



TEST REPORT

Rendered to:

SCREEN TIGHT

For:

PRODUCT: 72 in by 36 in Guardrail System

TYPE: Preservative-Treated Wood Rail with Mesh Screen Infill

Report No.: E8681.01-119-19

Report Date: 12/01/15

Test Record Retention Date: 08/24/19

Revision 1: 01/27/16



TEST REPORT

E8681.01-119-19
December 1, 2015
Revision 1: January 27, 2016

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TEST REPORT

Rendered to:

SCREEN TIGHT

One Better Way

Georgetown, South Carolina 29440

Report No.: E8681.01-119-19

Test Dates: 08/20/15

Through: 08/24/15

Report Date: 12/01/15

Test Record Retention Date: 08/24/19

Revision 1: 01/27/16

1.0 General Information

1.1 Product

72 in by 36 in Preservative-Treated Wood Rail with Mesh Screen Infill

1.2 Project Description

Architectural Testing, Inc., an Intertek company ("Intertek-ATI"), was contracted by Screen Tight to conduct structural performance tests on their 72" wide by 36" high preservative-treated rail with mesh screen infill guardrail system. The system was evaluated for the design load requirements of the following building codes:

2015 *International Building Code*®, International Code Council

2015 *International Residential Code*®, International Code Council

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

1.3 Limitations

All tests performed were to evaluate structural performance of the guardrail assembly to carry and transfer imposed loads to the supports (posts). The test specimens evaluated included the infill, rails, rail brackets, and attachment to the supporting structure. The support posts were conventional construction and not within the scope of the evaluation. Posts were therefore not a tested component and were included in the test specimen only to facilitate anchorage of the rail brackets.

Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

Testing is limited to satisfying the load requirements of IRC - One- and Two-Family Dwellings requirements.

1.4 Qualifications

Intertek-ATI in York, Pennsylvania 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).

1.5 Witnessing

Mr. Noel King of Screen Tight was present on 08/20/15 to witness the following tests and/or test setups and assist in test specimen fabrication:

- Structural performance testing of assembled railing systems

1.6 Product Description

Screen Tight provided the Mesh Guard Track and mesh screen infill components for testing. Wood components were supplied by Intertek-ATI and assembled by and Intertek-ATI technician. The assembled guardrail consisted of the following components:

Top Rail: Two-piece member consisting of one MCA preservative-treated wood (SYP) 2" by 4" (nominal) oriented with the 4" dimension vertical and one MCA preservative-treated wood (SYP) 2" by 4" (nominal) oriented with the 4" dimension horizontal

Bottom Rail: MCA preservative-treated wood (SYP) 2" by 4" (nominal) oriented with the 4" dimension horizontal

Infill: - Mesh Guard Screen

Post: MCA preservative-treated wood (SYP) 4" by 4" (nominal) with an MCA preservative-treated wood (SYP) 2" by 4" (nominal) side rail

Support Foot: MCA preservative-treated wood (SYP) 4" by 4" (nominal) cut to fit and located at mid-span of bottom rail

Mesh Guard Track: 1-7/16" wide by 1/4" high PVC section with 1/2" wide by 0.07" thick steel bar and 1-1/2" wide by 1/4" high PVC closure piece

1.6 Product Description (Continued)

- Fasteners:
- Top Rail to Post: (3) #10-9 x 3" (0.130 in minor diameter) star-drive, trim head, coated exterior deck screws, toe-nailed through rail into post
 - Top Rail Vertical Component to Top Rail Horizontal Component: #10-9 x 3" (0.130 in minor diameter) star-drive, trim head, coated exterior deck screws, 6" from each end and 12" on-center
 - Bottom Rail to Post: (2) #10-9 x 3" (0.130 in minor diameter) star-drive, trim head, coated exterior deck screws, toe-nailed through rail into post
 - Foot Block to Bottom Rail: (2) #10-9 x 3" (0.130 in minor diameter) star-drive, trim head, coated exterior deck screws, toe-nailed through rail into post
 - Mesh Guard Track to Top/Bottom/Side Rail: #6-18 x 1-1/4" (0.097 in minor diameter) philips-drive, pan head, stainless steel screw 4" from each end (top/bottom rail), 2" from each end (side rail) and 8" on-center

See drawings in Appendix A and photographs in Appendix B for additional details.

2.0 Structural Performance Testing of Assembled Railing Systems

2.1 Test 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.

2.2 Test Setup

The 72" wide by 36" 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 Appendix B for individual test setups.

2.3 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.

2.4 Test Results

The following tests were performed on the guardrail assemblies for the design load requirements of the codes referenced. 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.

