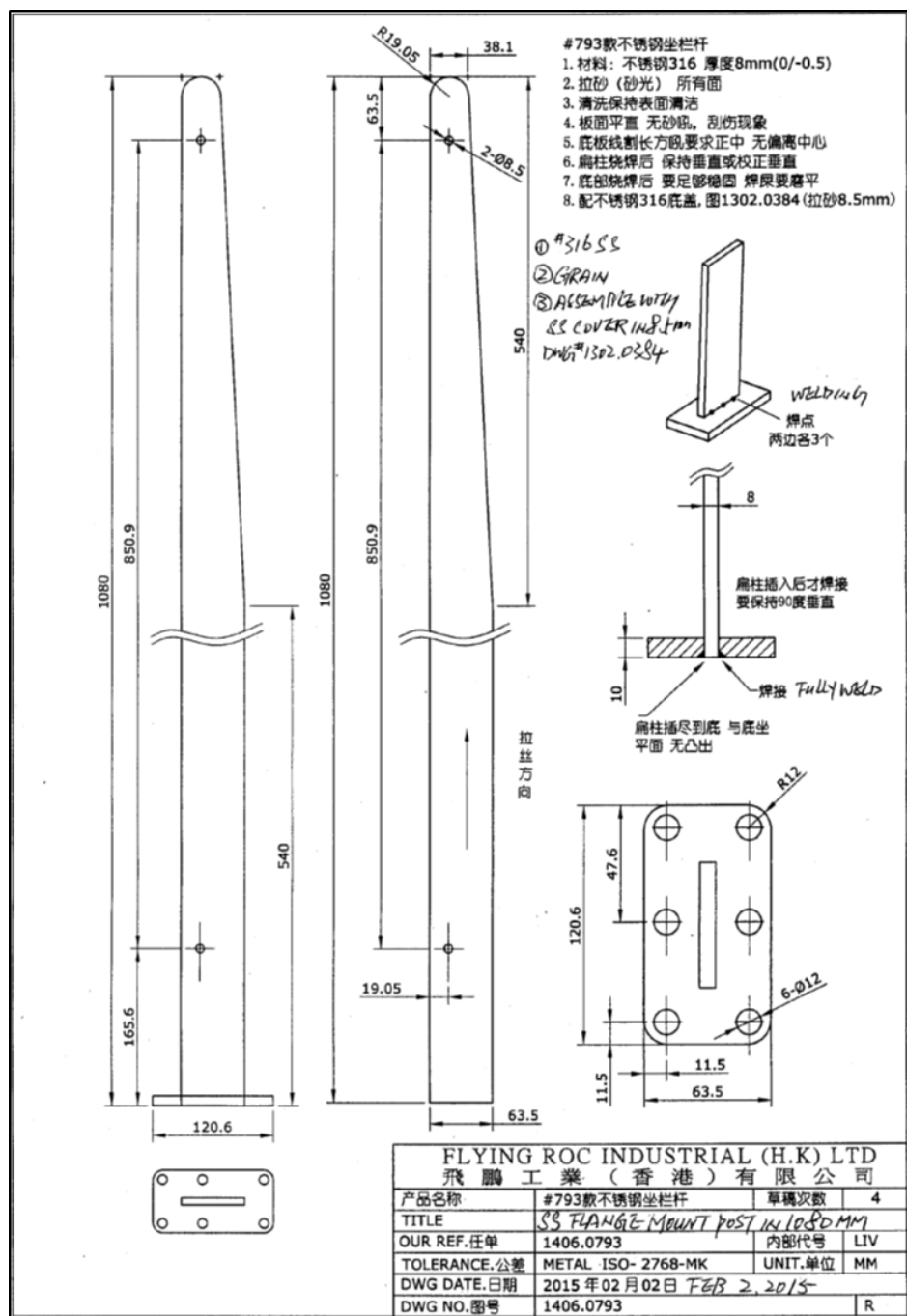
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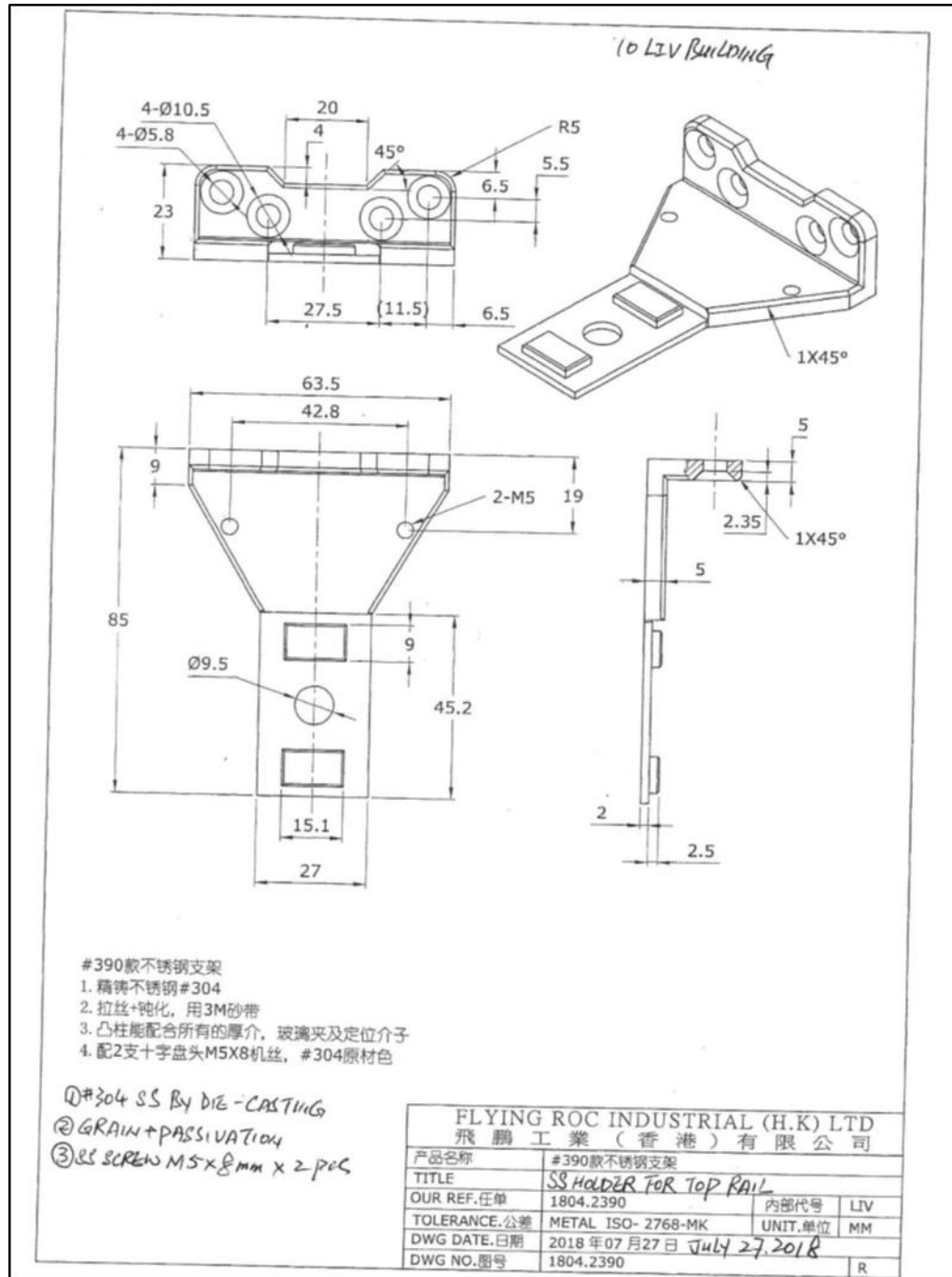
