



ASTM E985 TEST REPORT

GR2457 HCB-10 Base Shoe and PG2475 Pad and Isolator

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

Report Number: R15-06-210
Set-up Date: 06/30/2015
Test Date: 06/30/2015
Report Date: 07/02/2015

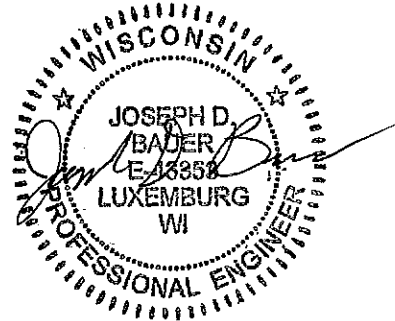
Project Identification: GR2457HCB-10 base shoe with PG2475 pad and isolator ASTM E985 Testing

Project Scope: Rice Engineering was contacted by R&B Wagner, Inc. to witness testing of their GR2457 base shoe guardrail system, specifically the amount of deflection that would occur in $\frac{3}{4}$ " thick monolithic tempered glass, and $\frac{13}{16}$ " thick tempered SGP laminated glass when pulled to design loads as described in ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings". On June 30, 2015, Joseph Bauer of Rice Engineering witnessed testing for the three different configurations. The testing was performed on-site at the R&B Wagner facility and was conducted by Justin Wesser.

Conclusions: The monolithic glass lite was tested to a maximum deflection of 0.97" at ultimate test load (365 lbf). The allowable deflection was 2.25". The residual deflection (measured at 90 lbf) was 0.068". 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 $\frac{3}{4}$ " monolithic glass passed the ASTM E985 test.

The SGP laminated glass lite was tested to a maximum deflection of 1.2513" at ultimate test load (365 lbf). The allowable deflection was 2.25". The residual deflection (measured at 90 lbf) was 0.123". 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 the $\frac{13}{16}$ " SGP laminated glass passed the ASTM E985 test.

Prepared & Witnessed By:



Joseph D. Bauer, Wisconsin P.E.



R & B WAGNER, INC.
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Railing System Load/Deflection Testing

Test Type:	Horizontal Load to 365 lbs per ASTM E985 per section 7.1.5	Submitted By:	KES	Date	07/02/15
Test Focus (Part #s):	50" Long GR2457HCB-10, 3/4" laminated with SGP interlayer (0.060"), PG2475 pad and isolator				
Railing Type:	Shoe molding, 4 panel grips, with glass and unsupported sides				
Railing Specifications:	42" (TOR) No caprail. 12" C-C hole locations				
Test Method:	365 lbf load per ASTM standards Tested using ID#0328 readout, load cell and string pot (calibration due 6/19/2016)				

Test Specifications per ASTM E985:		Results:				
	System Calculations:	Load (lbf)	Displacement (in.)			Test AVG
			Midrail	Left	Right	
<u>Pre Load</u>	180 (lbf)	Preload	0.24	0.314	0.345	0.2997
<u>Released Test Load</u>	90 (lbf)	RTL	0	0	0	0.0000
<u>Ultimate Test Load</u>	365 (lbf)	150	0.161	0.215	0.231	0.20233333
		200	0.314	0	0.445	0.3737
		250	0.521	0.664	0.691	0.6253
<u>Deflection Specifications Per ASTM E985</u>		300	0.772	0.932	0.946	0.8833
<u>Max Deflection</u>	$(h/24)+(l/96) = 2.25 \text{ in}$	UTL	1.142	1.325	1.287	1.2513
		RD	0.185	0.104	0.079	0.123
<u>Residual Deflection (At RTL)</u>	20% of MD = 0.45 in					

NOTES:

Midrail at 0 lbf = 1.804

Potentiometer cannot be zeroed, so calculations are done manually

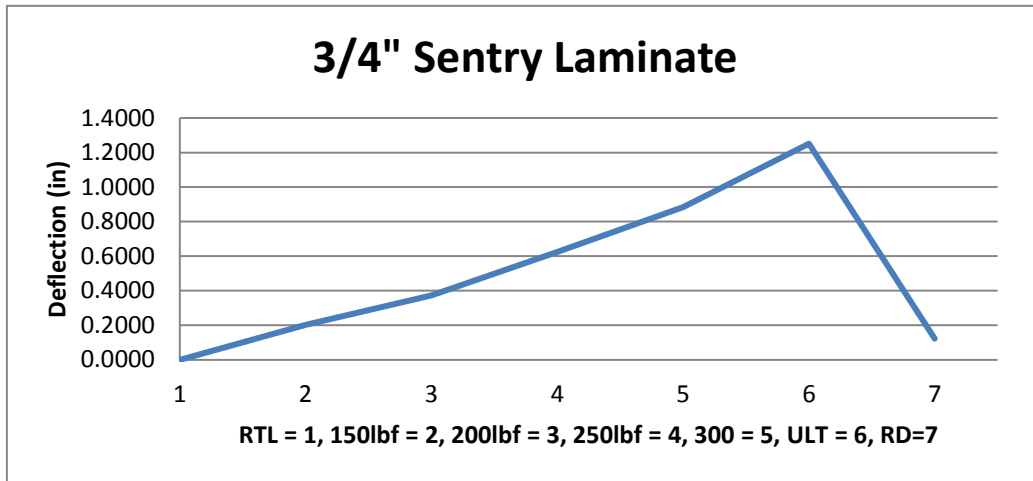
Mounted to steel plate. Panel grips torqued to 120 in-lbs

