



OFFICIAL TEST REPORT

(FBC, IBC: 2012, ANSI Z97.1, ASTM E2353 – E2358, ASTM E330,)

Q-LINE[®] POST SYSTEM

TOP MOUNT MOD 0917.448

+/- 50 psf wind pressure (design load)

MOD 24 with Glass: Laminated and tempered glass – 4,7mm/.06PVB/4,7mm

MOD 28 with Glass: Laminated and tempered glass – 4,7mm/.06SGP/4,7mm



LAMINATED GLASS RAILING WITH POST
FBC 2014 (Interior and Exterior)
International Building Code 2015 (Interior and Exterior)
National Building Code of Canada 2015 (Interior and Exterior)

May 2, 2017

REPORT NUMBER: **HETI-16-5089**

MANUFACTURER: Q-railing Europe GmbH & Co. KG
Max-Planck-Str. 7, 46446 Emmerich am Rhein, Germany

TEST LOCATION: Hurricane Engineering & Testing Inc.
6120 NW 97th Avenue, Doral, Florida, 33178

NOTIFICATION NUMBER: HETI16001 (MIAMI-DADE COUNTY, FLORIDA)

LAB. CERTIFICATION No.: 15-1216.04 (MIAMI-DADE COUNTY, FLORIDA)

IAS. CERTIFICATION No.: TL-296 (ISO 17025-05)

FBC ORGANIZATION No: TST1691

FBPE Certificate of Authorization Number: 6905

PRODUCT: 1.9" Double Tube Post Top Mount Model 24 Clamps

PRODUCT SIZE: 149 wide x 42 3/4" high

TEST SUBSTRATUM: Concrete Compressive strength 4030 PSI, HETI-16-C100.

DRAWING NO.: 16-5089 by Q-Railing, consisting of 3 pages dated 4/27/ 2017.
16-5090 by Q-Railing, consisting of 3 pages dated 4/27/ 2017.

DESIGN LOADS (psf): **HETI 16-5089 - +50, -50; 1/4" /0.060PVB/ 1/4" Glass Clamp Model 24**
HETI 16-5090 - +50, -50; 1/4" /0.060SGP/ 1/4" Glass Clamp Model 24

TEST WITNESSED BY: Syed Waqar Ali, Ph. D. (HETI)
Dr. Nasreen K Ali, E. I. (HETI)
Mr. Eugenio Rivera (HETI)
Mr. Paul Dructor (Manufacturer)
Mr. Rafael E. Droz-Seda, P.E. (HETI)



(Interior View)

Testing Standards (Interior and Exterior Application):

1. Florida Building Code (FBC) 2014, including High Velocity Hurricane Zone (HVHZ).
2. International Building Code (IBC) 2015, and as per ICC-ES Acceptance Criteria AC439.
3. National Building Code of Canada (NBC) 2015.

Testing Sequence (All tests performed on a single specimen):

1. Infill concentrated load test on 4"x4" and 12" x 12" squares.
2. Uniform Static Air Pressure Test as per TAS 202 & ASTM E330 as Section 1609 of FBC 2014 and IBC 2015 section 1609 with a safety factor of two.
3. Lateral and Downward Loads Test as per FBC/IBC Section 1618.4.6 and Section 1625 and ASTM E935-00 (Re-approved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010) and Section 3.3 and 9.8 of NBC.
4. Horizontal and Vertical Loading per IBC/FBC section 2407.1.2 and ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010) and AC439 Section 4.3 with a safety factor of four.
5. ANSI Z97.1-1984 (R1994) Sec 5 for Class A 1618.4.6 & CPSC 16 CFR Part 1201 for Class II as per Section 1618.4.6 & 2407.1.4.1 of FBC 2014.
6. Safety Glazing Testing as per ASTM E2353-14 Section 13.3.6.2 (Type V).

CONSTRUCTION DETAILS**SPECIMEN SELECTION AND IDENTIFICATION**

Number of Specimens	1
Method of Choosing	Provided by Manufacturer
Size of Specimen	149" wide x 42 ¾" high
Configuration	Fixed
Post to Post Distance	48"
Hand Rail	Top rail was installed

COMPONENTS & HARDWARE

Drawing No.	Description	Overall Dimension (in)	Maximum Thickness (in)	Material	Quantity
14.0900.038.12	Top Rail	1.49	0.075	316 S.S.	1
14.0711.238.12	Top Rail Bracket	2.56 x 1.91 x 4.75	0.547	316 S.S.	4
13.2400.000.12	Clamp Model 24	1.59 x 2.42 x 2.76	0.330	304 S.S.	12
14.0917.448.12	Steel Post	1.90	0.075	316 S.S.	4
	Steel Post Insert	1.73	0.075	2205	4
	Steel Post Base	4.11 x 0.85	0.512	316 S.S.	4

Glazing Material

HETI 16-5089: Laminated glass (NOA) 14.0916.10 by Kuraray America, Inc. consisted of:

- ¼" nominal (0.227" actual) Tempered Glass
- 0.060" Interlayer Butacite (PVB) by Kuraray America, Inc.
- ¼" nominal (0.227" actual) Tempered Glass
- ½" nominal (0.514" actual) total thickness

HETI 16-5090: Laminated glass (NOA) 14-0916.11 by Kuraray America, Inc. consisted of:

- ¼" nominal (0.228" actual) Tempered Glass
- 0.060" Interlayer SentryGlas® by Kuraray America, Inc.
- ¼" nominal (0.228" actual) Tempered Glass
- ½" nominal (0.516" actual) total thickness

Glazing Material Fabricator TechnoGlass

Glass Size and Quantity

(3) 44 ½" wide x 36" high

DLO:

(3) 44 ½" wide x 36" high

Glazing Method

The glass was leveled and installed onto each post using (2) glass clamps with gaskets. The sample was tested using glass clamp model 24, and each clamp was secured tightly to the glass using (2) 6mm x 20mm Flat Hex Socket Cap Screws and a gasket set. The gasket set for the model 24 clamps were part no. 19.5007.013.00. The glass was secured with a distance of 2" from the top of the substrate to the bottom of the glass lite. The glass clamps had a minimum glass bite of 1 ½".

