

# FORTRESS BUILDING PRODUCTS TEST REPORT

**SCOPE OF WORK**

STRUCTURAL PERFORMANCE TESTING ON THE 1-1/2 IN O.D. ROUND STEEL HANDRAIL

**REPORT NUMBER**

L9098.01-119-19 R0

**TEST DATE**

02/09/21

**ISSUE DATE**

03/18/21

**RECORD RETENTION END DATE**

02/09/25

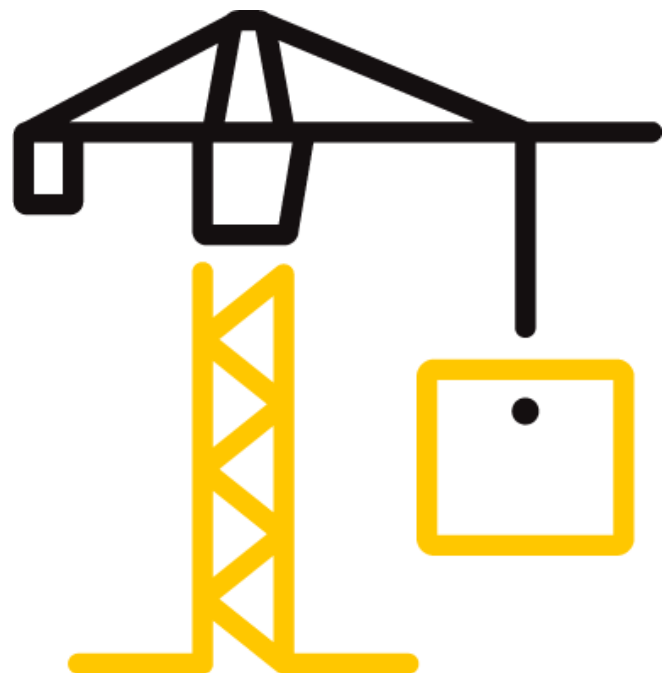
**PAGES**

16

**DOCUMENT CONTROL NUMBER**

RT-R-AMER-Test-2846 (02/09/18)

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## TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L9098.01-119-19 R0

Date: 03/18/21

### REPORT ISSUED TO

#### FORTRESS BUILDING PRODUCTS

1720 North First Street

Suite B

Garland, TX 75040

### SECTION 1

#### SCOPE

Architectural Testing, Inc. (an Intertek company) dba Intertek Building & Construction (B&C) was contracted by Fortress Building Products to perform structural performance testing in accordance with the 2015 National Building Code (NBC) of Canada (residential) and the 2018 International Residential Code (IRC) on their 1-1/2 in O.D. round steel handrail. All tests performed were to evaluate structural performance of the handrail assembly to carry and transfer imposed loads to the supporting structure. The test specimen evaluated included the handrail and rail brackets attached to either a preservative-treated southern yellow pine 4x4 or 2 in square steel post mount. 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. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule also called "Shared Risk approach," of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

### SECTION 2

#### SUMMARY OF TEST RESULTS

The specimen met the 2015 NBC (residential) and the 2018 IRC design load performance requirements.

For INTERTEK B&C:

<b>COMPLETED BY:</b>	Kevin J. Eichelberger	<b>REVIEWED BY:</b>	V. Thomas Mickley, Jr., P.E.
<b>TITLE:</b>	Technician I	<b>TITLE:</b>	Senior Staff Engineer
<b>SIGNATURE:</b>		<b>SIGNATURE:</b>	
<b>DATE:</b>	03/18/21	<b>DATE:</b>	03/18/21

KJE:vtm/aas

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### SECTION 3

#### TEST METHODS

The specimen was evaluated in accordance with the following:

**2015, National Building Code of Canada, Canadian Commission on Building and Fire Codes**

**2018, International Residential Code<sup>®</sup>, International Code Council**

Structural tests were performed according to Chapter 17 (Structural Tests and Special Inspections) of the 2018 *International Building Code<sup>®</sup>*, International Code Council.

#### Limitations

Testing is limited to satisfying the requirements of the 2015 National Building Code of Canada (residential) and the 2018, *International Residential Code<sup>®</sup>*.

Testing reported herein was performed using a safety factor of 2.5. Approval of the testing reported herein, and the use of the noted safety factor for the Canadian code is left up to the authority having jurisdiction.

### SECTION 4

#### MATERIAL SOURCE/INSTALLATION

Test samples were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of four years from the test completion date.