75.1 degrees F, 56% humidity

CONCLUSIONS:

Rail meets ASTM Standard for Max Deflection

Rail meets ASTM Standard for Residual Deflection



Initial Setup
(Middle)



Preload of 180 lbf
Actual Deflection of 0.24
in



Release Test Load of 90 lbf



Ultimate Test Load of 365 lbf
Actual Deflection of
1.142 in



Deflection at ULT



Residual Deflection at 90 lbf
Actual Deflection of
0.185 in



Initial Setup
(Left 1)



Preload of 180 lbf
Actual Deflection of
0.314 in



Release Test Load of 90 lbf



Ultimate Test Load of 365 lbf
Actual Deflection of
1.325 in



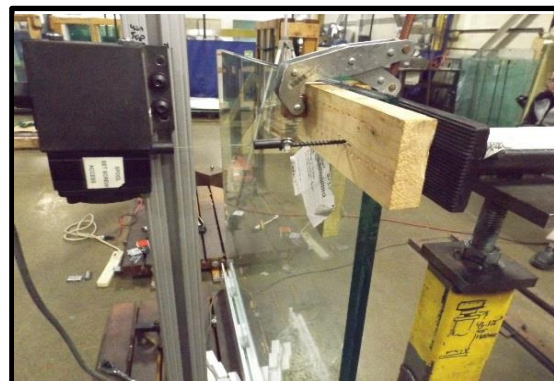
Deflection at ULT



Residual Deflection at 90 lbf
Actual Deflection of
0.104 in



Initial Setup
(Left 2)





Preload of 180 lbf
Actual Deflection of
0.345 in



Release Test Load of 90 lbf



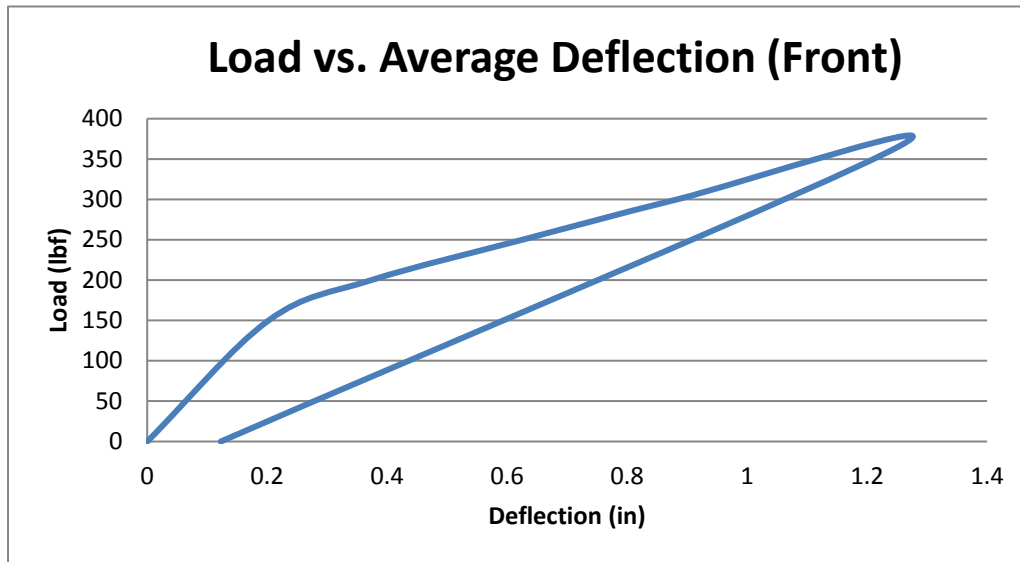
Ultimate Test Load of 365 lbf
Actual Deflection of
1.287 in



Deflection at ULT



Load	Average Deflection
0	0
150	0.2023333
200	0.3736667
250	0.6253333
300	0.8833333
365	1.2513333
0	0.1226667



