Intertek | Architectural Testing

AAMA 1503-09 THERMAL PERFORMANCE
TEST REPORT

Rendered to:

CMI ARCHITECTURAL PRODUCT, INC

SERIES/MODEL: 450 DT System
TYPE: Glazed Wall Systems (Site-built)

Summary of Results			
Thermal Transmittance (U-Factor)			0.34
Condensation Resistance Factor - Frame (CRF_f)			68
Condensation Resistance Factor - Glass (CRF_g)			76
Unit Size:		79" x 79"	
Layer 1:	1/4"	PPG SB60 (e=0.035*, #2)	
Gap 1:	0.50"	SS-D: Stainless Steel Spacer	90% Argon*
Layer 2:	1/4"	Clear	

Reference must be made to Report No. G9649.02-201-46, dated 08/09/17 for complete test specimen description and data.

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CMI ARCHITECTURAL PRODUCT, INC
1630 101st Avenue NE Suite 130
Blaine, Minnesota 55449

Report Number:	G9649.02-201-46
Test Date:	07/27/17
Report Date:	08/09/17

Test Sample Identification:

Series/Model: 450 DT System

Type: Glazed Wall Systems (Site-built)

Test Sample Submitted by: Client

Test Procedure: The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-09, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*

1. Average warm side ambient temperature 69.80 F
2. Average cold side ambient temperature -0.19 F
3. 15 mph dynamic wind applied to test specimen exterior.
4. 0.0" ±0.04" static pressure drop across specimen.

Test Results Summary:

1. Condensation resistance factor - Frame (CRF_f)	68
Condensation resistance factor - Glass (CRF_g)	76
2. Thermal transmittance due to conduction (U)	0.34
(U-factors expressed in Btu/hr·ft^2·F)	

Test Sample Description:

Frame:

Material:	AT (0.50"): Aluminum with Thermal Breaks - All Members		
Size:	79" x 79"		
Daylight Opening:	36-1/4" x 76-3/4" (x2)	**Glazing Method:**	Exterior
Exterior Color:	Gray	**Exterior Finish:**	Mill Finish
Interior Color:	Gray	**Interior Finish:**	Mill Finish
Corner Joinery:	Square Cut / Screws / Sealed		

Glazing Information:

Layer 1:	1/4"	PPG SB60 (e=0.035*, #2)	
Gap 1:	0.50"	SS-D: Stainless Steel Spacer	90% Argon*
Layer 2:	1/4"	Clear	
Gas Fill Method:		Single-Probe Method*	
Desiccant:		Yes	

**Stated per Client/Manufacturer*

N/A Non-Applicable

Test Sample Description: (Continued)

Weatherstripping:

Description	Quantity	Location
Rubber gasket	1 Row	Frame Perimeter

Hardware:

Description	Quantity	Location
No hardware		

Drainage:

Drainage Method	Size	Quantity	Location
Punched weephole	1/4" x 1/4"	4	Sill

Test Duration:

1. The environmental systems were started at 12:00 hours, 07/26/17.

2. The thermal performance test results were derived from 03:59 hours, 07/27/17 to 07:59 hours, 07/27/17.

Condensation Resistance Factor (CRF):

The following information, condensed from the test data, was used to determine the condensation resistance factor:

T_h	=	Warm side ambient air temperature	69.80 F
T_c	=	Cold side ambient air temperature	-0.19 F
FT_p	=	Average of pre-specified frame temperatures (14)	47.39 F
FT_r	=	Average of roving thermocouples (4)	42.29 F
W	=	$[(FT_p - FT_r) / (FT_p - (T_c + 10))] \times 0.40$	0.053
FT	=	$FT_p(1-W) + W (FT_r)$ = Frame Temperature	47.12 F
GT	=	Glass Temperature	52.55 F
CRF_g	=	Condensation resistance factor – Glass	76
		$CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	
CRF_f	=	Condensation resistance factor – Frame	68
		$CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	

The CRF number was determined to be 68 (on the size as reported). When reviewing this test data, it should be noted that the frame temperature (FT) was colder than the glass temperature (GT) therefore controlling the CRF number. Refer to the 'CRF Report' page and the 'Thermocouple Location Diagram' page of this report.

Thermal Transmittance (U_c):

T_h	=	Average warm side ambient temperature	69.80	F
T_c	=	Average cold side ambient temperature	-0.19	F
P	=	Static pressure difference across test specimen 15 mph dynamic perpendicular wind at exterior	0.00	psf
Nominal sample area			43.34	ft^2
Total measured input to calorimeter			1135.04	Btu/hr
Calorimeter correction			100.81	Btu/hr
Net specimen heat loss			1034.23	Btu/hr
U	=	Thermal Transmittance	0.34	$Btu/hr \cdot ft^2 \cdot F$

Glazing Deflection:

	Left Glazing	Right Glazing
Edge Gap Width	0.50"	0.50"
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.51"	0.51"
Center gap width at laboratory ambient conditions on day of testing	0.51"	0.51"
Center gap width at test conditions	0.44"	0.44"

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

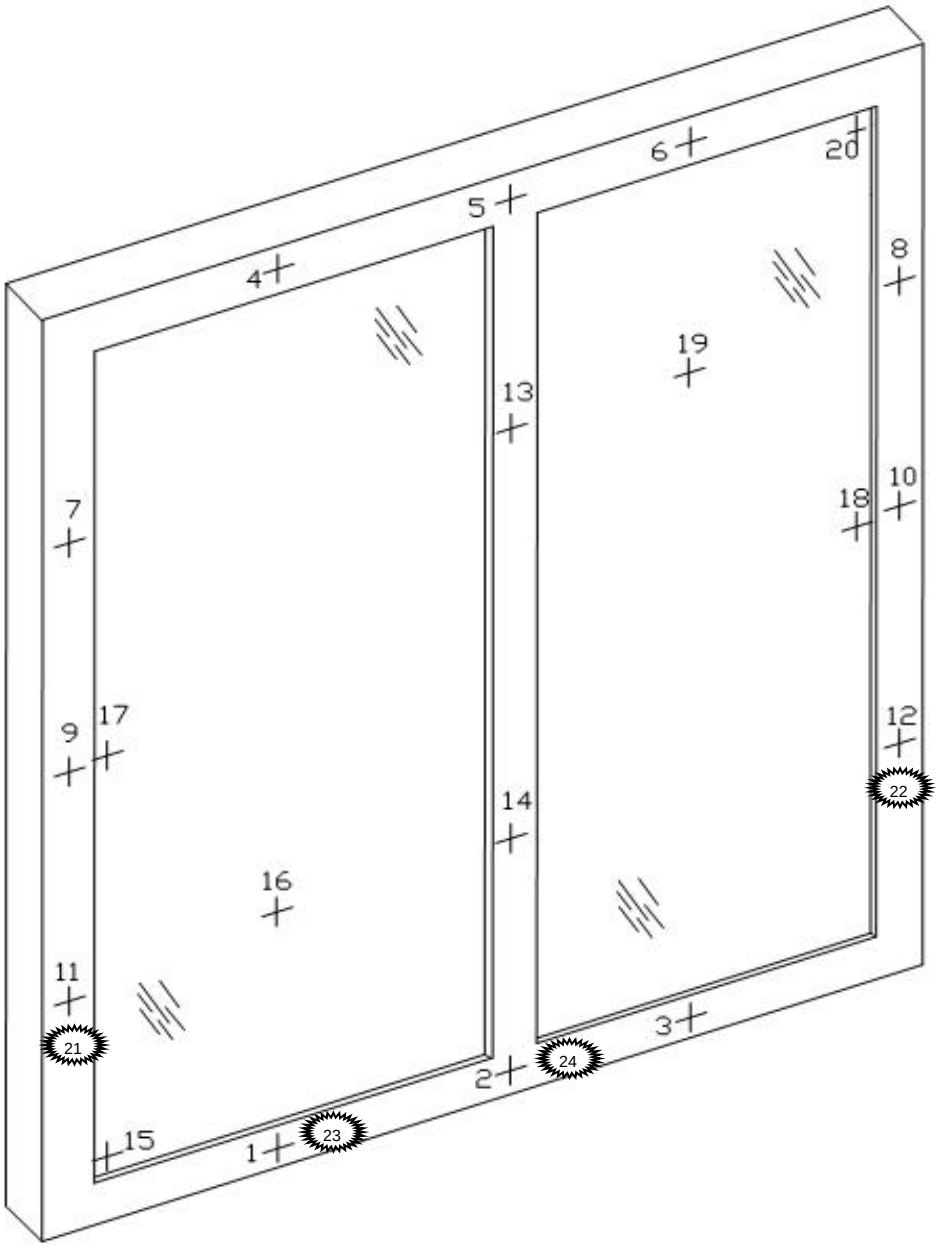
Prior to testing the specimen was sealed with silicone on the interior side and checked for air infiltration per Section 9.3.4.