Substrate

4030 PSI Concrete.

Installation

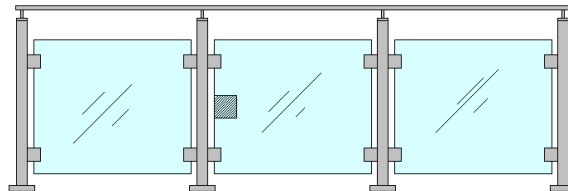
The (4) posts, 38" in length including the base, were installed onto the concrete substrate with a minimum edge distance of 3 3/8" from the edge using (3) ½" x 5" masonry anchors, part no. 19.4310.125.12, with Red Head EPCONA7 Screw Epoxy per post. Glass clamps were attached to each post using (1) 8mm x 19mm Standard Hex Socket Cap Screw, part no. 94.0680.820.14, which attached to a prefabricated threaded hole in the post. The clamps were located on each post at 8" and 32" from the bottom of the steel post base. The two exterior posts used (2) clamps while the two interior posts used (4) clamps. Each post was capped and glued with a saddle using Q-Railing glue, part no. 19.1331.000.00. The top rail was attached to the saddle using (2) 5mm x 15 mm Button Hex Socket Cap Screws.

INSTRUMENTATION

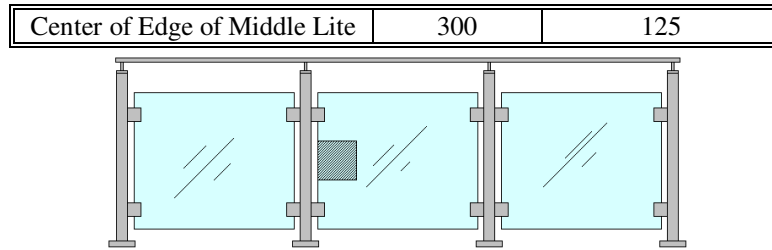
1. Digital Deflection Gauge System: HETI - 0311 and HETI - 1060
2. Manual Hydraulic Pump and Cylinder
3. Force Measurement System: HETI - 0182 and HETI - 0850
4. Test Wall System B, Pressure Transducer HET I- 0357
5. Test Wall System B, Deflection Gage HETI – 0172

TEST RESULTS (16-5089)**4" Infill Test (Lateral Load)****Test Date:** August 23, 2016

Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	112.4
Center of Edge of Middle Lite	300	187

**12" Infill Test (Lateral Load)****Test Date:** August 23, 2016

Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	50



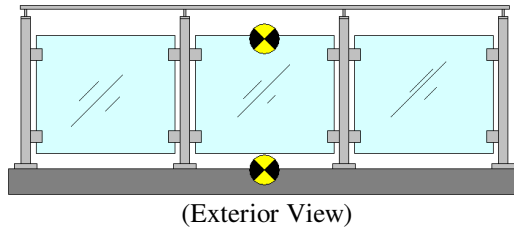
Uniform Static Air Pressure Test as per TAS 202 & ASTM E330

Uniform Static Air Pressure Test Results (HETI-16-5089)

Test Date: August 23, 2016

	Pressure (psf)	Def. Loc #1 (In)	Def. Loc #2 (In)	Set Loc1/Loc 2 (In)	Recovery Loc 1 (%)	Duration (sec)
Positive Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	+ 50	1.59	0.07	0.00/0.04	100	30
Test Load	+100	2.95	0.06	0.34/0.02	89	30
Negative Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	- 50	1.83	0.11	0.00/0.06	100	30
Test Load	-100	4.02	0.26	0.00/0.01	94	30

Uniform Load Test was performed with ASTM E330-14 test method. See Figure for Loc1 & Loc2.



Horizontal and Vertical Loading per ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010), FBC 2014 Section 1618.4.6 & 2407.1.2.

Loading Procedure:

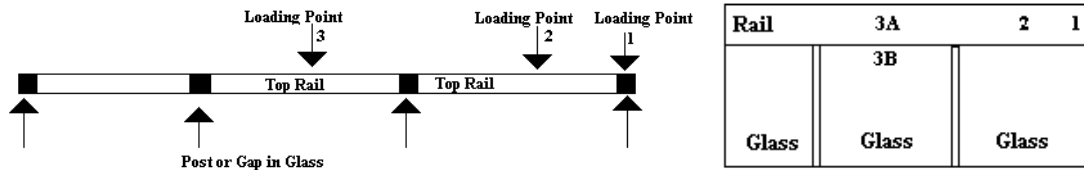
1. Apply 50% of the maximum load.
 2. Apply Maximum load in increments of 15%.
 - a. Each increment held for 60 seconds.
 - b. Record the deflection at start and end of 120 seconds period.
- Rate of loading shall be 5.0 mm per minutes to the desired load if possible.

Test Date: August 24, 2016 (16-5089)

Horizontal Load Application											
	Force (lbs)	Time (Sec)	Loc #1			Loc #2			Loc #3A		
			Deflection (in)		Set (in)	Deflection (in)		Set (in)	Deflection (in)		Set (in)
			Start	End		Start	End		Start	End	
From Interior	200	300	0.000	0.071	0.04				0.000	0.71	0.06
	400	300	0.000	1.69	0.16				0.000	1.42	0.10
	500	60	0.000	1.96	0.15				0.000	1.77	0.11
	500 (3B)	60							0.000	1.17	0.05
Ext Side	103	60							0.000	0.447	0.091
	172	60							0.000	0.660	0.034

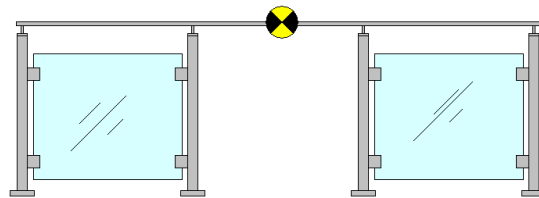
Vertical Load Application									
Top Rail	50	300	0.000	0.006	0.000		0.000	0.028	0.000
	100	300	0.000	0.013	0.000		0.000	0.050	0.000
	130	60	0.000	0.016			0.000	0.063	
	160	60	0.018	0.020			0.075	0.078	
	190	60	0.021	0.022			0.090	0.091	
	200	60	0.022	0.023	0.000		0.095	0.098	0.000
	687	60	0.000	0.059	0.013		0.000	0.376	0.020

Horizontal and Vertical Loading Points:



Horizontal and Vertical Loading per ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010) Level 2/ Type L-2

Description of Location	Duration (sec)	Force Applied (lbs)
Horiz. Center of Top Rail	60	125
Vert. Center of Top Rail	60	172
Center Glass was removed prior to applying load. Railing and Glass were intact and no damaged was observed.		



