TEST REPORT

REPORT NUMBER: 101821679COQ-001
ORIGINAL ISSUE DATE: October 15, 2014

EVALUATION CENTER

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

RENDERED TO

CENTURY ALUMINUM / DEKSMART RAILINGS
DIVISION OF BEAVER HOME IMPROVEMENTS LTD.
9685 AGUR STREET
SUMMERLAND, BC V0H 1Z2
CANADA

PRODUCT EVALUATED:
4 ft. Scenic Topless 10 mm Glass Railing

EVALUATION PROPERTY:
Load Requirements

Report of 4 ft. Scenic Topless 10 mm Glass Railing for compliance with the requirements of the following criteria:

- **2010 *National Building Code of Canada***
  - **Section 9.8.8.2, 9.8.8.3, 9.8.8.5, and 9.8.8.6**
- **2012 *Ontario Building Code***
  - **Section 9.8.8.2, 9.8.8.3, 9.8.8.5, and 9.8.8.6**
- **2012 *British Columbia Building Code***
  - **Section 9.8.8.2, 9.8.8.3, 9.8.8.5, and 9.8.8.6**
- **2006 *Alberta Building Code***
  - **Section 9.8.8.2, 9.8.8.3, 9.8.8.5, and 9.8.8.6**

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2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted a test program for the 4 ft. Scenic Topless 10 mm Glass Railing submitted by Century Aluminum/Deksmart Railings. The evaluation was carried out to determine whether the railings would resist the required loads for *guards within dwelling units and exterior guards serving not more than 2 dwelling units*, as specified in the following Building Codes:

- 2010 National Building Code of Canada (NBC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design of Guards to Not Facilitate Climbing*
- 2012 Ontario Building Code (OBC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Guards Designed Not to Facilitate Climbing*
- 2012 British Columbia Building Code (BCBC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design of Guards to Not Facilitate Climbing*
- 2006 Alberta Building Code (ABC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design to Prevent Climbing*

This evaluation was conducted in the month of October 2014.

3 Test Samples

3.1. SAMPLE SELECTION

The client submitted the guard rail system components to the Evaluation Center on September 22, 2014. The product was identified as Coquitlam ID# VAN1409221501-001.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The railing system was identified as the Scenic Topless 10 mm Glass Railing. Drawings of the railing and individual components with part numbers can be found in Appendix B. The details of the guardrail system are outlined below in Table 1:

Table 1. Railing Details			
Railing	**Posts**	**Mounting Plate**	**Panel Insert**
4 ft. Scenic Topless 10 mm Glass Railing	2-1/2" x 2-1/2" x 42-7/8" high with Pyramid Cap (6063-T54 Aluminum)	4" x 4" x 1/4" (6061-T6 Aluminum)	46-3/4" x 40" x 10 mm 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 5/16 in. grade 5 bolts and washers on each post were used to install the specimen for testing.

4 Testing and Evaluation Methods

The evaluation was conducted in general accordance with the testing procedures of ASTM E935-13e1, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.* 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. For each test, deflection measurements were taken at the point of load application. As per Section 9.8.8.2 of the 2010 NBC, 2012 OBC, 2012 BCBC, and 2006 ABC, the following tests were conducted for use within dwelling units and exterior guards serving not more than 2 dwelling units:

4.1 2010 NBC / 2012 OBC / 2012 BCBC / 2006 ABC: SECTION 9.8.8.2. *LOADS ON GUARDS*

1) The minimum specified horizontal load applied inward or outward at the top of every required guard shall be 0.5 kN/m or a concentrated load of 1.0 kN applied at any point

2) Individual elements within the *guard*, including solid panels and pickets, shall be designed for a concentrated load of 0.5 kN applied over an area of 300 mm x 300 mm located at any point in the element or elements so as to engage 3 balusters when possible.

3) The minimum specified load applied vertically at the top of every required *guard* shall be 1.5 kN/m.

4) None of the loads specified above need be considered to act simultaneously.

Notes: A safety factor of 2.5 is applicable to the above loads.

4.2 2010 NBC / 2012 OBC / 2012 BCBC / 2006 ABC: SECTION 9.8.8.3 *HEIGHT OF GUARDS*

1) All guards shall be not less than 1070 mm high.