Required annual calibrations for the Architectural Testing Inc., an Intertek company ("Intertek-ATI"), 'thermal test chamber' (ICN N000235) in St. Paul, Minnesota were last conducted in November 2016 in accordance with Intertek-ATI calibration procedure. A CTS Calibration verification was performed November 2016. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed November 2016.

CRF Report

Time:	05:59	06:29	06:59	07:29	07:59	AVERAGE
Pre-specified Thermocouples - Frame						
1	43.17	43.16	43.17	43.19	43.23	43.18
2	43.32	43.32	43.32	43.30	43.39	43.33
3	44.11	44.09	44.10	44.13	44.13	44.11
4	44.50	44.43	44.47	44.48	44.56	44.49
5	57.81	57.80	57.82	57.83	57.78	57.81
6	52.44	52.39	52.43	52.41	52.44	52.42
7	48.82	48.87	48.84	48.83	48.82	48.84
8	50.17	50.22	50.18	50.17	50.18	50.18
9	45.44	45.49	45.50	45.49	45.48	45.48
10	45.82	45.86	45.83	45.82	45.80	45.83
11	41.23	41.29	41.26	41.28	41.26	41.26
12	41.32	41.34	41.38	41.35	41.35	41.35
13	54.12	54.11	54.13	54.12	54.09	54.11
14	51.04	51.03	51.09	51.07	51.05	51.06
FT_P	47.38	47.39	47.39	47.39	47.40	47.39
Pre-specified Thermocouples - Glass						
15	40.25	40.25	40.23	40.23	40.23	40.24
16	56.91	56.93	56.93	56.92	56.92	56.92
17	52.06	52.08	52.08	52.05	52.04	52.06
18	52.73	52.71	52.72	52.72	52.69	52.71
19	58.62	58.66	58.65	58.63	58.62	58.63
20	54.82	54.74	54.76	54.74	54.74	54.76
GT	52.56	52.56	52.56	52.55	52.54	52.55
Cold Point (Roving) Thermocouples						
21	41.32	41.29	41.26	41.28	41.26	41.28
22	41.32	41.34	41.38	41.35	41.35	41.35
23	43.17	43.16	43.17	43.19	43.23	43.18
24	43.32	43.32	43.32	43.30	43.39	43.33
FT_R	42.28	42.28	42.28	42.28	42.31	42.29
W	0.05	0.05	0.05	0.05	0.05	0.05
FT	47.11	47.11	47.12	47.12	47.13	47.12
Warm Side - Room Ambient Air Temperature						
	69.81	69.81	69.81	69.80	69.78	69.80
Cold Side - Room Ambient Air Temperature						
	-0.81	-0.78	-0.79	-0.75	-0.77	-0.78
CRF_f	68	68	68	68	68	68
CRF_g	76	76	76	76	76	76

Thermocouple Location Diagram



Cold Point Locations

21. 41.28
22. 41.35
23. 43.18
24. 43.33

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period. The test record retention end date for this report is July 27, 2021.

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 tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI

Digitally Signed by: George Radysh

George Radysh
Thermal Technician

Digitally Signed by: Daniel A. Johnson

Dan A. Johnson
Director – Regional Operations
Individual-In-Responsible-Charge

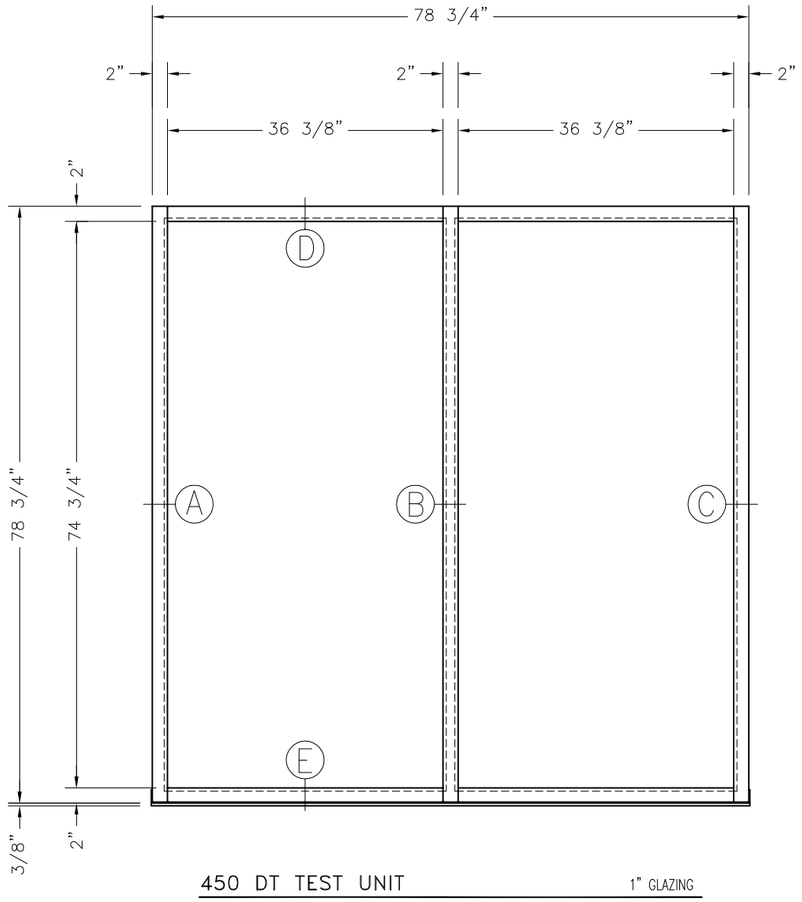
GR: daj/wmr
G9649.02-201-46

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Drawings (10)

Revision Log

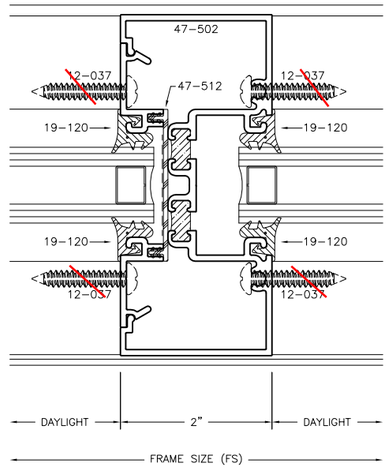
Rev. #	Date	Page(s)	Revision(s)
02-R0	08/09/17	All	Original Report Issue. Work requested by Geoffrey Helm of CMI Architectural Product, Inc.

