Quality Auditing Institute

CANADA:
16-211 SCHOOLHOUSE ST
COQUITLAM
BRITISH COLUMBIA
V3K 4X9
T: 604.527.8378
F: 604.527.8368
www.qai.org • info@qai.org

US:
8385 WHITE OAK AVENUE
RANCHO CUCAMONGA
CALIFORNIA
91730
T: 888.540.4024
F: 909.483.0336
www.qai.org • info@qai.org

1325 NORTH 108TH E. AVE
TULSA
OKLAHOMA
74116
T: 918.437.8333
F: 918.437.8487
www.qai.org • info@qai.org

TEST REPORT # T671-8

DATE: April 8, 2013

CLIENT: **AAA Aluminum Products Ltd.**
2901 Murray Street
Port Moody, BC, Canada
V3H 1X3
Contact: Steve Henderson

SAMPLE DESCRIPTION: See-View Topless Glass Rail System
Topless Glass and Aluminum Railing System with posts @ 4.5 ft on center

SAMPLING PROCEDURES: Specimen delivered to QAI by the client

DATE OF RECEIPT: March 14, 2013

DATE OF TESTING: March 14, 2013

TESTING REQUESTED: 2010 Canadian National Building Code (NBC) – section 4.1.5.14 & section 9.8.8.2 - Loads on Guards
2012 British Columbia Building Code (BCBC) – section 4.1.5.14 & section 9.8.8.2 -Loads on Guards
2006 Alberta Building Code (ABC) – section 4.1.5.15 & section 9.8.8.2 - Loads on Guards
2006 Ontario Building Code (OBC) – section 4.1.5.15 & section 9.8.8.2 - Loads on Guards

TEST RESULTS: See Pages 4 for the test results and conclusion.

CONTENTS: Test Report pages 1 through 5

TEST PERFORMED AT: **QAI Coquitlam, BC**

Oct. 17, 2014

Tested By

Jay Klassen
Test Technician

Reviewed By

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA K.M.S. SAITO

Kevin Saito, P. Eng.
Division Manager

INTRODUCTION:

Quality Auditing Institute (QAI) has conducted testing for AAA Aluminum Products Ltd. on the See-View Topless Glass Rail System with posts spaced at 4.5 ft. on center. The railing was delivered to QAI by AAA Aluminum Products Ltd. on March 14, 2013. The assembly was tested in accordance with 2010 Canadian National Building Code (NBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2012 British Columbia Building Code (BCBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2006 Alberta Building Code (ABC) – section 4.1.5.15 & section 9.8.8.2 – "Loads on Guards" and 2006 Ontario Building Code (OBC) – section 4.1.5.15 & section 9.8.8.2 – "Loads on Guards".

SAMPLE DESCRIPTION:

Samples were assembled by the client with the following components:

Post: Aluminum Extrusion - 1.75 in x 1.75 in x 0.080 in (6061-T6 Aluminum Alloy) with six screw chases (One at each inside corner and two offset towards the center of the post)

Base: Deck Mount:

4 in x 4 in x 1/4 in flat plate with 4 mounting holes (6061-T6 Aluminum Alloy)

Fascia Mount:

Refer to Intertek 3119437 Equivalency Letter – March 30, 2007

Rail: 42 in or less overall height (above the deck)

Glass Channel: 1-1/4" x 1-1/8" extruded glazing "U" channel 39" tall with ¾" opening for glass and gaskets (6061-T6 Aluminum Alloy)

Bottom Cap: 1-1/4" x 1-1/8" x ¼" with a leveling set screw

Setting Block: ¾" x 1" x ¼" thick rubber block

Top Cap: Injection molded cap glued to the top of the post

Glass Insert: 51-3/8" wide x 38-3/4" tall - 10mm Tempered Glass

Glass Gasket: Flexible Vinyl Gasket to fit into the glass channel extrusion to hold the 10mm tempered glass insert

