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FAIRWAY ARCHITECTURAL RAILING SOLUTIONS
TEST REPORT

SCOPE OF WORK
STRUCTURAL PERFORMANCE TESTING ON WELDED STEEL PANEL GUARDRAIL SYSTEM

REPORT NUMBER
H8228.03-119-19-R0

TEST DATE(S)
12/04/17

ISSUE DATE
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RECORD RETENTION END DATE
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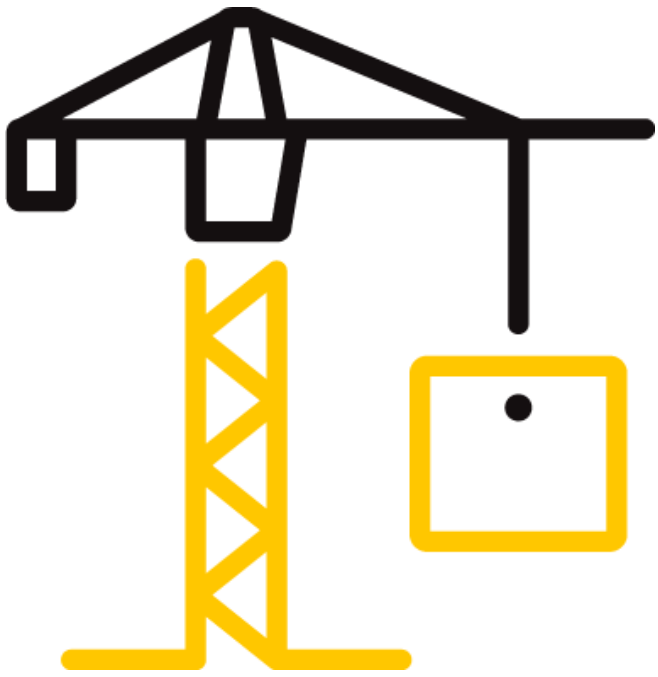

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TEST REPORT FOR FAIRWAY ARCHITECTURAL RAILING SOLUTIONS

Report No.: H8228.03-119-19-R0
Date: 04/11/18

REPORT ISSUED TO

FAIRWAY ARCHITECTURAL RAILING SOLUTIONS
53 Eby Chiques Road
P.O. Box 37
Mount Joy, PA 17552

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Fairway Architectural Railing Solutions to perform structural performance testing in accordance with the 2015 IBC on their 94 in wide by 42 in high welded steel panel guardrail system. All tests performed were to evaluate structural performance of the guardrail assembly to carry and transfer imposed loads to the supporting structure. The test specimens evaluated included the infill, rails and rail brackets. The support posts are not included in the scope of this testing and were included only to facilitate attachment of the rail. Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek test facility in York, Pennsylvania. Intertek B&C has demonstrated compliance with ISO/IEC International Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. (IAS). This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2

SUMMARY OF TEST RESULTS

The specimen met the 2015 IBC design load performance requirements.

For INTERTEK B&C:

COMPLETED BY:	Adam J. Schrum	**REVIEWED BY:**	V. Thomas Mickley, Jr., P.E.
TITLE:	Lead Technician	**TITLE:**	Senior Staff Engineer
SIGNATURE:	Digitally Signed by: Adam J. Schrum	**SIGNATURE:**	Digitally Signed by: Virgal Thomas Mickley, Jr.
DATE:	04/11/18	**DATE:**	04/11/18

AJS:vtm/aaa

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SECTION 3
TEST METHOD(S)

The specimen was evaluated in accordance with the following:

2015, *International Building Code*®, International Code Council

Structural tests were performed according to Chapter 17 (Structural Tests and Special Inspections) of IBC 2015.

SECTION 4
MATERIAL SOURCE/INSTALLATION

Test samples were provided by the client.

The 94 in wide by 42 in high guardrail assembly was installed and tested as a single railing section by directly securing the posts into a rigid steel test fixture, which rigidly restrained the posts from deflecting. Transducers mounted to an independent reference frame were located to record movement of reference points on the guardrail system components (ends and mid-point) to determine net component deflections. See photographs in Section 11 for individual test setups.

