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VISTA RAILING SYSTEMS INC.
TEST REPORT

SCOPE OF WORK
REPORT OF 4 FT. VISTA FRAMELESS 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
103705875COQ-001C

TEST DATES
12/11/18

ISSUE DATE
12/17/18

PAGES

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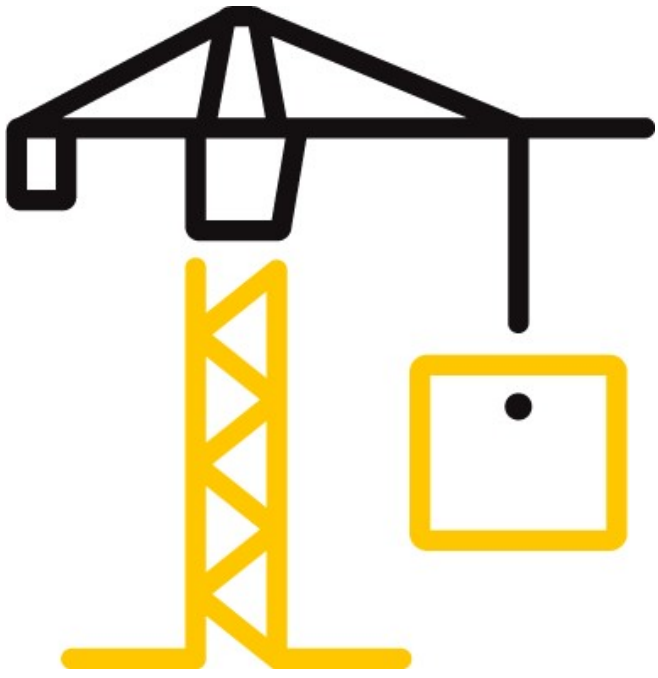
APPENDIX A	2 PAGES
APPENDIX B	2 PAGES
APPENDIX C	7 PAGES

DOCUMENT CONTROL NUMBER
GFT-OP-10c (AUGUST 27, 2018)



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TEST REPORT FOR VISTA RAILING SYSTEMS INC.
Report No.: 103705875COQ-001B
Date: 12/17/18

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 frameless 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:	12/17/18	**DATE:**	12/17/18

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TEST REPORT FOR VISTA RAILING SYSTEMS INC.
Report No.: 103705875COQ-001B
Date: 12/17/18

SECTION 2
SUMMARY OF TEST RESULTS

SYSTEM DESCRIPTION	TEST	PASS/FAIL
4 ft. Vista Frameless 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 November 5, 2018 (Coquitlam ID# VAN1811051245-001). 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

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
P60692	Artech 5k lb S-Type Load Cell	20210-5k	08/21/19
9-0176	Vaisala Temperature and Humidity Indicator	HMI 41/46	01/24/19
P60444	Extech Stopwatch	365515	06/26/19
52650	Mitutoyo 8 in. Digital Caliper	CD-8	05/23/19
P60016	Mitutoyo 2 in. Digital Deflection Gauge	C150 1050	02/01/19
P60020	Mitutoyo 2 in. Digital Deflection Gauge	C150 1050	02/01/19
P60022	Mitutoyo 2 in. Digital Deflection Gauge	C150 1050	02/01/19

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Chris Chang	Intertek B&C
Frank Gadea-Lopez	Intertek B&C

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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 4.0 for glass railing systems. 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 either 2.5 or 4.0. 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 either 500 lbs or 800 lbs was applied:

- horizontally at the mid-span of the top rail (800 lbs),
- horizontally at the top rail adjacent to the post connection to verify the connection capacity (800 lbs),
- horizontally at the top of the post (500 lbs),
- vertically at the mid-span of the top rail (800 lbs),
- vertically at the top rail adjacent to the post connection to verify the connection capacity (800 lbs), and
- vertically at the top of the post (500 lbs).

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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.