Connections:		
	Glass Channel to Post Fasteners:	5 - #10 x ¾" SS Flat Head Tek Screws
	Bottom Cap to Glass Channel:	4 - #6 x 1-1/4" SS Flat Head Screws
	Base Plate Fasteners:	6 - #14 x 3-½" CAD Plated Flat Screws

Note: *Drawings are on file at QAI. Base to sub-structure fastener evaluation is beyond the scope of this report. Four 3/8 inch Grade 5 bolts were used to attach the surface mount posts.*

TESTING REQUIREMENTS:

The guard is required to be loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The specified loads below are then held for one minute before the load is released. As per the 2010 Canadian National Building Code (NBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2012 British Columbia Building Code (BCBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2006 Alberta Building Code (ABC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards and 2006 Ontario Building Code (OBC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards the following tests were conducted:
One complete railing system, consisting of two posts, was tested at maximum spacing and height to represent the worst-case scenario.

1. The minimum specified horizontal load applied inward or outward at the minimum required height of every required guard shall be:

c) 0.75 kN/m or a concentrated load of 1.0 kN applied at any point, whichever governs for locations other than those described in Clauses (a) and (b).

2. Individual elements within the guard, including solid panels and picket, shall be designed for a load of 0.5 kN applied over an area of 100 mm x 100 mm located at any point in the elements so as to produce the most critical effect.

3. The loads required in Sentence (2) need not be considered to act simultaneously with the loads provided for in Sentences (1) and (4).

4. The Minimum specified load applied vertically at the top of every required guard shall be 1.5 kN/m and need not be considered to act simultaneously with the horizontal load provided for in sentence (1).

Note: Clauses (a) and (b) described in 1(c) refer to means of egress and equipment access walkways. This system is not intended for areas of means of egress and for equipment access walkways.

TESTING PROCEDURES:

After each test the system was evaluated for failure, any evidence of disengagements and/or visible cracking from any component.

1) In-fill Load Test:

A load consisting of 187 lbf (0.83 kN) was applied over a 0.108 ft^2 (0.09293 m^2) surface normal to the in-fill in a worst case scenario (i.e. least amount of in-fill support).

2) Uniform Horizontal Load Test

The top rail of the system was subjected to a maximum uniform load of 86 lbf/ft (1.25 kN/m) applied horizontal in an outward direction. Quarter point loading was used as an equivalent to uniform loading.

3) Concentrated Horizontal Load Test

The top rail of the system was subjected to a maximum concentrated horizontal test load of 375 lbf (1.67 kN) applied at the top of a single post in an outward direction.

4) Uniform Vertical Load Test

The top rail of the system was subjected to a maximum uniform load of 171 lbf/ft (2.5 kN/m) applied

vertically down on the top rail. Quarter point loading was used as an equivalent to uniform loading.

Notes:

1) None of the loads specified below need be considered to act simultaneously.
2) A live load factor of 1.5 is applied to the above loads in accordance with Section 4.1
3) NBC 2010 – Section 4.3.5.1 states that structural members made with aluminum shall conform to CAN/CSA-S157/S157.1, "Strength Design in Aluminum/Commentary on CSA S157-05, Strength Design in Aluminum." This standard specifies an aluminum performance factor of 0.9 to be factored in to the loads, when the mode of failure for the railing is ductile failure.

TESTING RESULTS:

The deck mounted posts were proven to be weaker than the fascia mounted posts, refer to Intertek 3119437 Equivalency Letter – March 30, 2007. Therefore, the full size guards were tested with a deck mounted post connection. Fascia mounted guards are considered to be stronger than the deck mounted guards.