SECTION 5
EQUIPMENT

The guardrail was tested in a self-contained structural frame designed to accommodate anchorage of the guardrail assembly and application of the required test loads. The specimens were loaded using an electric winch mounted to a rigid steel test frame. High strength steel cables, nylon straps, and load distribution beams were used to impose test loads on the specimens. Applied load was measured using an electronic load cell located in-line with the loading system. Electronic linear motion transducers were used to measure deflections.

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Travis Scott	Fairway Architectural Railing Solutions
Adam J. Schrum	Intertek B&C
Isaiah Gebhart	Intertek B&C

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SECTION 7
TEST PROCEDURE

Each test specimen was inspected prior to testing to verify size and general condition of the materials, assembly, and installation. No potentially compromising defects were observed prior to testing.

An initial load, not exceeding 50% of design load, was applied and transducers were zeroed. Load was then applied at a steady uniform rate until reaching 2.0 times design load in no less than 10 seconds. After reaching 2.0 times design load, the load was released. After allowing a minimum period of one minute for stabilization, load was reapplied to the initial load level used at the start of the loading procedure, and deflections were recorded and used to analyze recovery. Load was then increased at a steady uniform rate until reaching 2.5 times design load or until failure occurred. The testing time was continually recorded from the application of initial test load until the ultimate test load was reached.

Deflection and permanent set were component deflections relative to their end-points; they were not overall system displacements. All loads and displacement measurements were horizontal, unless noted otherwise.

Key to Test Results Tables:

Load Level: Target test load

Test Load: Actual applied load at the designated load level (target).

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure.

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SECTION 8
TEST SPECIMEN DESCRIPTION

Fairway Architectural Railing Solutions provided the fully-assembled test specimens with the following details:

PRODUCT	Welded Steel Panel Guardrail System
OVERALL DIMENSIONS	94 in wide (inside of post to inside of post) by 42 in high (deck surface to top of top rail)
TOP AND BOTTOM RAIL	1 in square steel extrusion with 0.06 in wall
PICKETS (IN-FILL)	5/8 in square steel extrusion with 0.05 in wall
RAIL BRACKETS	Cast steel socket brackets contoured to shape of rails
FASTENERS	#10-24 by 3/4 in flat head, thread tapping, sheet metal screws (two in bracket/post and one in rail/bracket)
POST	2 in square by 0.10 in wall hollow steel extrusion attached to a base plate with 1/8 in fillet weld all around
BASE PLATE	3-15/16 in square by 5/16 in thick steel plate with (4) 9/16 in diameter holes located 5/8 in on-center from edge of plate and (1) 1-1/2 in diameter hole in the center of the plate

SECTION 9
TEST RESULTS

Welded Steel Panel Level Guardrail System

TEST NO. 1 - 12/04/17
DESIGN LOAD: 50 lb / 1 Square ft at Center of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	25	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	102	00:16	0.65	0.78	0.61	0.15
Initial Load	25	02:21	0.02	0.03	0.02	0.01
93% Recovery from 2.0 x Design Load						
2.50 x Design Load	128	02:33	Achieved Load without Failure			

[1] *Net displacement was the infill displacement relative to its top and bottom.*

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TEST RESULTS (continued)

TEST NO. 2 - 12/04/17
DESIGN LOAD: 50 lb / 1 Square ft at Bottom of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	25	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	105	00:12	0.05	0.77	0.06	0.72
Initial Load	25	01:59	0.00	0.01	0.00	0.01
99% Recovery from 2.0 x Design Load						
2.50 x Design Load	128	02:11	Achieved Load without Failure			

[1] *Net displacement was the bottom rail displacement relative to its ends.*

TEST NO. 3 - 12/04/17
DESIGN LOAD: 50 plf Uniform Load on Top Rail - Horizontal [2]

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	78	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	784	00:38	0.10	5.98	0.12	5.87
Initial Load	80	02:33	0.01	1.48	0.00	1.48
75% Recovery from 2.0 x Design Load						
2.50 x Design Load	993	03:04	Achieved Load without Failure			

