

TEST REPORT

Rendered to:

KEYLINK FENCING & KENNELS

For:

PRODUCT: *6000 Series Arabian*
TYPE: Aluminum Guardrail System

Report No: 71004.01-119-19
Report Date: 02/09/07
Revision 1: 03/15/07

TEST REPORT

71004.01-119-19
Revision 1: March 15, 2007

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TEST REPORT

Rendered to:

KEYLINK FENCING & KENNELS
150 Orlan Road
New Holland, Pennsylvania 17557

Report No.: 71004.01-119-19
Test Date Started: 01/29/07
Test Date Completed: 01/31/07
Report Date: 02/09/07
Revision 1: 03/15/07

1.0 General Information

1.1 Product

6000 Series Arabian

1.2 Type

Aluminum Guardrail System

1.3 Project Description

Architectural Testing, Inc. (ATI) was contracted by Superior Plastic Products, Inc. to conduct structural performance tests on the 96" wide by 36" high *6000 Series Arabian* aluminum guardrail. The system was evaluated for the design load requirements of the following building codes:

IBC 2003, *International Building Code*[®]

IRC 2003, *International Residential Code*[®]

The railings are less than 42" in height and therefore are tested/evaluated for the design load requirements applicable to detached one- and two-family dwellings only. Structural tests were performed according to Chapter 17 (Structural Tests and Special Inspections) of IBC 2003.

Exception: *The test load of two times the design load was not held for 24-hours. The rationale is that guardrail systems are not subject to long term sustained loads such as snow loads and floor live loads.*

1.4 Limitations

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' components evaluated included the infill (pickets), rails, rail brackets, and support posts. The support posts are not tested components and are 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.

1.5 Product Description

Superior Plastic Products provided the fully-assembled test specimens with the following details:

Top Rail: 2" high by 1-3/4" wide contoured aluminum extrusion with 0.07" wall

Bottom Rail: 1-1/4" wide by 1-1/2" deep aluminum **U** extrusion with 0.07" wall

Pickets (In-Fill): 3/4" square aluminum extrusion with 0.05" wall

Rail Brackets: Cast aluminum socket brackets contoured to shape of rails

Fasteners: #8 by 1-1/4" self-drilling, flat head, sheet metal screws (four in bracket/post)

#8 by 3/4" self-drilling, pan-head, sheet metal screws (two in rail/bracket)

Post: Attached to rigid steel test bed with a single 5/8" bolt for stand-alone post test

2-1/2" square by 0.125" wall hollow aluminum extrusion sleeved over support foot

Support Foot: 1-1/2" square by 10" high steel tube welded to a 3-1/2" square by 1/4" thick base plate with a 2-1/8" square piece of sheet metal welded to the top of the tube to act as a post spacer

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 96" 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. For the concentrated load test on the stand-alone post mount, the post was directly secured into the surface of a rigid steel channel (to simulate anchorage into concrete) with a single 5/8" bolt. 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 reapplied and 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). Where more than one value is reported, the test load was the range (min.-max.) that was held during the time indicated in the test.

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure. Where more than one value is reported, the time was the range (start-end) that the designated load level was reached and sustained.

2.4 Test Results (Continued)

Test No. 1 - 01/29/07						
Design Load: 50 lb / 1 Square Ft. at Center of In-Fill (on three 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
2.0x Design Load	100 - 101	00:26 - 00:28	0.33	0.55	0.54	0.12
Initial Load	25	02:13	0.01	0.03	0.03	0.01
2.5x Design Load	127 - 129	02:32 - 02:52	93% Recovery			

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

Test No. 2 - 01/29/07						
Design Load: 50 lb / 1 Square Ft. at Bottom of In-Fill (on three 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
2.0x Design Load	100 - 101	00:35 - 00:37	0.04	0.74	0.03	0.71
Initial Load	25	02:24	0.00	0.02	0.00	0.02
2.5x Design Load	125	03:07 - 03:09	98% Recovery			

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

Test No. 3 - 01/29/07						
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	50	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	400 - 401	01:02 - 01:03	0.10	2.40	0.08	2.31
Initial Load	51	02:34	0.00	0.17	0.00	0.17
2.5x Design Load	500 - 503	04:14 - 04:19	92% Recovery			
Ultimate Load	652					