Guard test results are shown in the tables below (refer to Appendix A for detailed test data):

System Description	System Height (Inches)	Maximum Post to Post Center Spacing (Inches)	Test	Compliance
4.5 ft Topless Glass rail – 1.75" Post with Deck Mount	42"	54"	In-Fill Load	Pass
			Horizontal – Uniform Load	Pass
			Horizontal – Adjacent to Post Concentrated Load	Pass
			Vertical – Uniform Load	Pass

CONCLUSION:

Quality Auditing Institute Ltd., with lab facilities located in Coquitlam, British Columbia, performed testing in accordance with the 2010 Canadian National Building Code (NBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2012 British Columbia Building Code (BCBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2006 Alberta Building Code (ABC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards and 2006 Ontario Building Code (OBC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards on a representative sample of the See-View Topless Glass Rail System with posts spaced at 4.5 ft. on center. The topless glass railing can be attached with either deck mounted or fascia mounted Posts.

The railing system identified in this test report has complied with the loads specified in 2010 Canadian National Building Code (NBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2012 British Columbia Building Code (BCBC) – section 4.1.5.14 & section 9.8.8.2 "Loads on Guards", 2006 Alberta Building Code (ABC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards and 2006 Ontario Building Code (OBC) – section 4.1.5.15 & section 9.8.8.2 -Loads on Guards.

Test results in this report may not be reproducible in the field. Test results relate only to those products tested.

APPENDIX

CANADA:
16-211 SCHOOLHOUSE ST
COQUITLAM
BRITISH COLUMBIA
V3K 4X9
T: 604.527.8378
F: 604.527.8368
www.qai.org • info@qai.org

US:
8385 WHITE OAK AVENUE
RANCHO CUCAMONGA
CALIFORNIA
91730
T: 888.540.4024
F: 909.483.0336
www.qai.org • info@qai.org

1325 NORTH 108TH E. AVE
TULSA
OKLAHOMA
74116
T: 918.437.8333
F: 918.437.8487
www.qai.org • info@qai.org

Test: **Loads on Guards**
Test Methods: NBC 2010 & BCBC 2012 - Section 4.1.5.14 "Loads on Guards" Requirements

Date: 14-Mar-13 Technician: Jay Klassen
Project No: T671-8
Client: AAA Aluminum Products

Product: See-View Topless Glass Railing
Post Spacing: 4.5 ft 1.37 m
Height: 42 in. 1067 mm

Equipment: Loadcell8

Test	Failure Mode	*Factored Load	Required Proof Load (lbf)	Pass/Fail	Observations
In-Fill Load Test (100mm x 100mm)	Ductile	187	187	Pass	No Change
Uniform Horizontal Load Test (per ft)	Ductile	86	385	Pass	No Change
Concentrated Horizontal Load	Ductile	375	375	Pass	Slight deformantion of post
Uniform Vertical Load (per ft)	Ductile	171	771	Pass	No Change

Limit States Design - Live Load:
Safety Factor: 1.5

Aluminum Performance Factor:
Ductile Failure 0.9
Brittle Failure 0.67

*Note: These loads are as specified in the NBC 2010, BCBC 2012, 2006 ABC & 2006 OBC along with the factored loads (Live Load Safety Factor (section 4.1.3) & Aluminum Performance Factor(CAN/CSA S157/S157.1))