[1] *Net displacement was the bottom rail displacement relative to its ends.*

[2] *Uniform load was simulated with quarter point loading*

TEST NO. 4 - 12/04/17
DESIGN LOAD: 50 plf Uniform Load on Top Rail - Vertical [1]

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
			MID
Initial Load	80	00:00	0.00
2.0 x Design Load	784	00:29	1.12
Initial Load	80	02:36	0.17
85% Recovery from 2.0 x Design Load			
2.50 x Design Load	1007	02:57	Achieved Load without Failure

[1] *Uniform load was simulated with quarter point loading*

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TEST RESULTS (continued)

Test No. 5 - 12/04/17
DESIGN LOAD: 200 lb Horizontal Concentrated Load at Midspan of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	51	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	404	00:26	0.03	3.50	0.07	3.45
Initial Load	50	02:33	0.00	0.19	0.00	0.19
94% Recovery from 2.0 x Design Load						
2.50 x Design Load	507	02:50	Achieved Load without Failure			

[1] *Net displacement was mid-rail displacement relative to the rail at the support posts.*

Test No. 6 - 12/04/17
DESIGN LOAD: 200 lb Horizontal Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL [1]	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)	
			RAIL END #1	RAIL END #2
Initial Load	80	00:00	0.00	0.00
2.0x Design Load	813	00:46	0.22	0.25
Initial Load	80	02:42	0.03	0.04
86% Recovery (Rail End #1) and 84% Recovery (Rail End #2) from 2.0 x Design Load				
2.50 x Design Load	1025	02:58	Achieved Load without Failure	

[1] *A spreader beam was used to impose loads on* both *ends of the railing system; therefore, loads were doubled.*

Test No. 7 - 12/04/17
DESIGN LOAD: 200 lb Vertical Concentrated Load at Midspan of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	49	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	412	00:20	0.00	0.76	0.00	0.76
Initial Load	50	02:19	0.00	0.01	0.00	0.01
99% Recovery from 2.0 x Design Load						
2.50 x Design Load	506	02:37	Achieved Load without Failure			

[1] *Net displacement was mid-rail displacement relative to the rail at the support posts.*

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TEST RESULTS (continued)

Test No. 8 - 12/04/17
DESIGN LOAD: **200 lb Vertical Concentrated Load at Ends of Top Rail (Brackets)**

LOAD LEVEL [1]	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)	
			RAIL END #1	RAIL END #2
Initial Load	80	00:00	0.00	0.00
2.0 x Design Load	800	00:30	0.05	0.04
Initial Load	80	02:33	0.00	0.01
100% Recovery (Rail End #1) and 75% Recovery (Rail End #2) from 2.0 x Design Load				
2.50 x Design Load	1019	03:00	Achieved Load without Failure	

[1] *A spreader beam was used to impose loads on* both *ends of the railing system; therefore, loads were doubled.*

SECTION 10
CONCLUSION

Using performance criteria of withstanding an ultimate load of 2.5 times design load, the test results substantiate compliance with the design load requirements of the referenced building codes for the 94 in wide by 42 in high welded steel panel railing assembly reported herein. The support posts are not included in the scope of this testing and were included only to facilitate attachment of the rail. Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

