

**AAMA 1503-09 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

US ALUMINUM

SERIES/MODEL: IT451 Storefront

TYPE: Glazed Wall Systems (Site-built)

| Summary of Results | | |
|--|---------------|---------------------------------|
| Thermal Transmittance (U-Factor) | | 0.36 |
| Condensation Resistance Factor - Frame (CRF_f) | | 62 |
| Condensation Resistance Factor - Glass (CRF_g) | | 72 |
| Unit Size: | 79" x 78-1/2" | |
| Layer 1: | 1/4" | Cardinal LoE 366 (e=0.022*, #2) |
| Gap 1: | 0.51" | SS-D: Stainless Steel Spacer |
| Layer 2: | 1/4" | Clear |
| | | 90% Argon* |

Reference must be made to Report No. C4347.02-201-46, dated 12/20/12 for complete test specimen description and data.

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered to:

US ALUMINUM
200 Singleton Drive
Waxahachie, Texas 75165

Report Number: C4347.02-201-46

Test Date: 11/30/12

Revision 1 Date: 12/20/12

Test Record Retention End Date: 11/30/16

Test Sample Identification:

Series/Model: IT451 Storefront

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 | -0.38 F |
| 3. 15 mph dynamic wind applied to test specimen exterior. | |
| 4. 0.0" \pm 0.04" static pressure drop across specimen. | |

Test Results Summary:

- | | |
|---|------|
| 1. Condensation resistance factor - Frame (CRF _f) | 62 |
| Condensation resistance factor - Glass (CRF _g) | 72 |
| 2. Thermal transmittance due to conduction (U) | 0.36 |
| (U-factors expressed in Btu/hr·ft ² ·F) | |

Test Sample Description:

Frame:

| | | | |
|--------------------------|--|-------------------------|----------|
| Material: | AT (0.21"): Aluminum with Thermal Breaks - All Members | | |
| Size: | 79" x 78-1/2" | | |
| Daylight Opening: | 36" x 74" (x2) | Glazing Method: | Interior |
| Exterior Color: | Gray | Exterior Finish: | Anodized |
| Interior Color: | Gray | Interior Finish: | Anodized |
| Corner Joinery: | Butted / Screws / Unsealed | | |

Glazing Information:

| | | | |
|------------------|----------------------|---------------------------------|------------|
| Layer 1: | 1/4" | Cardinal LoE 366 (e=0.022*, #2) | |
| Gap 1: | 0.51" | 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 |
|-----------------|----------|----------|
| No weatherstrip | | |
| | | |
| | | |
| | | |
| | | |

Hardware:

| Description | Quantity | Location |
|-------------|----------|----------|
| No hardware | | |
| | | |
| | | |
| | | |
| | | |

Drainage:

| Description | Size | Quantity | Location |
|------------------|------|----------|----------|
| No visible weeps | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Test Duration:

1. The environmental systems were started at 12:00 hours, 11/29/12.
2. The thermal performance test results were derived from 03:20 hours, 11/30/12 to 07:20 hours, 11/30/12.

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 | -0.38 F |
| FT_p | = | Average of pre-specified frame temperatures (14) | 43.78 F |
| FT_r | = | Average of roving thermocouples (4) | 36.55 F |
| W | = | $[(FT_p - FT_r) / (FT_p - (T_c + 10))] \times 0.40$ | 0.085 |
| FT | = | $FT_p(1-W) + W (FT_r) = \text{Frame Temperature}$ | 43.17 F |
| GT | = | Glass Temperature | 50.25 F |
| CRF_g | = | Condensation resistance factor – Glass | 72 |
| | | $CRF_g = (GT - T_c) / (T_h - T_c) \times 100$ | |
| CRF_f | = | Condensation resistance factor – Frame | 62 |
| | | $CRF_f = (FT - T_c) / (T_h - T_c) \times 100$ | |

The CRF number was determined to be 62 (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 | -0.38 F |
| P | = Static pressure difference across test specimen | 0.00 psf |
| | 15 mph dynamic perpendicular wind at exterior | |
| | Nominal sample area | 43.07 ft ² |
| | Total measured input to calorimeter | 1200.82 Btu/hr |
| | Calorimeter correction | 110.58 Btu/hr |
| | Net specimen heat loss | 1090.24 Btu/hr |
| U | = Thermal Transmittance | 0.36 Btu/hr·ft ² ·F |

Glazing Deflection:

| | Left Glazing | Right Glazing |
|---|--------------|---------------|
| Edge Gap Width | 0.51" | 0.51" |
| Estimated center gap width upon receipt of specimen in laboratory (after stabilization) | 0.42" | 0.42" |
| Center gap width at laboratory ambient conditions on day of testing | 0.42" | 0.42" |
| Center gap width at test conditions | 0.36" | 0.36" |

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. 'thermal test chamber' (ICN N000235) in St. Paul, Minnesota were last conducted in September 2012 in accordance with Architectural Testing Inc. calibration procedure. A CTS Calibration verification was performed November 2012. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed September 2012.

CRF Report

| Time: | 05:20 | 05:50 | 06:20 | 06:50 | 07:20 | AVERAGE |
|-------|-------|-------|-------|-------|-------|---------|
|-------|-------|-------|-------|-------|-------|---------|

