Architectural Testing

ASTM E 1886 and ASTM E 1996
TEST REPORT

Report No.: B2778.02-701-18

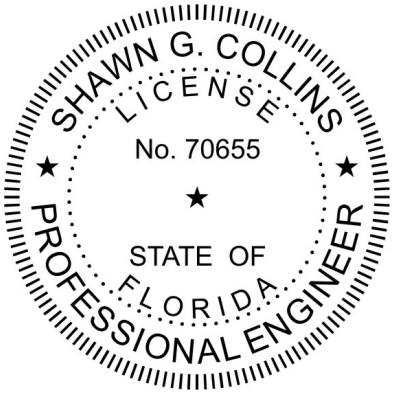
Rendered to:

PRL ARCHITECTURAL ALUMINUM PRODUCTS

PRODUCT TYPE: Aluminum Framed Curtainwall System
SERIES/MODEL: CW-600

This report contains in its entirety:

Cover Page:	1 page
Report Body:	8 pages
Sketches:	1 pages
Drawings:	12 pages



Digitally Signed by: Shawn G. Collins
2011.10.04 16:20:02 -04'00'

Test Dates:	08/31/11
Through:	09/01/11
Report Date:	10/04/11
Test Record Retention End Date:	09/01/15

4 Rancho Circle
Lake Forest, CA 92630
phone: 949-460-9600
fax: 949-460-9601
www.archtest.com

1.0 Report Issued To: PRL Architectural Aluminum Products
14760 Don Julian Road
City of Industry, California 91746

2.0 Test Laboratory: Architectural Testing, Inc.
4 Rancho Circle
Lake Forest, California 92630
949.460.9600

3.0 Project Summary:

3.1 Product Type: Aluminum Framed Curtainwall System

3.2 Series/Model: CW-600

3.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). The samples tested met the performance requirements set forth in the referenced test procedures for a +1676/-2873 Pa (+35/-60 psf) Design Pressure with missile impacts corresponding to Missile Level D and Wind Zone 3 for a basic protection rating.

3.4 Test Dates: 08/31/2011 - 09/01/2011

3.5 Test Location: Architectural Testing, Inc. test facility in Lake Forest, California. Calibration of test equipment was performed by Architectural Testing in accordance with AAMA 205-01 "In-Plant Testing Guidelines for Manufacturers and Independent Laboratories".

3.6 Test Sample Source: The test specimen was provided by the client. Representative samples of the test specimen(s) will be retained by Architectural Testing for a minimum of four years from the test completion date.

3.7 Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Architectural Testing per the drawings located in Appendix B. Any deviations are documented herein or on the drawings.

3.8 List of Official Observers:

Name	Company
Frank Fisher	PRL Architectural Aluminum Products
John S. Mayfield	Architectural Testing, Inc.

4.0 Test Specification(s):

ASTM E 1886-05, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.*

ASTM E 1996-05, *Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.*

5.0 Test Specimen Description:

5.1 Product Sizes:

Test Specimens #1 - #3:

Overall Area: 12.3 m^2 (132.4 ft^2)	**Width**		**Height**	
	millimeters	**inches**	**millimeters**	**inches**
Overall size	4636	182-1/2	2654	104-1/2

5.2 Frame Construction:

Frame Member	**Material**	**Description**
Vertical Mullion	Extruded aluminum	
Pressure plate closer	Extruded aluminum	Secured to each jamb and at the head and sill of each lite using one (1) #12 x 3/4" "B" point hex head screw located 2" on center from the ends and 12" on center thereafter
Pressure plate	Extruded aluminum	Secured to each vertical mullion using one (1) #12 x 3/4" "B" point hex head screw located 2" on center from the ends and 12" on center thereafter
Angle bracket	Extruded aluminum	Secured to the ends of each horizontal member using two (2) #10 x 1/2" phillips pan head sheet metal screws and secured to the ends of each vertical member using two (2) phillips pan sheet metal screws

	Joinery Type	**Detail**
All corners	Horizontal to vertical framing members	Butted and secured using a custom shaped aluminum angle bracket (P/N: CW-306-F01)

5.0 Test Specimen Description: (Continued)

5.3 Weatherstripping: No weatherstripping was utilized.

5.4 Glazing:

Exterior Lite	Spacer	Interior Lite		
3/16" heat strengthened	3/8" aluminum box	3/16" heat strengthened	0.060" DuPont SentryGlas®	3/16" heat strengthened

Glass Type	Overall Glass Thickness	Glazing Method
Laminated	1" I.G.	Dry glazed with compression gasket at the interior and exterior and secured full perimeter of each lite at the exterior with an aluminum pressure plate.

Daylight Opening		Glass Bite
millimeters	inches	
1492 x 2559	58-3/4 x 100-3/4	5/8"

5.5 Drainage:

Drainage Method	Size	Quantity	Location
Weep holes	3/8" diameter	2/lite	6" on center from the ends through the pressure bar and pressure bar cap

5.6 Hardware: No hardware was utilized.

5.7 Reinforcement: No reinforcement was utilized.

6.0 Installation:

The specimen was installed into an aluminum test buck. The rough opening allowed for a 1/4" shim space. The exterior perimeter of the window was sealed with duct tape.

6.0 Installation: (Continued)

Location	Anchor Description	Anchor Location
Ends of each jamb member	Custom shaped extruded aluminum angle clip (P/N: AB-1), secured to the frame and test buck, each using 4 (four) #12 x 1-1/4" hex head screws	Two (2) per member; located at the interior side of each jamb above the head member and below the sill member
Ends of each vertical mullion member	Custom shaped extruded aluminum angle clip (P/N: AB-1), secured to the frame and test buck, each using 4 (four) #12 x 1-1/4" hex head screws	Four (4) per member; located on each side of the vertical mullion members above the head member and below the sill member

7.0 Test Results: The results are tabulated as follows:

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 26°C (78°F)
Missile Weight: 4173 g (9.20 lbs)
Missile Length: 2.4 m (94")
Muzzle Distance from Test Specimen: 4.4 m (14'-6")

Test Unit #1: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.4 m/s (50.5 fps)	
Impact Area:	Center of left lite
Observations:	Missile penetrated the interior plane of the glazing causing an approximate 2" x 4" rupture in the glass.
Results:	Pass

Test Unit #2: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.4 m/s (50.4 fps)	
Impact Area:	Bottom left corner of center lite
Observations:	Missile penetrated the interior plane of the glazing causing an approximate 2" x 4" rupture in the glass.
Results:	Pass

Test Unit #3: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.4 m/s (50.4 fps)	
Impact Area:	Top right corner of right lite
Observations:	Missile penetrated the interior plane of the glazing causing an approximate 2" x 4" rupture in the glass.
Results:	Pass

***Note**: See Architectural Testing Sketch #1 for impact locations.*

7.0 Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #2
Design Pressure: +1676/-2873 Pa (+35/-60 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)		
			#1	#2	#3
335 to 838 (7.0 to 17.5)	3500	2.80	0.8 (0.03)	4.3 (0.17)	0.8 (0.03)
0 to 1005 (0 to 21.0)	300	2.92	1.0 (0.04)	5.8 (0.23)	1.0 (0.04)
838 to 1341 (17.5 to 28)	600	2.71	1.8 (0.07)	7.6 (0.30)	1.3 (0.05)
503 to 1676 (10.5 to 35)	100	3.99	2.0 (0.08)	9.1 (0.36)	1.5 (0.06)
			Permanent Set mm (inches)		
			0.5 (0.02)	1.0 (0.04)	0.5 (0.02)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)		
			#1	#2	#3
862 to 2873 (18.0 to 60.0)	50	4.00	10.2 (0.40)	26.0 (1.02)	10.2 (0.40)
1436 to 1915 (30.0 to 48.0)	1050	3.13	7.4 (0.29)	17.0 (0.67)	4.8 (0.19)
0 to 1724 (0 to 36.0)	50	3.98	4.3 (0.17)	9.9 (0.39)	2.3 (0.09)
575 to 1436 (12.0 to 30.0)	3350	2.79	3.8 (0.15)	8.9 (0.35)	2.3 (0.09)
			Permanent Set mm (inches)		
			0.3 (0.01)	0.3 (0.01)	0.3 (0.01)

***Observations**: No additional damage or deglazing was observed.*

Result: Pass

***Note**: See Architectural Testing Sketch #1 for indicator locations. Test Specimens were installed and cycled as a unitized system.*

***General Note**: Upon completion of testing, the specimens met the requirements of Section 7.1.1.1 of ASTM E 1996, for basic protection.*

8.0 Test Equipment:

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 2x4 Southern Pine

Timing Device: Electronic Beam Type

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

Deflection Measuring Device: Linear transducers

Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.