The round steel handrail 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 handrail was tested in a self-contained structural frame designed to accommodate anchorage of the guardrail assembly and application of the required test loads. The specimen was 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 specimen. 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.

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### SECTION 6

#### LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Kevin J. Eichelberger	Intertek B&C
Adam J. Schrum	Intertek B&C

### SECTION 7

#### TEST PROCEDURE

The 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.

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### SECTION 8

#### TEST SPECIMEN DESCRIPTION

Fortress Building Products provided the test specimen with the following details:

<b>PRODUCT</b>	Handrail
<b>MATERIAL</b>	Steel
<b>COLOR</b>	Black
<b>RAIL LENGTH</b>	97 in (center of post/bracket to center of post/bracket)
<b>HANDRAIL</b>	1-1/2 in outside diameter steel tube with 0.100 in thick wall
<b>RAIL BRACKETS</b>	Steel 90 degree "elbow" brackets contoured to allow the handrail to rest upon the bracket
<b>POST</b>	<ul style="list-style-type: none"> <li>- 2 in square by 0.096 in thick steel extrusion attached to a 4 in square by 0.225 in thick steel base plate with 1/8 in fillet weld all around; the base plate included one 15/16 in diameter hole and four 3/8 in diameter holes</li> <li>- 4x4 preservative treated SYP</li> </ul>

#### Fastening Schedule

CONNECTION	FASTENER
Bracket to Wood Post	Three #12-10 by 2-1/2" (0.152 in minor diameter) torx drive, trim head screws
Bracket to Steel Post <sup>1</sup>	Three #12-24 by 3/4" torx drive, trim head, thread cutting screws
Handrail to Bracket <sup>1</sup>	One #12-24 by 3/4" torx drive, trim head, thread cutting screw

<sup>1</sup> 3/16 in predrill

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**SECTION 9**

**TEST RESULTS**

**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.

**Test No. 1 - 02/09/21**

**Design Load: 202.3 lb Concentrated Horizontal Load at Midspan of Top Rail**

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)			
			END	MID	END	NET <sup>1</sup>
Initial Load	39	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	407	00:37	0.05	2.85	0.11	2.77
Initial Load	40	03:10	0.00	0.49	0.06	0.46
83% Recovery from 2.0 x Design Load						
2.5x Design Load	507	04:13	Achieved Load without Failure			

<sup>1</sup> Net displacement was mid-rail displacement relative to the rail at the support posts.

**Test No. 2 - 02/09/21**

**Design Load: 202.3 lb Concentrated Vertical Load at Midspan of Top Rail**

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)			
			END	MID	END	NET
Initial Load	40	00:00	--	0.00	--	--
2.0x Design Load	405	00:36	--	-- <sup>1</sup>	--	--
Initial Load	40	02:35	--	-- <sup>1</sup>	--	--
--% Recovery from 2.0 x Design Load						
2.5x Design Load	507	03:33	Achieved Load without Failure			

<sup>1</sup> Deflection readings were not recorded due to a transducer error.

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**Test No. 3 - 02/09/21**

**Design Load: 202.3 lb Concentrated Horizontal Load at Bracket**

LOAD LEVEL <sup>1</sup>	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) x 2	815	00:48	0.29	0.28
Initial Load	80	03:40	0.02	0.03
93% Recovery (Rail End #1) and 89% Recovery (Rail End #2) from 2.0 x Design Load				
(2.5x Design Load) x 2	1025	04:48	Achieved Load without Failure	

<sup>1</sup> A spreader beam was used to impose loads on both ends of the railing system; therefore, loads were doubled.

**Test No. 4 - 02/09/21**

**Design Load: 202.3 lb Concentrated Vertical Load at Bracket**

LOAD LEVEL <sup>1</sup>	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)	
			RAIL END #1	RAIL END #2
Initial Load	80	00:00	--	--
(2.0x Design Load) x 2	817	00:46	--	--
Initial Load	82	02:31	--	--
--% Recovery from 2.0 x Design Load				
(2.5x Design Load) x 2	1019	03:15	Achieved Load without Failure	

<sup>1</sup> 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 1-1/2 in O.D. round steel handrail assembly reported herein. 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**  
**Handrail as Received**



**Photo No. 2**  
**Specimen Installation**



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**Photo No. 3**  
**Bracket Connection - 4x4**



**Photo No. 4**  
**Bracket Connection - Post Mount**

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**Photo No. 5**  
**Concentrated Horizontal Load Test at Mid Span**



**Photo No. 6**  
**Concentrated Vertical Load Test at Mid Span**

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**Photo No. 7**  
**Concentrated Horizontal Load at Brackets**



**Photo No. 8**  
**Concentrated Vertical Load at Brackets**



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### SECTION 12 DRAWINGS

The "As-Built" drawings for the 1-1/2 in O.D. round steel handrail 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.