Pre-specified Thermocouples - Frame

| | | | | | | |
|-----------------|-------|-------|-------|-------|-------|-------|
| 1 | 43.31 | 43.30 | 43.33 | 43.31 | 43.28 | 43.31 |
| 2 | 35.95 | 35.91 | 35.94 | 35.95 | 35.92 | 35.93 |
| 3 | 42.08 | 42.07 | 42.15 | 42.21 | 42.14 | 42.13 |
| 4 | 49.62 | 49.60 | 49.63 | 49.66 | 49.59 | 49.62 |
| 5 | 47.12 | 47.11 | 47.14 | 47.10 | 47.12 | 47.12 |
| 6 | 50.32 | 50.25 | 50.22 | 50.27 | 50.28 | 50.27 |
| 7 | 45.89 | 45.90 | 45.92 | 45.89 | 45.88 | 45.90 |
| 8 | 46.59 | 46.58 | 46.63 | 46.58 | 46.57 | 46.59 |
| 9 | 42.53 | 42.51 | 42.51 | 42.49 | 42.46 | 42.50 |
| 10 | 42.92 | 42.97 | 42.93 | 42.98 | 42.98 | 42.96 |
| 11 | 39.36 | 39.33 | 39.36 | 39.29 | 39.31 | 39.33 |
| 12 | 40.56 | 40.49 | 40.47 | 40.53 | 40.51 | 40.51 |
| 13 | 48.52 | 48.55 | 48.53 | 48.49 | 48.54 | 48.52 |
| 14 | 38.22 | 38.17 | 38.21 | 38.25 | 38.18 | 38.20 |
| FT _P | 43.78 | 43.77 | 43.79 | 43.79 | 43.77 | 43.78 |

Pre-specified Thermocouples - Glass

| | | | | | | |
|----|-------|-------|-------|-------|-------|-------|
| 15 | 39.68 | 39.68 | 39.80 | 39.72 | 39.77 | 39.73 |
| 16 | 56.98 | 56.97 | 56.98 | 56.96 | 56.98 | 56.98 |
| 17 | 48.48 | 48.45 | 48.45 | 48.49 | 48.47 | 48.47 |
| 18 | 48.48 | 48.45 | 48.45 | 48.49 | 48.47 | 48.47 |
| 19 | 58.16 | 58.17 | 58.13 | 58.13 | 58.11 | 58.14 |
| 20 | 49.67 | 49.69 | 49.72 | 49.74 | 49.74 | 49.71 |
| GT | 50.24 | 50.23 | 50.26 | 50.25 | 50.26 | 50.25 |

Cold Point (Roving) Thermocouples

| | | | | | | |
|-----------------|-------|-------|-------|-------|-------|-------|
| 21 | 37.41 | 37.40 | 37.39 | 37.42 | 37.40 | 37.40 |
| 22 | 35.95 | 35.91 | 35.94 | 35.95 | 35.92 | 35.93 |
| 23 | 36.82 | 36.81 | 36.82 | 36.84 | 36.82 | 36.82 |
| 24 | 36.06 | 36.06 | 36.03 | 36.08 | 36.05 | 36.06 |
| FT _R | 36.56 | 36.55 | 36.55 | 36.57 | 36.55 | 36.55 |
| W | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| FT | 43.17 | 43.16 | 43.17 | 43.18 | 43.16 | 43.17 |

Warm Side - Room Ambient Air Temperature

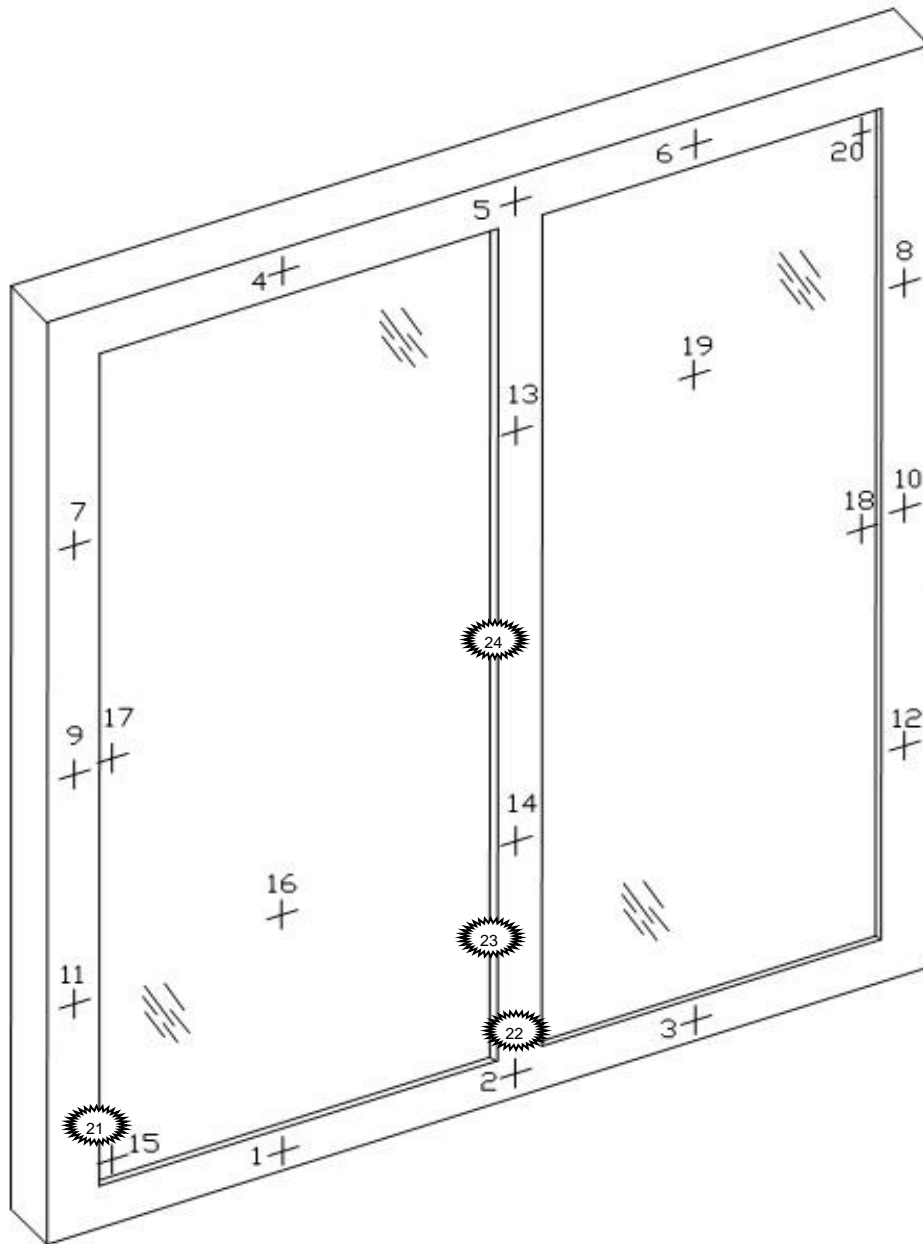
| | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| | 69.80 | 69.80 | 69.80 | 69.80 | 69.78 | 69.80 |
|--|-------|-------|-------|-------|-------|-------|

