

TEST REPORT



REPORT NUMBER: 101539476COQ-002C
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EVALUATION CENTER

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

RENDERED TO

VISTA RAILING SYSTEMS INC.
23282 RIVER ROAD
MAPLE RIDGE, BC V2W 1B6
CANADA

PRODUCT EVALUATED:
4 ft. Vista™ Frameless Railing System

EVALUATION PROPERTY:
Load Requirements

Report of 4 ft. Vista™ Frameless Railing System for compliance with the requirements of the following criteria:

- **2010 National Building Code of Canada**
 - Section 4.1.5.14, **Loads on Guards**
- **2012 Ontario Building Code**
 - Section 4.1.5.14, **Loads on Guards**

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1 Table of Contents

| | | |
|------------|--|----------|
| 1 | Table Of Contents | 2 |
| 2 | Introduction | 3 |
| 3 | Test Samples | 3 |
| | 3.1. Sample Selection | 3 |
| | 3.2. Sample And Assembly Description | 3 |
| 4 | Testing And Evaluation Methods | 3 |
| | 4.1 2010 NBC / 2012 OBC: Section 4.1.5.14 <i>Loads On Guards</i> | 4 |
| | 4.2 2010 NBC / 2012 OBC: Section 9.8.8.3 <i>Height Of Guards</i> | 4 |
| | 4.3 2010 NBC / 2012 OBC: Section 9.8.8.5 <i>Openings In Guards</i> | 4 |
| | 4.4 2010 NBC / 2012 OBC: Section 9.8.8.6 <i>Design Of Guards To Not Facilitate Climbing / Guards Designed Not To Facilitate Climbing</i> | 4 |
| | 4.5 In-Fill Load Test..... | 4 |
| | 4.6 Uniform Load Test..... | 5 |
| | 4.7 Concentrated Load Test..... | 5 |
| | 4.8 Height Of Guards | 5 |
| | 4.9 Openings In Guards | 5 |
| | 4.10 Design To Prevent Climbing..... | 5 |
| 5 | Testing And Evaluation Results | 6 |
| | 5.1. Results And Observations..... | 6 |
| 6 | Conclusion | 7 |
| Appendix A | Test Data..... | 4 Pages |
| Appendix B | Drawings | 11 Pages |

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted a test program for the 4 ft. Vista™ Frameless Railing System submitted by Vista Railing Systems Inc. The evaluation was carried out to determine whether the railings would meet the requirements of the following:

- 2010 National Building Code of Canada (NBC)
 - Section 4.1.5.14, *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 4.1.5.14, *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*

This evaluation was conducted in the month of January 2015.

3 Test Samples

3.1. SAMPLE SELECTION

The client submitted the guard rail system to the Evaluation Center on December 29, 2014. The product was identified as Coquitlam ID# VAN1501141519-001.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The railing system was identified as the Vista™ Frameless Railing System. 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. Vista™ Frameless Railing System | 2-1/2" x 2-1/2" x 43-1/4" high with Pyramid Cap (6005A-T61 Aluminum) End post and corner posts were tested. | 4" x 4" x 3/8" (6005A-T61 Aluminum) | 48" x 40" x 10 mm Tempered Glass |

Note: The installation of the guardrail to the deck 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 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 4.1.5.14 of the 2010 NBC and 2012 OBC, the following tests were conducted:

4.1 2010 NBC / 2012 OBC: SECTION 4.1.5.14 LOADS ON GUARDS

- 1) The minimum specified horizontal load applied inward or outward at the minimum required height of every guard shall be 0.75 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 100 mm x 100 mm located at any point in the element or elements so as to produce the most critical effect.
- 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 was applied to the above loads.

4.2 2010 NBC / 2012 OBC: 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: 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: SECTION 9.8.8.6 DESIGN OF GUARDS TO NOT FACILITATE CLIMBING / GUARDS DESIGNED NOT TO FACILITATE 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 100 mm x 100 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 of the guardrail system. A uniform load of 1.88 kN/m (128 plf) was applied horizontally to the top 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 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 of the guard,
- horizontally at the top of the guard 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 64 mm (2.5 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 2. A copy of the test data is located in Appendix A.

| Table 2. Test Results | | | | |
|------------------------------|---|---|--|------------------|
| Section | Property | Result | Requirement | Pass/Fail |
| 4.1.5.14 | In-fill Load | 281 lbs | 281 lbs | Pass |
| | Vertical Uniform Load | 257 plf | 257 plf | Pass |
| | Horizontal Uniform Load | 128 plf | 128 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 (Outward) | 640 lbs | As Reported | As Reported |
| | Top of Post – Ultimate Load (Inward) | 622 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: 64 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 Vista Railing Systems Inc. 4 ft. Vista™ Frameless Railing System identified in this test report has complied with the requirements as specified in the following:


- 2010 National Building Code of Canada (NBC)
 - Section 4.1.5.14, *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 4.1.5.14, *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*


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

INTERTEK TESTING SERVICES NA LTD.