Safety Glazing Testing as per ANSI Z97.1-1984 (R1994)

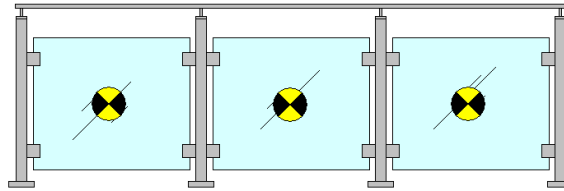
TEST PROCEDURE

The test specimen as described in construction details was tested. The sample was impacted at center of each glass with a 100-pound lead Impactor. The Impactor was constructed as specified in ANSI Z97.1-1984 (R1994). The drop height and test results are summarized in table below.

TEST RESULTS (16-5089)

Test Date: August 24, 2016

No.	Drop Height (in)	Results
Center of Left Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.
Center of Middle Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.
Center of Right Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Back glass lite shattered. Glass panel stayed intact.



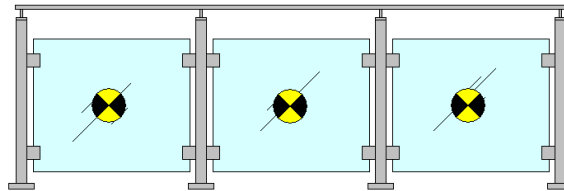
☢ - Impact Locations (interior view)

Steel Nose Pendulum Impact Test as per ASTM E2353-14, Section 13.4

TEST RESULTS (HETI-16-5089)

Test Date: August 25, 2016

Location	Horizontal Impact Energy (ft-lbf)	Results
Center of Left Glass Lite	74	Glass was intact and no damaged was observed.
Center of Middle Glass Lite	74	Glass was intact and no damaged was observed.
Center of Right Glass Lite	74	Glass was intact and no damaged was observed.



☢ - Impact Locations (interior view)

ADDITIONAL GLASS TESTING

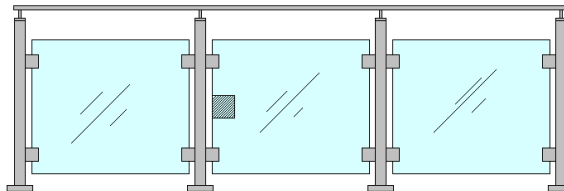
After the first sample was tested with 1/4"/0.060PVB/ 1/4" glass (Reference Test HETI-16-5089) with glass clamp model 24, the glass was changed to 1/4"/0.060SGP/ 1/4" glass (Reference Test HETI-16-5090) with glass clamp model 24. All glass specific testing was repeated on the same frame sample with the new glass and original glass clamps installed. The following test results are with the 1/4"/0.060SGP/ 1/4" glass with glass clamp 24.

TEST RESULTS

4" Infill Test (Lateral Load) (16-5090)

Test Date: August 25, 2016

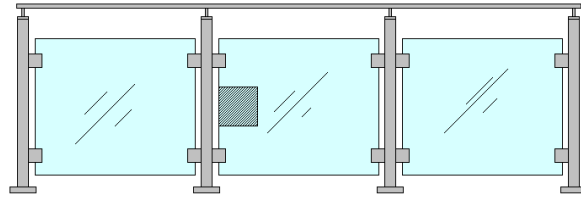
Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	112.4
Center of Edge of Middle Lite	300	187



12" Infill Test (Lateral Load) (16-5090)

Test Date: August 25, 2016

Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	50
Center of Edge of Middle Lite	300	125



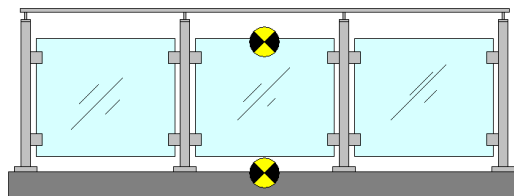
Uniform Static Air Pressure Test as per TAS 202 & ASTM E330

Uniform Static Air Pressure Test Results (HETI-16-5090)

Test Date: August 25, 2016

	Pressure (psf)	Def. Loc #1 (In)	Def. Loc #2 (In)	Set Loc1/Loc 2 (In)	Recovery Loc 1 (%)	Duration (sec)
Positive Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	+ 50	1.61	0.15	0.16/0.08	90	30
Test Load	+100	3.19	0.22	0.32/0.02	90	30
Negative Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	- 50	1.23	0.04	0.11/0.01	91	30
Test Load	-100	2.54	0.06	0.30/0.02	88	30

Uniform Load Test was performed with ASTM E330-14 test method. See Figure for Loc1 & Loc2.



(Exterior View)

Safety Glazing Testing as per ANSI Z97.1-1984 (R1994)

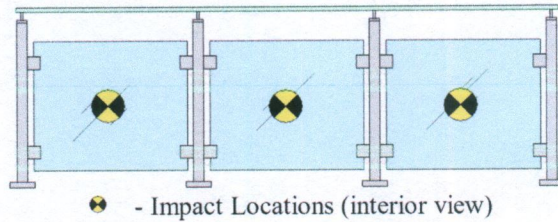
TEST PROCEDURE

The test specimen as described in construction details was tested. The sample was impacted at center of each glass with a 100-pound lead Impactor. The Impactor was constructed as specified in ANSI Z97.1-1984 (R1994). The drop height and test results are summarized in table below.

TEST RESULTS (16-5090)

Test Date: August 25, 2016

No.	Drop Height (in)	Results
Center of Left Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.
Center of Middle Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.
Center of Right Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.

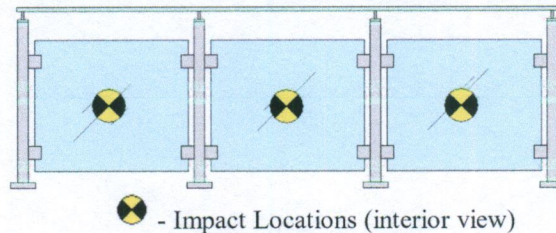


Steel Nose Pendulum Impact Test as per ASTM E2353-14, Section 13.4

TEST RESULTS (HETI-16-5090)

Test Date: August 25, 2016

Location	Horizontal Impact Energy (ft-lbf)	Results
Center of Left Glass Lite	74	Glass was intact and no damaged was observed.
Center of Middle Glass Lite	74	Glass was intact and no damaged was observed.
Center of Right Glass Lite	74	Glass was intact and no damaged was observed.