Cold Side - Room Ambient Air Temperature





| | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| | -0.36 | -0.41 | -0.33 | -0.42 | -0.39 | -0.38 |
|--|-------|-------|-------|-------|-------|-------|

| | | | | | | |
|------------------|----|----|----|----|----|----|
| CRF _f | 62 | 62 | 62 | 62 | 62 | 62 |
| CRF _g | 72 | 72 | 72 | 72 | 72 | 72 |

Thermocouple Location Diagram



Cold Point Locations

| | |
|---|-----------|
|  | 21. 37.40 |
|  | 22. 35.93 |
|  | 23. 36.82 |
|  | 24. 36.06 |

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured by using the designated test methods. 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.

Greg S Borchers
Technician

Michael P. Resech
Manager - Simulations and Thermal Testing
Individual-In-Responsible-Charge

GSB: gsb
C4347.02-201-46

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 | 12/10/12 | All | Original Report Issue. Work requested by Don Willard of US Aluminum. |
| 02-R1 | 12/20/12 | Cover, 2 | Revised Report Issue. Report revised to correct glass thickness from DS to 1/4". |

Appendix A: Drawings

NFRC PRODUCT CERTIFICATION PROGRAM

Submittal Form for Test Samples

For use by manufacturers, lineal suppliers and fabricators



1. Information on Production of the Test Sample (complete ALL fields):

Manufacturer: US Aluminum Date of sample manufacture: 11-2012
Plant Address where manufactured: Waxahachie
City: Waxahachie State: Texas Zip Code: 75165
Name of IA: ALI Phone: 214.565.0593 Fax: 214.565.1094

2. Product Information (complete ALL fields):

Product Line ID (CPD) No.: USA-A-5 Product/Operator Type (Table 4-3 of NFRC 100): NA
Series/Model: IT451 Storefront

3. Test sample is being submitted for (select ONE):

- a. ☐ Validation for Initial Certification (prototype only) no plant qualification
- b. ☐ Validation for Initial Certification (production line unit) & plant qualification
- c. ☒ Validation for Recertification (production line unit) & plant qualification
- d. ☐ Plant Qualification Only (production line unit)

I, Don Willard, as the designated agent for US Aluminum
do hereby attest that the foregoing information is true to the best of my information, knowledge, and belief.
Further, if the unit is identified in Section 3 as a production line unit, I hereby authorize the NFRC-accredited testing laboratory to send a copy of the test report to the IA identified above for plant qualification purposes pursuant to the NFRC Product Certification Program..

Signature: Don Willard Date: 12.04.12

FOR LABORATORY USE ONLY

1. Laboratory: ATI Minnesota
2. Date Sample Received: 11/27/12 File number ID: C4347
3. Date Sample Tested: 11/29/12 By: BB
4. Modifications made: _____

5. Reason for non-testing of sample unit: _____
[Note: If the sample submitted can not be tested due to damage prior to testing, a new sample and new form shall be submitted to the testing laboratory. Both forms shall be submitted to the IA when the testing is completed.]

| Mark | | Qty | Description | | | | |
|-------|-------|-----|--------------------|----------|---|---------------|--|
| A | | 1 | IT451 | 78.7500 | X | 78.4063 | |
| | | 2 | 1" Insulated glass | 37.2500 | X | 75.2813 | |
| | | | | | | NOTE: SUBSILL | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | HORIZONTALS | | | | |
| Part | Die | Qty | Description | Length | | | |
| IT433 | 60965 | 2 | HEAD | 36.3750 | | | |
| IM453 | 31793 | 2 | GLZ STOP | 36.3125 | | | |
| IT422 | 30907 | 2 | SILL | 36.3750 | | | |
| FT400 | 60619 | 1 | SUB SILL | 79.0000 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | VERTICALS | | | | |
| IT442 | 30908 | 3 | MULL | 78.4063 | | | |
| IX210 | 30889 | 1 | MULL FILLER | 78.4063 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | ASSECCORIES | | | | |
| NP225 | | 1 | GASKET | 945.0000 | | | |
| SB200 | | 4 | SETTING BLOCK | | | | |
| WB600 | | 4 | WALK BLOCK | | | | |
| WB601 | | 4 | SIDE BLOCK | | | | |
| ST251 | | 16 | ASSEM SCREW | | | | |



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# C4347
Date 12/7/12 Tech YB