The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

If test specimen contains glazing, no conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen(s) can be made. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Digitally Signed by: John S. Mayfield

John S. Mayfield
Project Manager

Digitally Signed by: Shawn G. Collins

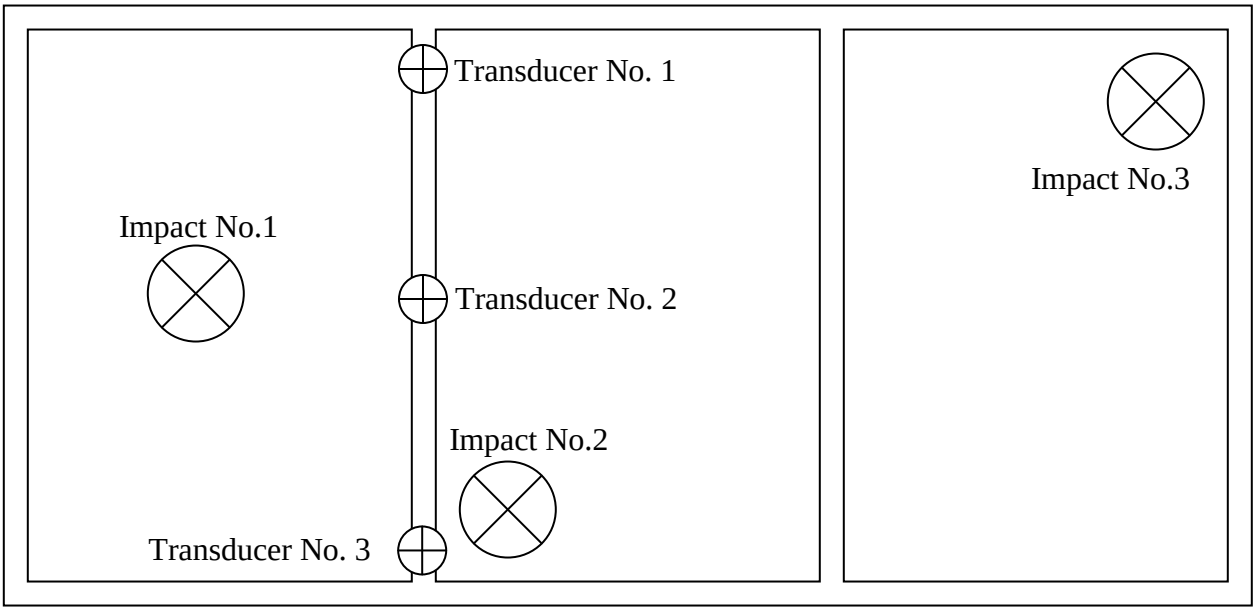
Shawn G. Collins, P.E.
Laboratory Support Engineer

JM:bu

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Sketches (1)
Appendix-B: Drawings (12)

Appendix A

Sketches



Sketch # 1: Impact and Linear Transducer Locations

Appendix B
Drawings

PRL 2 1/2" x 6" curtain wall CW-600 series

Bill of Material

PRL part number	manufacturer	description	qty required	size	
CW-601	PRL proprietary	vertical mullion	4	H	116 1/2"
CW-102	PRL proprietary	pressure plate closer	2	H	116 1/2"
CW-101	PRL proprietary	pressure plate	2	H	116 1/2"
CW-201	PRL proprietary	snap cap trim	4	H	116 1/2"
CW-602	PRL proprietary	horizontal mullion	6	W DLO	57 1/2"
400FF	PRL proprietary	horizontal mullion filler	6	W DLO - 1/32"	57 15/32"
CW-102	generic	pressure plate closer	6	W DLO - 1/4"	57 1/4"
CW-201	PRL proprietary	snap cap trim	6	W DLO - 1/16"	57 7/16"
AB-1	PRL	ANCHOR CLIP	12		
CW-306-F01	PRL	ANGLE CLIP/CORNERS	12		
WS-1	PRL	GLAZING GASKET	AS REQ'D		
		insulated glass width	3	DLO + 1 1/4"	
		insulated glass height	3	DLO + 1 1/4"	