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, the sample was 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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TEST REPORT FOR VISTA RAILING SYSTEMS INC.
Report No.: 103705875COQ-001B
Date: 12/17/18

SECTION 8
TEST SPECIMEN DESCRIPTION

The sample was identified as the following:

Table 1. Railing Configuration[1]

Railing	Post	Post Spacing	Mounting Plate	Rails	In-fill
4 ft. Vista Frameless Glass Railing System	2-1/2 in. x 2-1/2 in.	49-1/2 in. (single bay)	4 in. x 4 in. x 3/8 in.	42-7/8 in. high	48 in. x 40 in. x 10 mm Laminated Glass

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 building official. 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.

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SECTION 9
TEST RESULTS

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

SECTION 10
CONCLUSION

The Vista Railing Systems Inc. 4 ft. Frameless 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)	Chris Chang, Frank Gadea-Lopez
Project No.	G103705875	Reviewer	Baldeep Sandhu
Models	4 ft. Framesless Glass Railing System	Start/End Date	December 11, 2018
Product Name	Vista Aluminum Railing Systems	Sample ID	VAN1811051245-001
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:	G103705875
Date:	11-Dec-18	Eng/Tech:	Chris Chang
Client:	Vista Railing Systems Inc.		Frank Gadea-Lopez
Product:	Vista Frameless Glass Railing System	Reviewer:	Baldeep Sandhu
Post Spacing:	4.10 ft 1.25 m	Location:	Coquitlam, BC, Canada
Effective Length:	60 in. 1.52 m		
Height of Guard:	42.125 in 1070 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 (Intertek ID# P60692, cal due August 21, 2019) Vaisala Temp/RH Indicator (Intertek ID# 9-0176, cal due January 24, 2019) Stopwatch (Intertek ID# P60444, cal due June 26, 2019) Mitutoyo Digital Caliper (Intertek ID# 52650, cal due May 23, 2019) Mitutoyo Digital Deflection Gauge (Intertek ID# P60016, cal due February 1, 2019) Mitutoyo Digital Deflection Gauge (Intertek ID# P60020, cal due February 1, 2019)		
Time/Temp/RH:	8:00AM / 22.0°C / 50.0%		

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	800	-	-	800	2.38	-	-	0.63	Max: 0.8235 in. Net: 0.4075 in.	Pass
Horizontal: Adjacent to Post Concentrated Load	200	800	-	-	800	-	3.51	-	-	0.134	Pass
Horizontal: Top of Post Concentrated Load	200	500	-	-	500	-	3.51	-	-	0.909	Pass
Vertical: Midspan Concentrated Load	200	800	-	-	800	-	-	0.63	-	0.0145	Pass
Vertical: Adjacent to Post Concentrated Load	200	800	-	-	800	-	-	-	-	-	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	3.56	-	-	3.56	60.5	-	-	15.88	Max: 20.9 mm Net: 10.4 mm	Pass
Horizontal: Adjacent to Post Concentrated Load	0.89	3.56	-	-	3.56	-	89.2	-	-	3.39	Pass
Horizontal: Top of Post Concentrated Load	0.89	2.22	-	-	2.22	-	89.2	-	-	23.08	Pass
Vertical: Midspan Concentrated Load	0.89	3.56	-	-	3.56	-	-	15.88	-	0.37	Pass
Vertical: Adjacent to Post Concentrated Load	0.89	3.56	-	-	3.56	-	-	-	-	-	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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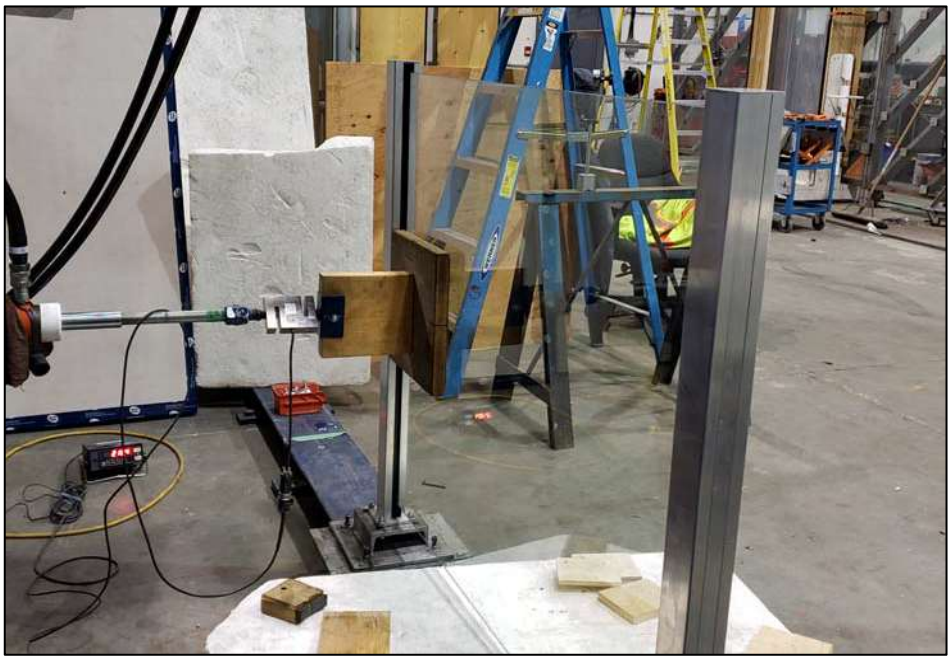