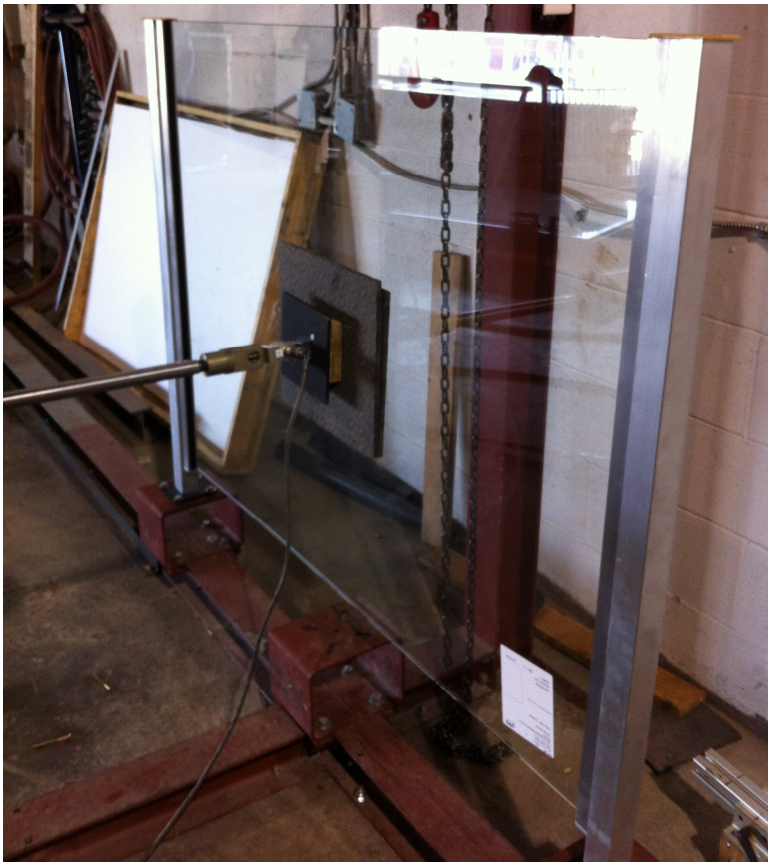

Figure 1: Horizontal-In-fill Load Test

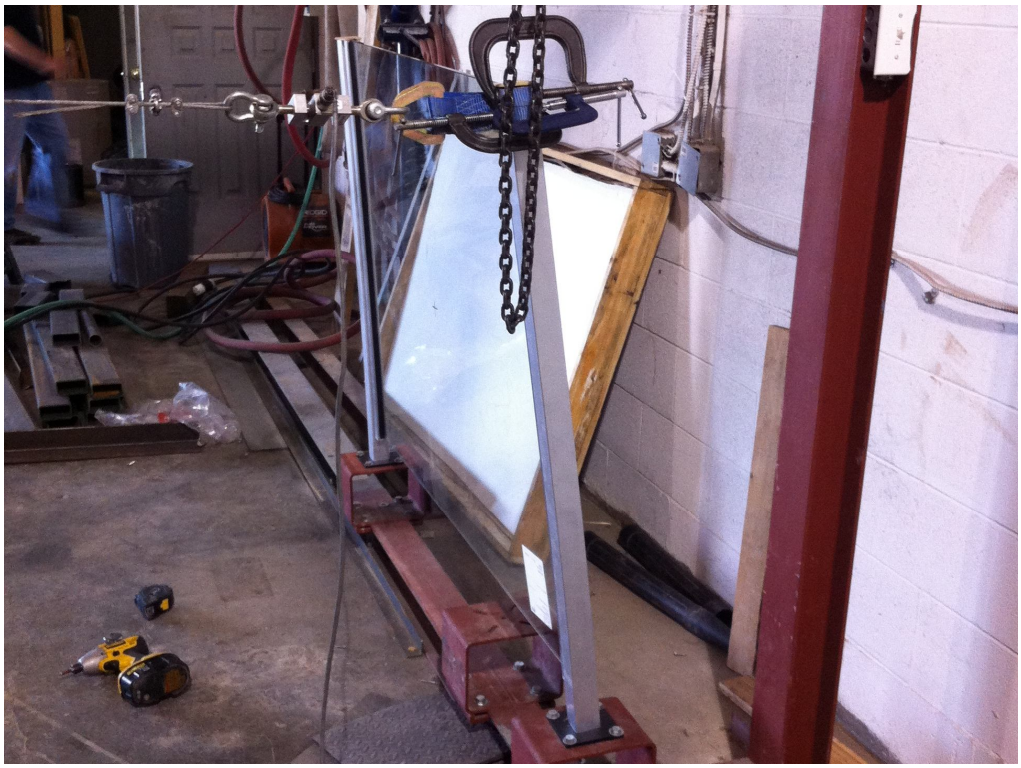

Figure 2: Concentrated Horizontal Load Test (Center of the Top Rail)