Railing System Load/Deflection Testing

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Test Specifications per ASTM E985:		Results:				
	System Calculations:	Load (lbf)	Displacement (in.)			Test AVG
<u>Pre Load</u>	180 (lbf)	Preload	Midrail	Left	Right	0.4440
<u>Released Test Load</u>	90 (lbf)	RTL	0	0	0	0.0000
<u>Ultimate Test Load</u>	365 (lbf)	150	0.288	0.306	0.309	0.301
		200	0.51	1	0.553	0.5370
		250	0.71	0.789	0.788	0.7623
<u>Deflection Specifications Per ASTM E985</u>		300	0.89	1.012	1.004	0.9687
<u>Max Deflection</u>	$(h/24)+(l/96) = 2.25 \text{ in}$	UTL	1.116	1.302	1.299	1.2390
		RD	0.064	0.043	0.057	0.0547
<u>Residual Deflection (At RTL)</u>	20% of MD = 0.45 in					

NOTES:

Midrail at 0 lbf = 3.319 in

Potentiometer cannot be zeroed, so calculations are done manually

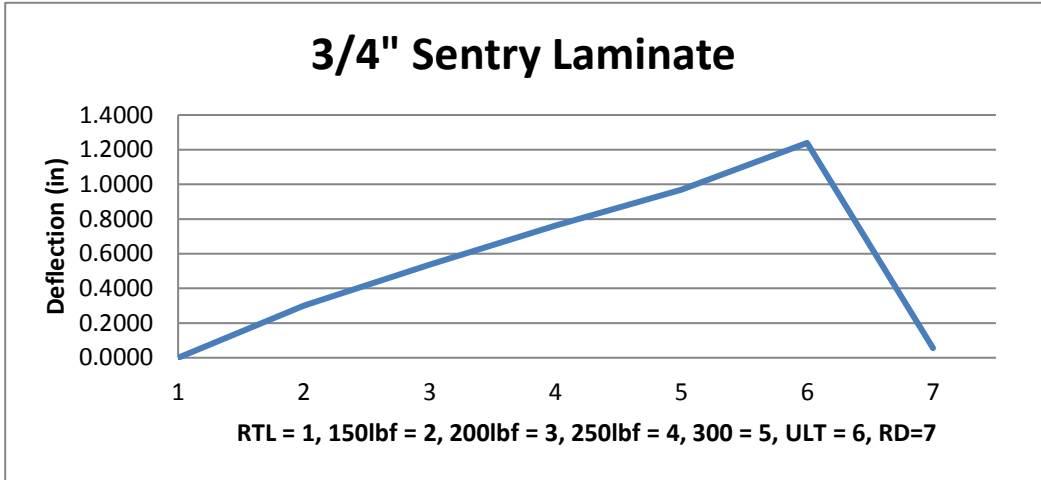
Mounted to steel plate. Panel grips torqued to 120 in-lbs

75.1 degrees F, 56% humidity

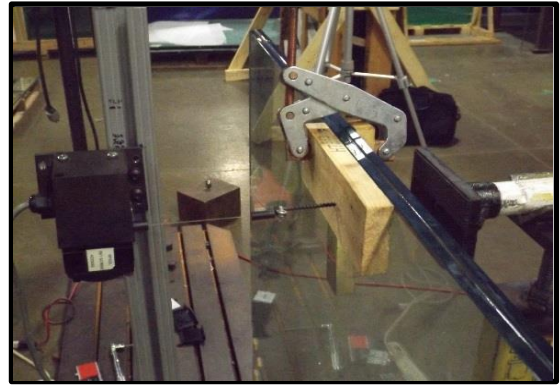
CONCLUSIONS:

Rail meets ASTM Standard for Max. Allowed Deflection

Rail meets ASTM Standard for Residual Deflection



Initial Setup
(Middle)



Preload of 180 lbf
Actual Deflection of
0.426 in



Release Test Load of 90 lbf



Ultimate Test Load of 365 lbf
Actual Deflection of
1.116 in



Deflection at ULT



Residual Deflection at 90 lbf
Actual Deflection of
0.064 in



Initial Setup
(Left)



Preload of 180 lbf
Actual Deflection of
0.445 in



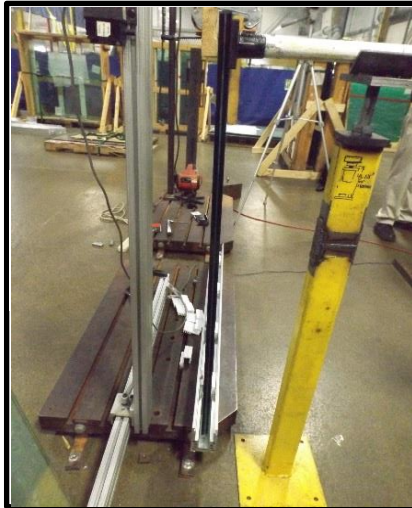
Release Test Load of 90 lbf



Ultimate Test Load of 365 lbf
Actual Deflection of
1.302 in



Deflection at ULT



Residual Deflection at 90 lbf
Actual Deflection of
0.043 in



Initial Setup
(Left 2)