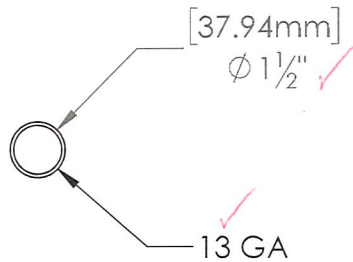
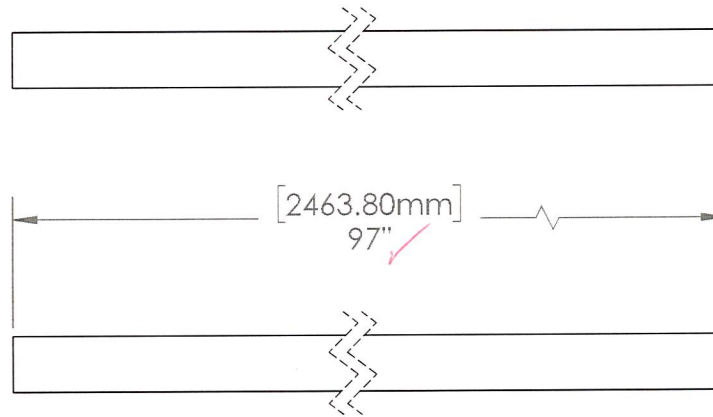
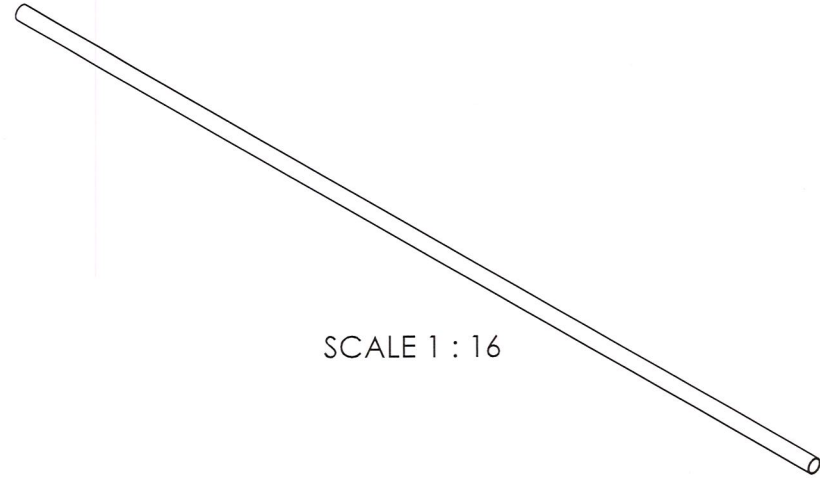
# intertek

Test sample complies with these details.  
Deviations are noted.

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SCALE 1 : 16



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Sheet: 1 OF 1

ITEM #:  
5050094X

FILE NAME/PART #:  
R3853-01686A

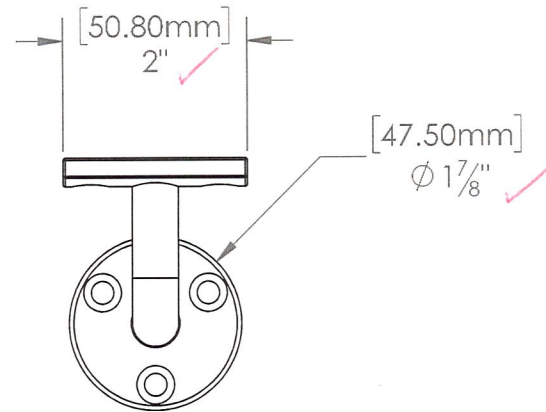
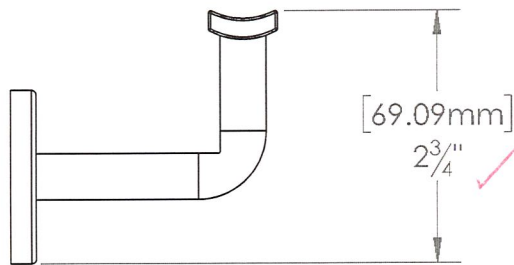
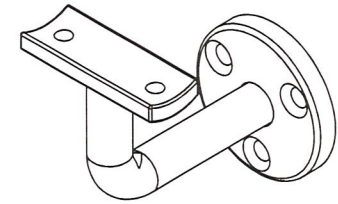
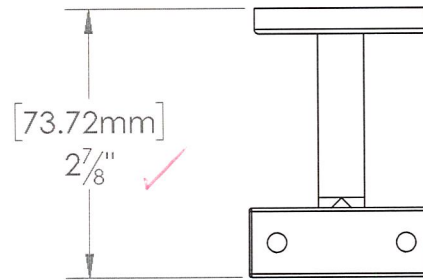
REV	DATE	BY	DESCRIPTION	SCALE
B	3/3/21	JH	Initial Drawing	
DESCRIPTION:				
ROUND HANDRAIL - 8'				
DRAWN BY: JohnathanH			SCALE:	1:5
DATE: 03/03/2021		DIVISION: Fortress Railing		
REV:				B



