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VISTA RAILING SYSTEMS INC.
TEST REPORT

SCOPE OF WORK
REPORT OF 6 FT. VISTA ALUMINUM GLASS RAILING SYSTEM TESTED IN ACCORDANCE WITH SELECTED LOAD REQUIREMENTS OF ICC-ES AC273, *ACCEPTANCE CRITERIA FOR HANDRAILS AND GUARDS,* APPROVED JUNE 2017, "FOR USE IN ONE- AND TWO-FAMILY DWELLINGS ONLY"

REPORT NUMBER
104482541COQ-001

TEST DATE
11/05/20

ISSUE DATE
11/10/20

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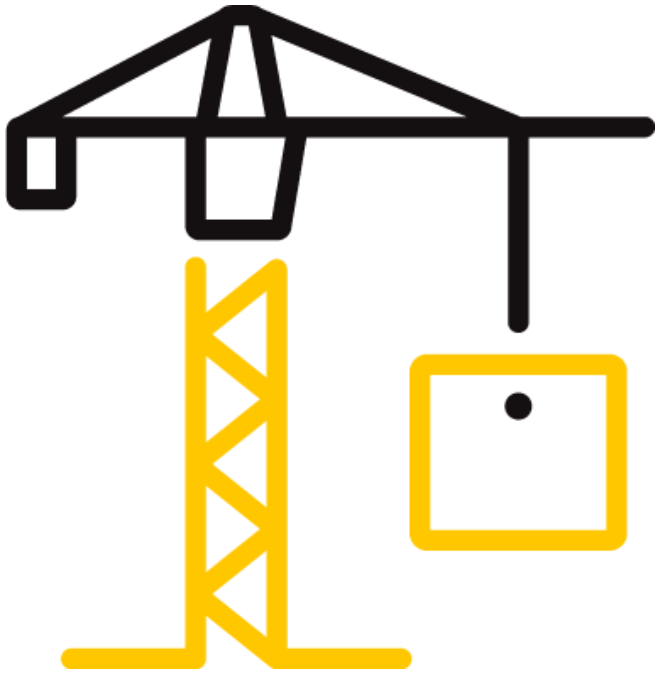

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TEST REPORT FOR VISTA RAILING SYSTEMS INC.
Report No.: 104482541COQ-001
Date: 11/10/20

REPORT ISSUED TO

VISTA RAILING SYSTEMS INC.
23282 River Road
Maple Ridge, BC, V2W 1B6
Canada

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Vista Railing Systems Inc. to perform testing in accordance with the load requirements of ICC-ES AC273, *Acceptance Criteria for Handrails and Guards,* Approved June 2017, for use in one- and two-family dwellings only, on their aluminum glass railing system. Results obtained are tested values and were secured by using the designated standard. Testing was conducted at the Intertek test facility in Coquitlam, BC, Canada.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Chris Chang	**REVIEWED BY:**	Baldeep Sandhu
TITLE:	Senior Tech – Building & Construction	**TITLE:**	Manager – Building & Construction
SIGNATURE:		**SIGNATURE:**	
DATE:	11/10/20	**DATE:**	11/10/20

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SECTION 2
SUMMARY OF TEST RESULTS

SYSTEM DESCRIPTION	TEST	PASS/FAIL
6 ft. Vista Aluminum Glass Railing System	In-fill Load	Pass
	Horizontal – Mid-Span Concentrated Load	Pass
	Horizontal – Adjacent to Post Concentrated Load	Pass
	Horizontal – Top of Post Concentrated Load	Pass
	Vertical – Mid-Span Concentrated Load	Pass
	Vertical – Adjacent to Post Concentrated Load	Pass
	Vertical – Top of Post Concentrated Load	Pass

Refer to Appendix B for photos of testing.

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SECTION 3
TEST METHOD

The specimen was evaluated in accordance with selected sections of the following:

> **ICC-ES AC273**, *Acceptance Criteria for Handrails and Guards,* Approved June 2017, "for use in one- and two-family dwellings only"

SECTION 4
MATERIAL SOURCE

The client submitted the railing system to the Evaluation Center on October 28, 2020 (Coquitlam ID# VAN2010281211-001). The sample was received in good condition and was suitable for testing unless noted otherwise. The sample was not independently selected for testing.