CONCLUSION

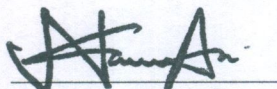
The test sample represented intended construction as indicated in the marked drawing. The sample was tested and passed the requirements in accordance with provisions of FBC 2014, IBC 2015, for interior and exterior application for all zones, and National Building Code of Canada 2015. For interior and exterior application as per acceptance criteria AC439, and ASTM standards as described in this report.


The sample railing was intact and all hardware parts were securely in place at the conclusion of each test. All tests were first performed on a single sample without glass or hardware replacement, subsequently additional glass compositions were qualified by performing glass specific tests with different glass but using the same hardware as indicated in the report with reference test number HETI-16-5090.

NOTE: The above results were obtained using the designated test methods, which indicates compliance with the performance requirements of the referenced specifications. This report does not constitute certification of the specimens tested. The Test records are maintained for a period of ten years and selected sample sections are maintained for a period of five year, and therefore this report will expire after ten year of test date.

STATEMENT OF INDEPENDENCE

The Hurricane Engineering & Testing, Inc., does not have, nor does it intend to acquire or will acquire, a financial interest in any company manufacturing or distributing products tested or labeled by the Hurricane Engineering & Testing, Inc. Hurricane Engineering & Testing, Inc., is not owned, operated or controlled by any company manufacturing or distributing products it test or labels.


Dr. Nasreen K. Ali
Vice President


Mr. Rafael E. Droz-Seda, P.E.
Resident Engineer

14.0900.038.12	TOP RAIL
14.0900.038.12	SADDLE
14.0900.038.12	GASKET
19.5001.013.00	CLAMP
13.2400.000.12	STEEL POST
14.0917.448.12	STEEL POST
19.4310.125.15	5/8" REBAR
19.4310.125.15	5/8" MASONRY SCREW
14.0900.038.12	TOP RAIL
14.0900.038.12	SADDLE
14.0900.038.12	GASKET
19.5001.013.00	CLAMP
13.2400.000.12	STEEL POST
14.0917.448.12	STEEL POST
19.4310.125.15	5/8" REBAR
19.4310.125.15	5/8" MASONRY SCREW

1.9" DOUBLE TUBE POST
GLASS CLAMP MODEL 24
1/4" T | 0.060PV B | 1/4" T

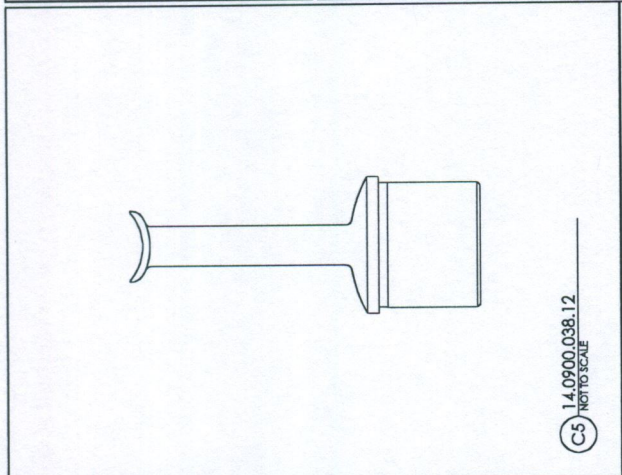
Q-rating

MARBLE CHISEL TRAPEZOID
D-4444
EMERICH OHN RHEIN
GERMANY
+49 (0) 2822 21 59-0
+49 (0) 2822 21 59-10

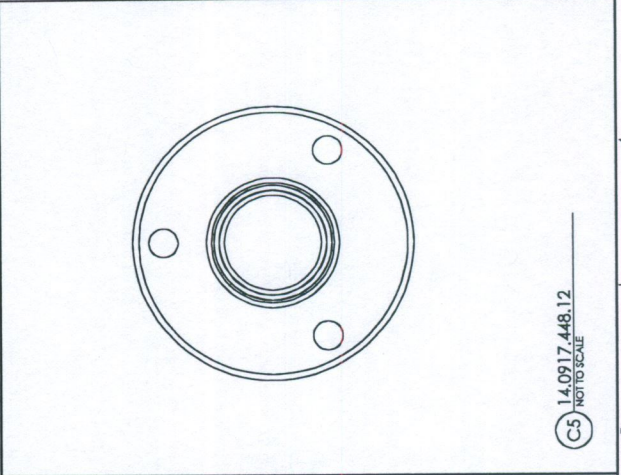
DATE: 04.08.2014
SCALE: 1:1
DRAWN BY: J.M.
CHECKED BY: J.M.
APPROVED BY: J.M.