4.3 2010 NBC / 2012 OBC / 2012 BCBC / 2006 ABC: SECTION 9.8.8.5 *OPENINGS IN GUARDS*

1) Openings through any guard shall be of a size that will prevent the passage of a spherical object having a diameter of 100 mm unless it can be shown that the location and size of openings that exceed this limit do not present a hazard.

4.4 2010 NBC / 2012 OBC / 2012 BCBC / 2006 ABC: SECTION 9.8.8.6 *DESIGN OF GUARDS TO NOT FACILITATE CLIMBING / GUARDS DESIGNED NOT TO FACILITATE CLIMBING / DESIGN TO PREVENT CLIMBING*

1) Guards except those in industrial occupancies and where it can be shown that the location and size of openings do not present a hazard, shall be designed so that no member, attachment or opening facilitates climbing.

2) Guards shall be deemed to comply with Sentence (1) where all elements protruding from the vertical and located within the area between 140 mm and 900 mm above the floor or walking surface protected by the guard conform to one of the following clauses:
a) they are located more than 450mm horizontally and vertically, or
b) they provide not more than 15 mm horizontal offset,
c) they do not provide a toe-space more than 45mm horizontally and 20 mm vertically, or
d) they present more than a 1-in-2 slope on the offset.

4.5 IN-FILL LOAD TEST

A load of 1.25 kN (281 lbf) was applied using a 300 mm x 300 mm square block on the center of the railing system normal to the in-fill. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

4.6 UNIFORM LOAD TEST

A uniform load of 3.75 kN/m (257 plf) was applied vertically to the top rail of the guardrail system. A uniform load of 1.25 kN/m (86 plf) was applied horizontally to the top rail of the guardrail system. The loads were applied using quarter point loads. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

4.7 CONCENTRATED LOAD TEST

The top rail of the guardrail system was subjected to three separate tests where a concentrated load of 2.5 kN (562 lbs) was applied:

- horizontally at the midspan 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.

The top of post concentrated load also was taken to ultimate failure.

4.8 HEIGHT OF GUARDS

The railing formed a protective barrier not less than 1070 mm (42 in.) high.

4.9 OPENINGS IN GUARDS

An opening of 50 mm (2.0 in.) under the glass panel prevented a sphere 4 in. (100 mm) in diameter to pass.

4.10 DESIGN TO PREVENT CLIMBING

No member, attachment or opening located between 140 mm and 900 mm above the floor or walking surface protected by the guards facilitated climbing.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The product test results are shown in Table 1. A copy of the test data is located in Appendix A.

Table 1. Test Results

Section	Property	Result	Requirement	Pass/Fail
9.8.8.2	In-fill Load	281 lbs	281 lbs	Pass
	Vertical Uniform Load	257 plf	257 plf	Pass
	Horizontal Uniform Load	86 plf	86 plf	Pass
	Mid-span Concentrated Load	562 lbs	562 lbs	Pass
	Adjacent to Post Connection Concentrated Load	562 lbs	562 lbs	Pass
	Top of Post Concentrated Load	562 lbs	562 lbs	Pass
	Top of Post – Ultimate Load	604 lbs	As Reported	As Reported
9.8.8.3	Height of Guards	1070 mm	≥ 1070 mm	Pass
9.8.8.5	Openings in Guards	Under Glass Panel: 50 mm	< 100 mm	Pass
9.8.8.6	Design to Not Facilitate Climbing	No elements protruding from the vertical between 140 mm and 900 mm that facilitate climbing	No elements from the vertical between 140 mm and 900 mm that facilitate climbing	Pass

6 Conclusion

The Century Aluminum/Deksmart Railings Scenic Topless 10 mm Glass Railing identified in this test report has complied with the load requirements for *guards within dwelling units and in exterior guards serving not more than 2 dwelling units*, as specified in the following Building Codes:

- 2010 *National Building Code of Canada* (NBC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design of Guards to Not Facilitate Climbing*
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  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Guards Designed Not to Facilitate Climbing*
- 2012 British Columbia Building Code (BCBC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design of Guards to Not Facilitate Climbing*
- 2006 Alberta Building Code (ABC)
  - Section 9.8.8.2, *Loads On Guards*
  - Section 9.8.8.3, *Height of Guards*
  - Section 9.8.8.5, *Openings in Guards*
  - Section 9.8.8.6, *Design to Prevent Climbing*

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

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