Figure 1. 4 ft. Vista Frameless Glass Railing System – In-Fill Load Test

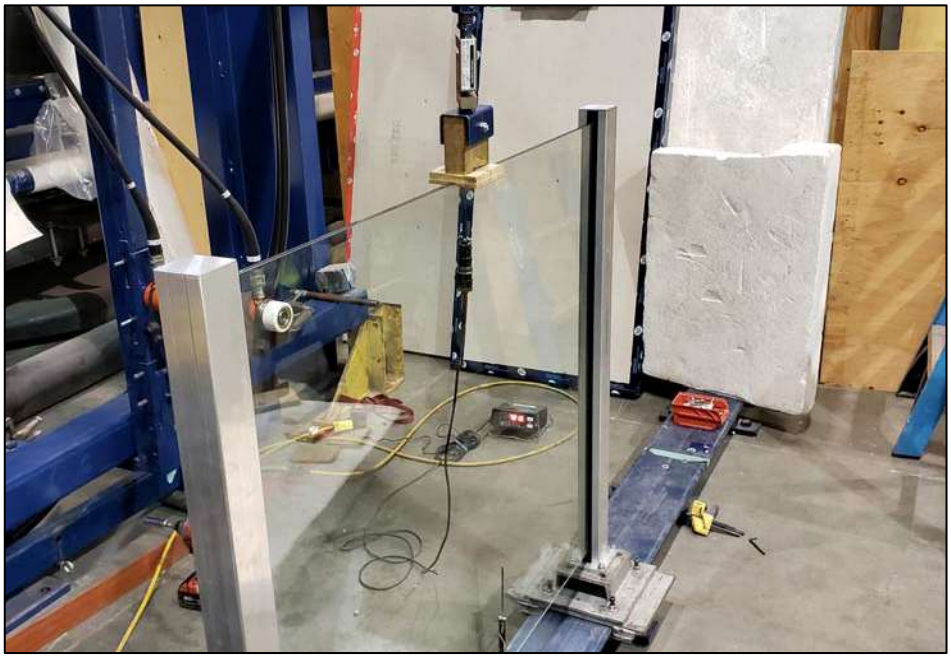

Figure 2. 4 ft. Vista Frameless Glass Railing System Vertical – Mid-Span of Top Rail Concentrated Load

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**Figure 3. 4 ft. Vista Frameless Glass Railing System
Horizontal – Mid-Span of Top Rail Concentrated Load**