ATI

Report # A2570

Date 10/5/10

Simulator Jason R. Miguel

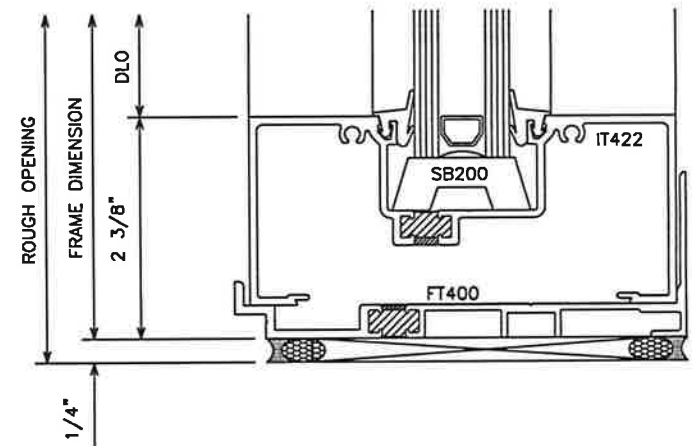
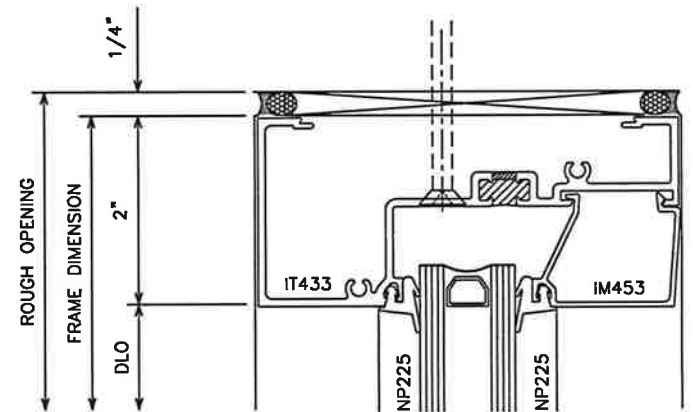
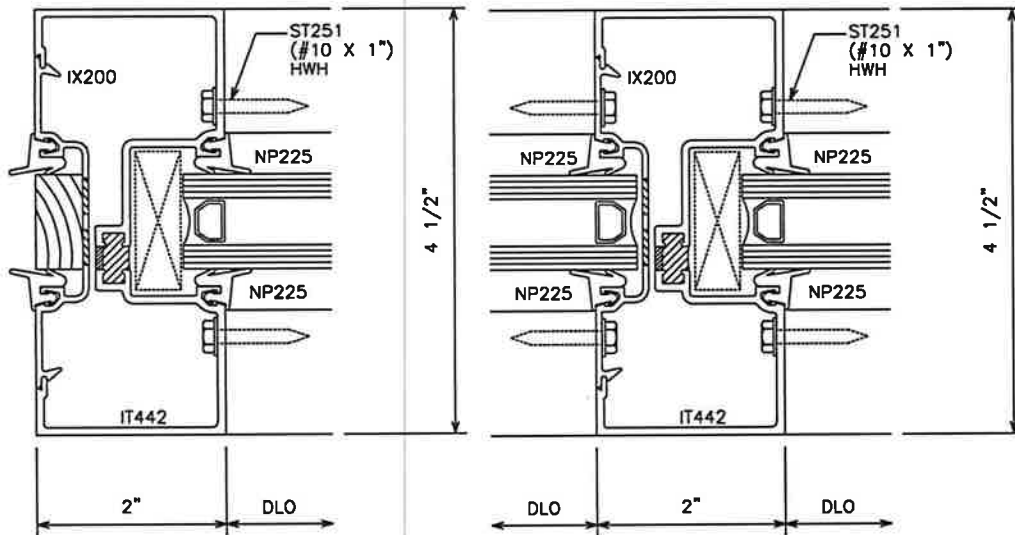


Architectural Testing

Test sample complies with these details.
Deviations are noted.

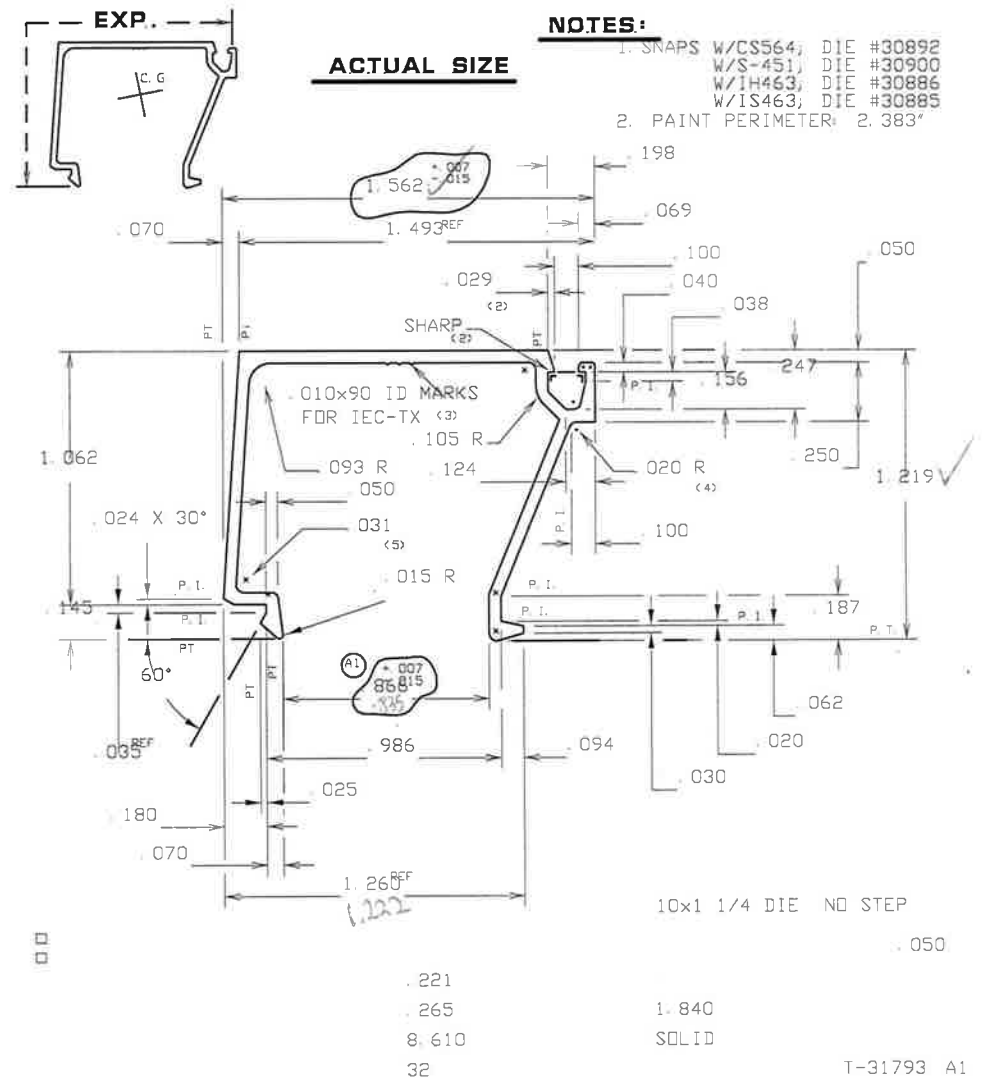
Report# C4347

Date 11/7/12 Tech YJB



Test sample complies with these details.
Deviations are noted.