Preload of 180 lbf
Actual Deflection of
0.461 in



Release Test Load of 90 lbf



Ultimate Test Load of 365 lbf
Actual Deflection of
1.299 in



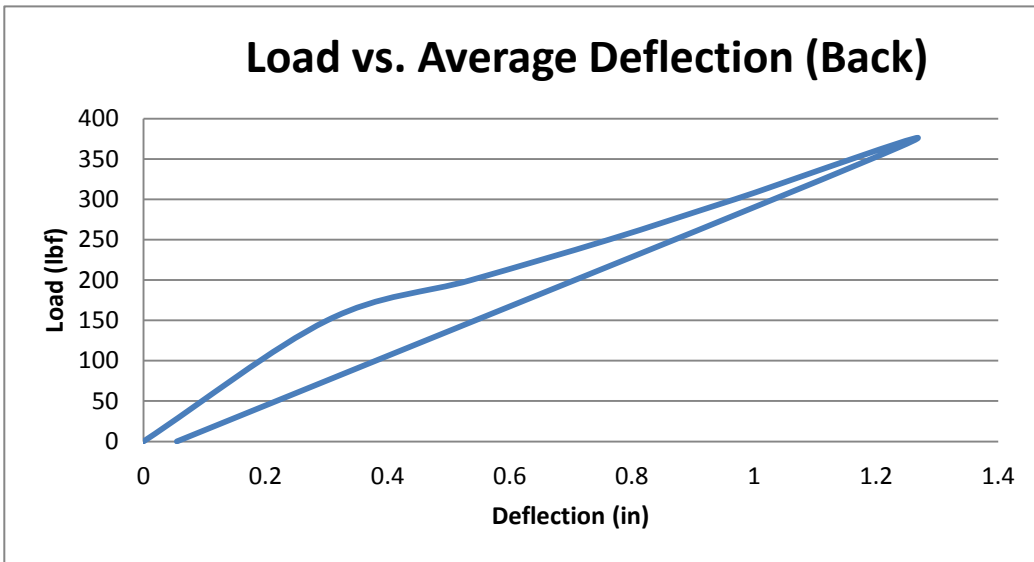
Deflection at ULT



Residual Deflection at 90 lbf
Actual Deflection of
0.057 in



Load	Average Deflection
0	0
150	0.301
200	0.537
250	0.7623333
300	0.9686667
365	1.239
0	0.0546667



Master Table

Key

Front

All Inputs should be unadjusted read outs from test	Mid	Left #1 (If Applicable)	Left #2 (If Applicable)
Deflection Reading @ 0 lbs	1.804	2.272	2.222
Deflection Reading @ Pre- Load	1.177	1.447	1.383
Deflection Reading @ Released Test Load (1/2 Pre- load)	1.417	1.761	1.728
Deflection Reading @150 lbsf	1.256	1.546	1.497
Deflection Reading @ 200 lbsf	1.103	1.399	1.283
Deflection Reading @ 250 lbsf	0.896	1.097	1.037
Deflection Reading @ 300 lbsf	0.645	0.829	0.782
Deflection Reading @ <u>U</u> ltimate Test Load	0.275	0.436	0.441
Deflection Reading @ Released Test Load (1/2 Pre- load)	1.232	1.657	1.649
Height of Rail (h)	42		
Length of Rail (l)	48		
Max Deflection $[(h/24)+(l/96)]$	2.25		
Max Residual Deflection (20% of Max)	0.45		

Back

All Inputs should be unadjusted read outs from test	Mid	Left #1 (If Applicable)	Left #2 (If Applicable)
Deflection Reading @ 0 lbs	3.319	3.477	3.426
Deflection Reading @ Pre- Load	2.513	2.534	2.51
Deflection Reading @ <u>Released Test Load</u> (1/2 Pre- load)	2.939	2.979	2.971
Deflection Reading @150 lbf	2.651	2.673	2.662
Deflection Reading @ 200 lbf	2.429	2.431	2.418
Deflection Reading @ 250 lbf	2.229	2.19	2.183
Deflection Reading @ 300 lbf	2.049	1.967	1.967
Deflection Reading @ <u>Ultimate</u> <u>Test Load</u>	1.823	1.677	1.672
Deflection Reading @ <u>Released Test Load</u> (1/2 Pre- load)	2.875	2.936	2.914