

Panel Grip 2 - Fascia Mount Guardrail Testing to Conform ASTM E985

105 School Creek Trail | Luxemburg, WI 54217 (P) 920.617.1042 | (F) 920.617.1100

Project Location:
Milwaukee, Wisconsin
REI Project # R16-02-285

Prepared for: R&B Wagner, Inc. - Milwaukee, WI 5/17/2016

Project Scope:

Rice Engineering was contacted by R&B Wagner, Inc. to witness testing of their Panel Grip 2 fascia shoe guardrail system, specifically the amount of deflection that would occur in:

3/4" thick monolithic tempered glass

3/4" thick tempered SGP laminated glass

3/4" thick tempered PVB laminated glass

5/8" thick tempered SGP laminated glass (Thick Out), 5/8" thick tempered SGP laminated glass (Thin Out)

5/8" thick tempered PVB laminated glass (Thick Out), 5/8" thick tempered PVB laminated glass (Thin Out)

21.5 mm thick tempered SGP laminated glass

21.5 mm thick tempered PVB laminated glass

When pulled to design loads as described in ASTM E985.

On March 29, 2016 Taurino Garcia, P.E. of Rice Engineering witnessed testing for the nine different configurations. The testing was performed on-site at the R&B Wagner facility and was conducted by Kelly Bauserman and Justin Wesser.

This report is only intended to analyze the deflection of the various glass types. The structural integrity of the base shoe, anchors and anchor substrate is outside the scope of this report. It should be noted that upon observation, no visual damage to the shoe, anchors or concrete barrier was observed after all testing was completed.

Conclusions:

See sheets: A3 -3/4" thick monolithic tempered glass, A5 - 3/4" thick tempered SGP laminated glass, A7 - 3/4" thick tempered PVB laminated glass, A9 – 5/8" thick tempered SGP laminated glass (Thick Out), A11 - 5/8" thick tempered SGP laminated glass (Thin Out), A13 - 5/8" thick tempered PVB laminated glass (Thin Out), A15 - 5/8" thick tempered PVB laminated glass (Thin Out), A17 -21.5 mm thick tempered SGP laminated glass and A19 -21.5 mm thick tempered PVB laminated glass.

Disclaimer:

This Certification is limited to the structural design of structural components of this handrail or divider system. It does NOT include responsibility for:

- Structural design of misc. hardware (latches, hinges, etc.).
- Structural design of concrete slabs and other masonry units
- Structural design of wood blocking or wood framing
- Structural design of all other anchorage substrates
- Glass breakage due to airborne debris or foreign objects
- The manufacture, assembly, or installation of the system.
- Quantities of materials or dimensional accuracy of drawings

Cover Page 1 of 2



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Project Location: Milwaukee, Wisconsin REI Project # R16-02-285 Prepared for: R&B Wagner, Inc. - Milwaukee, WI 5/17/2016

Page:	Description:	Date:	Revision:
A1	Master Table	5/6/16	
	-3/4" thick monolithic		
	tempered glass		
	-3/4" thick tempered SGP		
	laminated glass		
	-3/4" thick tempered PVB		
	laminated glass		
	-5/8" thick tempered SGP		
	laminated glass (Thick Out)		
	-5/8" thick tempered SGP		
	laminated glass (Thin Out)		
	-5/8" thick tempered PVB		
	laminated glass (Thick Out) -		
	5/8" thick tempered PVB		
	laminated glass (Thin Out)		
A2	Master Table	5/6/16	
	21.5 mm SGP Glass		
	21.5 mm PVB Glass		
A3	Railing System Load /	5/6/16	
	Deflection Testing		
	3/4" monolithic glass		
A4	Test Photos		
	3/4" monolithic glass		
A5	Railing System Load /	5/6/16	
	Deflection Testing		
	3/4" SGP Glass		
A6	Test Photos	5/6/16	
	3/4" SGP Glass		
A7	Railing System Load /	5/6/16	
	Deflection Testing		
	3/4" PVB Glass		
A8	Test Photos	5/6/16	
	3/4" PVB Glass		