W = width
H = height
DLO = day light opening

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B277801

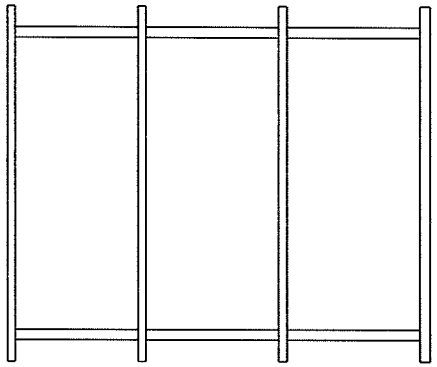
Date 9/27 Tech

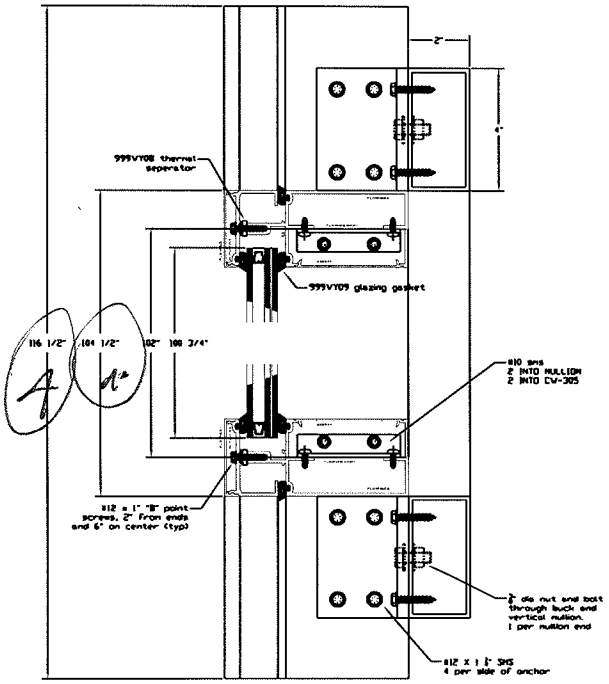
Architectural Testing

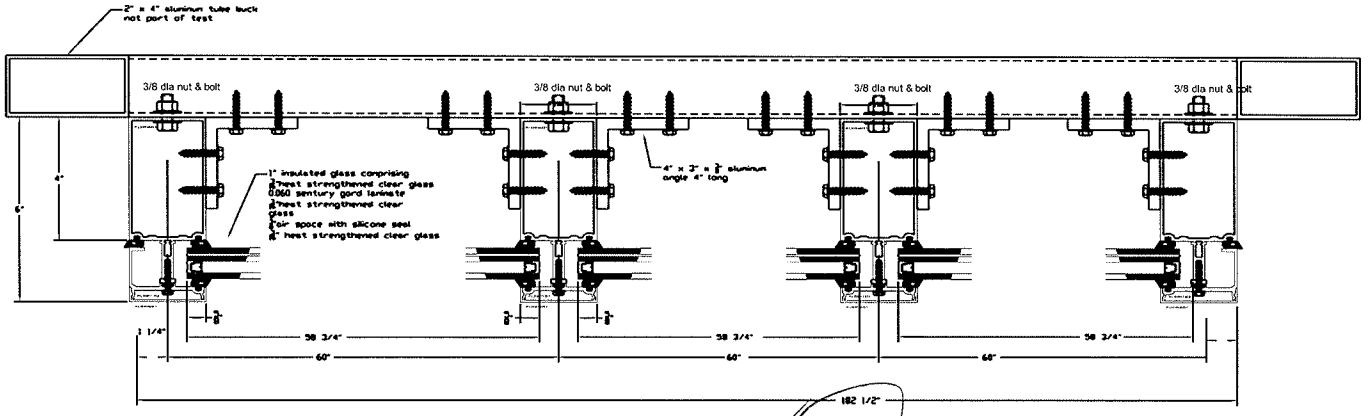
Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 5/27 Tech



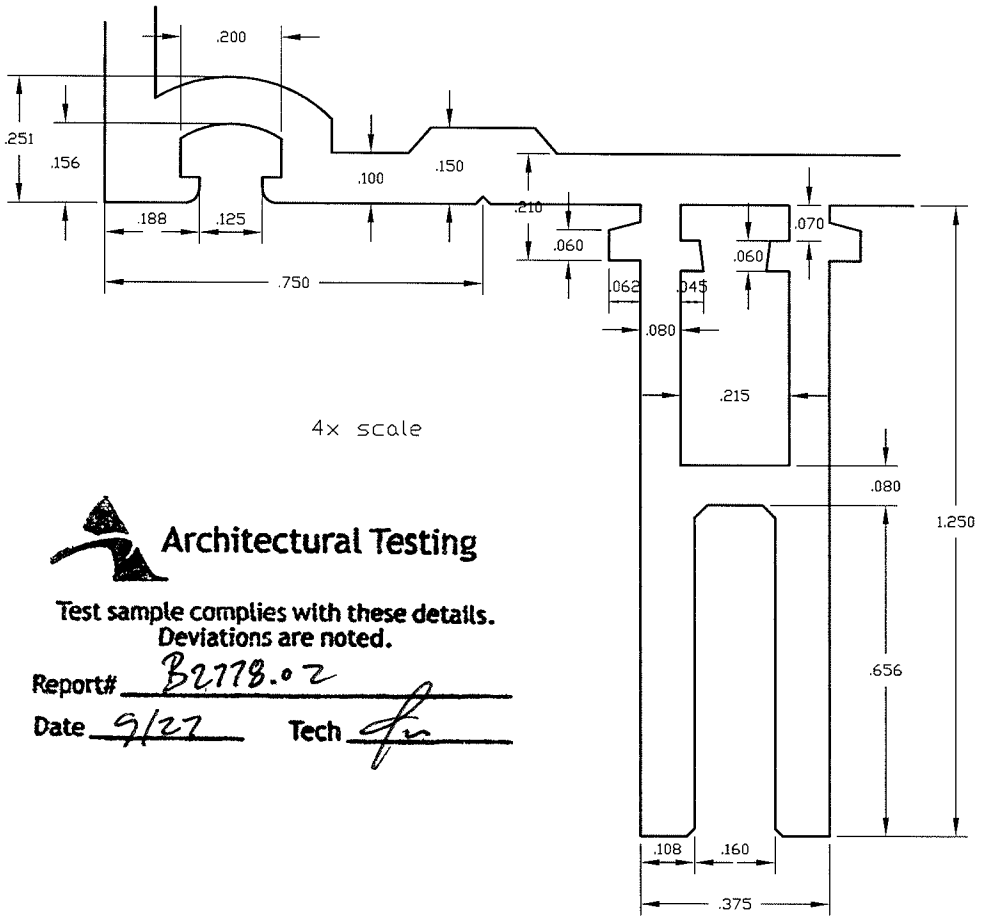




+35/-60 psf

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

DIE NO. X



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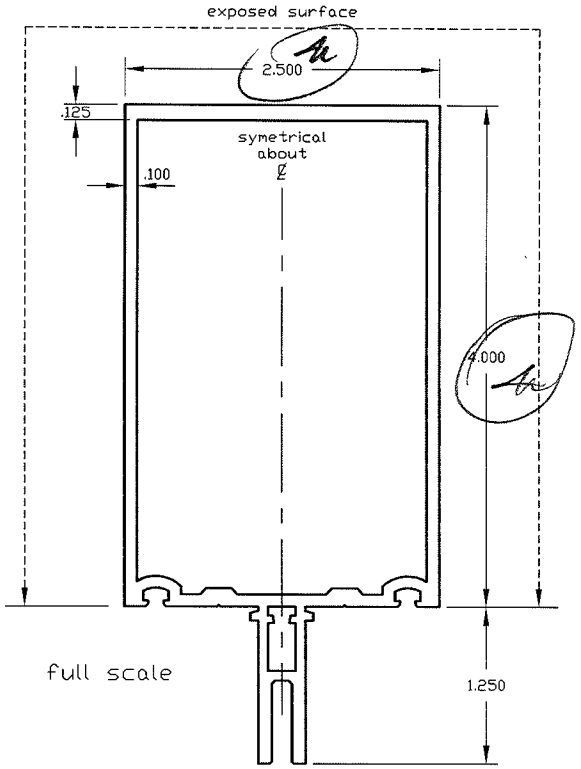


full scale

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 9/27 **Tech**

UNLESS OTHER WISE NOTED TYP. WALL UNMARKED CORNERS .020 R.

REVISION

CUSTOMER: ALUMINUM STOREFRONTS

MAT.'L 6063-T6	HOLES	* CRITICAL DIM	
AREA 1.647	BACKER	⊛ SPECIAL TOOL	
WT. / FT 1.976	BOLSTER		
PERI. 31.634	W/P	DRAWN: F²	
FACTOR 19	EXT. RATIO	DATE: 12-14-10	PART NAME: mullion
C.C.D. 5.55	CLASS hollow	SCALE	PART # CW-601