Appendix A: Drawings



450 DT TEST UNIT — 1" GLAZING

PARTS LIST:		
#	USE	DESCRIPTION
46–010	GLASS STOP	6063–T6 ALUMINUM
47–501	SILL	6063–T6 ALUMINUM DUAL POLYURETHANE THERMAL BREAK
47–502	HEAD/JAMB/VERTICAL	6063–T6 ALUMINUM DUAL POLYURETHANE THERMAL BREAK
47–512	VERTICAL FILLER	6063–T6 ALUMINUM DUAL DUROMETER PVC THERMAL BREAK
47–535	SUB–SILL	6063–T6 ALUMINUM DUAL POLYURETHANE THERMAL BREAK
32–071–09	PERIMETER FILLER	PVC
19–120	GLAZING GASKET	EPDM 70 ± 5 DUROMETER
12–037	FASTENERS	12–14 X 1 1/4" PPH TYPE AB, THREAD TAPPING SCREW, CLEAR ZINC PLATED



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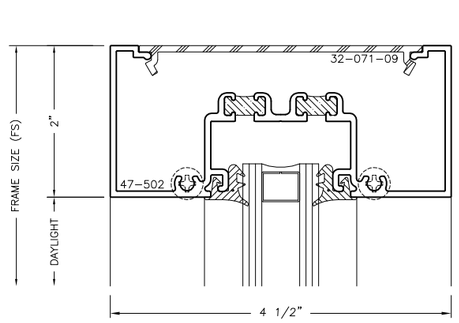

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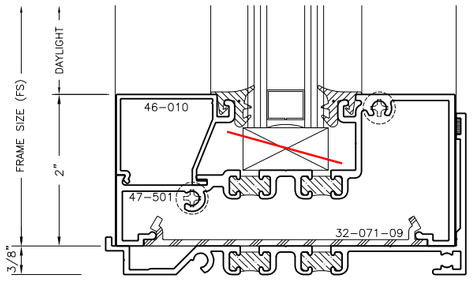


E / 1 SILL — SCALE: (1=1)

Intertek

Report #: G9649
Date: 08/07/17
Verified by:

CMI-ARCHITECTURAL PRODUCTS, INC.
20621 HWY 25 N.
DeSmet, South Dakota 57231
TELEPHONE (605)854-3326
FAX (605)854-3620

PROJECT: 450 DT NFRC 100/200/500

TESTING AGENCY: INTERTEK - ST. PAUL, MINNESOTA

REVISIONS

REV	INT'L	DATE

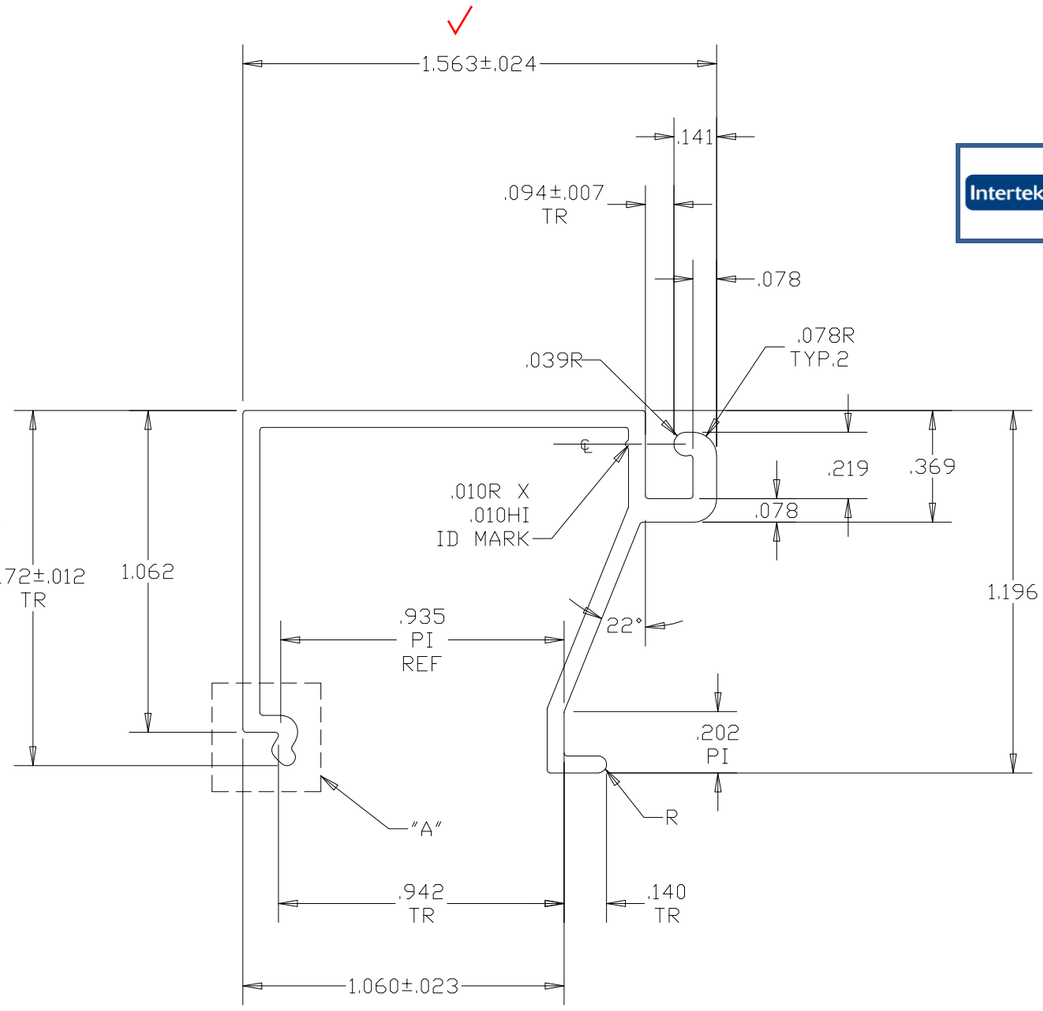
DATE DRAWN: 3-13-2017

DRAWN BY: GLH

SCALE: AS NOTED

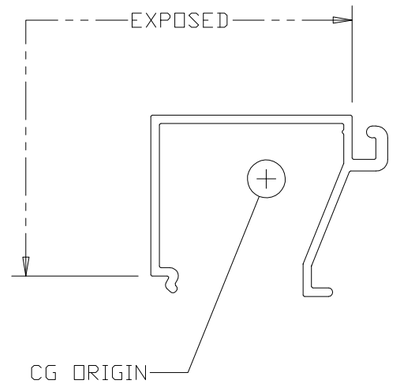
SHEET: 1 OF 1

Standard Aluminum Association tolerances apply unless otherwise noted.			DIE NUMBER	REV
CUST PART #: 46010-00	TITLE BLOCK: REV A	EUC	CRO-115	
CUST PART NAME: GLAZING STOP	DIM AND TOL BLOCK REMOVED	103		
PROPOSAL:	REL. DATE 10/13/04 MRW	ALLOY 6063-T6	FINISH AE, PAINT, ANOD	

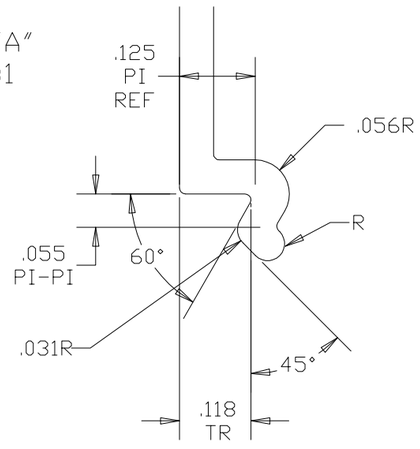


Intertek MT

Report #: G9649
Date: 08/07/17
Verified by:



ACTUAL SIZE



Aluminum Alloy - Anodized

Structural values estimated for reference only.					
Ix:	.0162 x 10^6 mm^4	.039 in^4	Iy:	.0333 x 10^6 mm^4	.080 in^4
Sx:	.825 x 10^3 mm^3	.050 in^3	Sy:	1.637 x 10^3 mm^3	.100 in^3
CGx:	19.69 mm	.775 in	CGy:	20.35 mm	.801 in

CRO-115

12343
CMI ARCHITECTURAL PRODS, INC.
608 4th STREET S.E.
P.O. BOX T

DE SMET SD 57231

THE WILLIAM L BONNELL CO
CAPITOL PRODUCTS CORPORATION
BON▪L▪CAMPO, LP BON▪L▪CANADA, INC
SUBSIDIARIES OF TREDEGAR INDUSTRIES, INC