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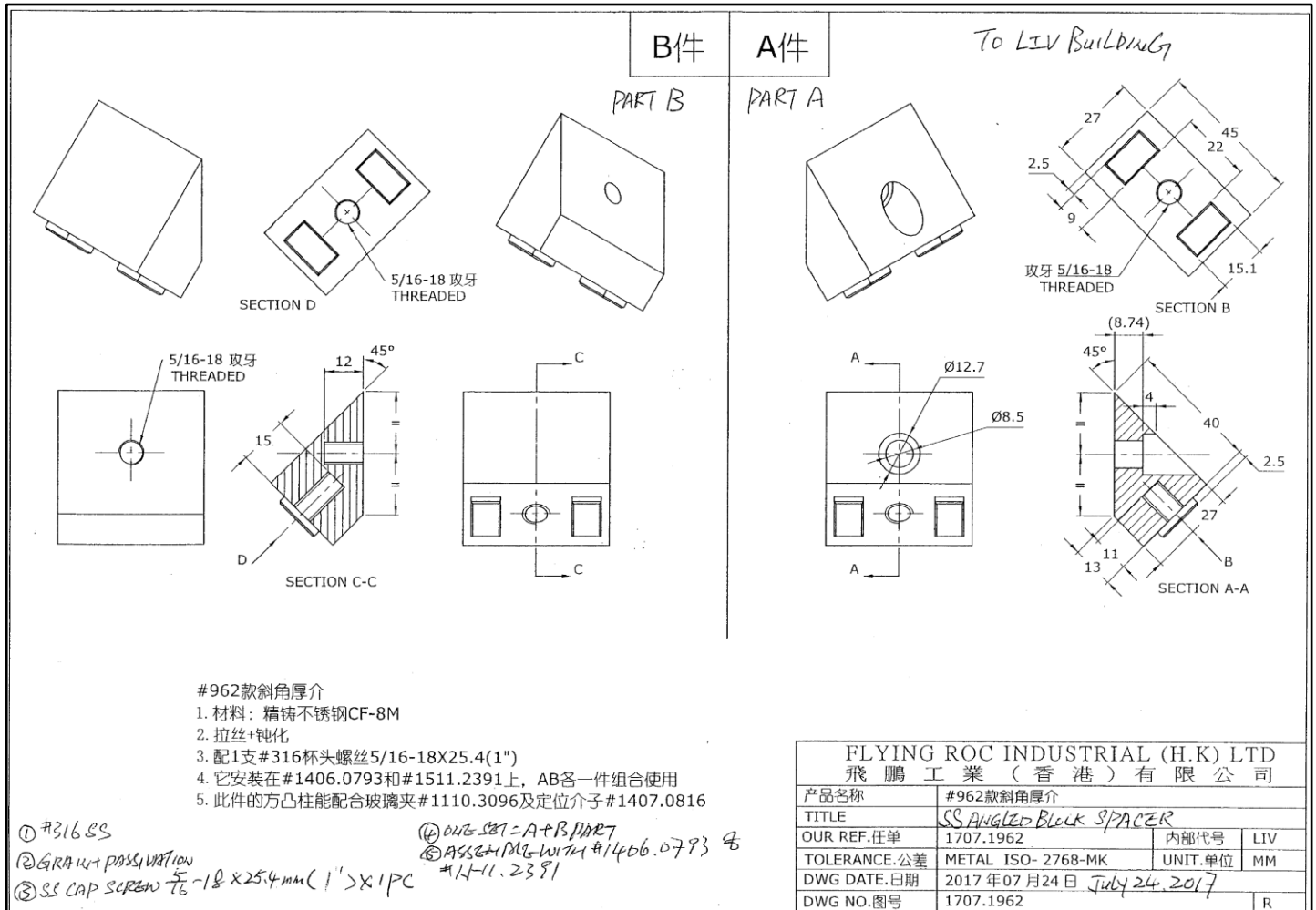
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