Page:	Description:	Date:	Revision:
A9	Railing System Load /	5/6/16	
	Deflection Testing		
	5/8" SGP Glass (Thick Out)		
A10	Test Photos	5/6/16	
	5/8" SGP Glass (Thick Out)		
A11	Railing System Load /	5/6/16	
	Deflection Testing		
	5/8" SGP Glass (Thin Out)		
A12	Test Photos	5/6/16	
	5/8" SGP Glass (Thin Out)		
A13	Railing System Load /	5/6/16	
	Deflection Testing		
	5/8" PVB Glass (Thick Out)		
A14	Test Photos	5/6/16	
	5/8" PVB Glass (Thick Out)		
A15	Railing System Load /	5/6/16	
	Deflection Testing		
	5/8" PVB Glass (Thin Out)		
A16	Test Photos	5/6/16	
	5/8" PVB Glass (Thin Out)		
A17	Railing System Load /	5/6/16	
	Deflection Testing		
	21.5 mm SGP Glass		
A18	Test Photos	5/6/16	
	21.5 mm SGP Glass		
A19	Railing System Load /	5/6/16	
	Deflection Testing		
	21.5 mm PVB Glass		
A20	Test Photos	5/6/16	
	21.5 mm SGP Glass		

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- Structural design of misc. hardware (latches, hinges, etc.).
- Structural design of concrete slabs and other masonry units
- Structural design of wood blocking or wood framing
- Structural design of all other anchorage substrates
- Glass breakage due to airborne debris or foreign objects
- The manufacture, assembly, or installation of the system.
- Quantities of materials or dimensional accuracy of drawings

Cover Page 2 of 2



> WAGO	ER		R & B WAGNER, INC PO BOX 423 BUTLER, WI 53007 10600 W BROWN DEER ROAD MILWAUKEE, WI 53224 PH 414,214,0444 FAX 414,214,8326				
		MASTER 7	CABLE				
	ZE	RO POINT FOR C	ALCULA	TIONS			
Height of Rail (h) (in.)	42						
Length of Rail (l) (in.)				48			
Max Mid Deflection				2.25			
[(h/24)+(1/96)] (in.)				2.23			
Max Residual Deflection				0.45			
(20% of Max Mid) (in.)	0.43						
		3/4 In	ch				
All inputs should be unadjusted read outs from test	Actual lbsf	MONO	Actual lbsf	SGP	Actual lbsf	PVB	
Deflection Reading @ 0 lbsf	0		0	4.890	0	4.627	
Deflection Reading @ Pre-Load (180 lbsf)	179	3.169	180	6.089	180	6.475	
Deflection Reading @ Released Test Load (1/2 Pre-load)	90	2.477	91	5.543	91	5.658	
Deflection Reading @ 150 lbsf	150	2.945	150	5.879	150	6.210	
Deflection Reading @ 200 lbsf	199	3.371	202	6.251	199	6.746	
Deflection Reading @ 250 lbsf	248	3.792	251	6.589	250	7.306	
Deflection Reading @ 300 lbsf	300	4.237	299	6.915	300	7.870	
Deflection Reading (a) Ultimate Test Load (365 lbsf)	364	4.726	364	7.371	364	8.586	
Deflection Reading @ Released Test Load (1/2 Pre-load)	90	2.709	90	5.640	90	5.975	