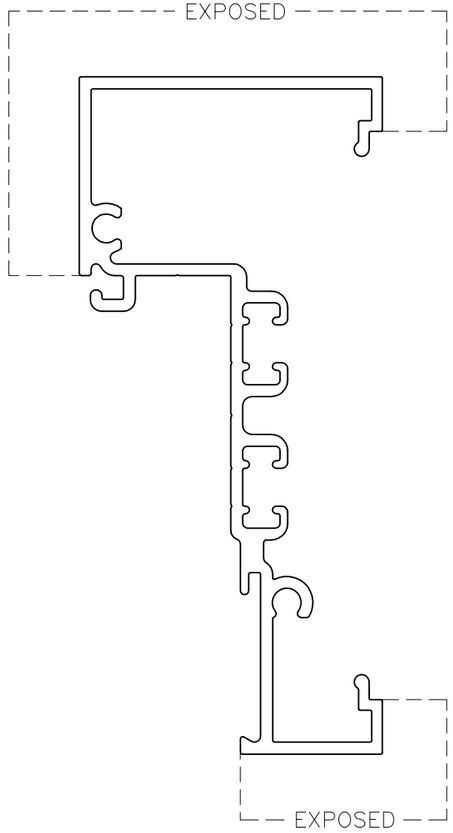
UNSPECIFIED WALLS:	1.42 mm	MASS:	.457 kg/m	.307 lb/ft
	.056 in	EST PER:	222.50 mm	8.760 in
UNSPECIFIED RADII:	.25R mm	OUT PER:	mm	in
	.010R in	EXP PER:	mm	in
DATE:	10/7/4	BUFF PER:	mm	in
DRAWN:	MRW	BUFF TURNS:	CLASS:	Solid
SCALE:	2:1	FACTOR:	487 metric	29 imperial
THM BAR:	NO	C.C.D.:	49.99 mm	1.968 in
P&D CODE:	NO	P&D AREA:	mm^2	in^2

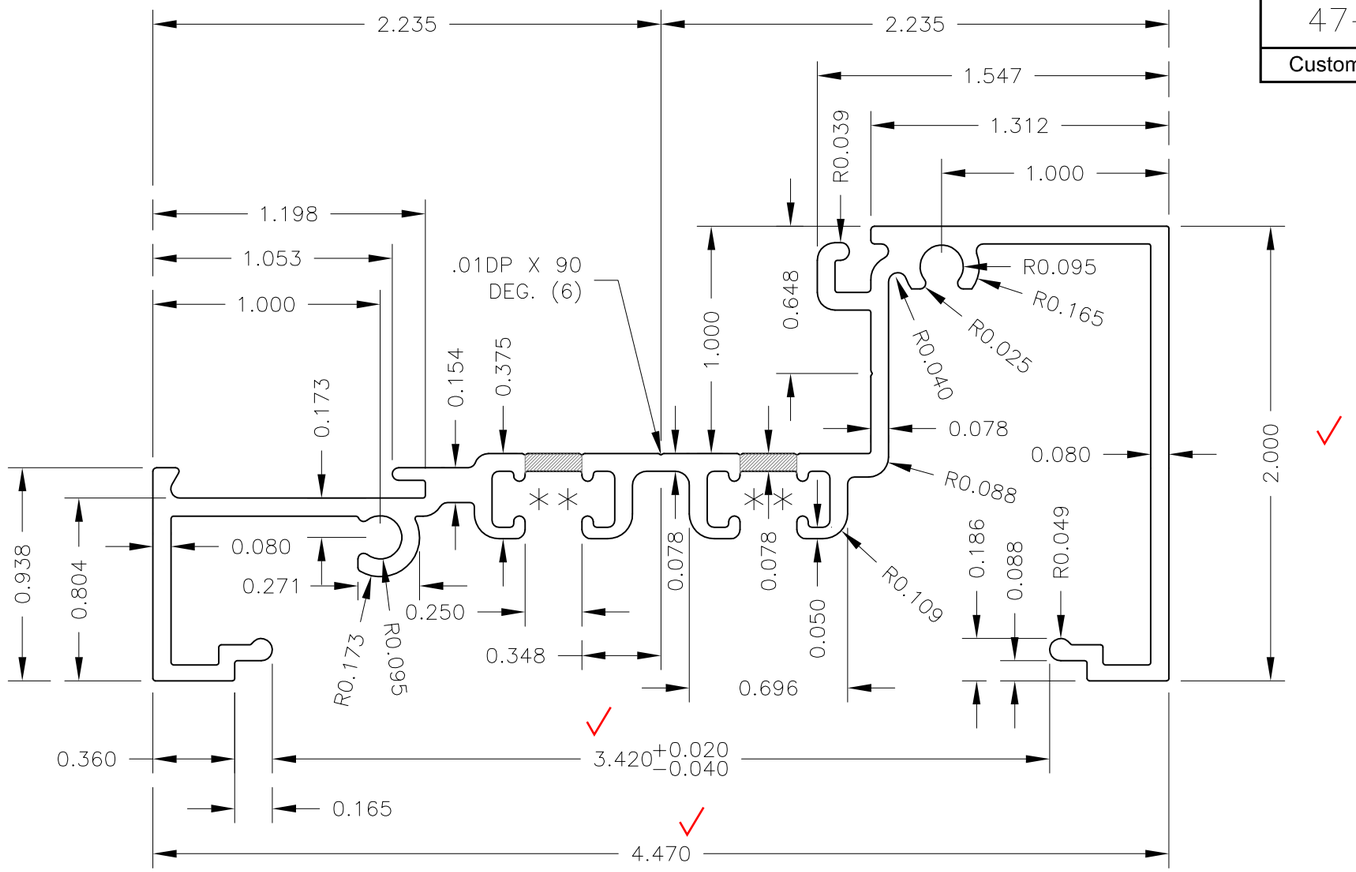
PRINT REVISIONS	DATE

Intertek MT

Report #: G9649
Date: 08/07/17
Verified by:

7835
Die Number
47–501
Customer Number





Aluminum Alloy - Anodized

SCALE 1.5:1

▨ = DE–BRIDGE FOR THERMAL BARRIER

ACTUAL SIZE

** POCKETS TO BE AZO–BRADED PRIOR TO FILLING WITH POLYURETHANE POLYMER THERMAL BARRIER.

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED: _____

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–T6		
AREA	1.179	WT/FT	1.386
PERIMETER	24.818	CIRCLE SIZE	5–6
OUTSIDE PERIMETER	24.818	FACTOR	
EXPOSED PERIMETER	4.970		SOLID

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
∗ =

DIE REVISIONS	DATE

CROWN EXTRUSIONS

Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER

CMI Architectural
CMI Architectural Products,Inc.
20621 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3620

PART NAME: 450 DT SILL

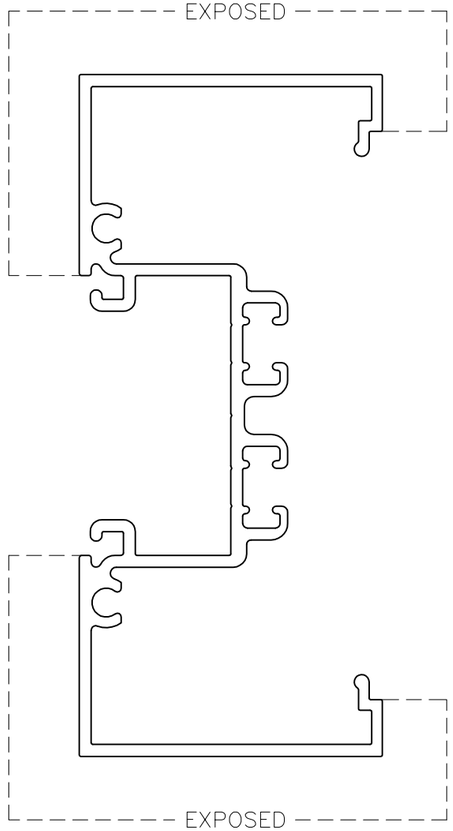
DIE # 7835
SCALE ACTUAL & NOTED
DATE 1–16–17
LAST REVISION
DRAWN GLH
CUSTOMER NUMBER 47–501