PRL ALUMINUM INC.
14760 DON JULIAN RD.
INDUSTRY CA. 91746
TEL. (877) 775-2586
PRL-ALUM
FAX (877) 274-8800

SCALE 1 2 3

snaps with 400-FF

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

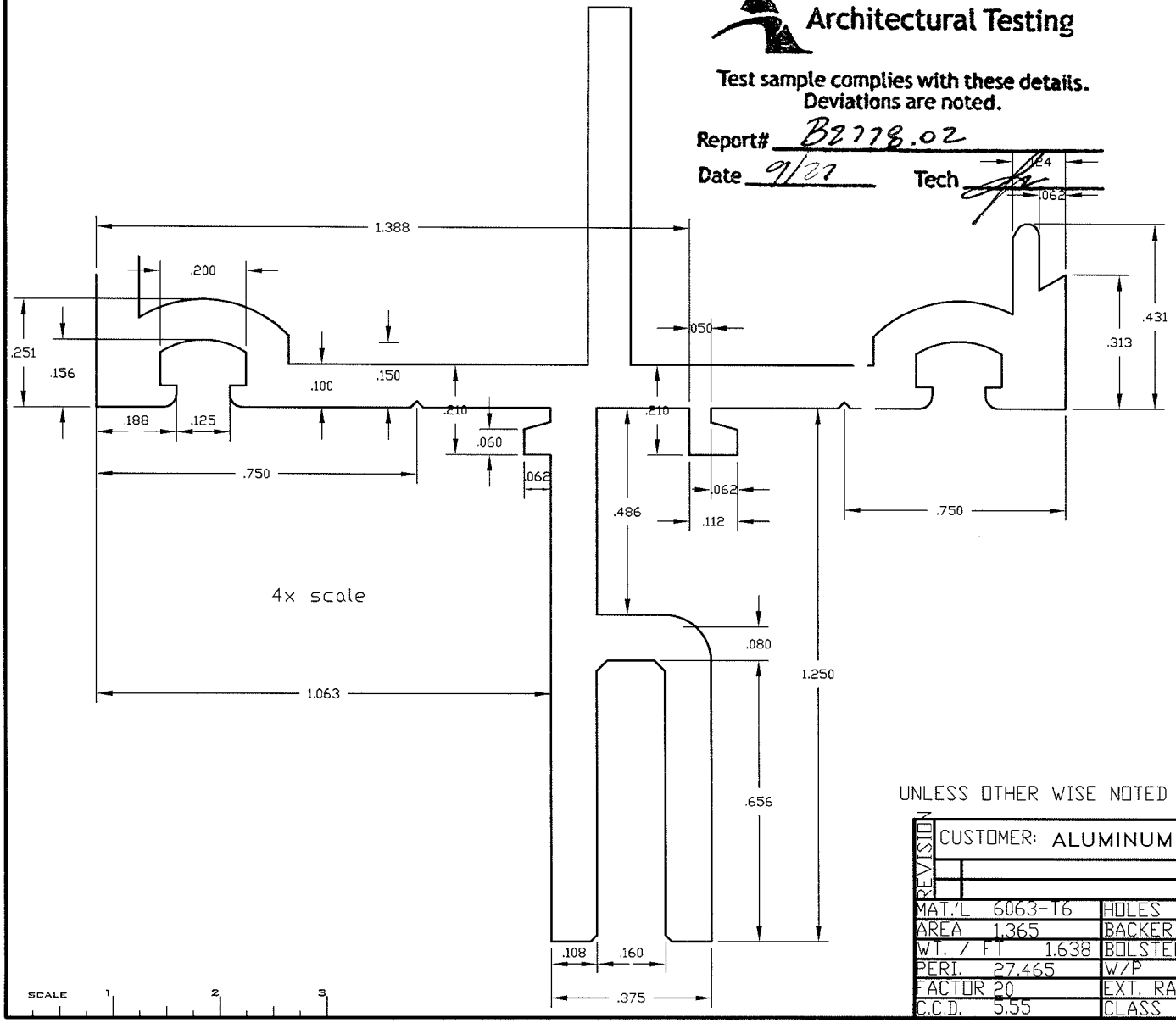
DIE NO. X

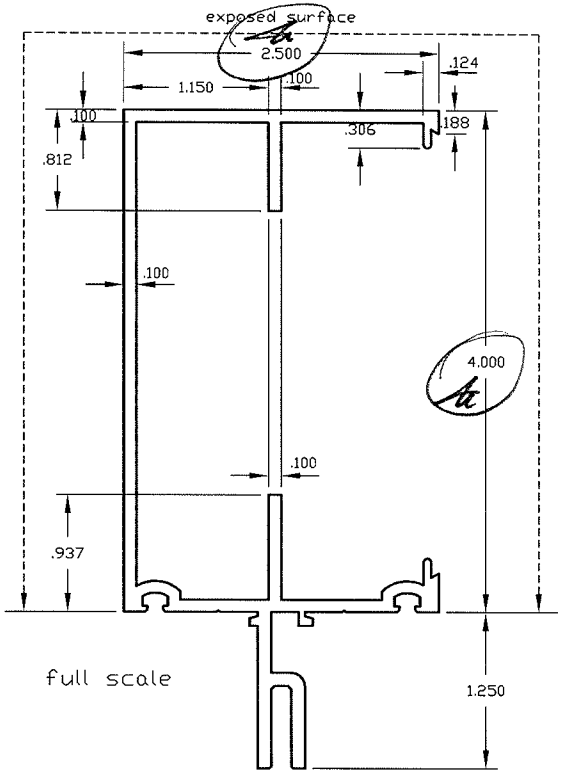
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 9/27 Tech





UNLESS OTHER WISE NOTED TYP. WALL UNMARKED CORNERS .020 R.

REVISION

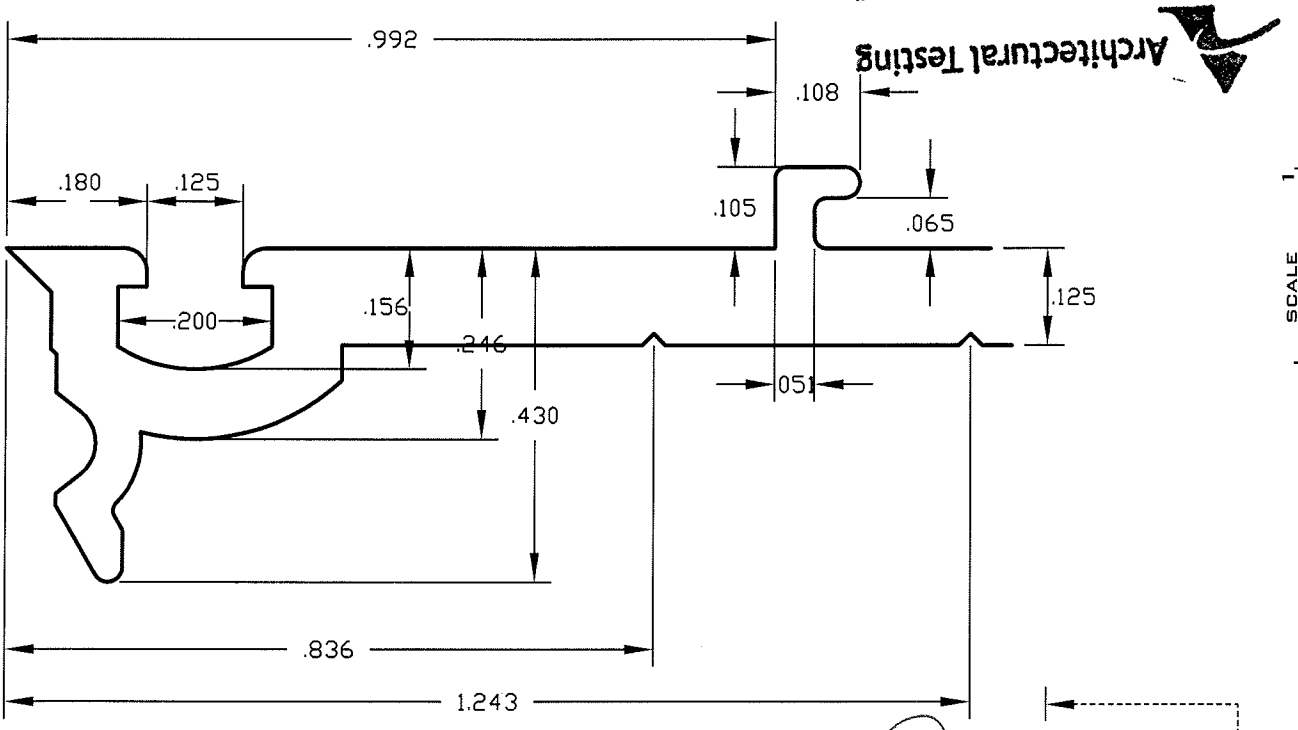
CUSTOMER: ALUMINUM STOREFRONTS

MAT.'L 6063-T6	HOLES	* CRITICAL DIM	PRL ALUMINUM INC.
AREA 1.365	BACKER	⊛ SPECIAL TOOL	14760 DON JULIAN RD.
WT. / FT 1.638	BOLSTER		INDUSTRY CA. 91746
PERI. 27.465	W/P	DRAWN: F²	TEL. (877) 775-2586
FACTOR 20	EXT. RATIO	DATE: 12-14-10	PRL-ALUM
C.C.D. 5.55	CLASS solid	SCALE	FAX (877) 274-8800
			PART NAME: mullion
			PART # CW-602