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SECTION 11
PHOTOGRAPHS

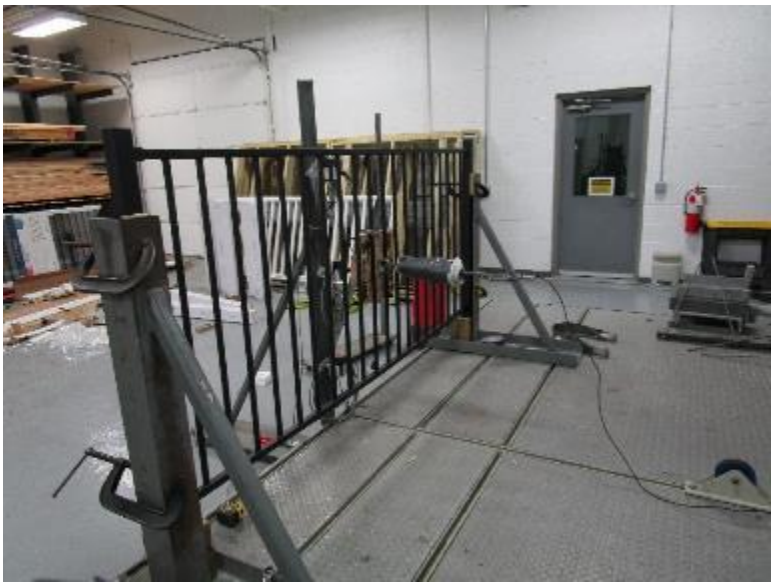

Photo No. 1
In-Fill Load Test at Center of Two Pickets

Photo No. 2
In-Fill Load Test at Bottom of Two Pickets

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Photo No. 3
Horizontal Uniform Load on Top Rail

Photo No. 4
Vertical Uniform Load on Top Rail

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Photo No.5
Concentrated Horizontal Load Test at Midspan of Top Rail

Photo No. 6
Concentrated Horizontal Load Test at Ends of Top Rail (Brackets)

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Photo No. 7
Concentrated Vertical Load Test at Mid-Span of Top Rail

Photo No. 8
Concentrated Vertical Load Test at Ends of Top Rail (Brackets)