PO BOX 423 BUTLER, WI 5300 10600 W BROWN DEER ROAD MILWALKEE, WI 532 PH 414.214.0444 FAX 414.214.8326								
		MASTER T	'ABLE				1	
	ZE	ERO POINT FOR C	ALCULA	TIONS				
Height of Rail (h) (in.)		41.75						
Length of Rail (l) (in.)				48			1	
Max Mid Deflection				2.240			1	
[(h/24)+(1/96)] (in.)				2.240				
Max Residual Deflection				0.448				
(20% of Max Mid) (in.)				0.440				
		-	5	/8 Inch			=	
All inputs should be unadjusted read outs from test	Actual lbsf	SGP - Thick Out	Actual lbsf	SGP - Thin Out	Actual lbsf	PVB - Thick Out	Actual lbsf	PVB - Thin Out
Deflection Reading @ 0 lbsf	0	4.471	0	5.353	0	5.319	0	1.296
Deflection Reading @ Pre-Load (180 lbsf)	180	6.099	180	6.991	180	7.987	180	4.026
Deflection Reading @ Released Test Load (1/2 Pre-load)	91	5.443	90	6.372	90	6.986	90	3.047
Deflection Reading @ 150 lbsf	152	5.873	150	6.765	150	7.655	149	3.688
Deflection Reading @ 200 lbsf	201	6.258	200	7.149	200	8.341	199	4.353
Deflection Reading @ 250 lbsf	250	6.683	249	7.548	249	9.056	251	5.15
Deflection Reading @ 300 lbsf	300	7.143	300	7.964	301	9.772	298	5.876
Deflection Reading @ <u>Ultimate Test Load</u> (365 lbsf)	367	7.687	364	8.495	MAXED OUT		367	6.789
Deflection Reading @ Released Test Load (1/2 Pre-load)	90	5.667	89	6.533	92	7.278	91	3.442

WAG	CR		10600 W	OX 423 Bu	FAX 414.214.8326	
		MASTER '	TABLE			
	ZE	RO POINT FOR (CALCULA'.	TIONS		
Height of Rail (h) (in.)	48					
Length of Rail (l) (in.)	48					
Max Mid Deflection				2.5		
[(h/24)+(1/96)] (in.)				2.3		
Max Residual Deflection				0.5		
(20% of Max Mid) (in.)				0.5		
		21.5 m	nm			
All inputs should be unadjusted	Actual	SGP	Actual	PVB		
read outs from test	lbsf	SGF	lbsf	FVD		
Deflection Reading @ 0 lbsf	0	2.838	0	2.159	7	
Deflection Reading @ Pre-Load (180 lbsf)	180	3.933	181	4.219		
Deflection Reading @ Released Test Load (1/2 Pre-load)	90	3.407	90	3.457		
Deflection Reading @ 150 lbsf	152	3.748	150	3.986	1	
Deflection Reading @ 200 lbsf	199	4.052	199	4.484	1	
Deflection Reading @ 250 lbsf	249	4.401	251	5.164		
Deflection Reading @ 300 lbsf	303	4.822	300	5.762		
Deflection Reading @ <u>U</u> ltimate <u>Test Load</u> (365 lbsf)	366	5.287	366	6.502		
Deflection Reading @ Released Test Load (1/2 Pre-load)	93	3.562	91	3.901		



			$\mathbf{W} \mathbf{A} \mathbf{G}$				
PΟ	вох	423	But er Road	LER,	WΙ	5.3	3007
10600) W Bro	WN DE	ER ROAD	MILX	VAUKE	E, WI	53224
PH	414.2	214.0	4 4 4	FAX	414.	214.8	3326