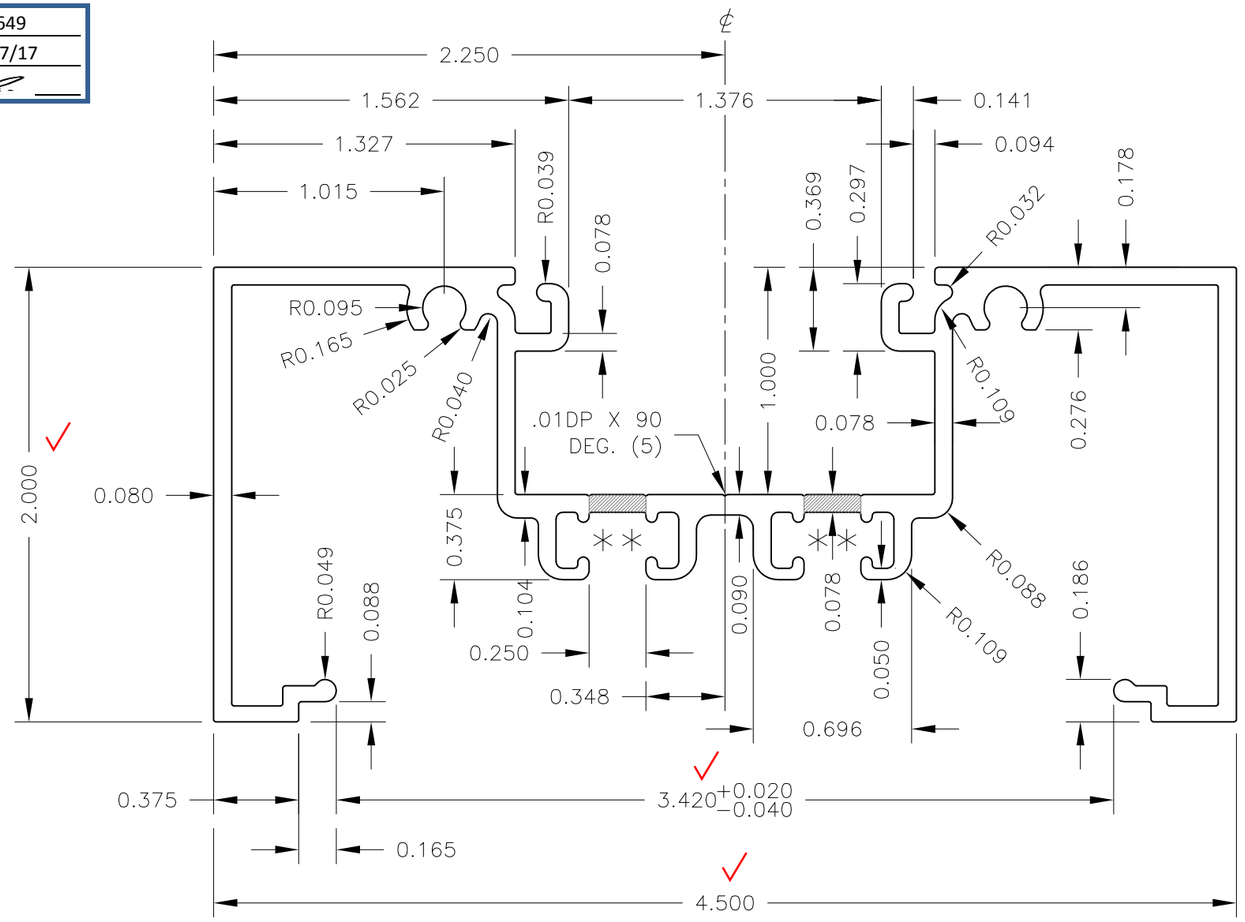
PRINT REVISIONS	DATE

Intertek

Report #: G9649
Date: 08/07/17
Verified by:

7836
Die Number
47–502
Customer Number





Aluminum Alloy - Anodized

SCALE 1.5:1

= DE–BRIDGE FOR THERMAL BARRIER

ACTUAL SIZE

** POCKETS TO BE AZO–BRADED PRIOR TO FILLING WITH POLYURETHANE POLYMER THERMAL BARRIER.

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED:

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–T6		
AREA	0.997	WT/FT	1.172
PERIMETER	29.285	CIRCLE SIZE	5–6
OUTSIDE PERIMETER	29.285	FACTOR	
EXPOSED PERIMETER	7.404		SOLID

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
∗ =

DIE REVISIONS	DATE

CROWN EXTRUSIONS

Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER

CMI Architectural

CMI Architectural Products,Inc.
20621 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3620

PART NAME: 450 DT HEAD / JAMB

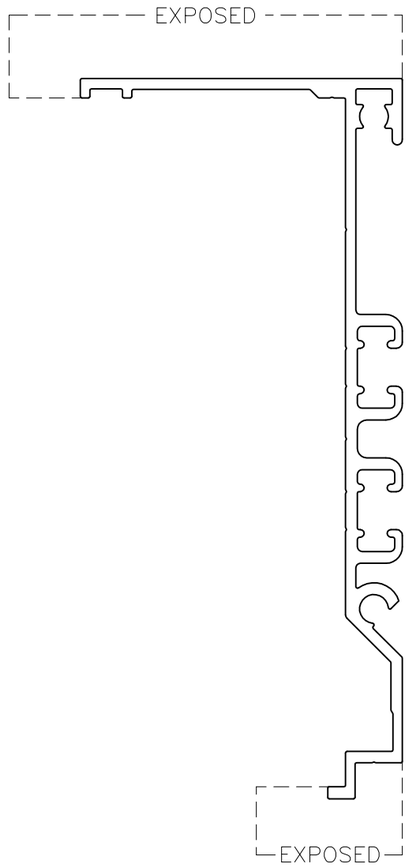
DIE #	7836
SCALE	ACTUAL & NOTED
DATE	1–16–17
LAST REVISION	
DRAWN	GLH
CUSTOMER NUMBER	47–502

PRINT REVISIONS	DATE

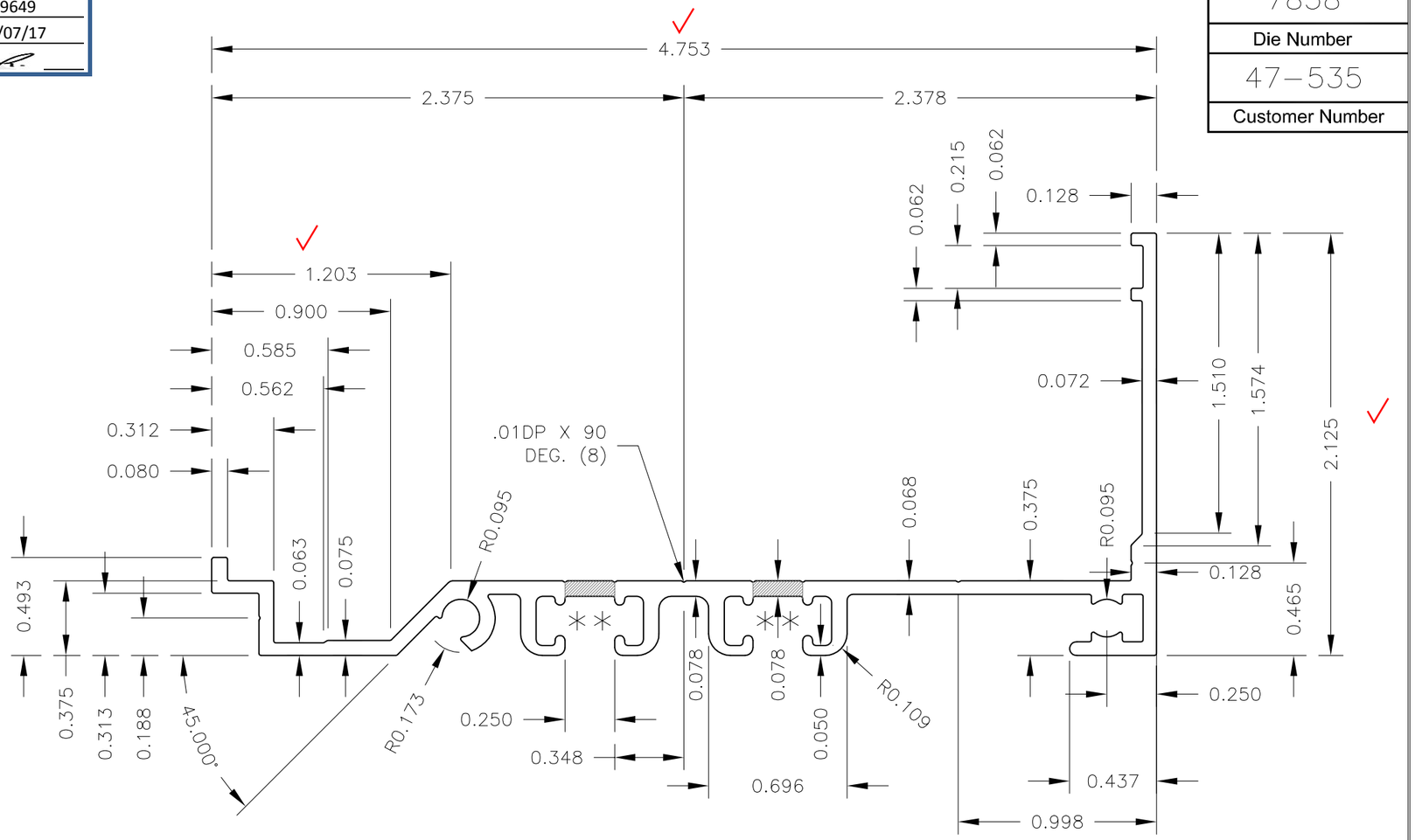
Intertek

Report #: G9649
Date: 08/07/17
Verified by:

7838
Die Number
47–535
Customer Number



ACTUAL SIZE



Aluminum Alloy - Anodized

SCALE 1.5:1

= DE–BRIDGE FOR THERMAL BARRIER

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED: _____

** POCKETS TO BE AZO–BRADED PRIOR TO FILLING WITH POLYURETHANE POLYMER THERMAL BARRIER.

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–T6		
AREA	0.742	WT/FT	0.873
PERIMETER	20.116	CIRCLE SIZE	5–6
OUTSIDE PERIMETER	20.116	FACTOR	
EXPOSED PERIMETER	3.063		SOLID

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
∗ =

DIE REVISIONS	DATE

CROWN EXTRUSIONS

Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER

[redacted] CMI Architectural
CMI Architectural Products,Inc.
20621 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3620

PART NAME: 450 DT SUB–SILL

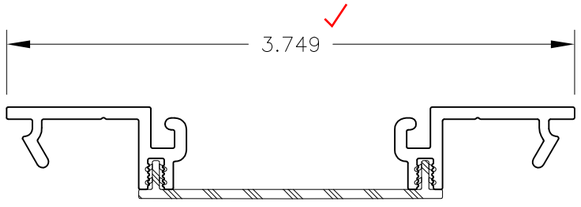
DIE #	7838
SCALE	ACTUAL & NOTED
DATE	1–16–17
LAST REVISION	
DRAWN	GLH
CUSTOMER NUMBER	47–535

PRINT REVISIONS	DATE

Intertek MT

Report #: G9649
Date: 08/07/17
Verified by:

7839
Die Number
32–101
Customer Number



ASSEMBLED PART 47–512

USE 2 EA. 32–101 W/
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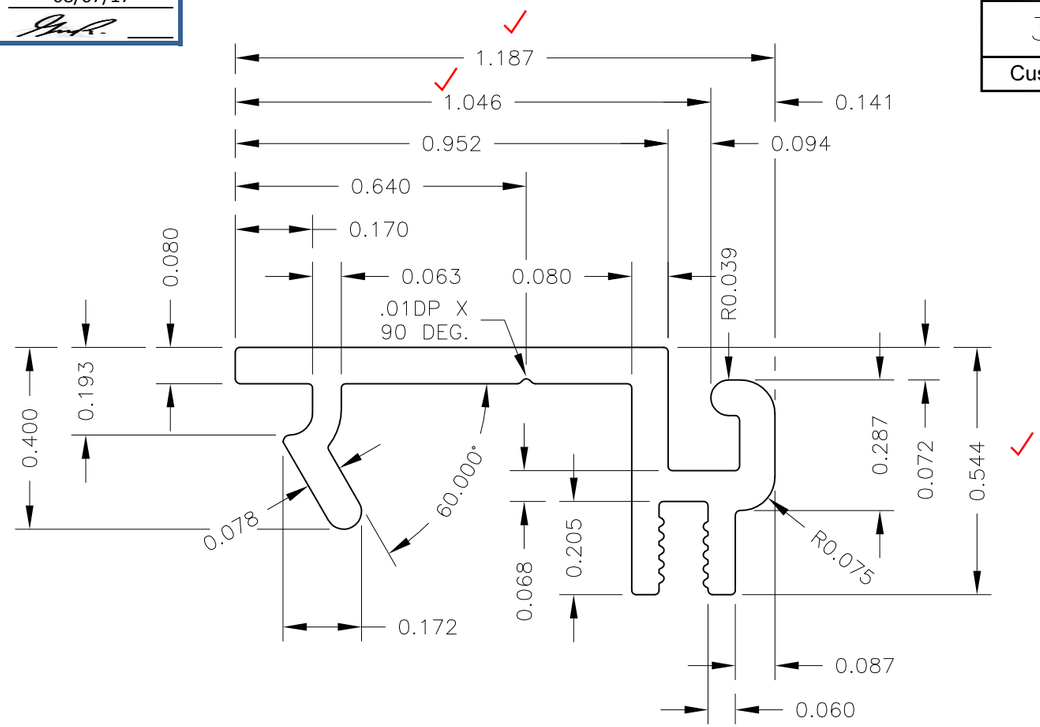
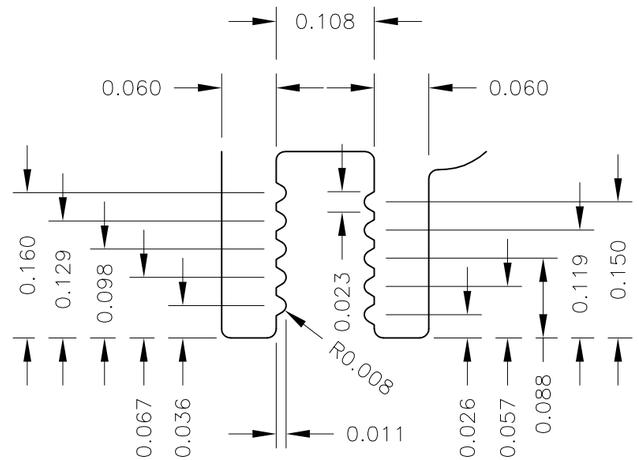
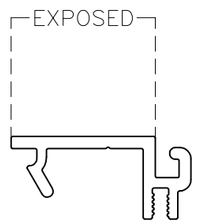




Aluminum Alloy - Anodized

SCALE 3:1



ACTUAL SIZE

SCALE 6:1

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED: _____

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–T6		
AREA	0.185	WT/FT	0.218
PERIMETER	5.206	CIRCLE SIZE	5–6
OUTSIDE PERIMETER	5.206	FACTOR	
EXPOSED PERIMETER	0.952	SOLID	