Date 12/7/12 Tech YMS





Architectural Testing

Test sample complies with these details.
Deviations are noted.

| | |
|-----------|--------------------|
| Report # | A2570 |
| Date | 10/5/10 |
| Simulator | <i>[Signature]</i> |

Report#

Date

Tech

| REV | REVISION | BY | DATE | CUSTOMER | DIE NO. |
|-----|----------|----|------|------------------------|----------|
| | | | | U.S. ALUMINUM CORP. | T-60965 |
| | | | | PART NAME | DATE |
| | | | | 2 X 4.5 THERM FLSH SYS | 01/09/91 |
| | | | | PART NO. | SCALE |
| | | | | | 2 X SIZE |

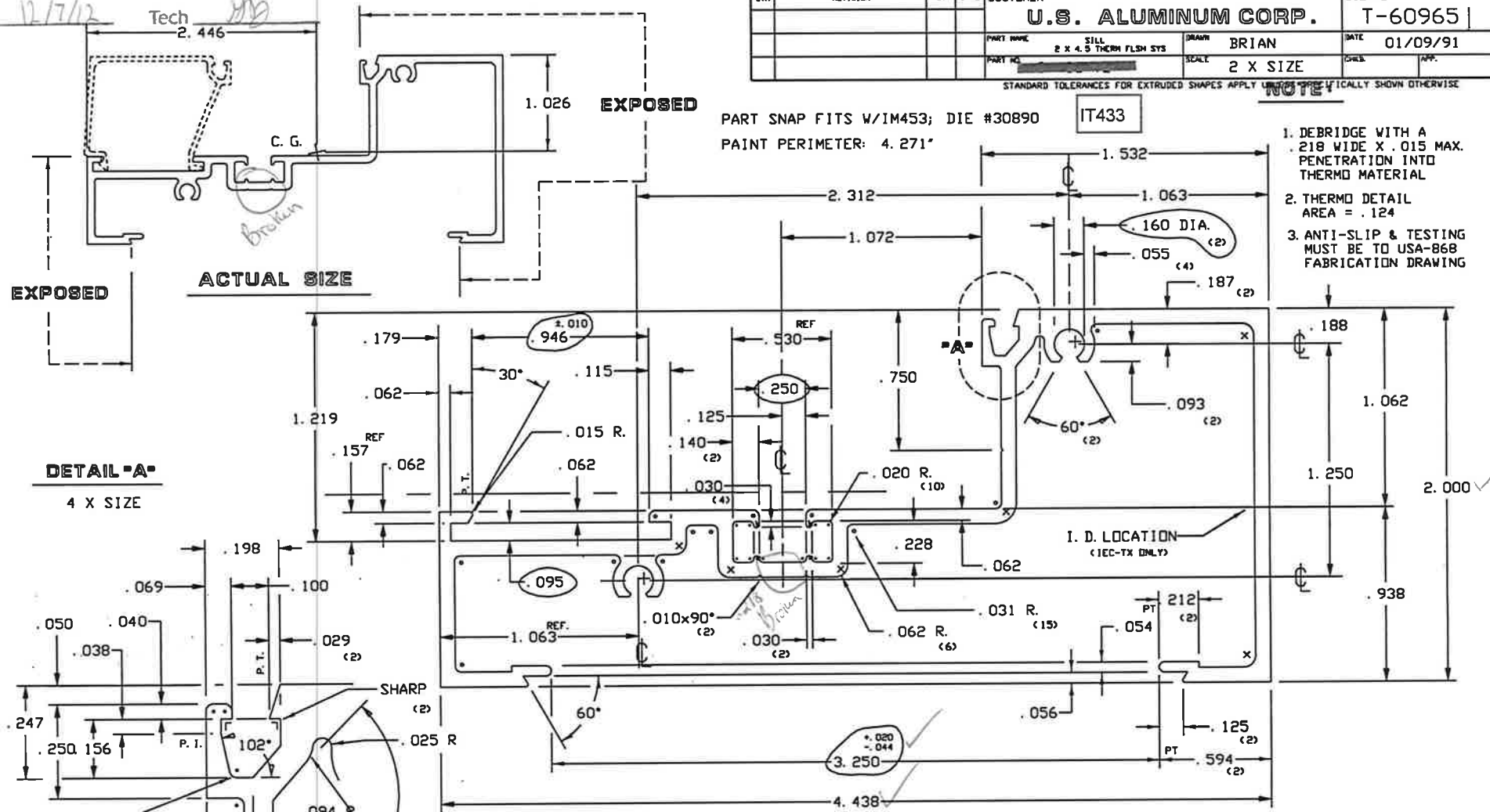
STANDARD TOLERANCES FOR EXTRUDED SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE

NOTE

PART SNAP FITS W/IM453; DIE #30890
PAINT PERIMETER: 4.271"

IT433

1. DEBRIDGE WITH A .218 WIDE X .015 MAX. PENETRATION INTO THERMO MATERIAL
2. THERMO DETAIL AREA = .124
3. ANTI-SLIP & TESTING MUST BE TO USA-868 FABRICATION DRAWING



DETAIL "A"
4 X SIZE

SECTION PROPERTIES:
 $I_{xx} = 2.103 \text{ in}^4$
 $S_{xx} = 0.860 \text{ in}^3$
 $I_{yy} = 0.326 \text{ in}^4$
 $S_{yy} = 0.318 \text{ in}^3$

CA
TX

International Extrusion Corporation
 202 SINGLETON DRIVE
 (972) 937-7032
 WAKAHACHIE, TEXAS 75165

| | | | |
|--|--------|-------------|----------|
| UNLESS OTHERWISE NOTED, ALL CORNERS ARE .015 R, AND TYPICAL WALL THICKNESS IS .085 | | | |
| EST. AREA | .911 | US-NO. | P-18825 |
| EST. WT/FT. | 1.093 | CIRCLE SIZE | 4.868 IN |
| EST. PERI. | 23.073 | CLASS | SOLID |
| FACTOR | 21 | ER | |
| | | PORTS | |
| | | BACKER | |
| | | SOLSTER | |
| | | DIE NO. | T-60965 |

PRODUCT:
PROJECT:

Test sample complies with these details.
Deviations are noted.