>+< WA	GIER.		PO Box 10600 W Bro PH 414.2	WN DEER ROA	TLER, WI D MILWAUKE FAX 414	53007 E, WI 53224 .214.8326		
Railin	ng System Loa			on T		7		
Test Type:	Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5 Submitted By: KGB On:					04/21/16		
Test Focus (Part #s):	3/4" monolithic glass, 42" x 48	/4" monolithic glass, 42" x 48", PGISO75, PG2475						
Railing Type:	Shoe molding, 4 panel grips, gla	ıss, unsupport	ed sides					
Railing Specifications:	42" TOR, no caprail, 12" C-C r.	mounting hole	s					
Test Method:	365 lbsf load per ASTM standa	rds						
Test Specificati	ons per ASTM E985			Results				
	System Calculations	Load (lbsf)	(in.)	Test Avg.				
<u>P</u> re <u>L</u> oad	180 (lbsf)	Load (1031)	Midrail	N/A	N/A			
<u>1</u> 10 <u>11</u> 024	100 (1531)	Preload	-0.692					
Released Test Load	90 (lbsf)	RTL	0					
Reseased Test Board		150	-0.468					
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-0.894					
D-0:::-:-	` '	250	-1.315					
Denection Specific	cations Per ASTM E985	300 UTL	-1.76 -2.249					
Max Mid Deflection	2.25	RD	-0.232					
Residual Deflection (At RTL)	0.45		3 .2 52					
, ,		Notes						
Potentiometer cannot be a	zeroed, so calculations are done	manually						
Shoe mounted to steel pla	te	· · · · · · · · · · · · · · · · · · ·						
		nclusions						
	d for Max. Allowed Deflection to	for Mid						
Rail meets ASTM Standar	d for Residual Deflection							

















Test Type: Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5 By: KGB Submitted On: On: O4/21	>+< WA	GOMPANIES		R & PO BOX 10600 W BRO PH 414.2	B W A 6 423 B U WN DEER ROA 214.0444	GNER, TLER, WI D MILWAUKE FAX 414	INC. 53007 EE, WI 53224 .214.8326
Test Type:	Railir	ng System Loa	ad/De	eflecti	ion T	esting)
Railing Type: Shoe molding, 4 panel grips, glass, unsupported sides Railing Specifications: 42" TOR, no caprail, 12" C-C mounting holes Test Method: 365 lbsf load per ASTM standards Test Specifications per ASTM E985 System Calculations Pre Load 180 (lbsf) Released Test Load 90 (lbsf) RTL 0 150 -0.336 Ultimate Test Load 365 (lbsf) 200 -0.708 250 -1.046 Deflection Specifications Per ASTM E985 Max Mid Deflection 2.25 Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Railing Type: Shoe mounted sides Results Displacement (in.) Midrail N/A N/A Test. Midrail N/A N/A Test. Midrail N/A N/A Test. Notes Potentione Test Load 365 (lbsf) 200 -0.708 250 -1.046 RD -0.097 Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate		Horizontal Load to 365 l	bsf per	Submitted		Submitted	04/21/16
Railing Specifications: 42" TOR, no caprail, 12" C-C mounting holes Test Method: 365 lbsf load per ASTM standards Test Specifications per ASTM E985 System Calculations Pre Load 180 (lbsf) Preload -0.546 Released Test Load 90 (lbsf) Rittl 0 150 -0.336 Ultimate Test Load 365 (lbsf) 200 -0.708 250 -1.046 Deflection Specifications Per ASTM E985 Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Railing Specifications Per ASTM standard for Max. Allowed Deflection for Mid	Test Focus (Part #s):	3/4" SGP glass, 48" x 48", PG	ISO75, PG24'	75			
Test Method: 365 lbsf load per ASTM standards	Railing Type:	Shoe molding, 4 panel grips, gla	ass, unsuppor	ted sides			
Test Specifications per ASTM E985 System Calculations Load (lbsf) Displacement (in.) Midrail N/A N/A N/A Preload -0.546 Preload -0.546 Preload -0.546 Preload -0.546 Preload -0.546 Preload -0.708 Preload Preload -0.708 Preload Preload -0.708 Preload -0.708 Preload Preload	Railing Specifications:	42" TOR, no caprail, 12" C-C r	mounting hole	es			
System Calculations Load (lbsf) Displacement (in.) Midrail N/A N/A N/A	Test Method:	365 lbsf load per ASTM standa	rds				
Pre Load 180 (lbsf)	Test Specificati	ons per ASTM E985			Results		
Pre Load 180 (lbsf) Preload -0.546 Released Test Load 90 (lbsf) RTL 0 Ultimate Test Load 365 (lbsf) 200 -0.708 Deflection Specifications Per ASTM E985 300 -1.372 Max Mid Deflection (At RTL) 0.45 RD -0.097 Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	-	System Calculations	Tood (IboA	Dis	placement	(in.)	Toot Arrow
Released Test Load 90 (lbsf) RTL 0 150 -0.336	Dro Load	100 (110	Load (lbsi)	Midrail	N/A	N/A	1 est Avg.
150 -0.336	<u>F</u> re <u>L</u> oad	180 (1881)	Preload	-0.546			
Ultimate Test Load 365 (lbsf) Deflection Specifications Per ASTM E985 Max Mid Deflection 2.25 Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Released Test Load	90 (lbef)	RTL	0			
Deflection Specifications Per ASTM E985 Deflection Specifications Per ASTM E985 Max Mid Deflection 2.25 Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Keleased Lest Load	90 (IDSI)	150	-0.336			
Deflection Specifications Per ASTM E985 300 -1.372 Max Mid Deflection 2.25 UTL -1.828 RD -0.097 Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Ultimate Test Load	365 (lbsf)		-0.708			
Max Mid Deflection Residual Deflection (At RTL) 0.45 Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid		, í					
Max Mid Deflection Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Deflection Specific	cations Per ASTM E985					
Residual Deflection (At RTL) Notes Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Max Mid Deflection	2.25					
Potentiometer cannot be zeroed, so calculations are done manually Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid		0.45					
Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	·		Notes				
Shoe mounted to steel plate Conclusions Rail meets ASTM Standard for Max. Allowed Deflection for Mid	Potentiometer cannot be	zeroed, so calculations are done	manually				
Rail meets ASTM Standard for Max. Allowed Deflection for Mid			·				
Rail meets ASTM Standard for Max. Allowed Deflection for Mid							
		Con	nclusions				
Rail meets ASTM Standard for Residual Deflection	Rail meets ASTM Standar	d for Max. Allowed Deflection	for Mid				
	Rail meets ASTM Standar	d for Residual Deflection					



















