

TEST REPORT

Intertek

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EVALUATION CENTER

INTERTEK TESTING SERVICES NA LTD.
1500 BRIGANTINE DRIVE
COQUITLAM, BC V3K 7C1

RENDERED TO

CENTURY ALUMINUM RAILINGS
A DIVISION OF BEAVER HOME IMPROVEMENTS LTD.
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SUMMERLAND, BC V0H 1Z2
CANADA

PRODUCT EVALUATED: Aluminum Picket and Glass Railing Systems
EVALUATION PROPERTY: Load Requirements

Report of Aluminum Picket and Glass Railing Systems for compliance with the applicable requirements of the following:

- **2015 International Building Code (IBC), Section 1607.8.1 Handrails and Guards**
- **2015 International Residential Code (IRC), Section R301.5 Live Load**

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2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted a test program for Century Aluminum Railings on aluminum railing systems. The evaluation was carried out to determine whether the railing systems would resist the loads specified in the following:

- 2015 International Building Code (IBC), Section 1607.8.1 *Handrails and Guards*
- 2015 International Residential Code (IRC), Section R301.5 *Live Load*

This evaluation was conducted in the month of February 2015.

3 Test Samples

3.1. SAMPLE SELECTION

The client submitted two (2) aluminum railing systems to the Evaluation Center on February 2, 2015 (Coquitlam ID# VAN1502051454-001). Samples were not independently selected for testing.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The different samples were identified as the following:

Railing	Post	Post Spacing	Mounting Plate	Rails	Picket/Panel Insert
Picket – Deck Mount	2-1/2" x 2-1/2"	75"	4" x 4" x 1/4"	42" high	5/8" x 5/8"
Glass Panel - Deck Mount	2-1/2" x 2-1/2"	75"	4" x 4" x 1/4"	42" high	1/4" Clear Tempered Glass

Note: The installation of the guardrail to the deck and wall connection was not within the scope of this report, and is subject to evaluation and approval by the building official. Four 3/8 in. grade 5 bolts and washers on each post were used to install the specimen for testing.

4 Testing and Evaluation Methods

The test specimens were loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The specified test loads were held for one minute before the load was released. The following tests were conducted:

4.1. 2015 IBC: SECTION 1607.8.1 HANDRAILS AND GUARDS

- 1) Handrails and guards shall be designed to resist a linear load of 50 pounds per linear foot (plf) (0.73 kN/m) applied in any direction along the handrail or top rail.
- 2) Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN), applied in any direction at any point on the handrail or top rail and to transfer the load through the supports to the structure to produce the maximum load effect on the element being considered.

- 3) Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) including openings and space between rails and located so as to produce the maximum load effect.

4.2. 2015 IRC: SECTION R301.5 LIVE LOAD

- 1) Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN), applied in any direction at any point on the handrail or top rail and to transfer the load through the supports to the structure to produce the maximum load effect on the element being considered.
- 2) Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) including openings and space between rails and located so as to produce the maximum load effect.

Notes:

1. A live load factor of 2.5 was applied to the above loads. Glazing used in handrail assemblies and guards were tested using a live load factor of 4.0.

4.3. IN-FILL LOAD TEST

For the picket system, a load of 125 lbs was applied using a 1 square foot block normal to the in-fill. For the glass systems, a load of 200 lbs was applied to the glass panel using a 1 square foot block normal to the in-fill. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and/or visible cracking from any component.

4.4. UNIFORM LOAD TEST

The guardrail systems were subjected to a maximum equivalent uniform load of 125 plf applied horizontally to the top rail. The load was applied using quarter point loading. After release of the load, the system was evaluated for failure, any evidence of disengagements and/or visible cracking from any component.

4.5. CONCENTRATED LOAD TEST

The top rails of the guardrail systems were subjected to a horizontal concentrated load of 500 lbs adjacent to the rail post connection to verify the connection capacity.

The top rail of the guardrail systems were subjected to three separate tests where a concentrated load of 500 lbs was applied:

- horizontally at the mid-span of the top rail,
- horizontally at the top rail adjacent to the post connection to verify the connection capacity, and
- horizontally at the top of post.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The product test results are shown in Table 1 below and a full set of test data is located in Appendix A.

Table 1. Test Results		
System Description	Test	Compliance
Aluminum Picket Railing System – Top Mount	In-fill Load	Pass
	Uniform Load	Pass
	Mid-span Concentrated Load	Pass
	Adjacent to Post Connection Concentrated Load	Pass
	Top of Post Concentrated Load	Pass
Aluminum Glass Panel Railing System – Top Mount	In-fill Load	Pass
	Uniform Load	Pass
	Mid-span Concentrated Load	Pass
	Adjacent to Post Connection Concentrated Load	Pass
	Top of Post Concentrated Load	Pass


6 Conclusion

The Century Aluminum Railings products identified in this test report have complied with the load requirements of the following:

- 2015 International Building Code (IBC), Section 1607.8.1 *Handrails and Guards*
- 2015 International Residential Code (IRC), Section R301.5 *Live Load*

The product test results are presented in Section 5 of this report.

INTERTEK TESTING SERVICES NA LTD.