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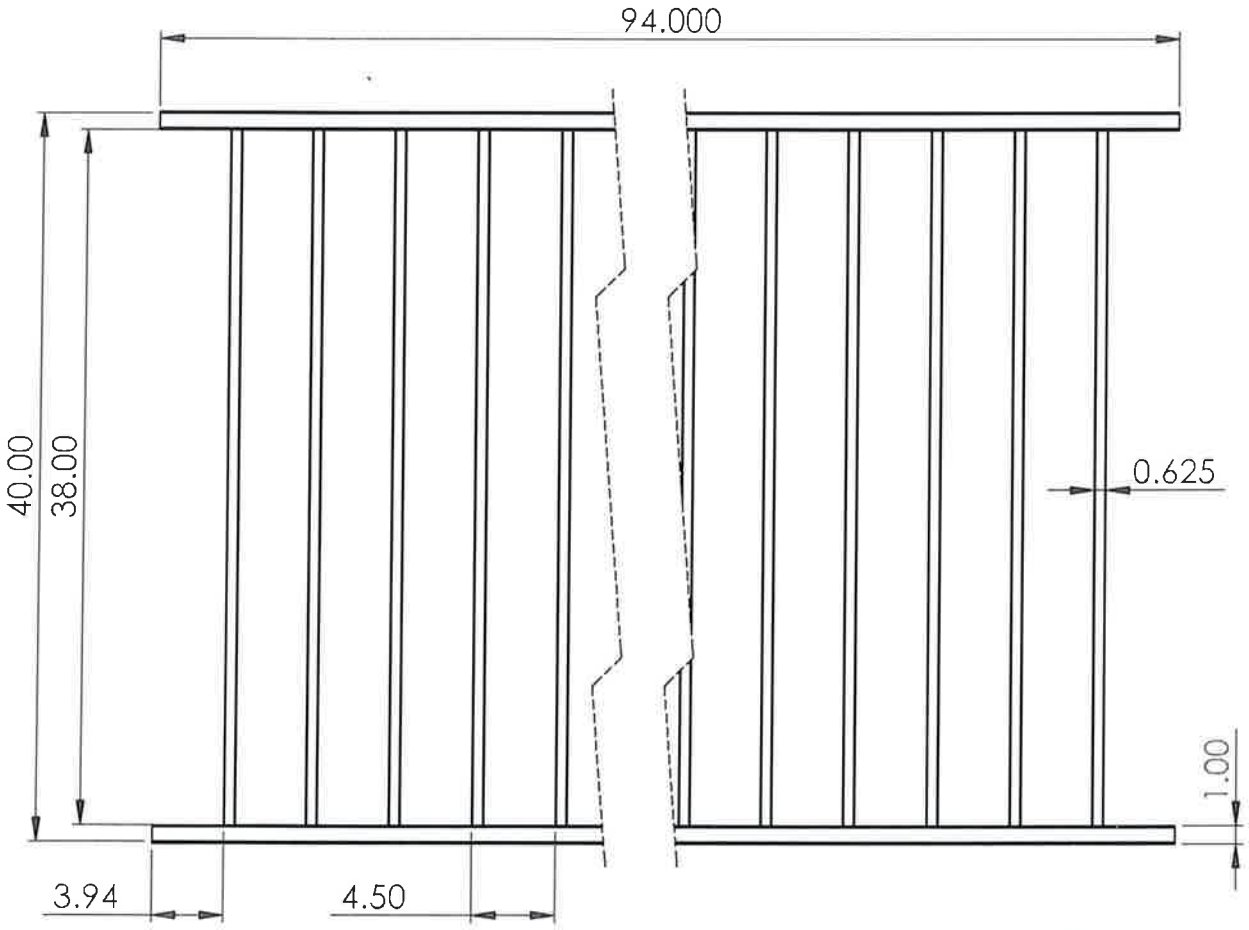
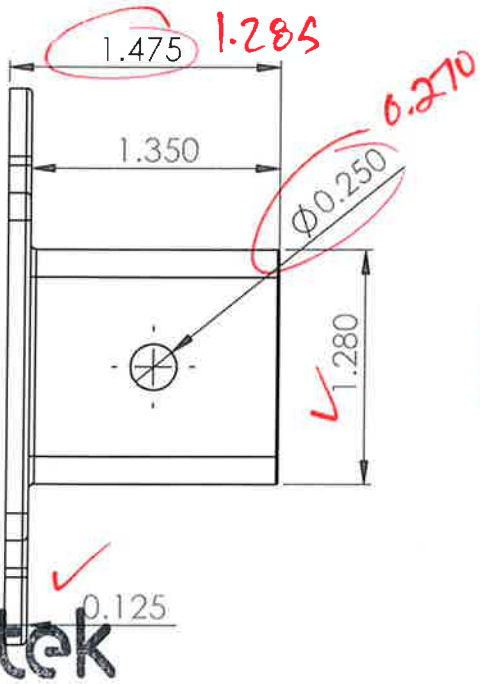
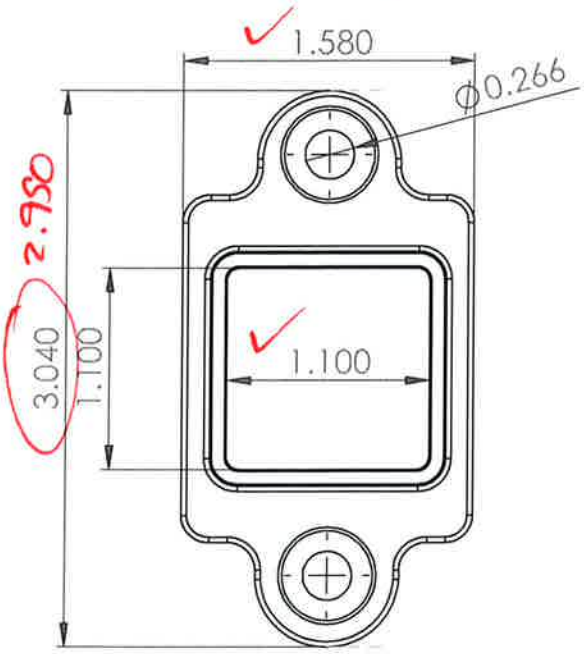
SECTION 12
DRAWINGS

The "As-Built" drawings for the welded steel panel guardrail system which follow have been reviewed by Intertek B&C and are representative of the project reported herein. Project construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.







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Test sample complies with these details.
Deviations are noted.

Report # H8228.03

Date 4/10/18 Tech EDE

Dimensions and tolerances contained on drawings and figures are for reference only and may not encompass total allowable and approved dimensional variations.

Title: S110 40" x 94" Level Rail Panel

Fairway Building Products, L.P.
P.O Box 37 Mount Joy, PA 17552

UOM	REF#	REV.
inch		

SCALE	SHEET#	DRAWN BY	Date
	1 of 1	FBP	1/11/18

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SECTION 13
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	04/11/18	N/A	Original Report Issue