Report#

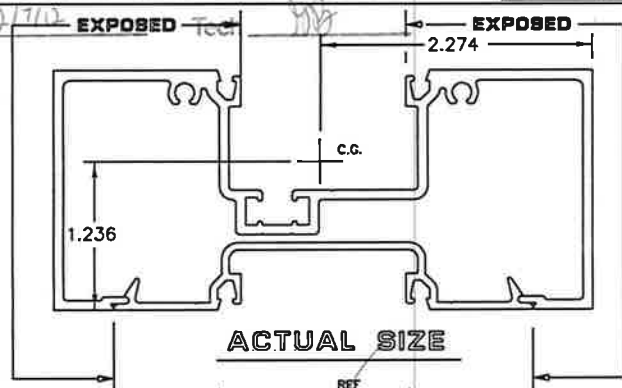
Date _____

AT1
Report # A2570
Date 10/5/10
Simulator *Jim R. Mott*

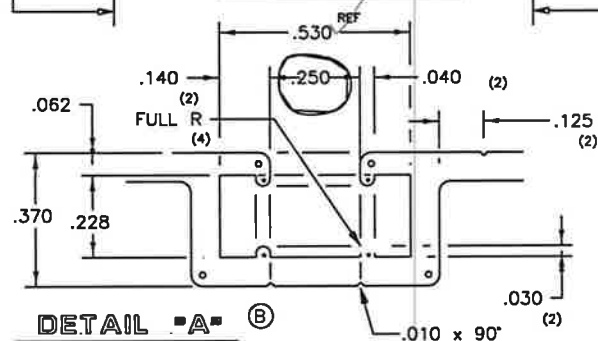
NOTE: (B)

- | | | |
|---|---|---|
| 1. DEBRIDGE WITH A .218 X .015 MAX.PENETRATION INTO THERMO MATERIAL | B | THERMO PKCT REDESIGNED |
| 2. THERMO DETAIL AREA =.124 | ⊕ | LD.MARK,PAINT PERIM. & EXACT C.S. ADDED |
| 3. SNAP-FITS W/S200; DIE #30889 | ? | I-422 TL WAS IT422 TL |
| 4. ANTI-SUP & TESTING MUST BE TO USA-868 FABRICATION DRAWING | | |
| 5. PAINT PERIMETER: 7.708" | | |

| | | | | | | | | |
|---|---|----------------|-----|------------|---|----------|----------|---|
| Ø | TOLERANCE WS | +0.00 -.094 | DC | 5-20 91 | U.S. ALUMINUM CORP. | | T-30907 | 1 |
| B | THERMO PKCT REDESIGNED | | MM | 8-2 93 | HEAD EXTRUSION 2 X 4 1/2 TOP LOAD THERM FLSH SYS | BRIAN | 01/09/91 | |
| Ø | I.D. MARK, PAINT PERIM, & EXACT C.S. ADDED | | M.M | 2/20 95 | I-422 TL ? | 2 X SIZE | | |
| ? | I-422 TL WAS IT422 TL | | M.M | 2/19 95 | | | | |

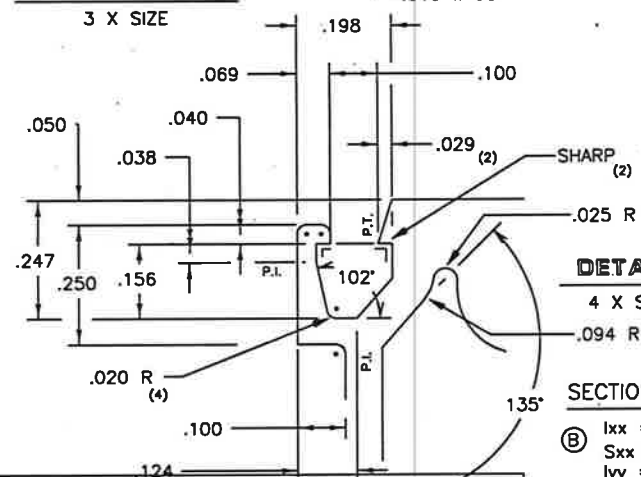


ACTUAL SIZE



DETAIL "A"