DIE NO. X

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

snaps with CW-201



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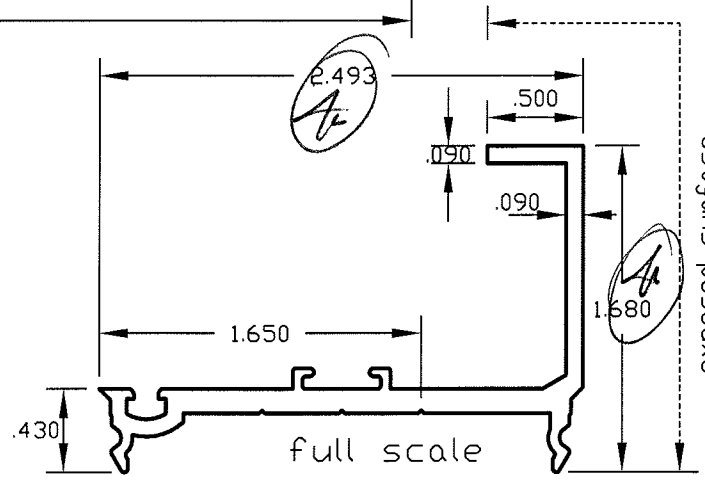


full scale

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 9/22 Tech

UNMARKED CORNERS .020 R.
UNLESS OTHER WISE NOTED

TYP. WALL

REVISION	CUSTOMER: ALUMINUM STOREFRONTS		

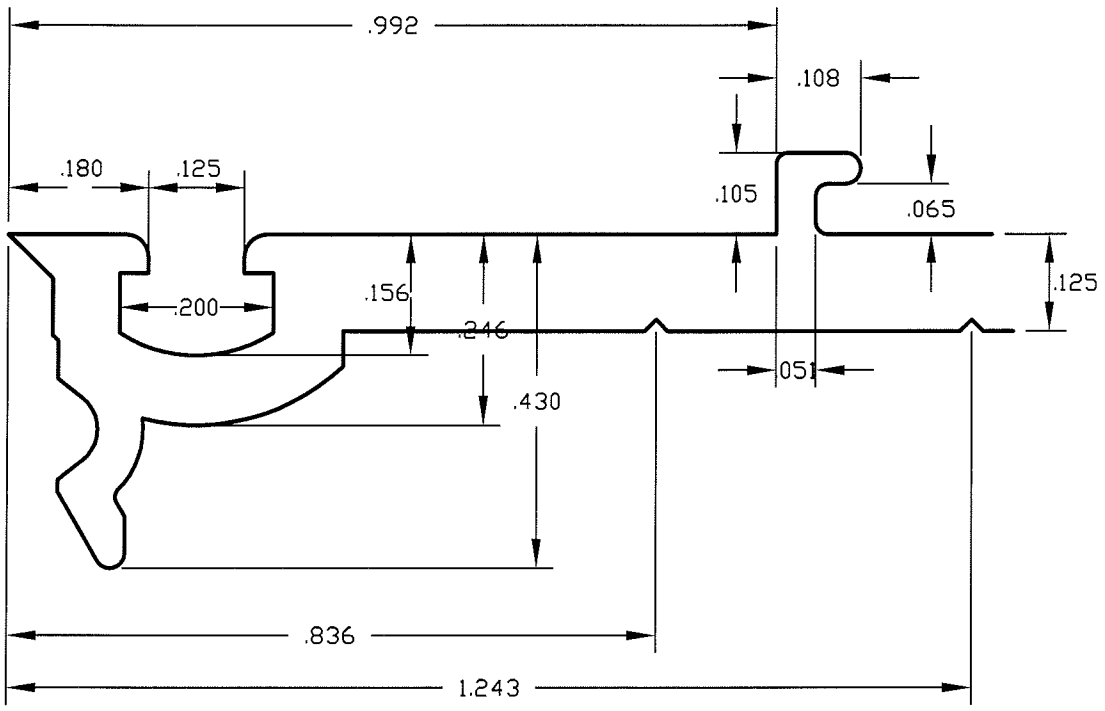
MAT.'L 6063-T6	HOLES	* CRITICAL DIM	PRL ALUMINUM INC.
AREA 0.513	BACKER	⊛ SPECIAL TOOL	14760 DON JULIAN RD.
WT. / FT 0.616	BOLSTER		INDUSTRY CA. 91746
PERI. 10.578	W/P	DRAWN: F2	TEL. (877) 775-2586
FACTOR 20	EXT. RATIO	DATE: 12-14-10	PRL-ALUM
C.C.D. 2.906	CLASS solid	SCALE	FAX (877) 274-8800
			PART NAME: pressure plate
			PART # CW-102

DIE NO. X

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

no exposed surface

snaps with CW-201



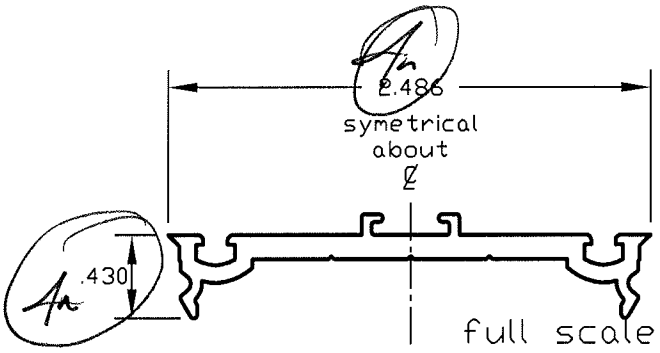
4x scale

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 9/27 Tech



UNMARKED CORNERS .020 R.
UNLESS OTHER WISE NOTED

TYP. WALL

REVISION

CUSTOMER: ALUMINUM STOREFRONTS

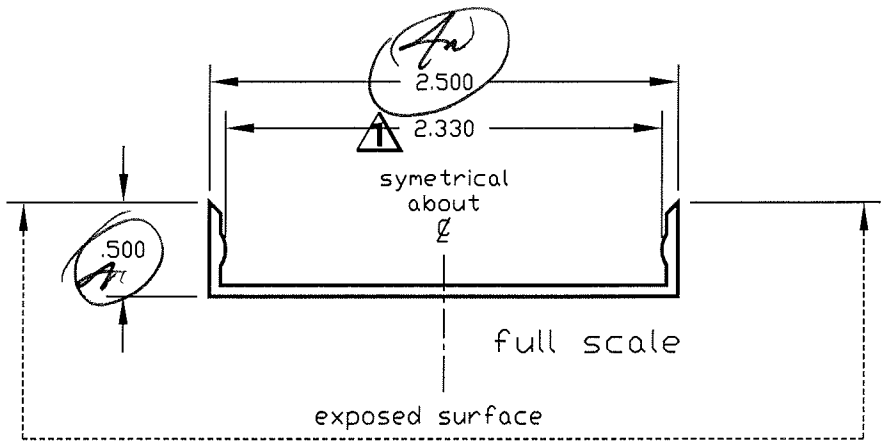
PRL ALUMINUM INC.
14760 DON JULIAN RD.
INDUSTRY CA. 91746
TEL. (877) 775-2586
PRL-ALUM
FAX (877) 274-8800