DIE REVISIONS	DATE
NEW DIE	3/13/17

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
∗ =

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

CROWN EXTRUSIONS

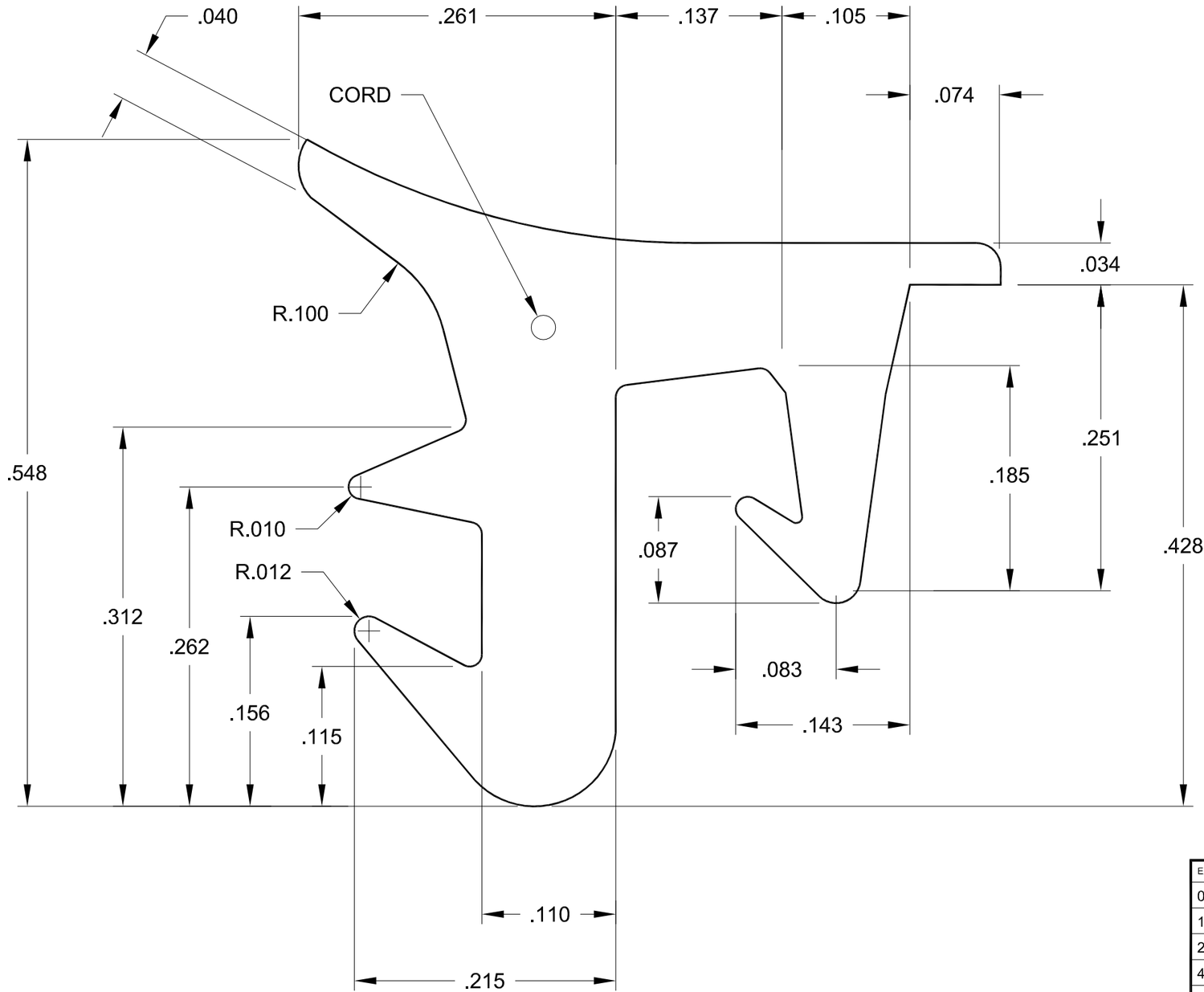
Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER

CMI Architectural
CMI Architectural Products,Inc.
20621 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3620

PART NAME: 450 DT VERTICAL FILLER

DIE #	7839
SCALE	ACTUAL & NOTED
DATE	1–16–17
LAST REVISION	
DRAWN	GLH
CUSTOMER NUMBER	32–101



Intertek

Report #: G9649
Date: 08/07/17
Verified by:

FULL SCALE

EPDM

THIS PROFILE TO BE SILICONE COATED.

EXTRUSION CUT LENGTH TOLERANCE	
0 - 1.6"	±.060"
1.6" - 2.5"	±.080"
2.5" - 4.0"	±.100"
4.0" - 6.3"	±.130"
6.3" - 10.0"	±.160"
10.0" - 16.0"	±.200"
16.0" - 25.0"	±.250"
25.0" - 40.0"	±.400"
40.0" - 63.0"	±.500"
63.0" - 100.0"	±.630"
100.0" - 160.0"	±.800"
+160.0"	±.50%

No.	Date	Description	By
2	3-11-11	ADDED CORD	DLS
1	12-20-07	ADDED NOTE RE: SILICONE COATING	DLS

TREMCO
SEALANT / WEATHERPROOFING DIVISION

1451 Jacobson Ave
Ashland, Ohio 44805 U.S.A.

Phone : 800-321-6357
Fax : 419-289-6645

Customer: CMI

Customer Part No.: 19-120

Project:

Drawn by: E. TANGO

Scale: 10X

Date: 6/13/2005

Compound: EPDM

Designed F.C. *.188

Drawing No.: TR-13919E

Durometer: 70 ±5

Area:

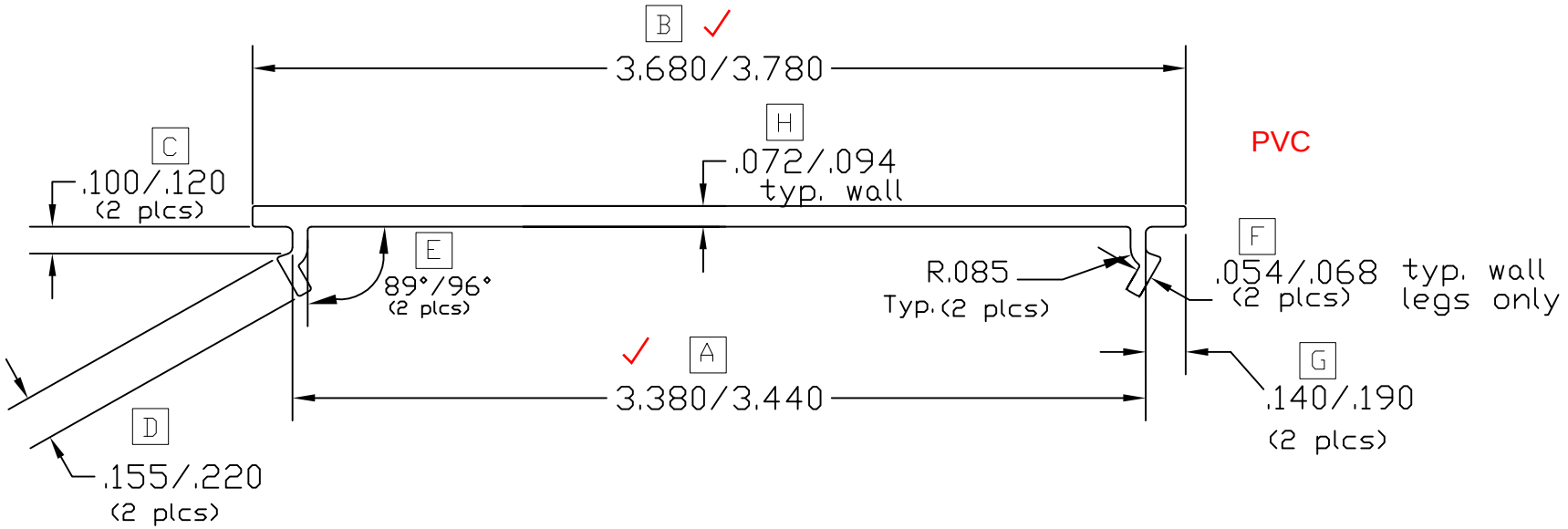
Intertek

Report #: G9649
Date: 08/07/17
Verified by:

REGRIND DIE

Your signature on this print indicates your approval of design and dimensions as shown. Please sign and return as soon as possible. Die construction cannot proceed until approval is recieved.

Approved DECEMBER 20 09
Customer CMI
Per



REVISIONS			
NO.	DESCRIPTION	DATE	BY
1	C WAS .100/.117	4/18/02	JB
1	E WAS 88°/92°	4/18/02	JB
1	G WAS .150/.170	4/18/02	JB
1	H WAS .075/.088	4/18/02	JB
2	C WAS .100/.120	12/15/09	JB
2	D WAS .160/.190	12/15/09	JB
2	F WAS .055/.065	12/15/09	JB
2	G WAS .150/.180	12/15/09	JB
2	H WAS .075/.092	12/15/09	JB

S

ASTRO PLASTICS
COVINGTON, GA ROSEMOUNT, MN

CMI
Open Back Filler

DATE 3/21/02 | SCALE nts | DRAWN BY JB | DRAWING NO. AP 4588
MATERIAL PVC Color: Black | APPRD. BY JB

Your signature on this print indicates your approval of design and dimensions as shown. Please sign and return as soon as possible. Die construction cannot proceed until approval is recieved.