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APPENDIX A: Test Data (4 pages)



| | | | |
|--------------|--|----------------|----------------------------|
| Company | Vista Railing Systems Inc. | Technician(s) | Kevin Penner / Chris Chang |
| Project No. | G101539476 | Reviewer | Riccardo DeSantis |
| Models | Vista Frameless Railing System | Start/End Date | January 14, 2015 |
| Product Name | Same as above | Sample ID | VAN1501141519-001 |
| Standard | 2010 NBC/2012 OBC, Section 4.1.5.14 Loads on Guards | | |

Test Data Package

Table of Contents

| Sheet | Page |
|--|------|
| Table of Contents (This Sheet) | 1 |
| ProBuilt Windscreen - Load Testing (Outward) | 2 |
| ProBuilt Windscreen - Load Testing (Inward) | 3 |
| ProBuilt Windscreen - Dimensional Checks | 4 |



Test: **Loads on Guards - Outward** Project: G101539476
 Date: 14-Jan-15 Eng/Tech: Kevin Penner
 Client: Vista Railing Systems Inc. Blair Hendry
 Product: **Vista Frameless Railing System** Reviewer: Riccardo DeSantis
 Post Spacing: 4.083 ft 1.24 m
 Height of Guard: 42 in 1067 mm
 Opening in Guard: 2 in 51 mm
 Method: 2010 National Building Code of Canada, 4.1.5.14 Loads on Guards
 2012 Ontario Building Code, 4.1.5.14 Loads on Guards
 Safety Factor: 2.50
 Equipment: Artech 5000 lbf Load Cell (Intertek ID# P60691, cal due November 2015)
 Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due July 2015)
 Stopwatch (Intertek ID# P60624, cal due July 2015)
 Mitutoyo Digital Caliper (Intertek ID# P60005, cal due May 2015)
 Time/Temp/RH: 10:25AM / 23.0°C / 50.0%

| Direction | Test | Design Load (Inward/Outward) (lbf) | Factored Load | Calculated Moment (lbf-ft) | Equivalent Quarter-Point Load (lbf) | Required Proof Load (lbf) | Deflections (in.) | Pass/Fail |
|-----------|---|------------------------------------|---------------|----------------------------|-------------------------------------|---------------------------|-------------------|-----------|
| Outward | Individual Elements (over 4 in. x 4 in.) (most critical location) | 112 | 281 | - | - | 281 | 1.106 | Pass |
| | Vertical Uniform Load (per ft) | 103 | 257 | 535 | 524 | 1049 | 0.366 | Pass |
| | Horizontal Uniform Load (per ft) | 51 | 128 | 268 | 262 | 524 | 1.701 | Pass |
| | Midspan Horizontal Concentrated Load | 225 | 562 | - | - | 562 | 1.958 | Pass |
| | Top Rail Adjacent to Connection Concentrated Load | 225 | 562 | - | - | 562 | 2.082 | Pass |
| | Top of Post | 225 | 562 | - | - | 562 | 2.037 | Pass |

Ultimate Load: 639.5 lbs

| Direction | Test | Design Load (Inward/Outward) (kN) | Factored Load | Calculated Moment (kNm) | Equivalent Quarter-Point Load (kN) | Required Proof Load (kN) | Deflections (mm) | Pass/Fail |
|-----------|---|-----------------------------------|---------------|-------------------------|------------------------------------|--------------------------|------------------|-----------|
| Outward | Individual Elements (over 100 mm in. x 100 mm) (most critical location) | 0.5 | 1.25 | - | - | 1.25 | 28.1 | Pass |
| | Vertical Uniform Load (per m) | 1.5 | 3.75 | 0.73 | 2.33 | 4.67 | 9.3 | Pass |
| | Horizontal Uniform Load (per m) | 0.75 | 1.88 | 0.36 | 1.17 | 2.33 | 43.21 | Pass |
| | Midspan Horizontal Concentrated Load | 1 | 2.50 | - | - | 2.50 | 49.73 | Pass |
| | Top Rail Adjacent to Connection Concentrated Load | 1 | 2.50 | - | - | 2.50 | 52.89 | Pass |
| | Top of Post | 1 | 2.50 | - | - | 2.50 | 51.75 | Pass |