SECTION 5
EQUIPMENT

Calibration of test equipment was performed by Intertek B&C in accordance with ISO 17025 requirements.

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
P60692	Artech 5k lb S-Type Load Cell	20210-5k	10/22/21
P60610	T&D Temperature and Humidity Logger	TR-72Ui	04/20/21
P60444	Extech Stopwatch	365515	02/05/21
D7810	Micro Mule	Intertek-York	12/29/20
D7818	Tyco Electronics Linear Transducer	PT1MA-20-UP-420E-M6	12/29/20
D7822	Tyco Electronics Linear Transducer	PT1MA-20-UP-420E-M6	12/29/20
D7817	Tyco Electronics Linear Transducer	PT1MA-20-UP-420E-M6	12/29/20

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SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Kevin Penner	Intertek B&C
Chris Chang	Intertek B&C

Note: The above observer(s) witnessed part of the test program.

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SECTION 7
TESTING PROCEDURE

Testing was conducted with reference to the test procedures of ASTM E935-13e1, *Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings* and ASTM E985-00 (Reapproved 2006), *Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.* The test specimen was 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. As per Section 4.2 of ICC-ES AC273, the following tests were conducted:

IN-FILL LOAD TEST

The in-fill load test was conducted in accordance with Section 4.2.4 *In-fill Load Test* of ICC-ES AC273. Testing was conducted with reference to Section 10.4 of ASTM E935-13e1 and the load specified in Section 7.1.7 of ASTM E985-00 (2006) with a safety factor of 4.0. A load of 200 lbs was applied 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.

UNIFORM LOAD TEST

For one- and two-family dwellings, the uniform load test was not required as per Section 4.2.3 *Structural Test Requirements* of ICC-ES AC273.

CONCENTRATED LOAD TEST

The concentrated load tests were conducted in accordance with Section 4.2.6 *Concentrated Load Test* of ICC-ES AC273. Testing was conducted with reference to Section 10.6 of ASTM E935-13e1 and the load specified in Section 7.1.1 of ASTM E985-00 (2006) with a safety factor of 2.5. The top rail of the guardrail system was subjected to three (3) separate horizontal and three (3) separate vertical 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,
- horizontally at the top of the post,
- vertically at the mid-span of the top rail,
- vertically at the top rail adjacent to the post connection to verify the connection capacity, and
- vertically at the top of the post.

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.

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During testing, when the applied concentrated load reached 200 lbf (0.890 kN), the vertical and horizontal deflection of the top rail and horizontal deflection of the posts, measured at the point of loading, was recorded. When the load was applied mid-span of the rail, the horizontal deflection was not to exceed the sum of the rail height (*h*) divided by 24 plus the rail length (*l*) between the vertical supports divided by 96, or *h*/24 + *l*/96. When the load was applied mid-span of the rail, the vertical deflection was not to exceed the length (*l*) divided by 96, or *l*/96. Additionally, the top rail horizontal mid-span net deflection was not to exceed L/96, where the horizontal mid-span net deflection was the measured top rail mid-span horizontal deflection reading minus the post average horizontal deflection readings. When the load was applied at the top rail adjacent to the post connection and at top of the post, the horizontal deflection was not to exceed the rail height (*h*) divided by 12, or *h*/12.

DEVIATION FROM STANDARD METHOD

Per the client's request, samples were not independently selected for testing per Section 2.4 *Product Sampling* of ICC-ES AC273. Only one (1) railing was tested per the load requirements instead of the three (3) railing tests required per Section 4.2.2 of ICC-ES AC273. Additionally, testing of the top rail-to-post connections at corners was not evaluated per Section 4.7 of ICC-ES AC273.