Test Series No. 1 Level Guardrail (In-Line Application) with Mesh Guard Screen - Heavy Duty IRC - One- and Two-Family Dwellings

Test No. 1 - 08/20/15						
Design Load: 50 lb / 1 Square Ft at Center of In-Fill						
Load Level	Test Load (lb)	E.T. (min:sec)	Displacement (in)			
			End	Mid	End	Net ¹
Initial Load	26	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	102	00:24	0.26	1.15	0.26	0.89
Initial Load	27	02:45	0.00	0.02	0.00	0.02
98% Recovery from 2.0 x Design Load						
2.5x Design Load	126	03:12	Achieved Load without Failure			

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

2.4 Test Results (Continued)

Test Series No. 1 (Continued)

Test No. 2 - 08/20/15						
Design Load: 50 lb / 1 Square Ft at Bottom of In-Fill						
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
2.0x Design Load	103	00:18	0.01	0.02	0.01	0.01
Initial Load	25	01:40	0.00	0.00	0.00	0.00
100% Recovery from 2.0 x Design Load						
2.5x Design Load	127	01:55	Achieved Load without Failure			

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

Test No. 3 - 08/20/15						
Design Load: 200 lb 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	59	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	408	00:16	0.03	0.46	0.02	0.44
Initial Load	59	01:30	0.00	0.00	0.00	0.00
100% Recovery from 2.0 x Design Load						
2.5x Design Load	586	01:45	Achieved Load without Failure			

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

Test No. 4 - 08/20/15				
Design Load: 200 lb 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	100	00:00	0.00	0.00
2.0x Design Load	809	00:37	0.07	0.05
Initial Load	101	02:09	0.00	0.00
100% Recovery from 2.0 x Design Load				
2.5x Design Load	1024	02:32	Achieved Load without Failure	

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

2.4 Test Results (Continued)

Test Series No. 2
Level Guardrail (In-Line Application) with
Mesh Guard Screen - Regular Duty
IRC - One- and Two-Family Dwellings

Test No. 1 - 08/24/15						
Design Load: 50 lb / 1 Square Ft at Center of In-Fill						
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
2.0x Design Load	101	00:23	0.25	1.14	0.31	0.86
Initial Load	25	02:58	0.00	0.10	0.02	0.09
90% Recovery from 2.0 x Design Load						
2.5x Design Load	126	03:15	Achieved Load without Failure			

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

Test No. 2 - 08/24/15						
Design Load: 50 lb / 1 Square Ft at Bottom of In-Fill						
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
2.0x Design Load	105	00:18	0.01	0.05	0.00	0.05
Initial Load	25	02:12	0.00	0.00	0.00	0.00
100% Recovery from 2.0 x Design Load						
2.5x Design Load	128	02:32	Achieved Load without Failure			

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

2.4 Test Results (Continued)

Test Series No. 2 (Continued)

Test No. 3 - 08/24/15						
Design Load: 200 lb 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	61	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	403	00:29	0.03	0.59	0.02	0.57
Initial Load	61	02:20	0.00	0.06	0.00	0.06
89% Recovery from 2.0 x Design Load						
2.5x Design Load	508	02:46	Achieved Load without Failure			

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

Test No. 4 - 08/24/15				
Design Load: 200 lb 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	100	00:00	0.00	0.00
2.0x Design Load	799	00:40	0.27	0.14
Initial Load	103	02:08	0.03	0.02
Percent Recovery from 2.0 x Design Load			89%	86%
2.5x Design Load	1006	02:33	Achieved Load without Failure	

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

2.5 Summary and Conclusions

Using performance criteria of 75% deflection recovery from 2.0 times design load and 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 72" wide by 36" high railing 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.

3.0 Closing Statement

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI:

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Structural Systems Testing

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Structural Systems Testing

AJS:vtm/jas

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix A - Drawings (3)

Appendix B - Photographs (2)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	12/01/15	N/A	Original report issue
1	01/27/16	2, 4, 6	Changed "1814 Regular Screen" and "Pet Screen" to "Mesh Guard Screen"



E8681.01-119-19-R1

APPENDIX A

Drawings

Architectural Testing

Test sample complies with these details.
Deviations are noted.