DRAWING NUMBER
16-5089

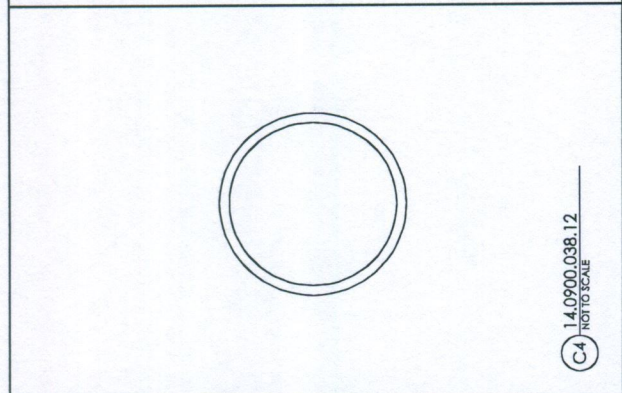
SHEET NUMBER
1 OF 3



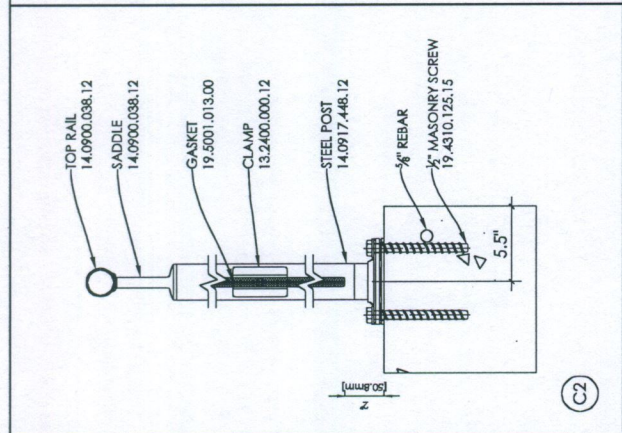
C5 14.0900.038.12
NOT TO SCALE



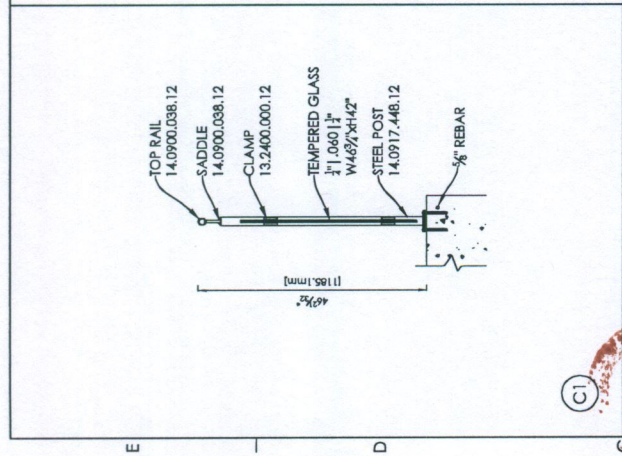
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NOT TO SCALE



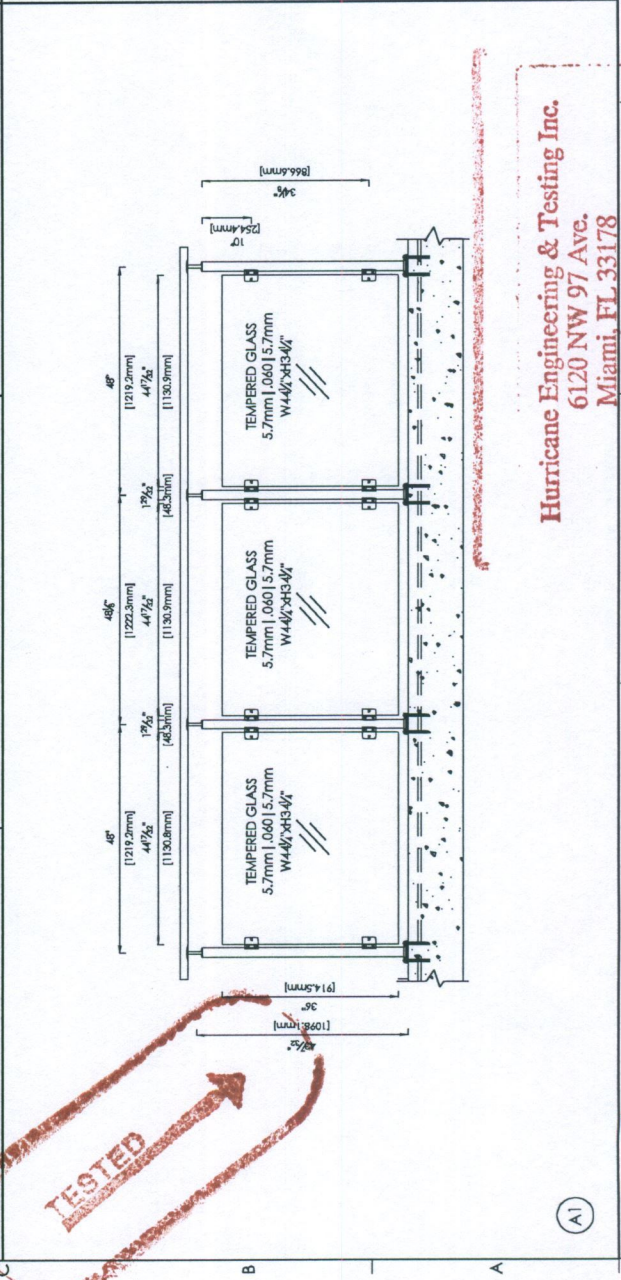
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C2