MAT.'L 6063-T6	HOLES	* CRITICAL DIM	
AREA 0.361	BACKER	⊛ SPECIAL TOOL	
WT. / FT 0.433	BOLSTER		
PERI. 7.631	W/P	DRAWN: F2	
FACTOR 21	EXT. RATIO	DATE: 12-14-10	PART NAME: pressure plate
C.C.D. 2.486	CLASS solid	SCALE	PART # CW-101

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

DIE NO. X

snaps with CW-101



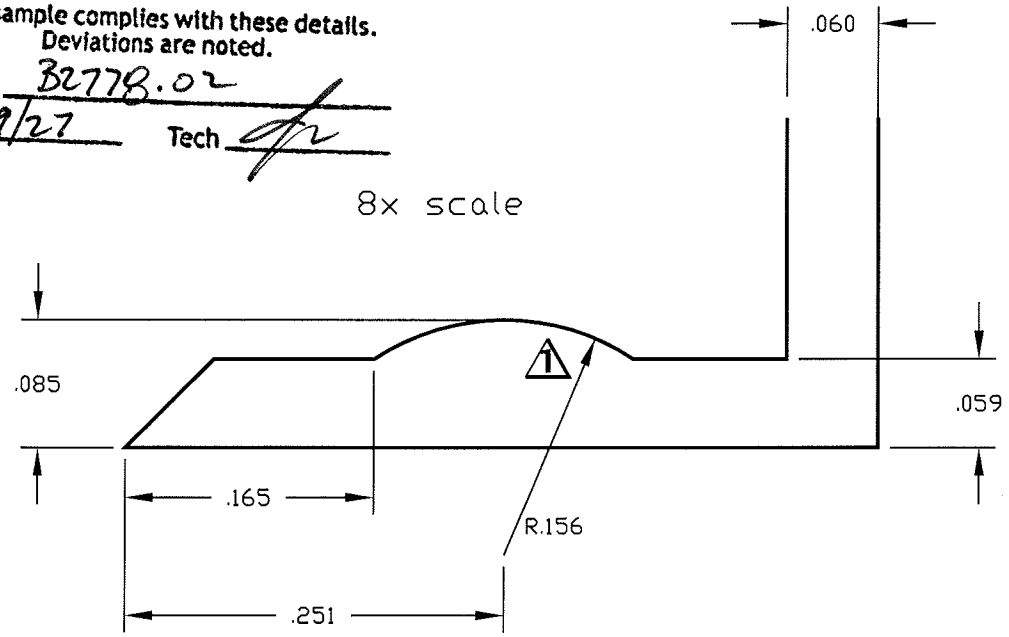
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 32778.02

Date 9/27 Tech

8x scale

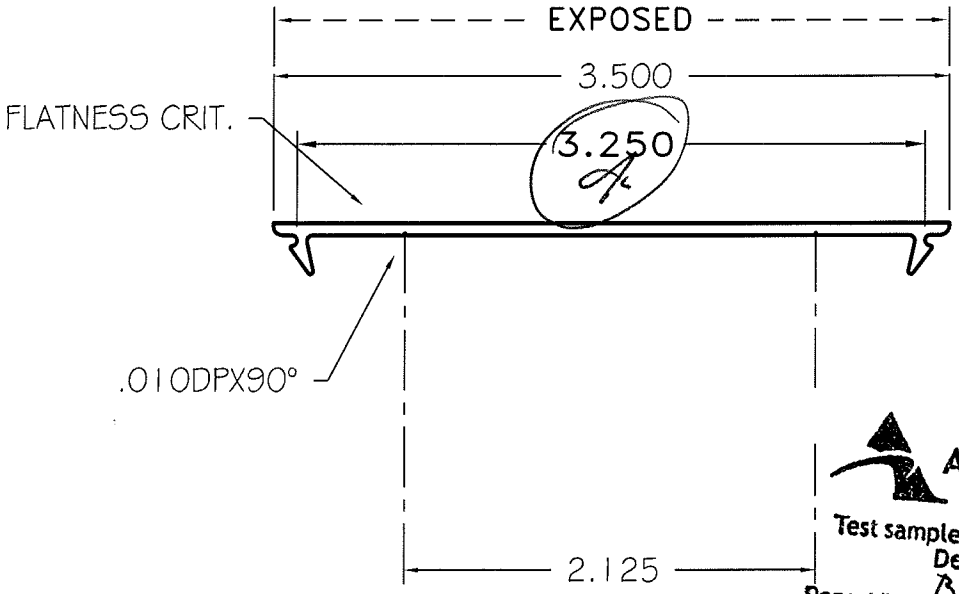


UNMARKED CORNERS .020 R.
UNLESS OTHER WISE NOTED TYP. WALL

REVISION	CUSTOMER: ALUMINUM STOREFRONTS		PRL ALUMINUM INC. 14760 DON JULIAN RD. INDUSTRY CA. 91746 TEL. (877) 775-2586 PRL-ALUM FAX (877) 274-8800
1	reduced interference of snap. 2/15/11 F²		
MAT.'L 6063-T6	HOLES	* CRITICAL DIM	
AREA 0.205	BACKER	⊛ SPECIAL TOOL	
WT. / FT 0.250	BOLSTER		
PERI. 6.831	W/P	DRAWN: F²	
FACTOR 33	EXT. RATIO	DATE: 12-14-10	PART NAME: snap cap
C.C.D. 2.550	CLASS solid	SCALE	PART # CW-201

