



ASTM E985 TEST REPORT

GR2460 Base Shoe, PG2460 Pad, and PGISO60 Isolator

Rendered to:
R&B Wagner, Inc.
10600 W Brown Deer Rd
Milwaukee, WI 53224

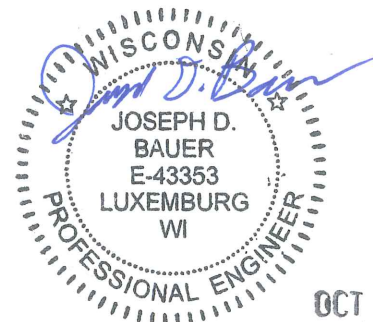
Report Number: R17-09-262
Set-up Date: 09/28/2017
Test Date: 09/28/2017
Report Date: 10/09/2017

Project Identification: GR2460 base shoe with PG2460 pad and PGISO60 isolator ASTM E985 Testing

Project Scope: Rice Engineering was contacted by R&B Wagner, Inc. to witness testing of their GR2460 base shoe guardrail system, specifically the amount of deflection that would occur in 1/2" thick (9/16") tempered SGP laminated glass (1/4" / 0.060" SGP / 1/4") when pulled to design loads as described in ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings". On September 28, 2017, Joseph Bauer of Rice Engineering witnessed testing for side and center loaded configurations for a base shoe mounted on concrete. The testing was performed on-site at the R&B Wagner facility and was conducted by Kelly Bauserman.

Conclusions: The SGP laminated glass lite was tested to a maximum deflection of 2.353" on the end and 2.087" at the center (ultimate test load of 365 lbf). The allowable deflection was 3.5" at the left and 2.25" at the center. The residual deflection (measured at 90 lbf) was 0.172". The allowable residual deflection was 0.45". There were no signs of deformation on the base shoe or any problems with the pad and isolators, therefore 1/2" thick (9/16") tempered SGP laminated glass passed the ASTM E985 test.

Prepared & Witnessed By:



Joseph D. Bauer, Wisconsin P.E.

MASTER TABLE

ZERO POINT FOR CALCULATIONS

Height of Rail (h) (in.)	42
Length of Rail (l) (in.)	48
Max Left Deflection [h/12] (in.)	3.5
Max Mid Deflection [(h/24)+(l/96)] (in.)	2.25
Max Residual Deflection (20% of Max Mid) (in.)	0.45

Front

All inputs should be unadjusted read outs from test	Actual lbsf	Mid	Actual lbsf	Left (If Applicable)	Actual lbsf	Left 2 (If Applicable)
Deflection Reading @ 0 lbsf	0	5.932	0	5.142	0	5.122
Deflection Reading @ Pre-Load (180 lbsf)	181	4.260	180	3.111	180	2.975
Deflection Reading @ Released Test Load (1/2 Pre-load)	90	4.951	90	3.851	89	3.806
Deflection Reading @ 150 lbsf	151	4.453	153	3.341	151	3.226
Deflection Reading @ 200 lbsf	202	4.107	200	2.939	201	2.79
Deflection Reading @ 250 lbsf	250	3.736	248	2.533	250	2.381
Deflection Reading @ 300 lbsf	299	3.377	300	2.084	302	1.965
Deflection Reading @ Ultimate Test Load (365 lbsf)	365	2.864	365	1.523	365	1.453
Deflection Reading @ Released Test Load (1/2 Pre-load)	91	4.779	93	3.725	89	3.77

Back

All inputs should be unadjusted read outs from test	Actual lbsf	Mid	Actual lbsf	Left (If Applicable)	Actual lbsf	Left 2 (If Applicable)
Deflection Reading @ 0 lbsf	0	6.014	0	5.946	0	5.932
Deflection Reading @ Pre-Load (180 lbsf)	180	4.538	180	4.325	180	4.226
Deflection Reading @ Released Test Load (1/2 Pre-load)	89	5.289	89	5.096	90	5.010
Deflection Reading @ 150 lbsf	153	4.702	152	4.555	150	4.472
Deflection Reading @ 200 lbsf	202	4.336	204	4.130	204	4.028
Deflection Reading @ 250 lbsf	252	3.999	250	3.741	254	3.607
Deflection Reading @ 300 lbsf	301	3.681	301	3.312	302	3.208
Deflection Reading @ Ultimate Test Load (365 lbsf)	367	3.225	365	2.753	366	2.963
Deflection Reading @ Released Test Load (1/2 Pre-load)	89	5.267	90	5.034	90	5.019