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Test sample complies with these details.  
Deviations are noted.

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Sheet: 1 OF 1

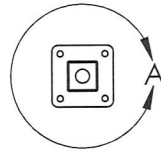
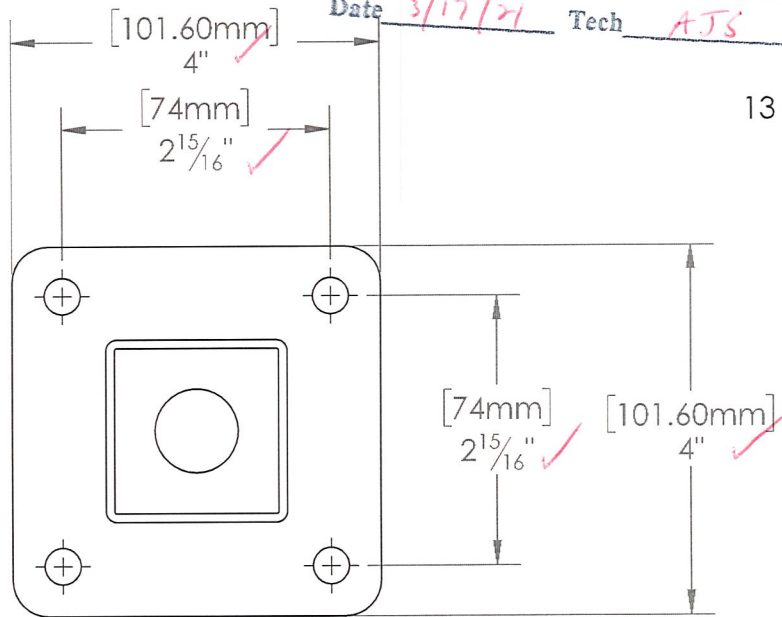
A	3/3/21	JH	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION: ROUND HANDRAIL BRACKET WELDMENT			
DRAWN BY: JohnathanH			SCALE: 1:2
DATE: 03/03/2021		DIVISION: Fortress Rail	
ITEM #: 5050091X	FILE NAME/PART #: R3834-11194A		REV: A

intertek

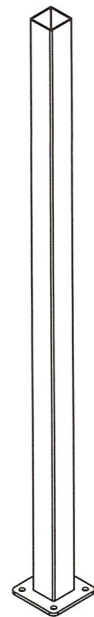
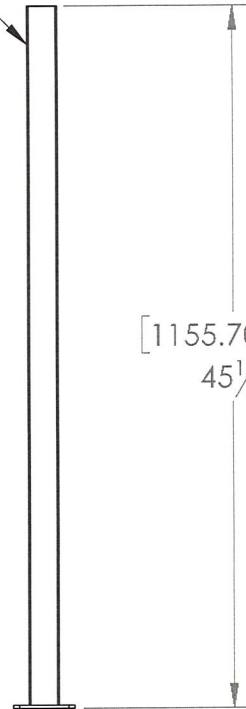
Test sample complies with these details.  
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13 GA



DETAIL A  
SCALE 1 : 2

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Sheet: 1 OF 1

D	3/3/21	JH	ADD GAUGE
REV	DATE	BY	DESCRIPTION
DESCRIPTION: FE26 POST 2" X 45.5" WELDMENT			
DRAWN BY: KevinF		SCALE: 1:12	
DATE: 01/14/2019	DIVISION: Fortress Railing		REV: D
ITEM #:	FILE NAME/PART #: R3135-00955A		



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### SECTION 13

#### REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	03/18/21	N/A	Original Report Issue