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

Test No. 4 - 01/29/07				
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	175	00:00	0.00	0.00
2.0x Design Load	800 - 816	00:37 - 00:39	0.26	0.23
Initial Load	175	02:08	0.03	0.01
2.5x Design Load	1000 - 1018	02:58 - 03:03	90% Recovery	97% Recovery

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 No. 5 - 01/31/07			
Design Load: 200 lb Concentrated Load at Top of Stand-Alone¹ Post (36" high)			
Load Level	Test Load (lb)	E.T. (min:sec)	Post Displacement (in)
Initial Load	40	00:00	0.00
2.0x Design Load	400	00:40	2.75
Initial Load	40	02:27	0.68
2.5x Design Load	500	03:21 - 04:20	75% Recovery
Ultimate Load	868		

¹ Post was conservatively tested without a railing attached.

3.0 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 only detached one- and two-family dwellings for the 96" wide by 36" high railing assembly (6000 Series Arabian) and 36" high support post 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.

A copy of this report will be retained by ATI for a period of four years. This report is the exclusive property of the client so named herein and is applicable only to the samples tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced except in full without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

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JMM:jmm/cmd/nlb

Attachments (pages) *This report is complete only when all attachments listed are included.*
Appendix A - Drawings (2)
Appendix B - Photographs (4)

Revision Log

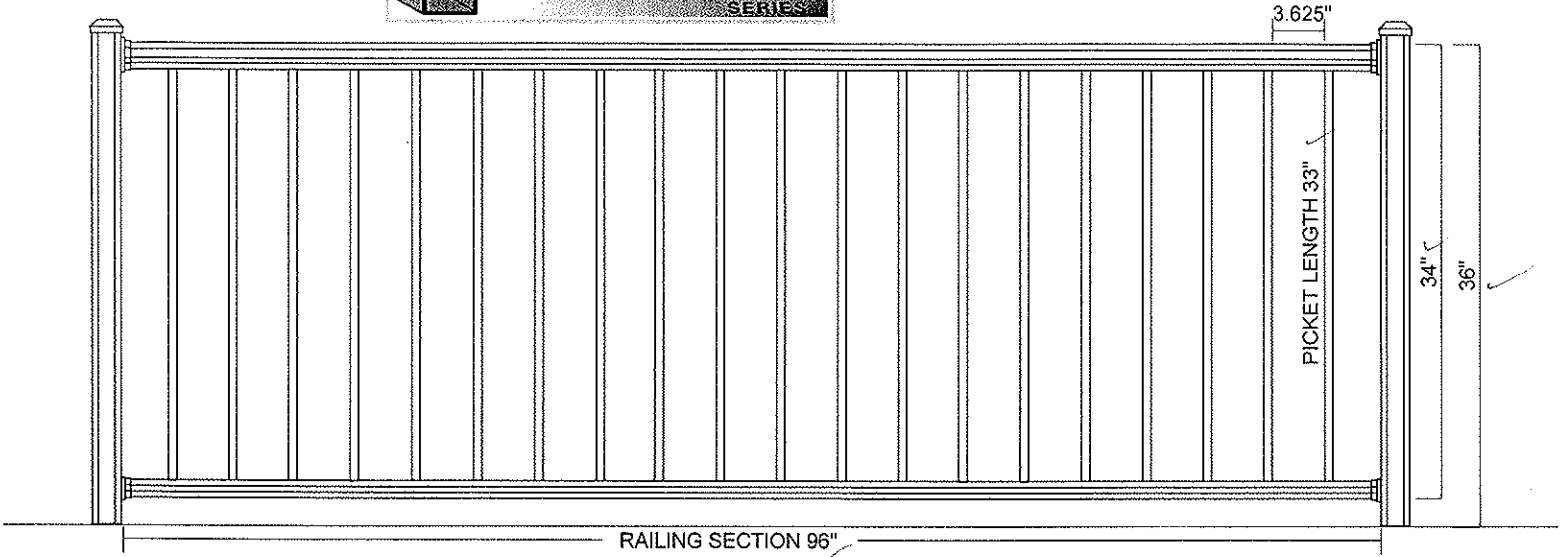
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0	02/09/07	N/A	Original report issue
1	03/15/07	1, 5	Added One- and Two-Family Dwelling limitation statement
		4	Clarified footnote for Test No. 2