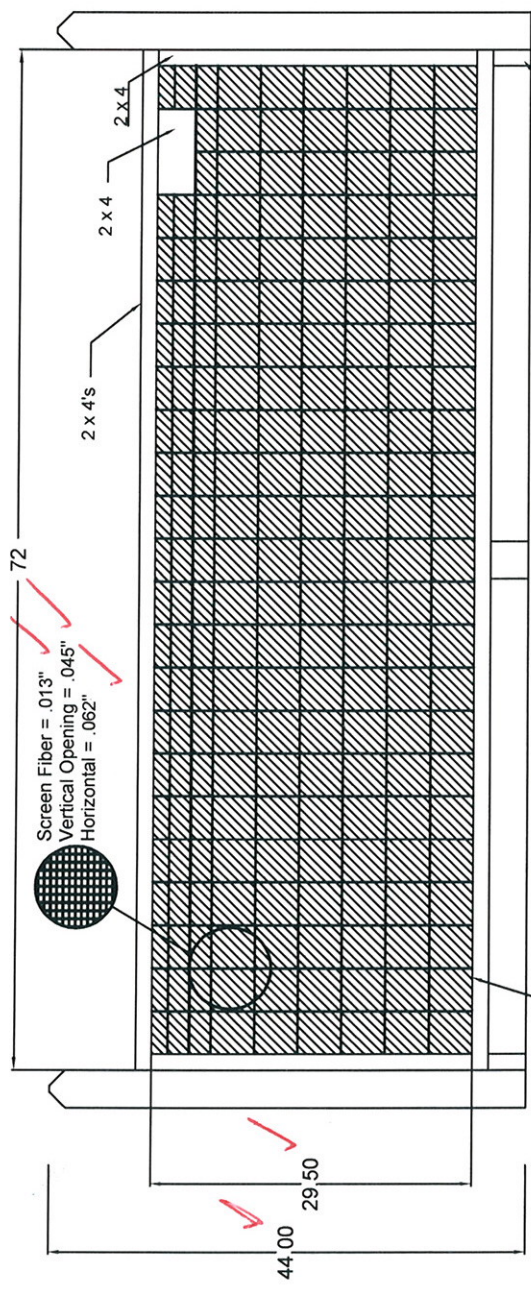
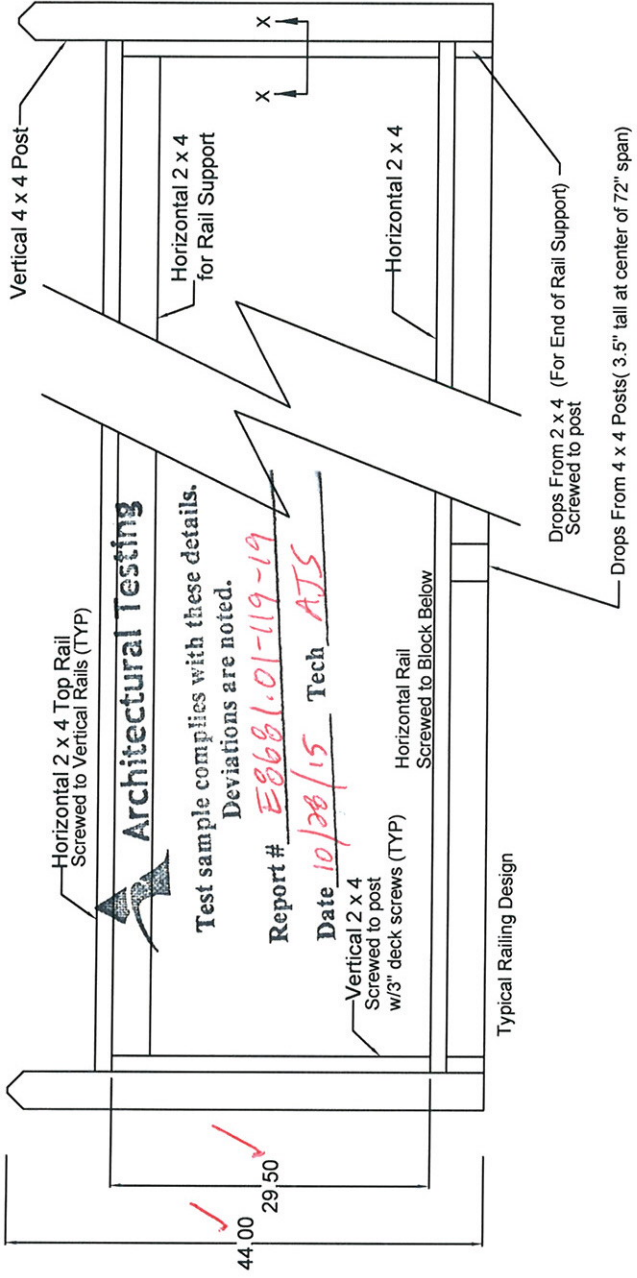
Report # E8681.01-119-19

Date 10/28/15 Tech ATS

Vertical 2 x 4
Screwed to post
w/3" deck screws (TYP)

Horizontal Rail
Screwed to Block Below

Typical Railing Design



New Purposed Screen Railing System

Drops From 2 x 4 (For End of Rail Support)

High Strength Mesh Guard system to replace pickets.