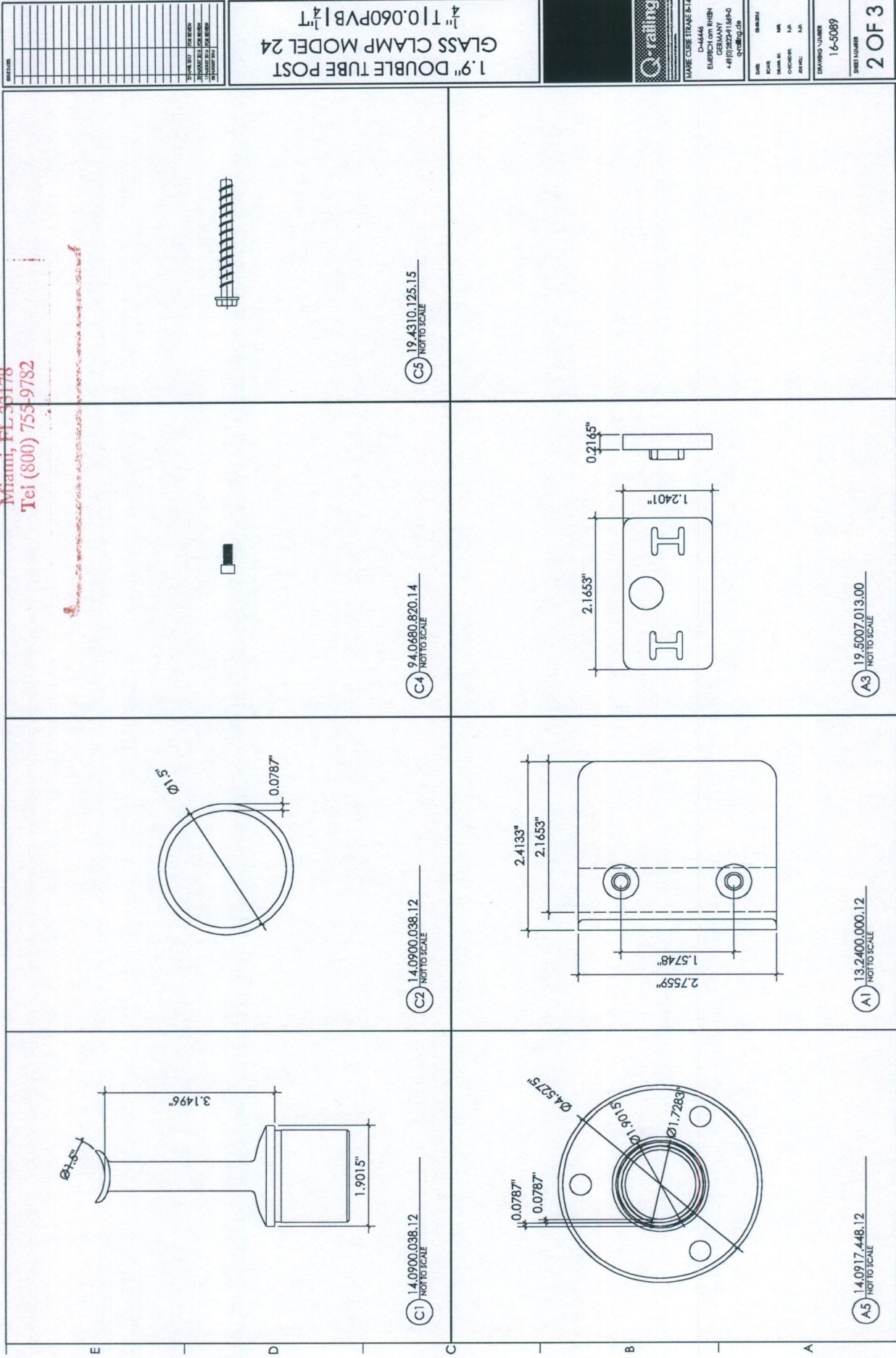
C1



A1

Hurricane Engineering & Testing Inc.
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LAMINATED GLASS RAILING WITH POST
FBC 2014 (Interior and Exterior)
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National Building Code of Canada 2015 (Interior and Exterior)

May 2, 2017

REPORT NUMBER: **HETI-16-5091**

MANUFACTURER: Q-railing Europe GmbH & Co. KG
Max-Planck-Str. 7, 46446 Emmerich am Rhein, Germany

TEST LOCATION: Hurricane Engineering & Testing Inc.
6120 NW 97th Avenue, Doral, Florida, 33178

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IAS. CERTIFICATION No.: TL-296 (ISO 17025-05)

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FBPE Certificate of Authorization Number: 6905

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DESIGN LOADS (psf): **+ 50, - 50**

TEST WITNESSED BY: Syed Waqar Ali, Ph. D. (HETI)
Dr. Nasreen K Ali, E. I. (HETI)
Mr. Eugenio Rivera (HETI)
Mr. Paul Dructor (Manufacturer)
Mr. Rafael E. Droz-Seda, P.E. (HETI)



(Exterior View)

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4. Horizontal and Vertical Loading per IBC/FBC section 2407.1.2 and ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010) and AC439 Section 4.3 with a safety factor of four.
5. ANSI Z97.1-1984 (R1994) Sec 5 for Class A 1618.4.6 & CPSC 16 CFR Part 1201 for Class II as per Section 1618.4.6 & 2407.1.4.1 of FBC 2014.
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CONSTRUCTION DETAILS**SPECIMEN SELECTION AND IDENTIFICATION**

Number of Specimens	1
Method of Choosing	Provided by Manufacturer
Size of Specimen	149" wide x 42 ¾" high
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Post to Post Distance	48"
Hand Rail	Top Rail was installed

COMPONENTS & HARDWARE

Drawing No.	Description	Overall Dimension (in)	Maximum Thickness (in)	Material	Quantity
14.0900.038.12	Top Rail	1.49	0.075	316 S.S.	1
14.0711.238.12	Top Rail Bracket	2.56 x 1.91 x 4.75	0.547	316 S.S.	4
13.2800.000.12	Clamp Model 28	1.38 x 1.77 x 2.66	0.225	304 S.S.	12
14.0917.448.12	Steel Post	1.90	0.075	316 S.S.	4
	Steel Post Insert	1.73	0.075	2205	4
	Steel Post Base	4.11 x 0.85	0.512	316 S.S.	4

Note: S.S. – Stainless Steel

Glazing Material Laminated glass (NOA) 14-0916.11 by Kuraray America, Inc. consisted of:

- ¼" nominal (0.228" actual) Tempered Glass
 - 0.060" Interlayer SentryGlas® by Kuraray America, Inc.
 - ¼" nominal (0.228" actual) Tempered Glass
- ½" nominal (0.516" actual) total thickness

Glazing Material Fabricator TechnoGlass

Glass Size and Quantity (3) 44 ½" wide x 36" high

DLO: (3) 44 ½" wide x 36" high

Glazing Method The glass was leveled and installed onto each post using (2) glass clamps with gaskets. The sample was tested using glass clamp model

28, and each clamp was secured tightly to the glass using (2) 6mm x 20mm Flat Hex Socket Cap Screws and a gasket set. The gasket set for the model 28 clamps were part no. 19.5001.013.00. The glass was secured with a distance of 2" from the top of the substrate to the bottom of the glass lite. The glass clamps had a minimum glass bite of 1 ½".

Substrate

4030 PSI Concrete.

Installation

The (4) posts, 38" in length including the base, were installed onto the concrete substrate with a minimum edge distance of 3 3/8" from the edge using (3) ½" x 5" masonry anchors, part no. 19.4310.125.12, with Red Head EPCONA7 Screw Epoxy per post. Glass clamps were attached to each post using (1) 8mm x 19mm Standard Hex Socket Cap Screw, part no. 94.0680.820.14, which attached to a prefabricated threaded hole in the post. The clamps were located on each post at 8" and 32" from the bottom of the steel post base. The two exterior posts used (2) clamps while the two interior posts used (4) clamps. Each post was capped and glued with a saddle using Q-Railing glue, part no. 19.1331.000.00. The top rail was attached to the saddle using (2) 5mm x 15 mm Button Hex Socket Cap Screws.