APPENDIX A

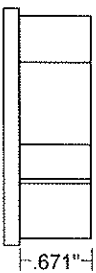
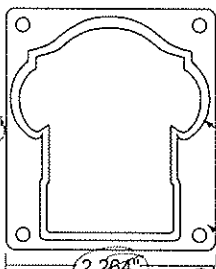
Drawings



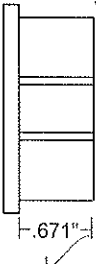
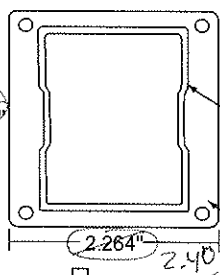
SPEC SHEET



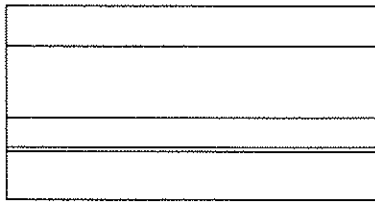
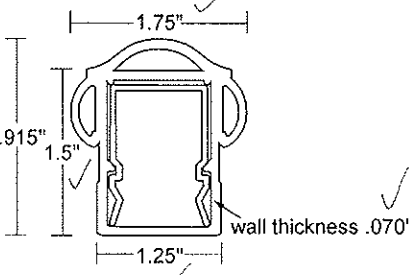
TOP BRACKET



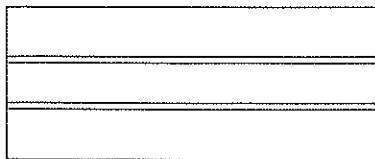
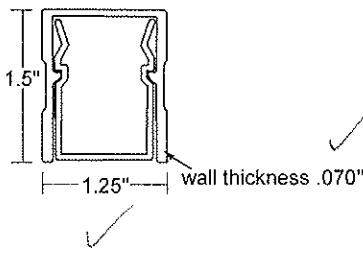
BOTTOM BRACKET



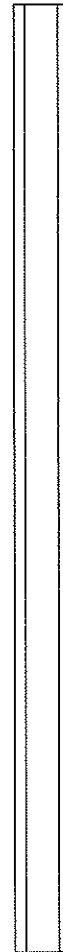
TOP RAIL



BOTTOM RAIL



POSTS
2.5" sq. x 38" H
Wall thickness: .125"



PICKETS
.75" sq. x 33" H
Wall thickness: .053"