Test: **Loads on Guards - Inward** Project: G101539476
 Date: 14-Jan-15 Eng/Tech: Kevin Penner
 Client: Vista Railing Systems Inc. Blair Hendry
 Product: **Vista Frameless Railing System** Reviewer: Riccardo DeSantis
 Post Spacing: 4.083 ft 1.24 m
 Height of Guard: 42 in 1067 mm
 Opening in Guard: 2 in 51 mm
 Method: 2010 National Building Code of Canada, 4.1.5.14 Loads on Guards
 2012 Ontario Building Code, 4.1.5.14 Loads on Guards
 Safety Factor: 2.50
 Equipment: Artech 5000 lbf Load Cell (Intertek ID# P60691, cal due November 2015)
 Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due July 2015)
 Stopwatch (Intertek ID# P60624, cal due July 2015)
 Mitutoyo Digital Caliper (Intertek ID# P60005, cal due May 2015)
 Time/Temp/RH: 10:25AM / 23.0°C / 50.0%

| Direction | Test | Design Load (Inward/Outward) (lbf) | Factored Load | Calculated Moment (lbf-ft) | Equivalent Quarter-Point Load (lbf) | Required Proof Load (lbf) | Deflections (in.) | Pass/Fail |
|-----------|---|------------------------------------|---------------|----------------------------|-------------------------------------|---------------------------|-------------------|-----------|
| Inward | Individual Elements (over 4 in. x 4 in.) (most critical location) | 112 | 281 | - | - | 281 | 1.129 | Pass |
| | Vertical Uniform Load (per ft) | 103 | 257 | 535 | 524 | 1049 | 0.401 | Pass |
| | Horizontal Uniform Load (per ft) | 51 | 128 | 268 | 262 | 524 | 1.685 | Pass |
| | Midspan Horizontal Concentrated Load | 225 | 562 | - | - | 562 | 2.213 | Pass |
| | Top Rail Adjacent to Connection Concentrated Load | 225 | 562 | - | - | 562 | 2.204 | Pass |
| | Top of Post | 225 | 562 | - | - | 562 | 2.166 | Pass |

Ultimate Load: 622 lbs

| Direction | Test | Design Load (Inward/Outward) (kN) | Factored Load | Calculated Moment (kNm) | Equivalent Quarter-Point Load (kN) | Required Proof Load (kN) | Deflections (mm) | Pass/Fail |
|-----------|---|-----------------------------------|---------------|-------------------------|------------------------------------|--------------------------|------------------|-----------|
| Inward | Individual Elements (over 100 mm in. x 100 mm) (most critical location) | 0.5 | 1.25 | - | - | 1.25 | 28.67 | Pass |
| | Vertical Uniform Load (per m) | 1.5 | 3.75 | 0.73 | 2.33 | 4.67 | 10.19 | Pass |
| | Horizontal Uniform Load (per m) | 0.75 | 1.88 | 0.36 | 1.17 | 2.33 | 42.79 | Pass |
| | Midspan Horizontal Concentrated Load | 1 | 2.50 | - | - | 2.50 | 56.2 | Pass |
| | Top Rail Adjacent to Connection Concentrated Load | 1 | 2.50 | - | - | 2.50 | 55.99 | Pass |
| | Top of Post | 1 | 2.50 | - | - | 2.50 | 55.02 | Pass |

| | | | |
|-------------------|---|-----------|-------------------|
| Test: | Dimensional Checks | Project: | G101539476 |
| Date: | 14-Jan-15 | Eng/Tech: | Chris Chang |
| Client: | Vista Railing Systems Inc. | Reviewer: | Riccardo DeSantis |
| Product: | Vista Frameless Railing System | | |
| Post Spacing: | 4.083 ft | 1.24 | m |
| Height of Guard: | 42 in | 1070 | mm |
| Opening in Guard: | 2.5 in | 64 | mm |
| Method: | 2010 National Building Code of Canada 2012 Ontario Building Code 9.8.8.3 Height of Guards 9.8.8.5 Openings in Guards 9.8.8.6 Design of Guards to Not Facilitate Climbing / Guards Designed Not to Facilitate Climbing | | |
| Time/Temp./RH: | 10:25AM / 23.0°C / 50.0% | | |
| Equipment: | Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due July 2015) Tape Measure (Intertek ID# P60494, cal due August 2015) | | |

| Description | Measured Dimension (mm) | Requirement (mm) | Pass/Fail |
|----------------------------|-------------------------|------------------|-----------|
| 9.8.8.3 Height of Guards | 1070 | ≥ 1070 | Pass |
| 9.8.8.5 Openings in Guards | Under Bottom Rail | < 100 | Pass |

| Description | Result | Requirement | Pass/Fail |
|--|---|---|-----------|
| 9.8.8.6 Design of Guards to Not Facilitate Climbing / Guards Designed Not to Facilitate Climbing | No elements protruding from the vertical between 140 mm and 900 mm that facilitate climbing | No elements protruding from the vertical between 140 mm and 900 mm that facilitate climbing | Pass |