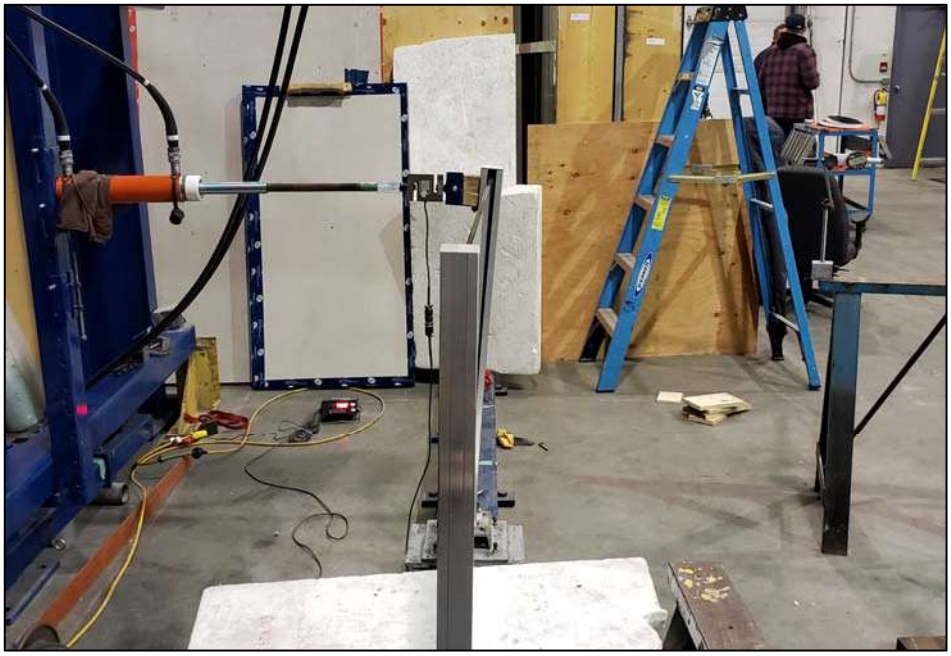

**Figure 4. 4 ft. Vista Frameless Glass Railing System
Horizontal – Top of Post Concentrated Loa**

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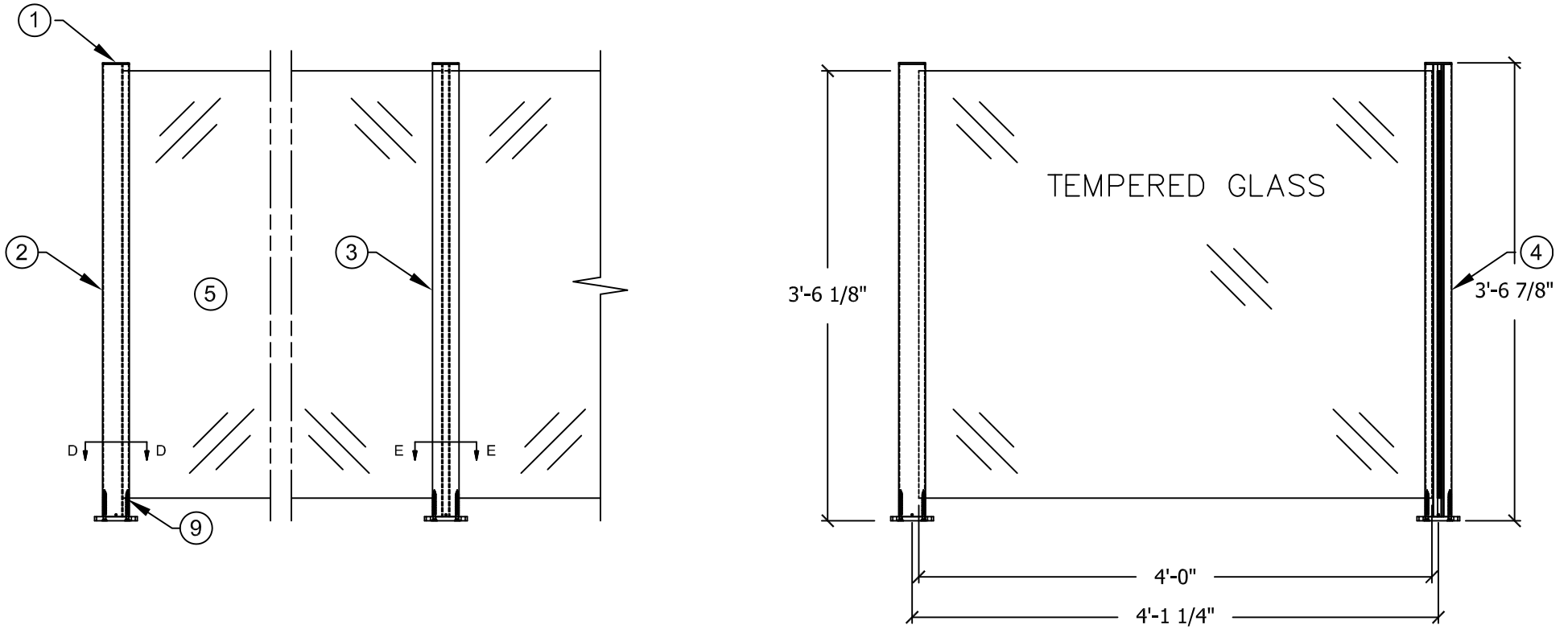
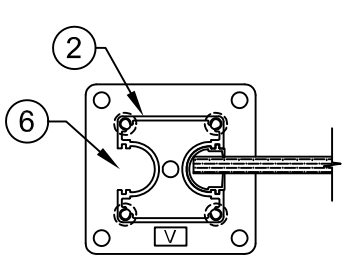
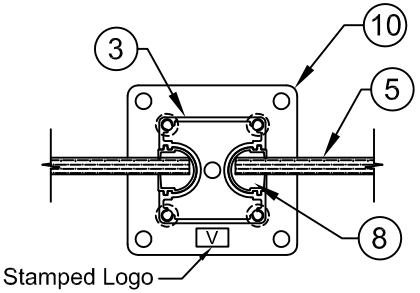
APPENDIX C – DRAWINGS (7 PAGES)