Approved _____ 20 ____

Customer _____

Per _____

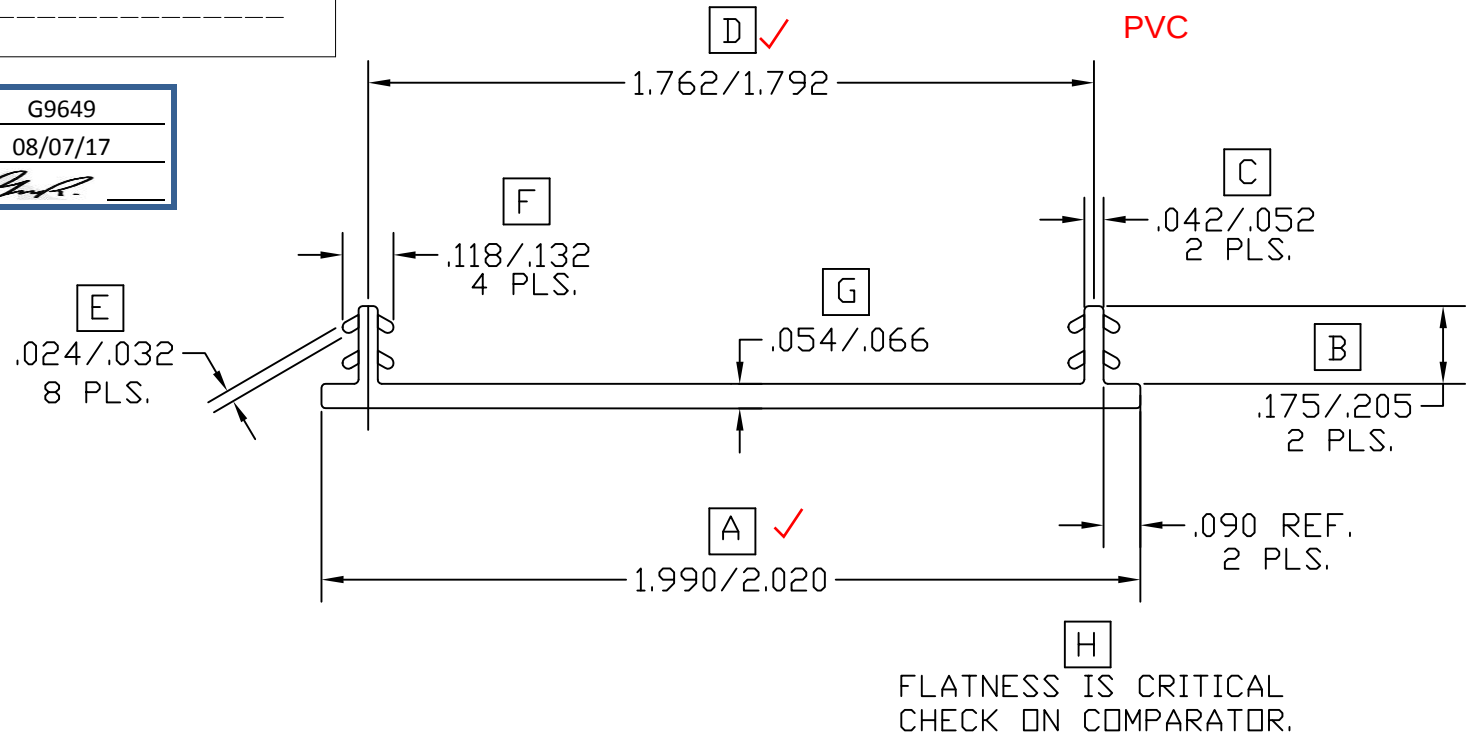
Intertek

Report #: G9649

Date: 08/07/17

Verified by:

NOTE: TRY TO HOLD DIMENSION F AT .125.

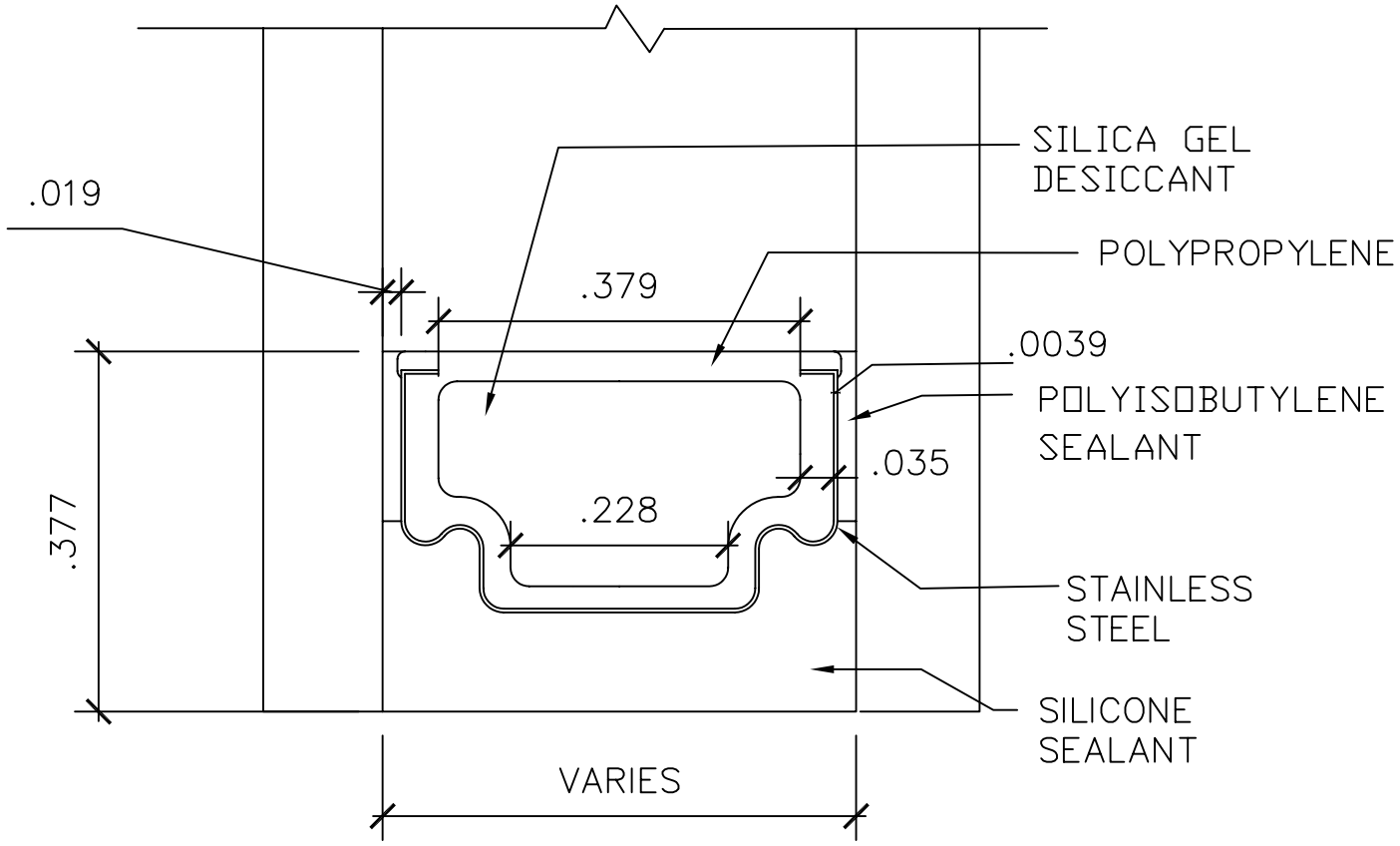


REVISIONS			
NO.	DESCRIPTION	DATE	BY
F	WAS .135/.149	3/13/17	ML

1. BOND IS CRITICAL
2. FIT GAUGE IS CRITICAL.

S

QUOTE # R-16610	CUSTOMER PART # 02790		TRACKING / X #		
ASTRO PLASTICS COVINGTON, GA ROSEMOUNT, MN	CMI ARCHITECURAL 450 DT VERTICAL FILLER	DATE 1/25/17	SCALE NONE	DRAWN BY ML	DRAWING NO. AP5834
		MATERIAL DUAL PVC		APPRD. BY JN	



DETAIL FOR THERMAL MODELING OF
TGI WAVE SPACER (TS-D)