3 X SIZE

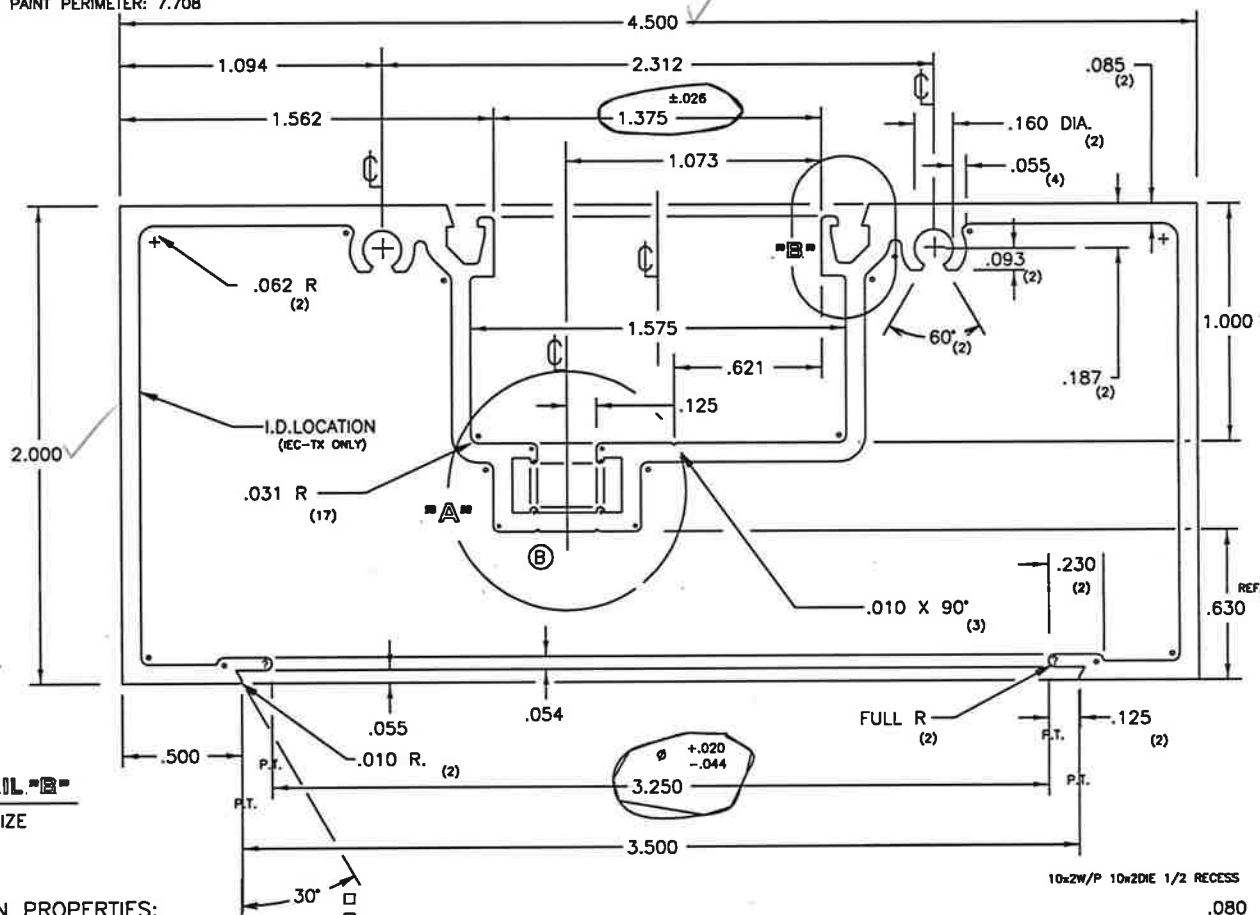


DETAIL "B"

4 X SIZE

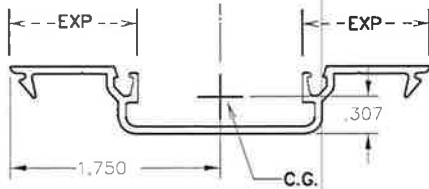
SECTION PROPERTIES:

(B) $l_{xx} = 2.680$ in 4
 $S_{xx} = 1.179$ in 3
 $l_{yy} = 0.446$ in 4
 $S_{yy} = 0.361$ in 3



| | | | |
|--------|---------|---------|----|
| 1.078 | P-18824 | 1 | WP |
| 1.294 | 4.924 | | |
| 26.879 | SOLID | | |
| 21 | | T-30907 | |

| | |
|-----------|----------|
| Report # | ATI |
| Date | A2570 |
| Simulator | 10/25/10 |



NOTE

1. SNAPS W/S-451; DIE #30900
2. PAINT PERIMETER: 1.728"

B 2.312 WAS 2.125 MM 1/29
C 3.350 WS 3.320 AND .050 SC 3/21
WS .035, CHG TOL. 93
D ADDED .010x90° ID MARKS MM 11/2
FOR IEC-TX 94

U.S. ALUMINUM CORP. T-30889 D

SNAP IN FILLER

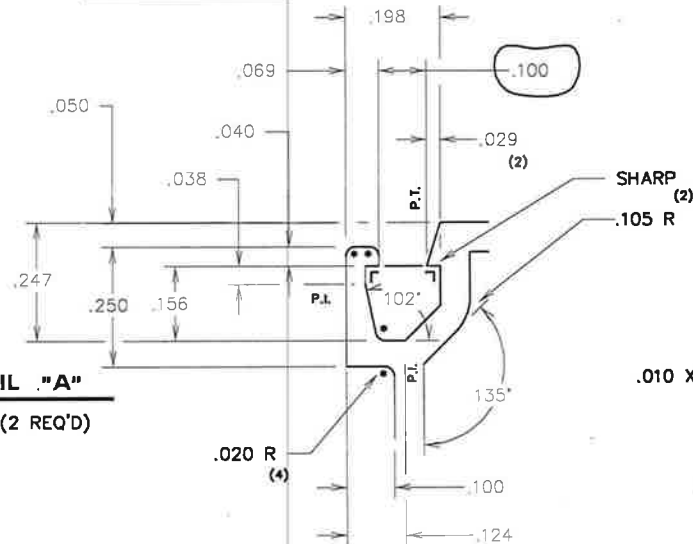
BRIAN

8/27/90

2 X SIZE

IX200

ACTUAL SIZE



DETAIL "A"