Railing System Load/Deflection Testing

Test Type:	Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5	Submitted By:	KGB	Submitted On:	09/29/17
Test Focus (Part #s):	PGISO60, PG2460, GR2460				
Railing Type:	1/2" SGP glass, 48"x348" 0.519" thick, unsupported sides, no cap rail				
Railing Specifications:	42" TOR, 4 grips				
Test Method:	365 lbsf load per ASTM standards				

Test Specifications per ASTM E985		Results				
	System Calculations	Load (lbsf)	Displacement (in.)			Test Avg.
			Midrail	Left	Left 2	
Pre Load	180 (lbsf)	Preload	0.691	0.740	0.831	0.7540
Released Test Load	90 (lbsf)	RTL	0.000	0.000	0.000	0.0000
		150	0.498	0.510	0.580	0.5293
Ultimate Test Load	365 (lbsf)	200	0.844	0.912	1.016	0.9240
		250	1.215	1.318	1.425	1.3193
Deflection Specifications Per ASTM E985		300	1.574	1.767	1.841	1.7273
Max Mid Deflection	$(h/24)+(l/96) = 2.25$ in	UTL	2.087	2.328	2.353	2.2560
Max Left Deflection	$(h/12) = 3.5$ in	RD	0.172	0.126	0.036	0.1113
Residual Deflection (At RTL)	20% of MD = 0.45 in					

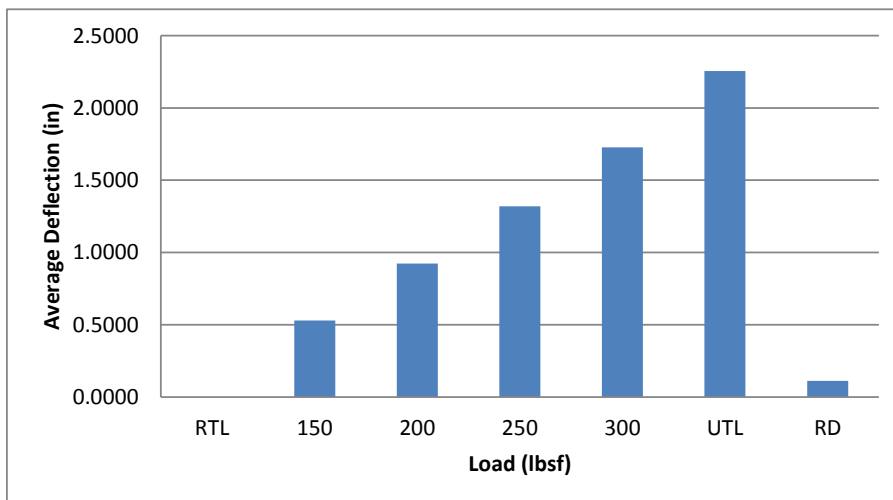
Notes

Midrail at 0 lbf = 5.932
 Displacement readings are developed by the difference between the original and final readings of the potentiometer
 Railing mounted to concrete using the 3/8"x4" DeWALT Screw Bolt +

Conclusions

Rail meets ASTM Standard for Max. Allowed Deflection for Mid
 Rail meets ASTM Standard for Residual Deflection
 Rail meets ASTM Standard for Max. Allowed Deflection for Left 1
 Rail meets ASTM Standard for Max. Allowed Deflection for Left 2