MeshGuard Design

Date: 02-20-15

scale: NTS

Revision: 10-27-15

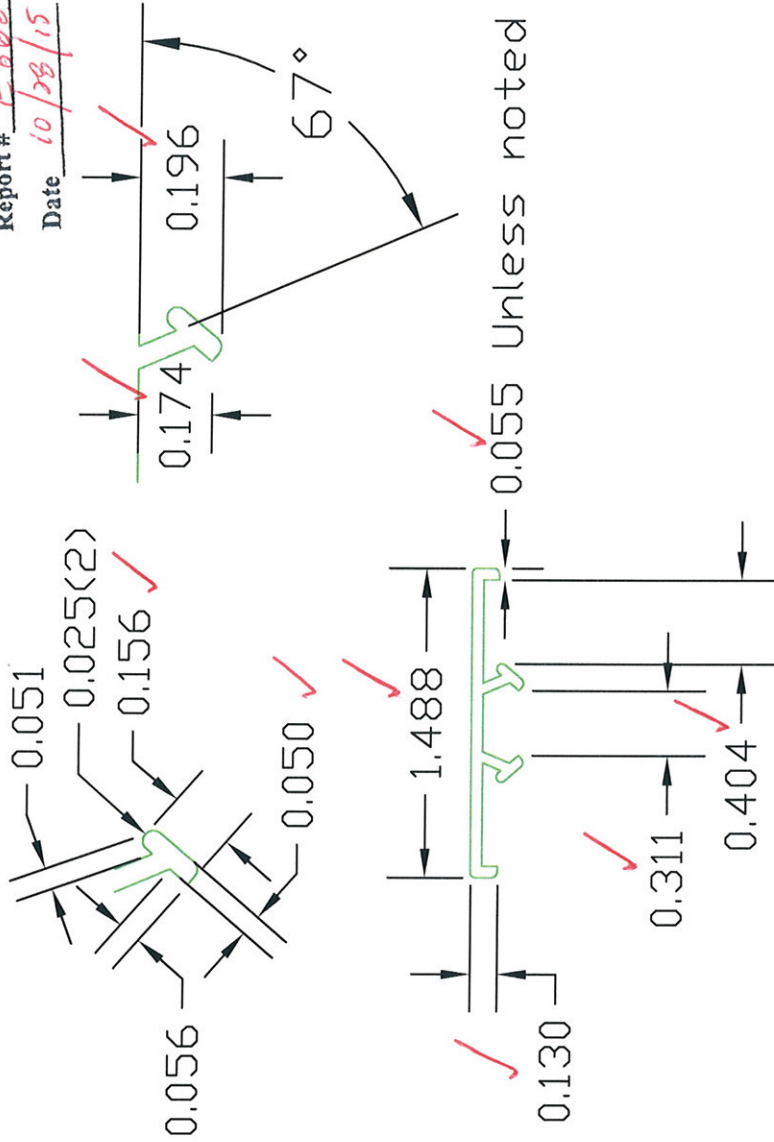


Architectural Testing

Test sample complies with these details.
Deviations are noted.

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Date 10/28/15 Tech AJS



Mesh Guard Cap

Date: 10-28-15

Scale: NTS

Revision:

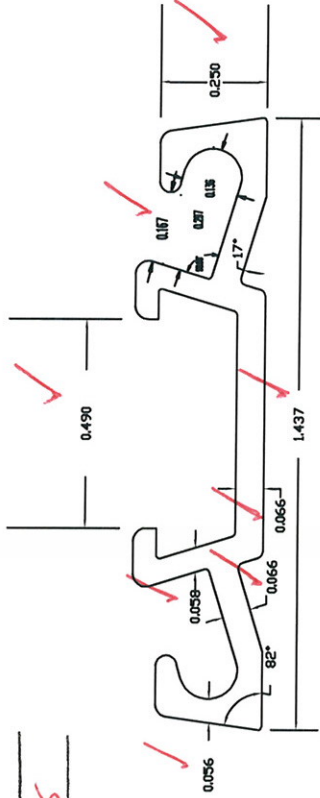


Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E8681.01-119-19

Date 10/28/15 Tech AJS



Area = .1621 (1.641 oz/ft)

Tuff Screen Track

Date: 11-14-14

scale: 1 : 1 Unless Noted

Revision: 12-1-14



E8681.01-119-19-R1

APPENDIX B

Photographs



Photo No. 1
In-Fill Load Test at Center of Screen Mesh



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



Photo No. 3
Concentrated Load Test at Ends of Top Rail (Brackets)



Photo No. 4
Railing Assembly Prior to Installation of Screen