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SECTION 8
TEST SPECIMEN DESCRIPTION

The samples were identified as the following:

TABLE 1. RAILING CONFIGURATION

PART NAME	PART NUMBER	QTY	PART DIMENSIONS				REPORTED MATERIAL
			LENGTH	WIDTH	HEIGHT	NOMINAL THICKNESS	
Base Plate	PB5468	2	4.00 in.	4.00 in.	0.313 in.	-	Aluminum
Post		2	42.12 in.	2.00 in.	2.00 in.	0.104 in.	Aluminum
Top Rail	PB2104	1	72.0 in.	2.300 in.	2.498 in.	0.059 in.	Aluminum
Bottom Rail	PB2102	1	72.0 in.	0.952 in.	1.530 in.	0.059 in.	Aluminum
Infill	PB1465	1	68.0 in.	36.0 in.	0.25 in.	-	Tempered Glass(2)
Support Leg	PB7408	1	1.00 in.	1.625 in.	2.62 in.	0.120 in.	Aluminum
Top Rail Glass Gasket	PB2108	1	72.0 in.	0.670 in.	1.080 in.	0.050 in.	Black PVC
Channel Glass Gasket	PB1465	1	72.0 in.	0.558 in.	1.056 in.	0.050 in.	Black PVC

The railing had one (1) support leg under the bottom rail at mid-span. The support leg was rigidly fixed to the test frame by screwing the front side with a #8 x 1-1/2 in. long deck screw into nominal 2x4 SPF lumber, which was then clamped to the steel test frame. For detailed drawings of the test sample and components, refer to Appendix C.

Note 1: The supporting structure attachment was outside the scope of this evaluation, and is subject to evaluation and approval by the Engineer of Record and Authority Having Jurisdiction (AHJ). The guard assemblies were attached to a rigid test support using steel plates with four (4) 3/8 in. Grade 5 bolts on each post.

Note 2: The railing was submitted to the Evaluation Center with a single sheet of tempered glass. Per the 2018 International Building Code (IBC), a single fully tempered glass sheet complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1 shall be permitted to be used in handrails and guards where there is no walking surface beneath them or the walking surface is permanently protected from the risk of falling glass.

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SECTION 9
TEST RESULTS

A full set of test results is included in Appendix A.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule also called "Shared Risk Approach," of ILAC G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

SECTION 10
CONCLUSION

The Vista Railing Systems Inc. Aluminum Glass Railing System identified and evaluated in this report has met the load requirements of ICC-ES AC273, *Acceptance Criteria for Handrails and Guards,* Approved June 2017, "for use in one- and two-family dwellings only" with deviations as noted in Section 7 of this report.

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SECTION 11

APPENDIX A – TEST DATA (2 PAGES)

Company	Vista Railing Systems Inc.	Technician(s)	Kevin Penner
Project No.	G104482541	Reviewer	Baldeep Sandhu
Models	6 ft. Glass Infill	Start/End Date	November 5, 2020
Product Name	Vista Aluminum Glass Railing System	Sample ID	VAN2010281211-001
Standard	**ICC-ES AC273, *Acceptance Criteria for Handrails and Guards,* Approved June 2017**		

Test Data Package

Table of Contents

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Test:	**AC 273 Structural Tests (for one- and two- family dwellings)**	Project:	G104482541
Date:	5-Nov-20	Eng/Tech:	Kevin Penner
Client:	Vista Railing Systems Inc.	Reviewer:	Baldeep Sandhu
Product:	6 ft. Vista Aluminum Glass Railing System	Location:	Coquitlam, BC, Canada
Post Spacing:	6.17 ft 1.88 m		
Effective Length:	72 in. 1.83 m		
Height of Guard:	42.125 in 1070 mm		
Opening in Guard:	2 in 51 mm		
Method:	AC 273, *Acceptance Criteria for Handrails and Guards,* Approved June 2017		
	4.2 Guard Assembly Load Test		
Safety Factor:	2.5		
	4		
Equipment:	Artech 5000 lbf Load Cell with Gauge Readout (Intertek ID# P60692, cal due October 22, 2021)		
	T&D TR-72Ui Temperature and Humidity Indicator (Intertek ID# P60610, cal due April 20, 2021)		
	Stopwatch (Intertek ID# P60444, cal due February 5, 2021)		
	Micro MULE (Intertek ID# D7810, cal due December 29, 2020)		
	Tyco Electronics Linear Transducer PT1MA-20-UP-420E-M6 (Intertek ID# D7818, cal due December 29, 2020)		
	Tyco Electronics Linear Transducer PT1MA-20-UP-420E-M6 (Intertek ID# D7822, cal due December 29, 2020)		
	Tyco Electronics Linear Transducer PT1MA-20-UP-420E-M6 (Intertek ID# D7817, cal due December 29, 2020)		
Time/Temp/RH:	2:50PM / 18.0°C / 43.0%		