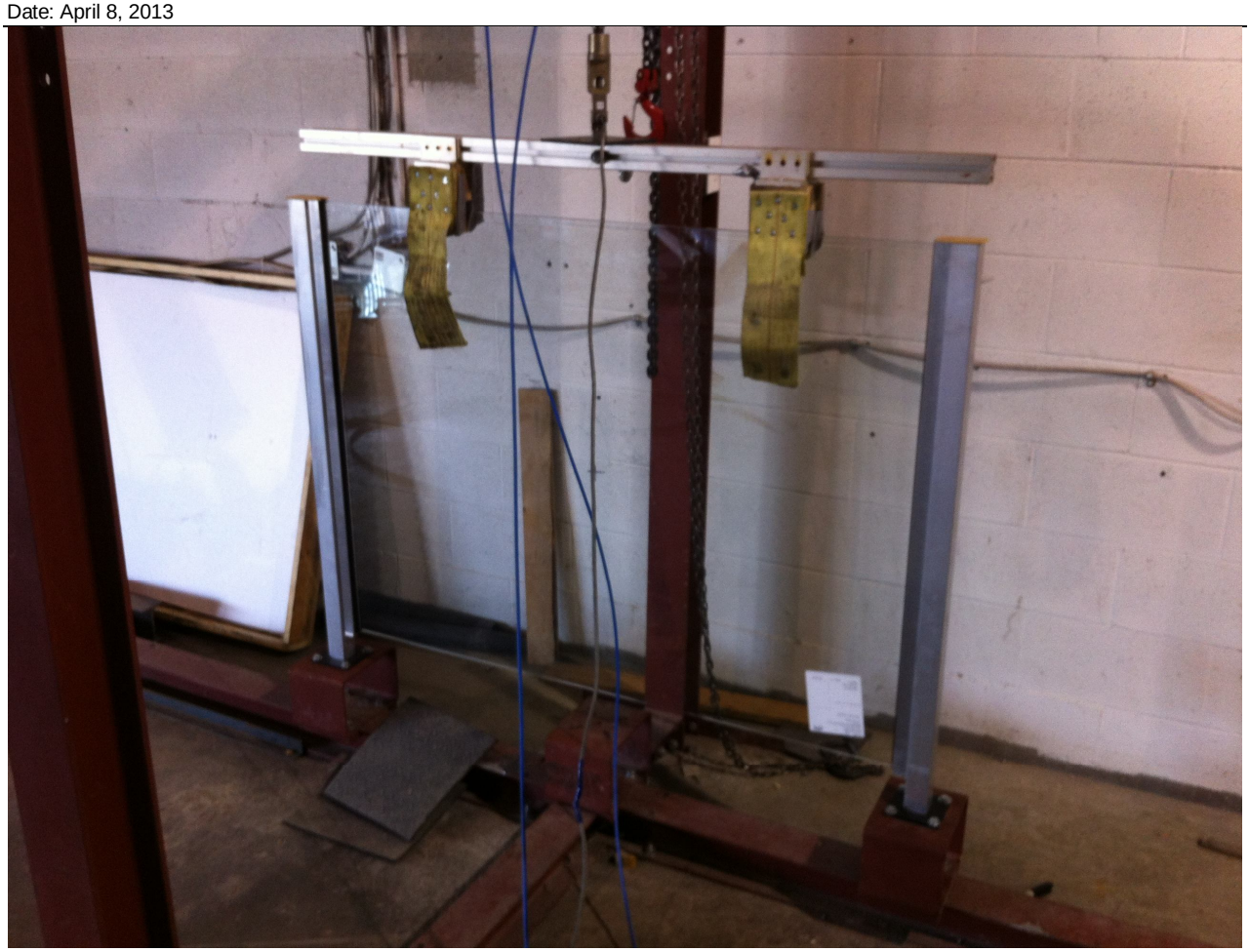

Figure 3: Concentrated Horizontal Load Test (Top of end post)