 R
 &
 B
 WAGNER,
 INC

 PO BOX 423 | BUTLER, WI | 53007

 10600 W BROWN DEER ROAD | MILWAUKEE, WI | 53224

 PH 414.214.0444 | FAX 414.214.8326

Railin	ng System Loa	ad/De	eflecti	on T	esting	,
Test Type:		Horizontal Load to 365 lbsf per Submitted KGB Submitted O4 ASTM E985 per section 7.1.5 By: Con:				
Test Focus (Part #s):	3/4" PVB glass, 48" x 48", PG1	SO75, PG24	75			
Railing Type:	Shoe molding, 4 panel grips, gla	ss, unsupport	ed sides			
Railing Specifications:	42" TOR, no caprail, 12" C-C r	nounting hole	S			
Test Method:	365 lbsf load per ASTM standards					
Test Specificati	ons per ASTM E985			Results		
	System Calculations	Load (lbsf) Displacement (in.) Tes				Test Avg.
Pre Load	180 (lbsf)	Load (1031)	Midrail	N/A	N/A	Test Avg.
rie Load	100 (1081)	Preload	-0.817			
Released Test Load	90 (lbcf)	RTL	0			
Meleased Test Load	90 (lbsf)	4.50				
	` ,	150	-0.552			
Ultimate Test Load	365 (lbsf)	150 200	-0.552 -1.088			
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)					
	365 (lbsf)	200	-1.088			
Deflection Specific	cations Per ASTM E985	200 250	-1.088 -1.648			
	, ,	200 250 300	-1.088 -1.648 -2.212			

Notes

Potentiometer cannot be zeroed, so calculations are done manually

0.45

Shoe mounted to steel plate

(At RTL)

Conclusions

Rail does not meet ASTM Standard for Max. Allowed Deflection for Mid

Rail meets ASTM Standard for Residual Deflection

Rail fails.

