INSTRUMENTATION

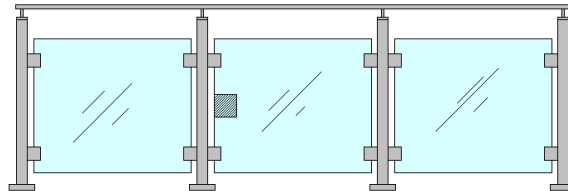
1. Digital Deflection Gauge System: HETI - 0311 and HETI - 1060
2. Manual Hydraulic Pump and Cylinder
3. Force Measurement System: HETI - 0182 and HETI - 0850
4. Test Wall System B, Pressure Transducer HET I- 0357
5. Test Wall System B, Deflection Gage HETI – 0172

TEST RESULTS

4" Infill Test (Lateral Load)

Test Date: August 26, 2016

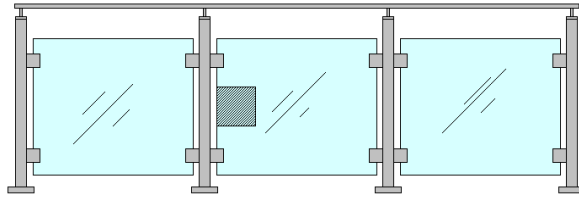
Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	112.4
Center of Edge of Middle Lite	300	187



12" Infill Test (Lateral Load)

Test Date: August 26, 2016

Description of Location	Duration (sec)	Force Applied (lbs)
Center of Edge of Middle Lite	300	50
Center of Edge of Middle Lite	300	125



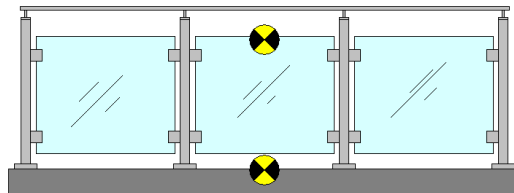
Uniform Static Air Pressure Test as per TAS 202 & ASTM E330

Uniform Static Air Pressure Test Results

Test Date: August 26, 2016

	Pressure (psf)	Def. Loc #1 (In)	Def. Loc #2 (In)	Set Loc1/Loc 2 (In)	Recovery Loc 1 (%)	Duration (sec)
Positive Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	+ 50	1.52	0.15	0.06/0.06	96	30
Test Load	+100	2.62	0.12	0.33/0.04	88	30
Negative Pressure						
Half Test Load	---	---	---	---	---	---
Design Load	- 50	1.75	0.08	0.17/0.02	90	30
Test Load	-100	3.80	0.40	0.65/0.01	83	30

Uniform Load Test was performed with ASTM E330-14 test method. See Figure for Loc1 & Loc2.



(Exterior View)

Horizontal and Vertical Loading per ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010), FBC 2014 Section 1618.4.6 & 2407.1.2.

Loading Procedure:

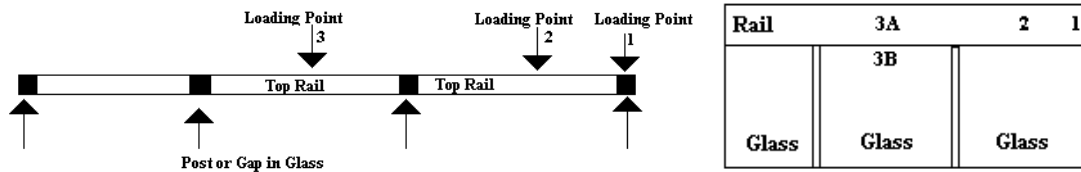
1. Apply 50% of the maximum load.
 2. Apply Maximum load in increments of 15%.
 - a. Each increment held for 60 seconds.
 - b. Record the deflection at start and end of 120 seconds period.
- Rate of loading shall be 5.0 mm per minutes to the desired load if possible.

Test Date: August 26, 2016

Horizontal Load Application											
	Force (lbs)	Time (Sec)	Loc #1			Loc #2			Loc #3A		
			Deflection (in)		Set (in)	Deflection (in)		Set (in)	Deflection (in)		Set (in)
			Start	End		Start	End		Start	End	
From Interior	200	300	0.00	0.96	0.27				0.000	0.71	0.00
	400	300	0.00	1.97	0.60				0.000	1.44	0.09
	500	60	0.00	2.08	0.30				0.000	1.86	0.19
	500 (3B)	60							0.000	1.30	0.02
Ext Side	103	60				0.000	0.345	0.03			
172	60	0.000				0.682	0.06				
	Vertical Load Application										
To p	50	300	0.000	0.007	0.000				0.000	0.025	0.000
	100	300	0.000	0.011	0.000				0.000	0.047	0.000

	130	60	0.000	0.016					0.000	0.059	
	160	60	0.018	0.018					0.069	0.072	
	190	60	0.020	0.021					0.087	0.088	
	200	60	0.022	0.022	0.003				0.090	0.091	0.003
	687	60	0.000	0.035	0.016	0.000	0.330	0.003			

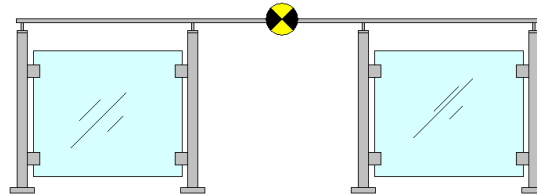
Horizontal and Vertical Loading Points:



Horizontal and Vertical Loading per ASTM E935-00 (Reapproved 2006) Sec. 4.3 (AC 439) and ASTM E2358-04 (Reapproved 2010) Level 2/ Type L-2

Test Date: August 26, 2016

Description of Location	Duration (sec)	Force Applied (lbs)
Horiz. Center of Top Rail	60	125
Vert. Center of Top Rail	60	172
Center Glass was removed prior to applying load. Railing and Glass were intact and no damaged was observed.		



Safety Glazing Testing as per ANSI Z97.1-1984 (R1994)

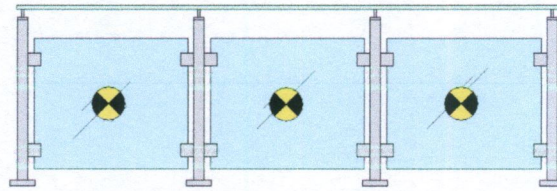
TEST PROCEDURE

The test specimen as described in construction details was tested. The sample was impacted at center of each glass with a 100-pound lead Impactor. The Impactor was constructed as specified in ANSI Z97.1-1984 (R1994). The drop height and test results are summarized in table below.

TEST RESULTS

Test Date: August 26, 2016

No.	Drop Height (in)	Results
Center of Left Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Both glass lites shattered. Glass panel stayed intact.
Center of Middle Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Glass was intact and no damaged was observed.
Center of Right Glass Lite		
1	12	Glass was intact and no damaged was observed.
2	18	Glass was intact and no damaged was observed.
3	48	Back glass lite shattered. Glass panel stayed intact.