UNLESS OTHERWISE SPECIFIED STANDAR ALUMINUM ASSOCIATION TOLERANCES APPLY

DIE NO. 2051

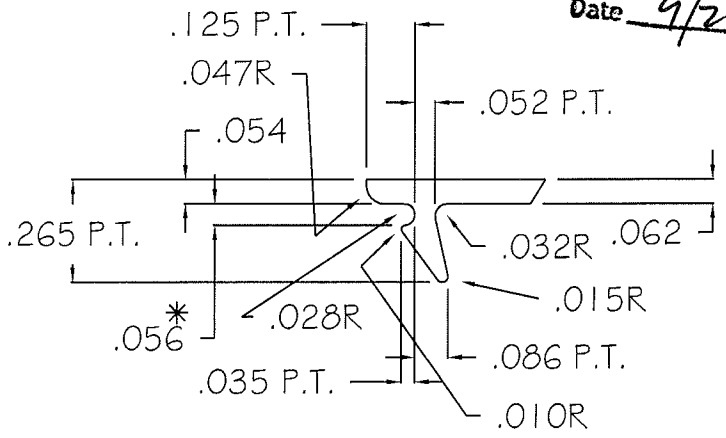


Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 9/21 Tech

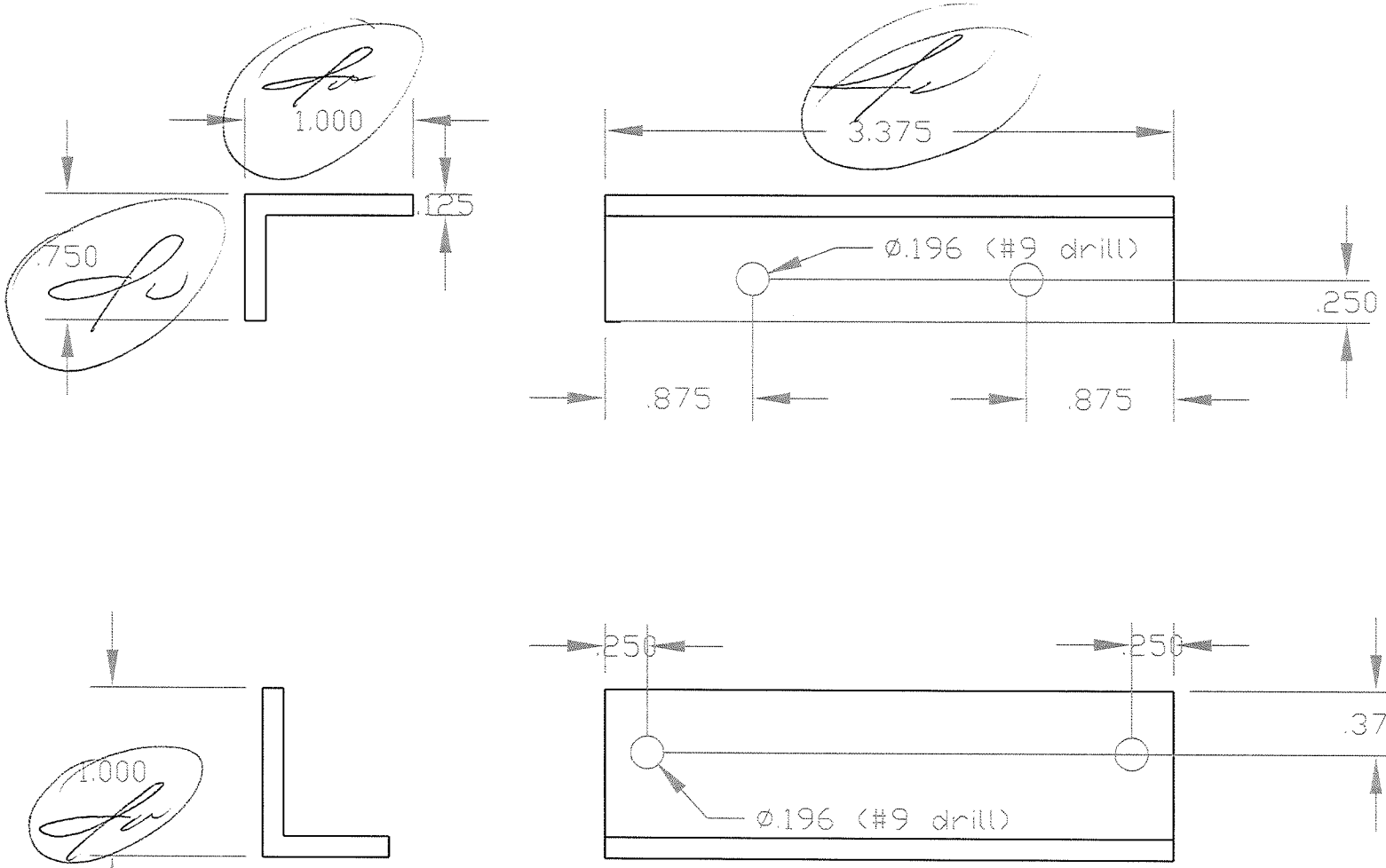


UNLESS OTHER WISE NOTED .062 TYP. WALL

UNMARKED CORNERS .020 R.

REVISION	CUSTOMER:		

MAT.'L 6063-T5	HOLES	* CRITICAL DIM.	PRL ALUMINUM INC.
AREA .241	BACKER	⊛ SPECIAL TOOL	14760 DON JULIAN RD.
WT. / FT .289	BOLSTER		INDUSTRY CA. 91746
PERI. 7.896	W/P	DRAWN: OLDS 015	TEL. (877) 775-2586 PRL-ALUM
FACTOR 27.32	EXT. RATIO	DATE: 9-26-07	FAX (877) 274-8800
C.C.D.	CLASS SOLID	SCALE FULL	PART NAME: FLATE FILLER
			PART # 400FF