Horizontal Load Test - Form # EF.03.007.HRZ.R1

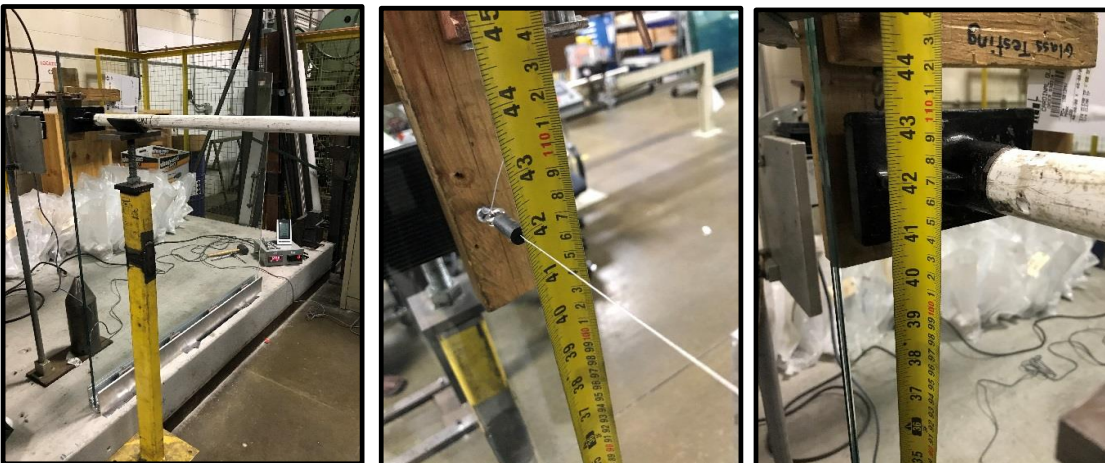


TEST PHOTOS

Initial Setup: Mid



Initial Setup: Left



Railing System Load/Deflection Testing

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Test Method:	365 lbsf load per ASTM standards				

Test Specifications per ASTM E985		Results				
	System Calculations	Load (lbsf)	Displacement (in.)			Test AVG
Pre Load	180 (lbsf)		Midrail	Left	Left 2	
		Preload	0.751	0.771	0.784	0.7687
Released Test Load	90 (lbsf)	RTL	0	0	0	0.0000
		150	0.587	0.541	0.538	0.55533333
Ultimate Test Load	365 (lbsf)	200	0.953	1	0.982	0.9670
		250	1.29	1.355	1.403	1.3493
Deflection Specifications Per ASTM E985		300	1.608	1.784	1.802	1.7313
Max Mid Deflection	$(h/24)+(l/96) = 2.25$ in	UTL	2.064	2.343	2.047	2.1513
Max Left Deflection	$(h/12) = 3.5$ in	RD	0.022	0.062	-0.009	0.0250
Residual Deflection (At RTL)	20% of MD = 0.45 in					

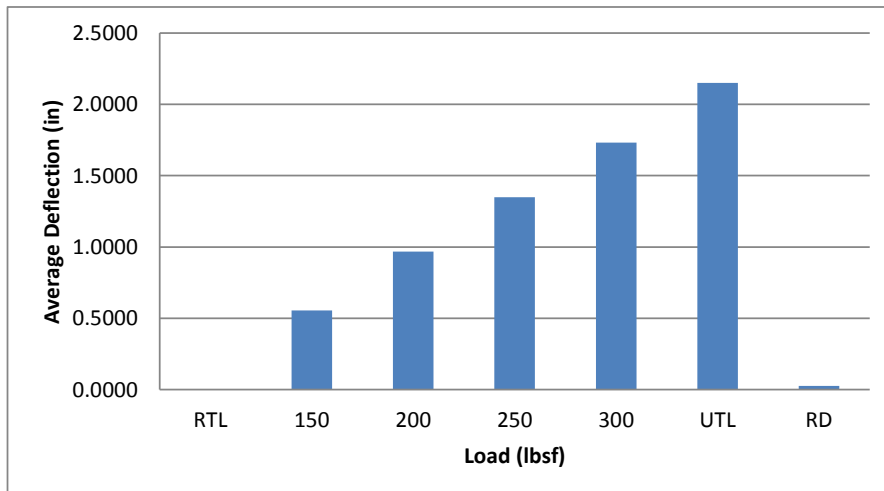
Notes

Midrail at 0 lbf = 6.014 in
 Displacement readings are developed by the difference between the original and final readings of the potentiometer
 Railing mounted to concrete using the 3/8"x4" DeWALT Screw Bolt +

Conclusions

Rail meets ASTM Standard for Max. Allowed Deflection for Mid
 Rail meets ASTM Standard for Residual Deflection
 Rail meets ASTM Standard for Max. Allowed Deflection for Left 1
 Rail meets ASTM Standard for Max. Allowed Deflection for Left 2

Horizontal Load Test - Form # EF.03.007.HRZ.R1



TEST PHOTOS

Initial Setup: Mid



Initial Setup: Left