WHI	COMPANIES		10600 W Bro PH 414.2	WN DEER ROA	TLER, WI D MILWAUKE FAX 414	53007 EE, WI 53224 .214.8326
Railir	ng System Loa	ad/De	eflecti	on T	esting	7
Test Type:	Horizontal Load to 365 l ASTM E985 per section	1	Submitted By:	KGB	Submitted On:	04/21/16
Test Focus (Part #s):	5/8" SGP glass, 48" x 48", PGI	SO17, PG247	75			
	Shoe molding, 4 panel grips, gla					
Railing Specifications:	42" TOR, no caprail, 12" C-C r	nounting hole	s			
Test Method:	365 lbsf load per ASTM standa	rds				
Test Specificati	ons per ASTM E985			Results		
-	System Calculations	Load (lbsf)	Displacement (in.)			
Pre Load	180 (lbsf)	Load (lost)	Midrail	N/A	N/A	Test Avg.
rie Load	100 (1051)	Preload	-0.656			
Released Test Load	90 (lbsf)	RTL	0			
Keleased Lest Load	70 (IDSI)	150	-0.43			
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-0.815			
	` ′	250	-1.24			
Deflection Specific	cations Per ASTM E985	300	-1.7			
Max Mid Deflection	2.25	UTL	-2.244			
1/2011 1/120 2 0110011011		RD	-0.224			
Residual Deflection (At RTL)	0.45					
		Notes				
Potentiometer cannot be	zeroed, so calculations are done	manually				
Shoe mounted to steel pla	te	•				
Thick side of glass facing	out					

Conclusions

Rail meets ASTM Standard for Max. Allowed Deflection for Mid

Rail meets ASTM Standard for Residual Deflection

















Rail meets ASTM Standard for Residual Deflection

R & B WAGNER, INC.
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WH	COMPANIES		PO BOX 10600 W BRO PH 414.2	423 BU WN DEER ROA 14.0444	TLER, WI AD MILWAUKE FAX 414	53007 E, WI 53224 .214.8326
Railin	ng System Loa	ad/De	eflecti	on T	esting	۳
Test Type:		Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5 Submitted By: KGB On:				
Test Focus (Part #s):	5/8" SGP glass, 48" x 48", PGI	ISO17, PG247	75			
Railing Type:	Shoe molding, 4 panel grips, gla	ıss, unsupport	ed sides			
Railing Specifications:	42" TOR, no caprail, 12" C-C r	nounting hole	S			
Test Method:	365 lbsf load per ASTM standa	rds				
Test Specificati	ons per ASTM E985			Results		
•	System Calculations	Load (lbsf)	Dis Midrail	placement N/A	(in.) N/A	Test Avg.
<u>P</u> re <u>L</u> oad	180 (lbsf)	Preload	-0.619	11/11	14/11	
	90 (lbsf)	RTL	0			
<u>R</u> eleased <u>T</u> est <u>L</u> oad		150	-0.393			
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-0.777			
	, ,	250	-1.176			
Deflection Specific	cations Per ASTM E985	300	-1.592			
Max Mid Deflection	2.25	UTL	-2.123			
	2.20	RD	-0.161			
Residual Deflection (At RTL)	0.45					
		Notes				
Potentiometer cannot be a	zeroed, so calculations are done	manually				
Shoe mounted to steel pla	te	<u>-</u>				
Γhin side of glass facing o	ut					
		nclusions				
Rail meets ASTM Standar	d for Max. Allowed Deflection f	for Mid				

