- Impact Locations (interior view)

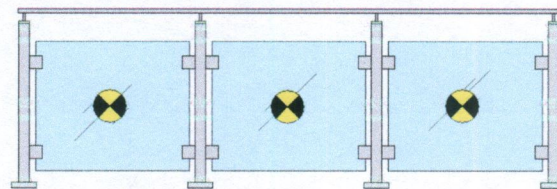
Steel Nose Pendulum Impact Test as per ASTM E2353-14, Section 13.4

TEST RESULTS

Test Date: August 26, 2016

Location	Horizontal Impact Energy (ft-lbf)	Results
Center of Left Glass Lite	74	Glass was intact and no damaged was observed.
Center of Middle Glass Lite	74	Glass was intact and no damaged was observed.
Center of Right Glass Lite	74	Glass was intact and no damaged was observed.

***Prior to test, all damaged glass was replaced.**



- Impact Locations (interior view)

CONCLUSION

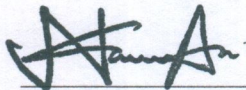
The test sample represented intended construction as indicated in the marked drawing. The sample was tested and passed the requirements in accordance with provisions of FBC 2014, IBC 2015, for interior and exterior application for all zones, and National Building Code of Canada 2015. For interior and exterior application as per acceptance criteria AC439, and ASTM standards as described in this report.

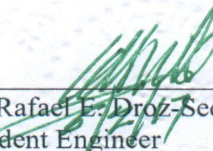
The sample railing was intact and all hardware parts were securely in place at the conclusion of each test, except the steel nose pendulum impact test as per ASTM E2353-14, Section 13.4 were performed with the glass replaced with same type of glass.

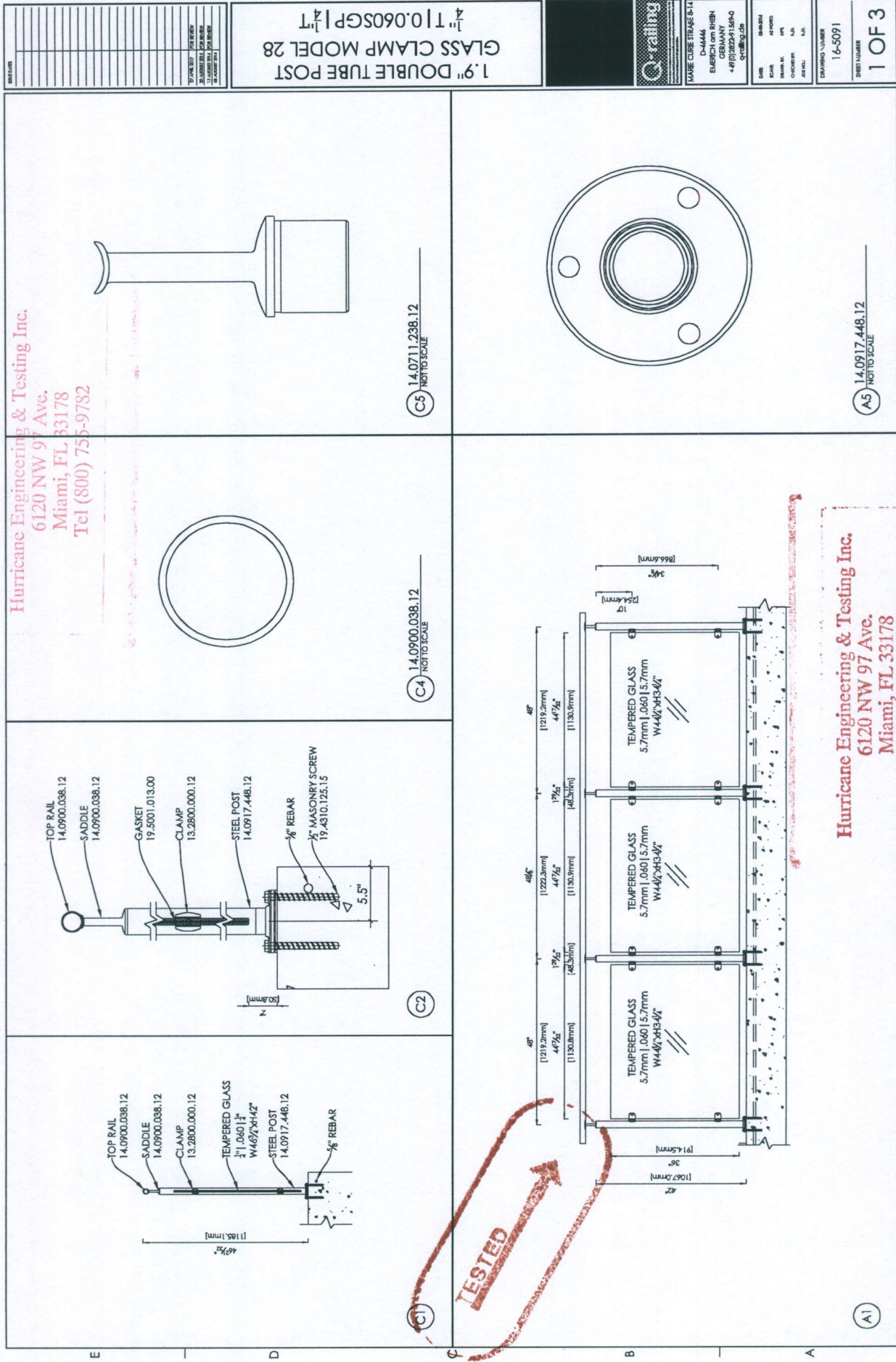
NOTE: The above results were obtained using the designated test methods, which indicates compliance with the performance requirements of the referenced specifications. This report does not constitute certification of the specimens tested. The Test records are maintained for a period of ten years and selected sample sections are maintained for a period of five year, and therefore this report will expire after ten year of test date.

STATEMENT OF INDEPENDENCE

The Hurricane Engineering & Testing, Inc., does not have, nor does it intend to acquire or will acquire, a financial interest in any company manufacturing or distributing products tested or labeled by the Hurricane Engineering & Testing, Inc. Hurricane Engineering & Testing, Inc., is not owned, operated or controlled by any company manufacturing or distributing products it test or labels.


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TESTED