SCALE	DIMENSION UNITS		PRODUCT FAMILY	DRAWING #
Drawn: 1:1 Displayed: NTS	Inches	ASSEMBLY DRAWING	Vista	Frameless Railing

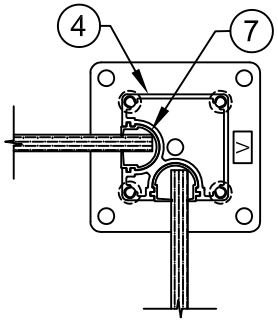




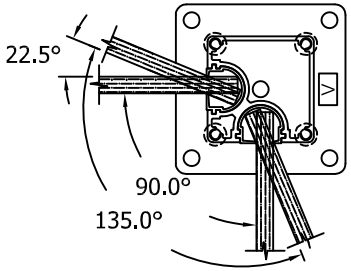
SECTION D-D
END POST



SECTION E-E
MID POST



SECTION D-D
CORNER POST



SECTION D-D
ANGLED POST

vista

No.	PART	BILL OF MATERIALS	QTY.	Cut Length	±	No.	PART	BILL OF MATERIALS	QTY.	Cut Length	±	No.	PART	BILL OF MATERIALS	QTY.	Cut Length	±
1	V????	2.5" Flat Cap	2	N/A	N/A	5	Misc.	48" x 40" 10mm Tempered Glass	1			9	V????	#14 x 3" Flat Head Screw			
2	PB7878	2.5" SQ Windscreen End Post	1	42.375"	N/A	6	V1313	Frameless Track	1	42.375"	N/A	10	V5213	4" SQ. 3/8" Base Plate			
3	PB7880	2.5" SQ Windscreen Line Post	1	42.375"	N/A	7	V1810	Glass Gasket	2	42.375"	0.020"	11					
4	PB7879	2.5" SQ Windscreen 90° Post	1	42.375"	N/A	8	V1811	Glass Setting Block	2	1.625"	0.008"	12					

DWN BY:
DATE: November 5, 2018
CKD BY: Name
PART NAME:
2.5" SQ Frameless Glass Railing
EST. WEIGHT. Lbs. N/A Kg. N/A

Cad File
Frameless Glass Railing