>+< WA	GOMPANIES		R & PO BOX 10600 W BRO PH 414.2	423 Bu	GNER, TLER, WI AD MILWAUK FAX 414	INC 53007 53007 EE, WI 53224 4.214.8326
Railir	ng System Loa	ad/De	eflecti	ion T	esting	<i>y</i>
Test Type:	Horizontal Load to 365 lbsf per Submitted KGB Submitted O4/21/					
Test Focus (Part #s):	5/8" PVB glass, 48" x 48", PG	ISO17, PG24	75			
Railing Type:	Shoe molding, 4 panel grips, gl	ass, unsuppor	ted sides			
Railing Specifications:	42" TOR, no caprail, 12" C-C 1	nounting hole	es			
Test Method:	365 lbsf load per ASTM standa	rds				
Test Specificati	ons per ASTM E985			Results		
-	System Calculations	Load (lbsf)	Dis	placement	(in.)	Test Avg.
Dro Load	180 (lbsf)	Load (1081)	Midrail	N/A	N/A	Test Avg.
Pre Load	100 (1081)	Preload	-1.001			
Released Test Load	90 (lbsf)	RTL	0			
<u>Keleased Test L</u> oad	90 (IDSI)	150	-0.669			
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-1.355			
	, ,	250	-2.07			
Deflection Specific	cations Per ASTM E985	300	-2.786			
Max Mid Deflection	2.25	UTL				
		RD	-0.292			
<u>R</u> esidual <u>D</u> eflection (At RTL)	0.45					
		Notes				
Potentiometer cannot be	zeroed, so calculations are done	manually				
Shoe mounted to steel pla	te					
Thick side of glass facing						
Pot. Maxed out during ult	imate load - no reading taken					
		nclusions				
	Standard for Max. Allowed De	flection for M	lid			
	d for Residual Deflection					
Pail faile						















>+< WA	R & B WAGNER, INC PO BOX 423 BUTLER, WI 53007 10600 W BROWN DEER ROAD MILWAUKEE, WI 53224 PH 414.214.0444 FAX 414.214.8326							
Railir	ng System Loa	ad/De	eflecti	on T	esting)		
Test Type:	Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5		Submitted By:	KGB	Submitted On:	04/21/16		
Test Focus (Part #s):	: 5/8" PVB glass, 48" x 48", PGISO17, PG2475							
Railing Type:	Shoe molding, 4 panel grips, gla	ass, unsuppor	ted sides					
Railing Specifications:	42" TOR, no caprail, 12" C-C r	nounting hole	es					
Test Method:	365 lbsf load per ASTM standa	rds						
Test Specificati	ons per ASTM E985	Results						
	System Calculations	Tood (IboA	Displacement (in.)			75		
Don I and	400 (1) 0	Load (lbsf)	Midrail	N/A	N/A	Test Avg.		
<u>P</u> re <u>L</u> oad	180 (lbsf)	Preload	-0.979					
Pologod Took Load	00 41 0	RTL	0					
<u>R</u> eleased <u>T</u> est <u>L</u> oad	90 (lbsf)	150	-0.641					
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-1.306					
		250	-2.103					
Deflection Specific	cations Per ASTM E985	300	-2.829					
Max Mid Deflection	2.25	UTL	-3.742					
Wax Wild Deliection		RD	-0.395					
Residual Deflection (At RTL)	0.45							
,		Notes						
Potentiometer cannot be a	zeroed, so calculations are done							
Shoe mounted to steel pla								
Thin side of glass facing o	out							
<u> </u>								
	Con	nclusions						
Rail does not meet ASTM	Standard for Max. Allowed De	flection for M	id					
Rail meets ASTM Standar								
Rail fails.								