Reported by: 
Chris Chang, P.Eng.
Engineer, Building Products

Reviewed by: 
Riccardo DeSantis
Manager, Building Products

APPENDIX A: Test Data (3 pages)



Company	Century Aluminum Railings	Technician(s)	Chris Chang
Project No.	G101945528	Reviewer	Riccardo DeSantis
Models	Picket and Glass Railing	Start/End Date	February 5, 2015
Product Name	Same as above	Sample ID	VAN1502051454-001
Standard	2015 International Building Code (IBC), 2015 International Residential Code (IRC)		

Test Data Package

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Picket Railing System - Loads on Guards	2
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Test: Loads on Guards
Date: 4-Feb-15
Client: Century Aluminum Railings
Product: **Aluminum Picket Guardrail System**
Post Spacing: 6.250 ft 1.91 m
Height of Guard: 42 in 1067 mm
Opening in Guard: 3.875 in 98 mm
Method: 2015 International Building Code (IBC)
 2015 International Residential Code (IRC)
Safety Factor: 2.50
Equipment: Artech 5000 lbf Load Cell (Intertek ID# P60690, cal due November 2015)
 Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due July 2015)
 Stopwatch (Intertek ID# P60624, cal due July 2015)
Time/Temp/RH: 8:30AM / 22.0°C / 51.0%

Project: G101945528
Eng/Tech: Chris Chang
Reviewer: Riccardo DeSantis

Direction	Test	Design Load (Inward/Outward) (lbf)	Factored Load	Calculated Moment (lbf-ft)	Equivalent Quarter-Point Load (lbf)	Required Proof Load (lbf)	Pass/Fail
Outward	Individual Elements (over 12 in. x 12 in.) (most critical location)	50	125	-	-	125	Pass
	Horizontal Uniform Load (per ft)	50	125	610	391	781	Pass
	Midspan Horizontal Concentrated Load	200	500	-	-	500	Pass
	Top Rail Adjacent to Connection Concentrated Load	200	500	-	-	500	Pass
	Top of Post	200	500	-	-	500	Pass

Direction	Test	Design Load (Inward/Outward) (kN)	Factored Load	Calculated Moment (kNm)	Equivalent Quarter-Point Load (kN)	Required Proof Load (kN)	Pass/Fail
Outward	Individual Elements (over 305 mm in. x 305 mm) (most critical location)	0.22	0.56	-	-	0.56	Pass
	Horizontal Uniform Load (per m)	0.73	1.83	0.83	1.74	3.48	Pass
	Midspan Horizontal Concentrated Load	0.89	2.22	-	-	2.22	Pass
	Top Rail Adjacent to Connection Concentrated Load	0.89	2.22	-	-	2.22	Pass
	Top of Post	0.89	2.22	-	-	2.22	Pass

Test: Loads on Guards
Date: 4-Feb-15
Client: Century Aluminum Railings
Product: **Aluminum Glass Panel Guardrail System**
Post Spacing: 6.250 ft 1.91 m
Height of Guard: 42 in 1067 mm
Opening in Guard: 2 in 51 mm
Method: 2015 International Building Code (IBC)
 2015 International Residential Code (IRC)
Safety Factor: 2.50
 4.00 (for glass in-fill)
Equipment: Artech 5000 lbf Load Cell (Intertek ID# P60690, cal due November 2015)
 Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due July 2015)
 Stopwatch (Intertek ID# P60624, cal due July 2015)
Time/Temp/RH: 10:00AM / 23.0°C / 50.0%

Project: G101945528
Eng/Tech: Chris Chang
Reviewer: Riccardo DeSantis

Direction	Test	Design Load (Inward/Outward) (lbf)	Factored Load	Calculated Moment (lbf-ft)	Equivalent Quarter-Point Load (lbf)	Required Proof Load (lbf)	Pass/Fail
Outward	Individual Elements (over 12 in. x 12 in.) (most critical location)	50	200	-	-	200	Pass
	Horizontal Uniform Load (per ft)	50	125	610	391	781	Pass
	Midspan Horizontal Concentrated Load	200	500	-	-	500	Pass
	Top Rail Adjacent to Connection Concentrated Load	200	500	-	-	500	Pass
	Top of Post	200	500	-	-	500	Pass

Direction	Test	Design Load (Inward/Outward) (kN)	Factored Load	Calculated Moment (kNm)	Equivalent Quarter-Point Load (kN)	Required Proof Load (kN)	Pass/Fail
Outward	Individual Elements (over 305 mm in. x 305 mm) (most critical location)	0.22	0.89	-	-	0.89	Pass
	Horizontal Uniform Load (per m)	0.73	1.83	0.83	1.74	3.48	Pass
	Midspan Horizontal Concentrated Load	0.89	2.22	-	-	2.22	Pass
	Top Rail Adjacent to Connection Concentrated Load	0.89	2.22	-	-	2.22	Pass
	Top of Post	0.89	2.22	-	-	2.22	Pass

REVISION SUMMARY

DATE	SECTION		SUMMARY	INTERTEK INITIALS	
				TECHNICIAN	REVIEWER
17-Feb-15	All	Throughout	Revised name from "Deksmart Railings" to "Century Aluminum Railings"	