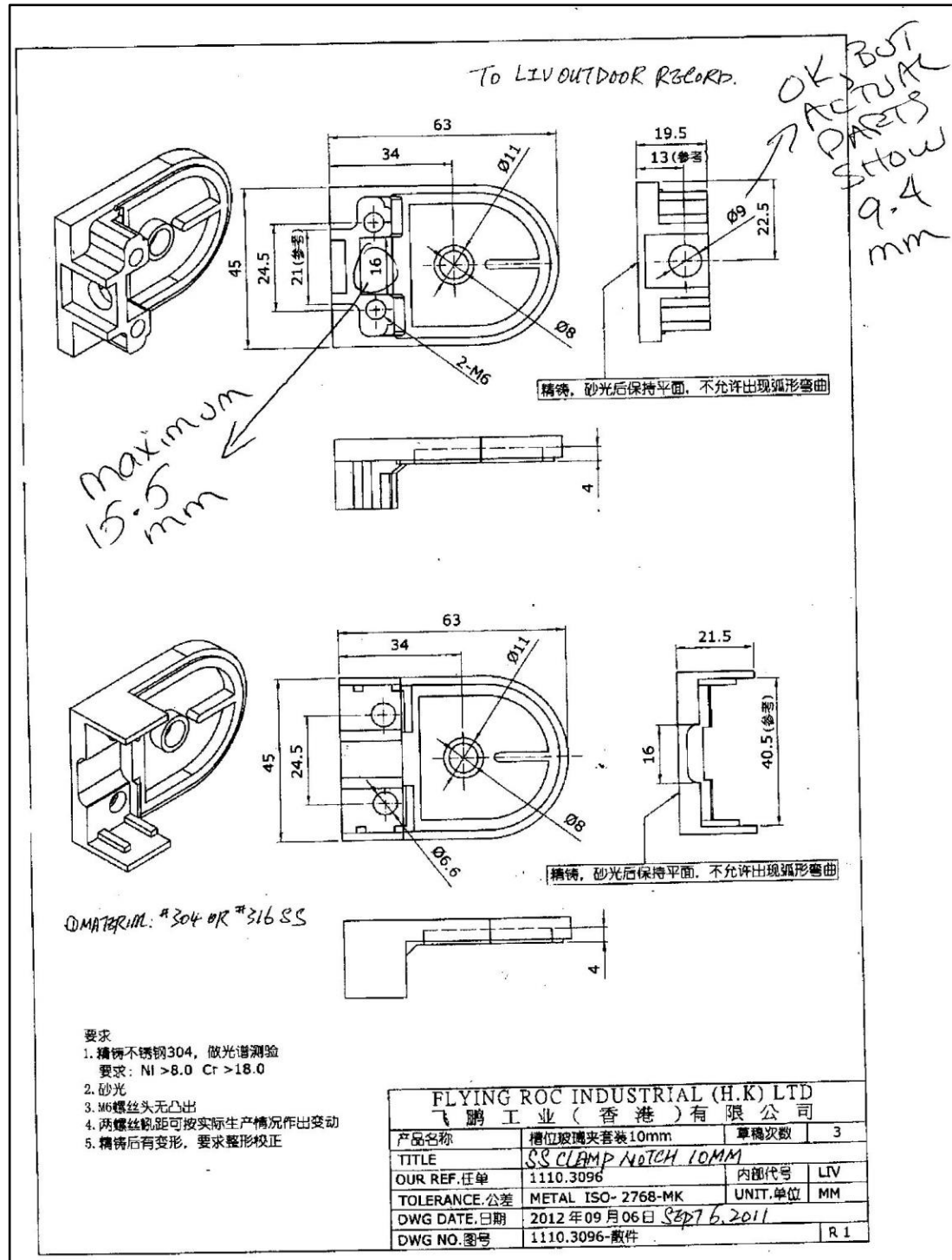
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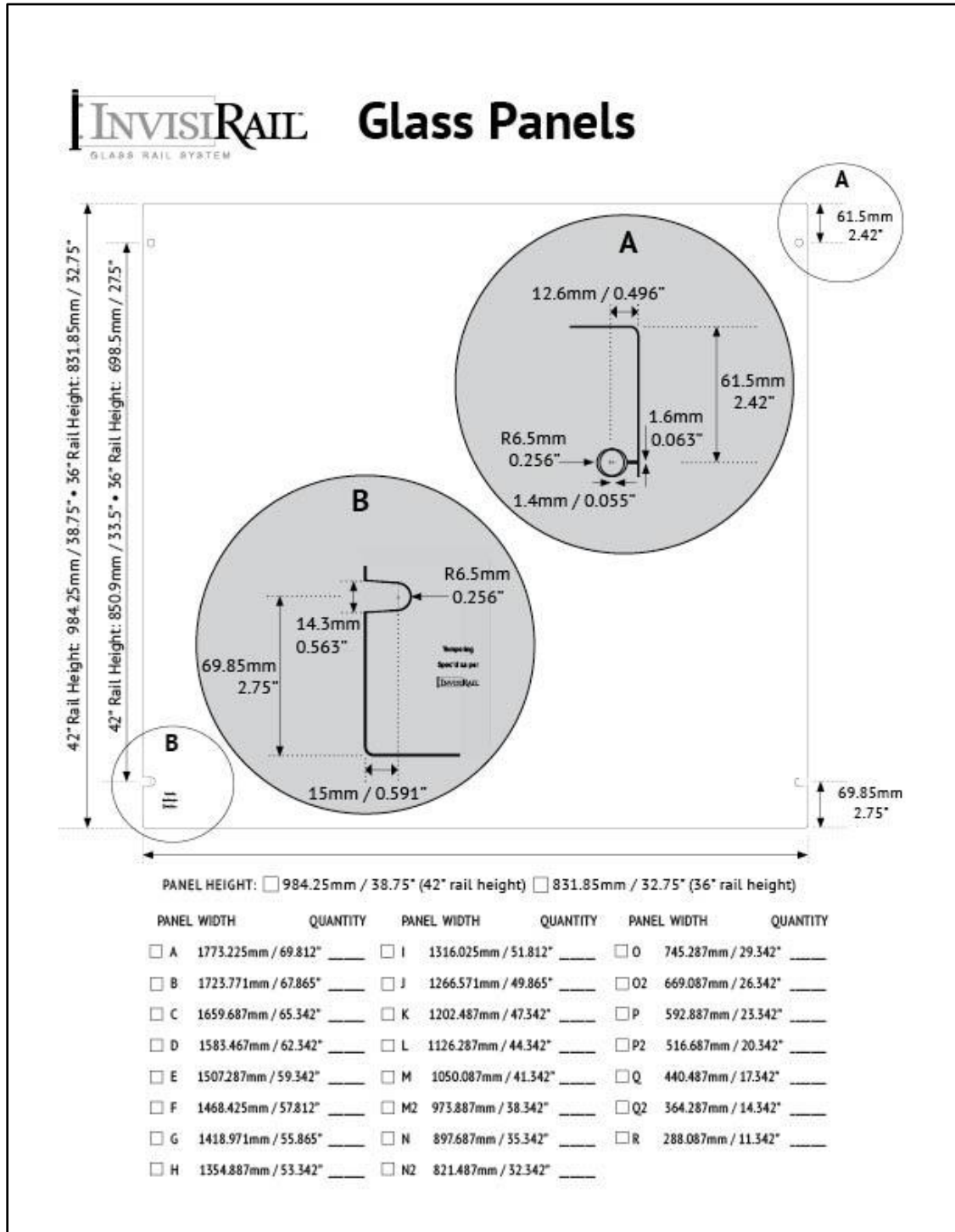
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6225 Kenway Dr.
Mississauga, ON, L5T 2L3

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

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SECTION 14

REVISION LOG

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