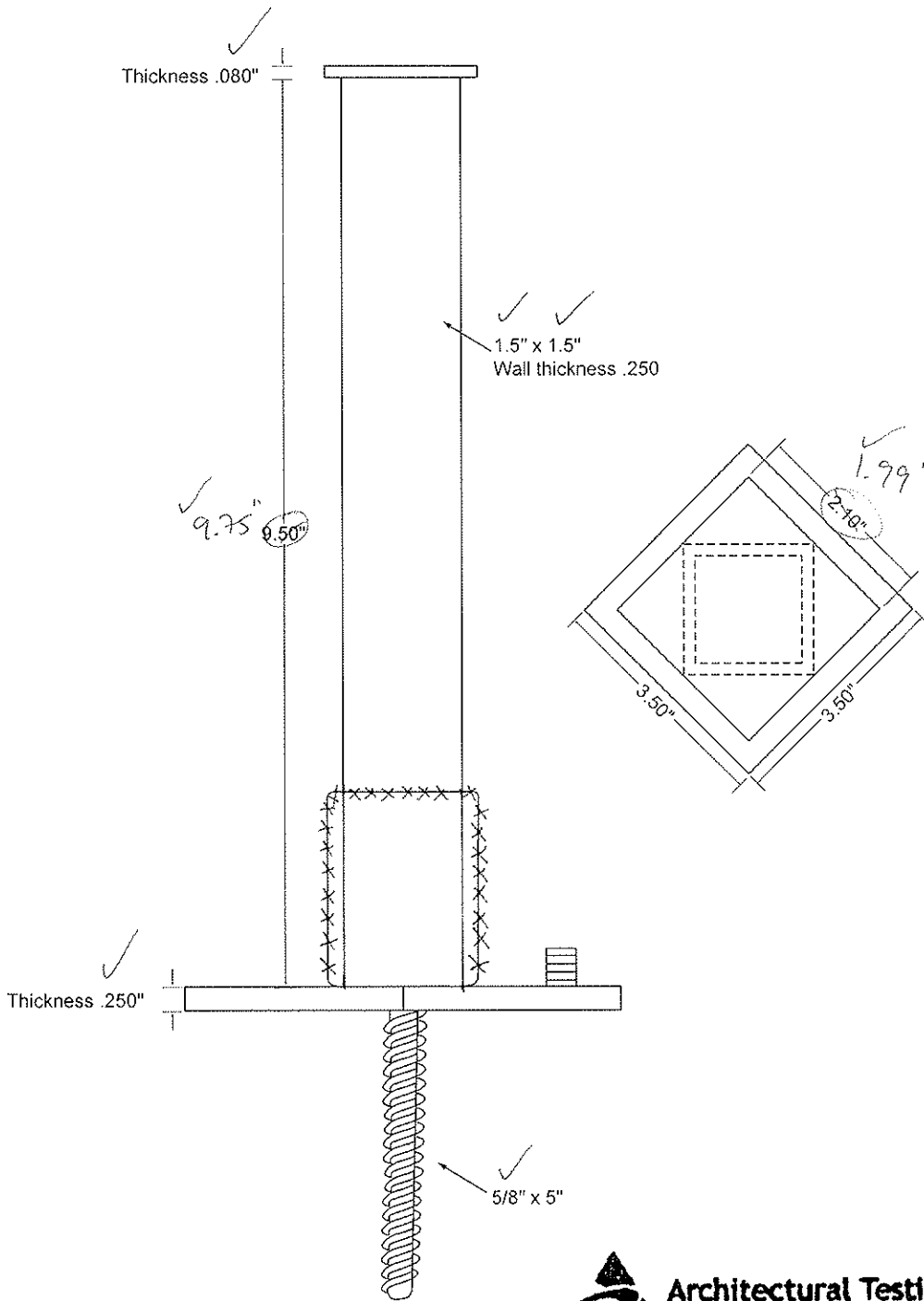
Architectural Testing

Test sample complies with these details. Deviations are noted.

Report# 71004.01-119-19

Date 2/8/07

Rech DMM



Architectural Testing

Test sample complies with these details.
Deviations are noted.

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 Date 2/9/07 Tech JMM

APPENDIX B

Photographs



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



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



Photo No. 3
Concentrated Load Test at Midspan of Top Rail



Photo No. 4
Concentrated Load Test at Ends of Top Rail (Brackets)

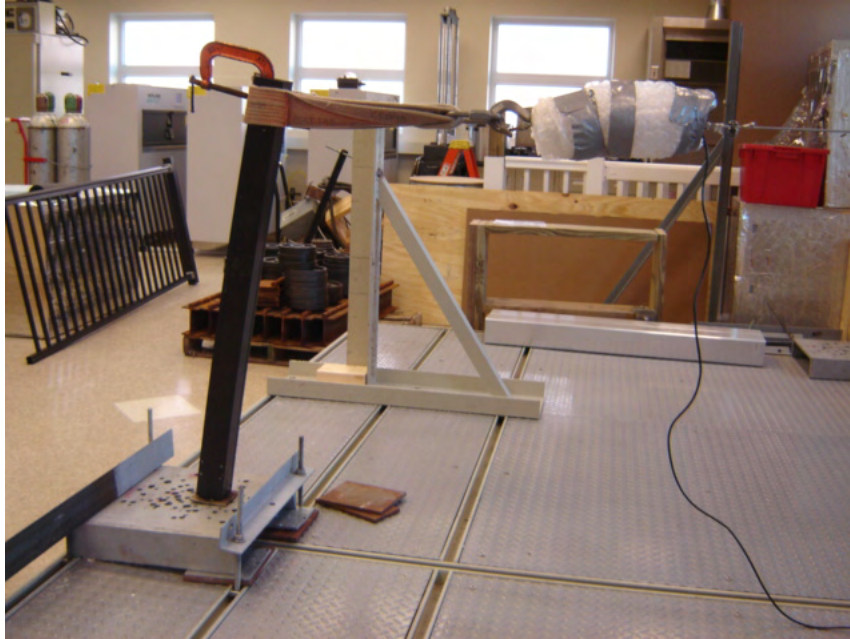


Photo No. 5
Concentrated Load Test at Top of Stand-Alone Post (36" high)



Photo No. 6
Internal Post Mount



Photo No. 7
Cast Aluminum Bracket for Top Rail



Photo No. 8
Cast Aluminum Bracket for Bottom Rail