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02-701-18

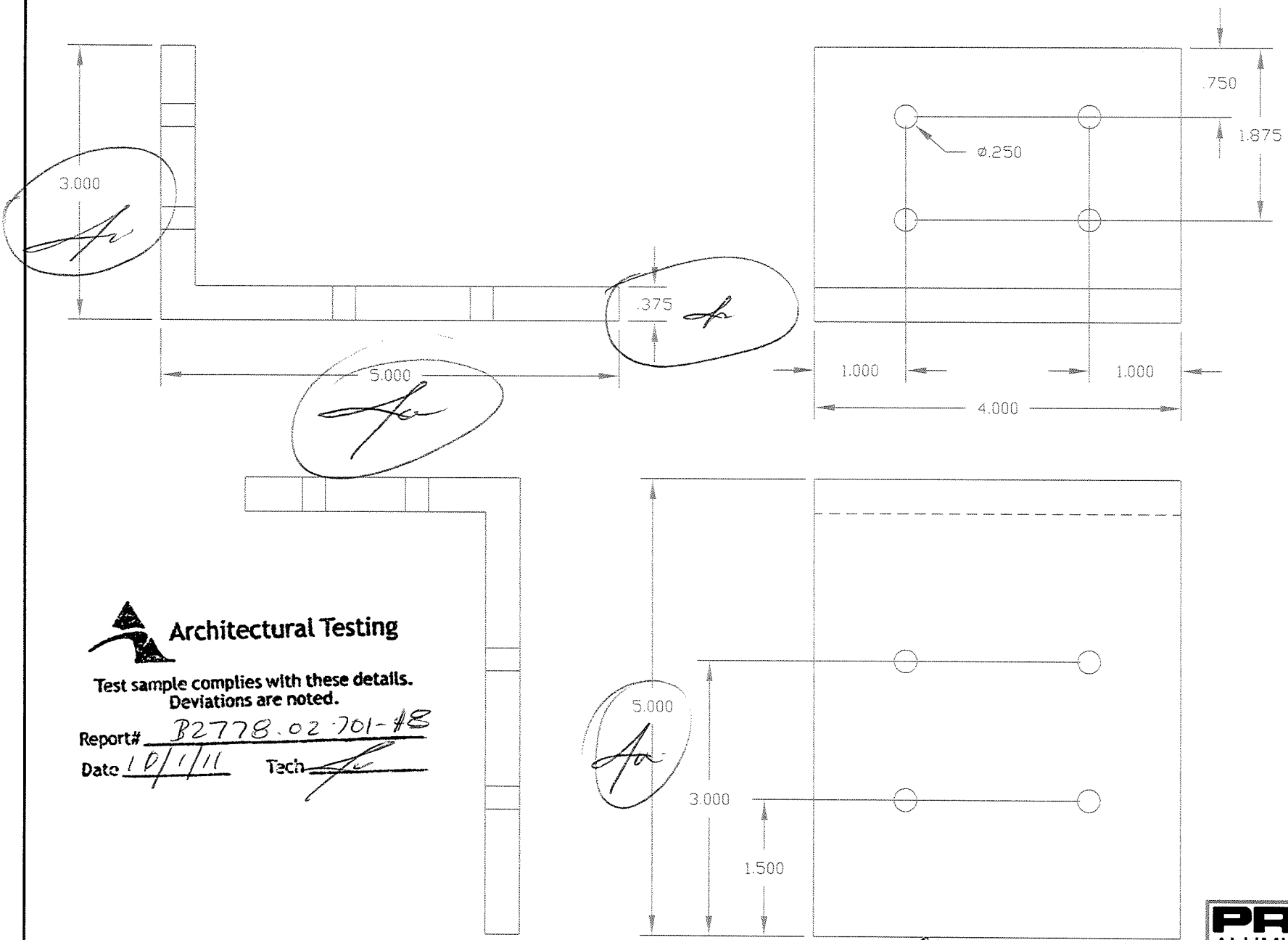
Date 10/3/11 Tech

part number: **CW-306-F01**

USE WITH CW-602 & CW-702

DRAWN F²
DATE: 04-21-11

PRL ALUMINUM INC.
14760 DON JULIAN RD.
INDUSTRY CA. 91746
TEL. (877) 775-2586
PRL-ALUM
FAX (877) 274-8800



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02-701-18

Date 10/1/11 Tech

EP/N: AB-9

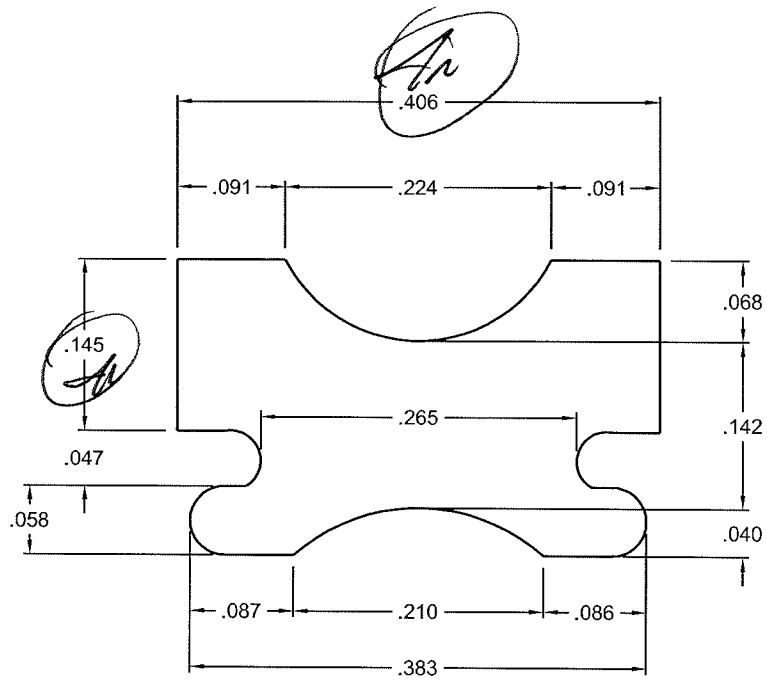
CURTAIN WALL ANCHOR

DRAWN F^2

DATE:

PRL ALUMINUM INC.
14760 DON JULIAN RD.
INDUSTRY CA. 91746
TEL. (877) 775-2586
PRL-ALUM
FAX (877) 274-8800

FULL SCALE



THIS DRAWING IS:
- [X] APPROVED
- [ ] APPROVED AS NOTED
- [ ] DISAPPROVED

DATE 12-21-40

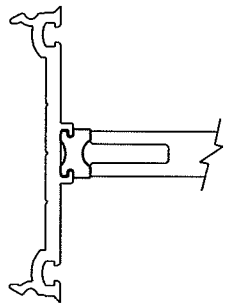
BY frank fisher (PRL aluminum)

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02

Date 1/27 Tech



NOTE: CUT LENGTH = 10'-0" ±2.000

+.015 -.010	+.020 -.015	+.025 -.020	+.030 -.025
±.040			
±.035			
±.030			
±.025			
±.020			
±.015			
±.010			

EXTRUSION CUT LENGTH TOLERANCE	
0 - 1.59"	±.060"
1.6" - 2.49"	±.080"
2.5" - 3.99"	±.100"
4.0" - 6.29"	±.130"
6.3" - 9.99"	±.160"
10.0" - 15.99"	±.200"
16.0" - 24.99"	±.250"
25.0" - 39.99"	±.400"
40.0" - 62.99"	±.500"
63.0" - 99.99"	±.630"
100.0" - 159.99"	±.800"
160.0" +	±.50%

No.	Date	Description	By

Customer: PRL Aluminum

Customer Part No.

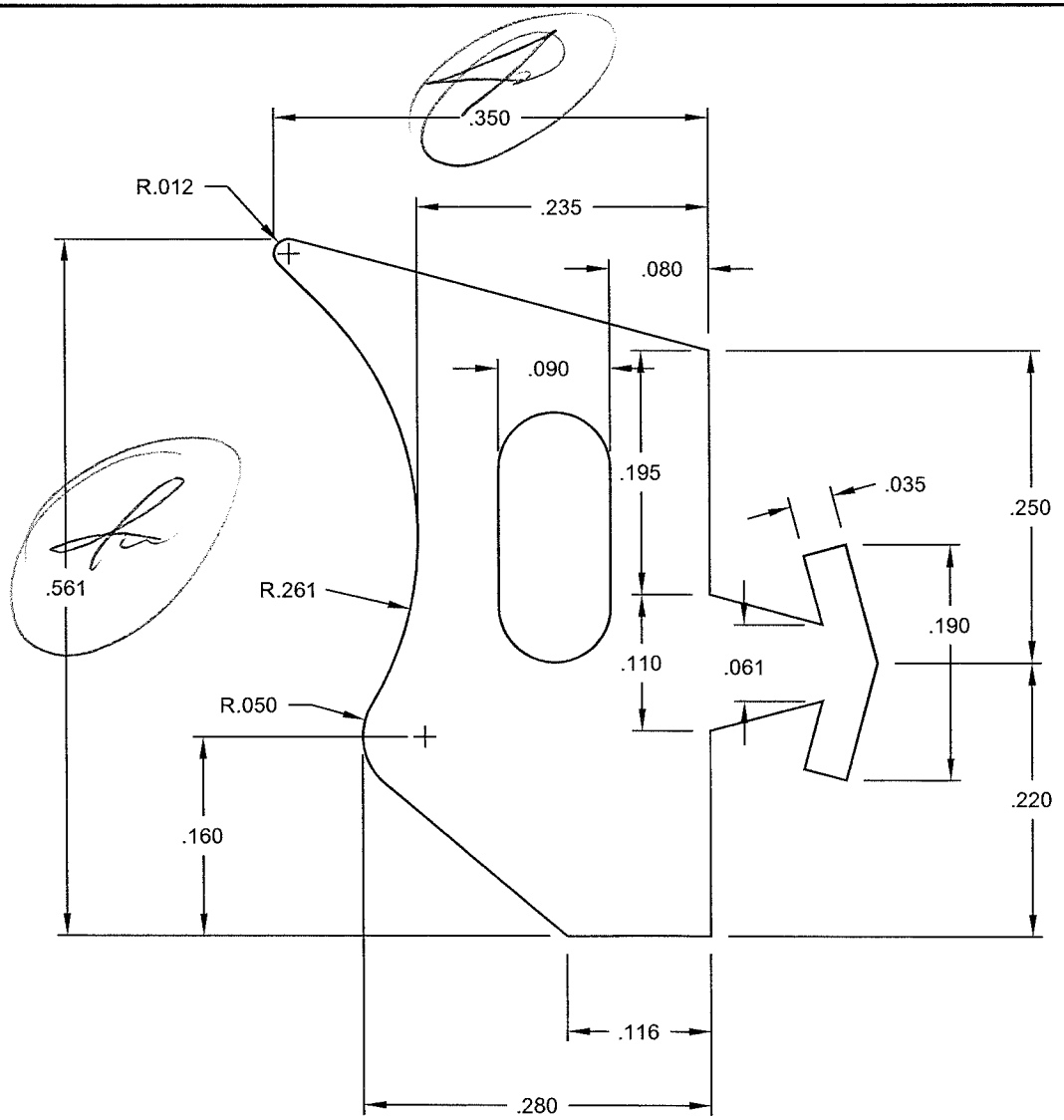
Project:

Rev No.

Drawn by: VDS | Scale: 10X | Date: 12/21/2010

Compound: Rigid PVC | Designed F.C. .145 | Drawing No. 999VY08

Durometer: GEON | Area: .0765



FULL SCALE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# B2778.02-701-18

Date 10/3 Tech

WS-1

EXTRUSION CUT	
0	- 1
1.6"	- 2
2.5"	- 3
4.0"	- 6
6.3"	- 9
10.0"	- 15
16.0"	- 24
25.0"	- 39
40.0"	- 62
63.0"	- 99
100.0"	- 159
160.0" +	