Test	Design Load (Inward/ Outward) (lbf)	Factored Load (lbf)	Calculated Moment (lbf-ft)	Equivalent Quarter-Point Load (lbf)	Required Proof Load (lbf)	Required Maximum Deflection h/24 + l/96 (in)	Required Maximum Deflection h/12 (in)	Vertical Deflection limit l/96 (in)	Net Deflection limit l/96 (in)	Measured Deflection at 200 lbf (in)	Pass/Fail
In-fill Load Test (12 in. x 12 in.)	50	200	-	-	200	-	-	-	-	-	**Pass**
Horizontal: Midspan Concentrated Load	200	500	-	-	500	2.51	-	-	0.75	Max: 1.293 in. Net: 0.311 in.	**Pass**
Horizontal: Adjacent to Post Concentrated Load	200	500	-	-	500	-	3.51	-	-	1.561	**Pass**
Horizontal: Top of Post Concentrated Load	200	500	-	-	500	-	3.51	-	-	1.672	**Pass**
Vertical: Midspan Concentrated Load	200	500	-	-	500	-	-	0.75	-	0.35	**Pass**
Vertical: Adjacent to Post Concentrated Load	200	500	-	-	500	-	-	-	-	-	**Pass**
Vertical: Top of Post Concentrated Load	200	500	-	-	500	-	-	-	-	-	**Pass**

Test	Design Load (Inward/ Outward) (kN)	Factored Load (kN)	Calculated Moment (kNm)	Equivalent Quarter-Point Load (kN)	Required Proof Load (kN)	Required Maximum Deflection h/24 + l/96 (mm)	Required Maximum Deflection h/12 (mm)	Vertical Deflection limit l/96 (mm)	Net Deflection limit l/96 (mm)	Measured Deflection at 0.890 kN (mm)	Pass/Fail
In-fill Load Test (305 mm x 305 mm)	0.22	0.89	-	-	0.89	-	-	-	-	-	**Pass**
Horizontal: Midspan Concentrated Load	0.89	2.22	-	-	2.22	63.6	-	-	19.05	Max: 32.8 mm Net: 7.90 mm	**Pass**
Horizontal: Adjacent to Post Concentrated Load	0.89	2.22	-	-	2.22	-	89.2	-	-	39.65	**Pass**
Horizontal: Top of Post Concentrated Load	0.89	2.22	-	-	2.22	-	89.2	-	-	42.47	**Pass**
Vertical: Midspan Concentrated Load	0.89	2.22	-	-	2.22	-	-	19.05	-	8.89	**Pass**
Vertical: Adjacent to Post Concentrated Load	0.89	2.22	-	-	2.22	-	-	-	-	-	**Pass**
Vertical: Top of Post Concentrated Load	0.89	2.22	-	-	2.22	-	-	-	-	-	**Pass**

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APPENDIX B – PHOTOS (2 PAGES)

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Figure 1. In-Fill Load Test

Figure 2. Horizontal – Mid-Span of Top Rail Concentrated Load

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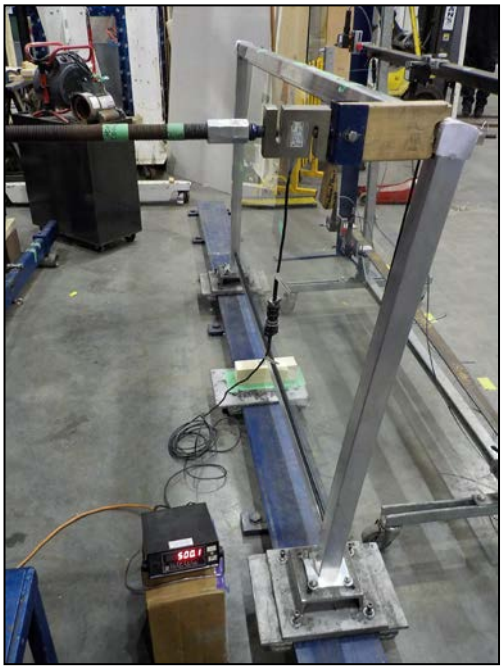

Figure 3. Horizontal – Top of Post Connection Concentrated Load

Figure 4. Vertical – Mid-Span of Top Rail Concentrated Load