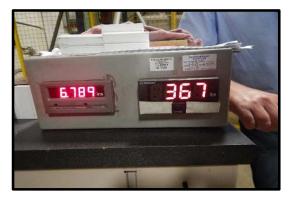
















R & B WAGNER, INC

PO BOX 423 | BUTLER, WI | 53007

10600 W BROWN DEER ROAD | MILWAUKEE, WI | 53224

PH 414,214,0444 FAX 414,214,8326

COMPANIES			PO BOX 423 BUTLER, WI 53007 10600 W Brown Deer Road Milwaukee, WI 53224 PH 414.214.0444 FAX 414.214.8326					
Railin	g System Loa	ad/De	eflecti	ion T	esting	<i>y</i>		
Test Type:	Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5		Submitted By:	KGB	Submitted On:	04/21/16		
Test Focus (Part #s): 2	21.5 mm SGP glass, 48" x 48",	PGISO21, PC	G2475					
Railing Type: S	Shoe molding, 4 panel grips, gla	ass, unsupport	ed sides					
Railing Specifications:	42" TOR, no caprail, 12" C-C r	nounting hole	:s					
Test Method: 3	365 lbsf load per ASTM standa	rds						
Test Specification	ons per ASTM E985		Results					
<u> </u>	System Calculations	T 1/11 0	Displacement (in.)			Test Avg		
Pre Load	100 (11 - 0	Load (lbsf)	Midrail	N/A	N/A	Test Avg.		
rie Load	180 (lbsf)	Preload	-0.526					
Released Test Load	90 (lbsf)	RTL	0					
Heleased Test Load	70 (ISSI)	150	-0.341					
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-0.645					
	ations Per ASTM E985	250 300	-0.994					
Denection specifica	auons Per ASTM E305	UTL	-1.415 -1.88					
Max Mid Deflection	2.25	RD	-0.155					
Residual Deflection (At RTL)	0.45							
		Notes						
otentiometer cannot be ze	eroed, so calculations are done	manually						
hoe mounted to steel plate	e							
_								
	Co	nclusions						
Vail meets ASTM Standard	for Max. Allowed Deflection t							
tail meets ASTM Standard		101 11110						
			Но	rizontal Load T	Гest - Form # EF	7.03.007.HRZ.R		

















>+< WA	GOMPANIES		PO BOX 10600 W Bro PH 414.2		GNER, UTLER, WI AD MILWAUKI FAX 414	53007 53224 .214.8326	
Railir	ng System Loa	ad/De	eflecti	on T	esting	7	
Test Type:	Horizontal Load to 365 lbsf per ASTM E985 per section 7.1.5		Submitted By:	KGB	Submitted On:	04/21/16	
Test Focus (Part #s):	21.5 mm PVB glass, 48" x 48", PGISO21, PG2475						
Railing Type:	Shoe molding, 4 panel grips, gla	ıss, unsupport	ed sides				
Railing Specifications:	42" TOR, no caprail, 12" C-C r	mounting hole	S				
Test Method:	365 lbsf load per ASTM standa	rds					
Test Specification	ons per ASTM E985			Results			
*	System Calculations	T 1/11 0	Dis	placement	(in.)	T	
D. T. 1	400 (11 0	Load (lbsf)	Midrail	N/A	N/A	Test Avg.	
<u>P</u> re <u>L</u> oad	180 (lbsf)	Preload	-0.762				
D-11/T1	90 (lbsf)	RTL	0				
<u>R</u> eleased <u>T</u> est <u>L</u> oad		150	-0.529				
<u>U</u> ltimate <u>T</u> est <u>L</u> oad	365 (lbsf)	200	-1.027				
		250	-1.707				
Deflection Specific	eations Per ASTM E985	300	-2.305				
Max Mid Deflection	2.25	UTL	-3.045				
Wax Wid Deficetion		RD	-0.444				
Residual Deflection (At RTL)	0.45						
, ,		Notes					
Potentiometer cannot be z	eroed, so calculations are done	manually					
Shoe mounted to steel pla	te						
	Co	nclusions					
	Standard for Max. Allowed De	flection for M	id				
Rail meets ASTM Standard	d for Residual Deflection						
Rail fails.							