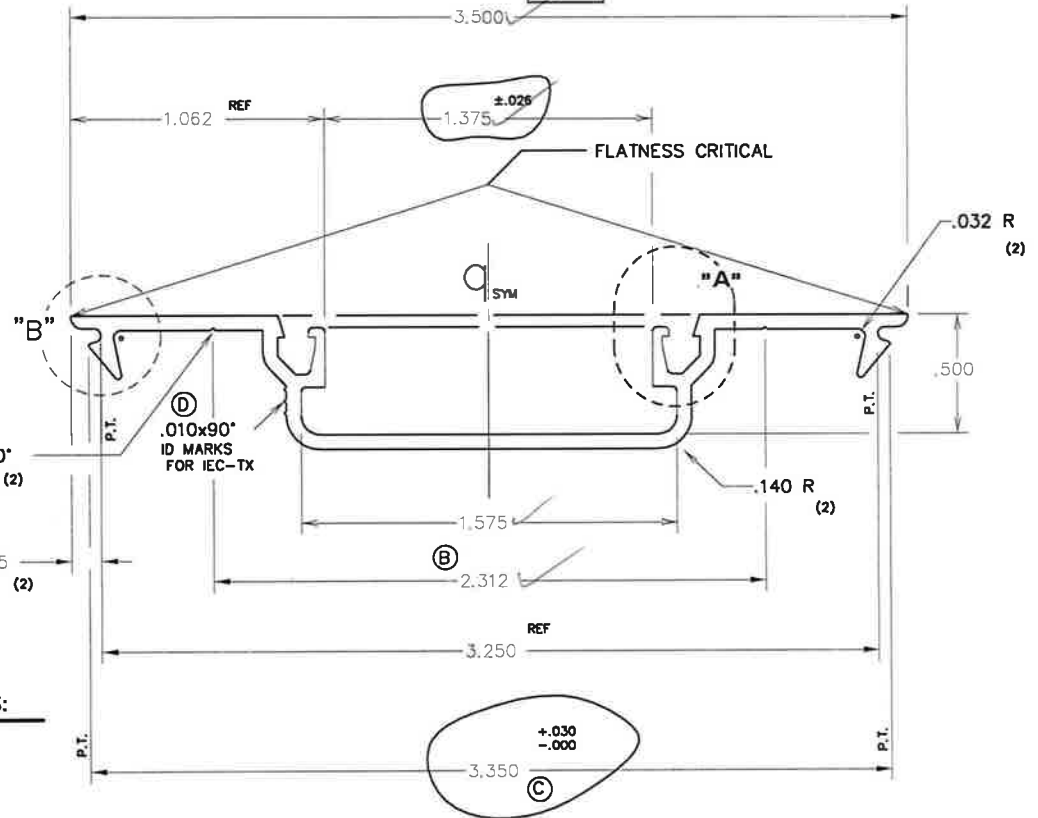
(4X SIZE)(2 REQ'D)

SECTION PROPERTIES:

Ixx = 0.340 in⁴
Sxx = 0.194 in³
Iyy = 0.015 in⁴
Syy = 0.049 in³

DETAIL "B"

(4X SIZE)(2 REQ'D)



Test sample complies with these details.
Deviations are noted.

Report#

C4347

Date

12/7/12

Tech

HB

.326 (B)
.391 (B)
10.822 (D)
28 (B)

P-18332
3.500
SOLID

.062
WP
T-30889 D

USA-822 B

NOTE:

- ③

ATI
A2570
10/5/10
Joan R. Miguel

Report # A2570

Date 10/5/10

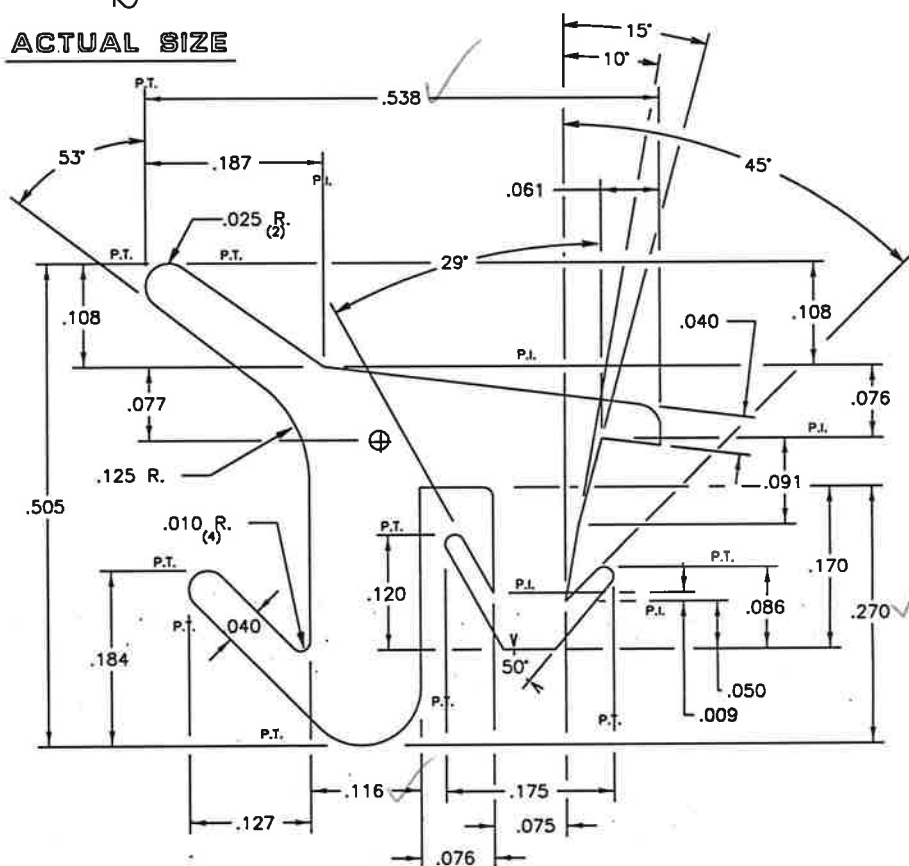
Simulator James A. Mihal

Test sample doughnuts with these details.
Deflections are noted.

Report# C4347

Date 12/7/12 Tech HB

ACTUAL SIZE



| | | | | | | |
|---|------------|---------|----|---------|-------------------------------------|-----------------|
| | | | | | U.S. ALUMINUM CORP. | |
| | | | | MAMO | TOP LOAD GASKET 1/4" OR 1" GLASS | |
| B | NOTE ADDED | 6/12/90 | MM | 8/16/90 | PART NO: NP225 | USA-822B |
| | | | | 8X SIZE | | |

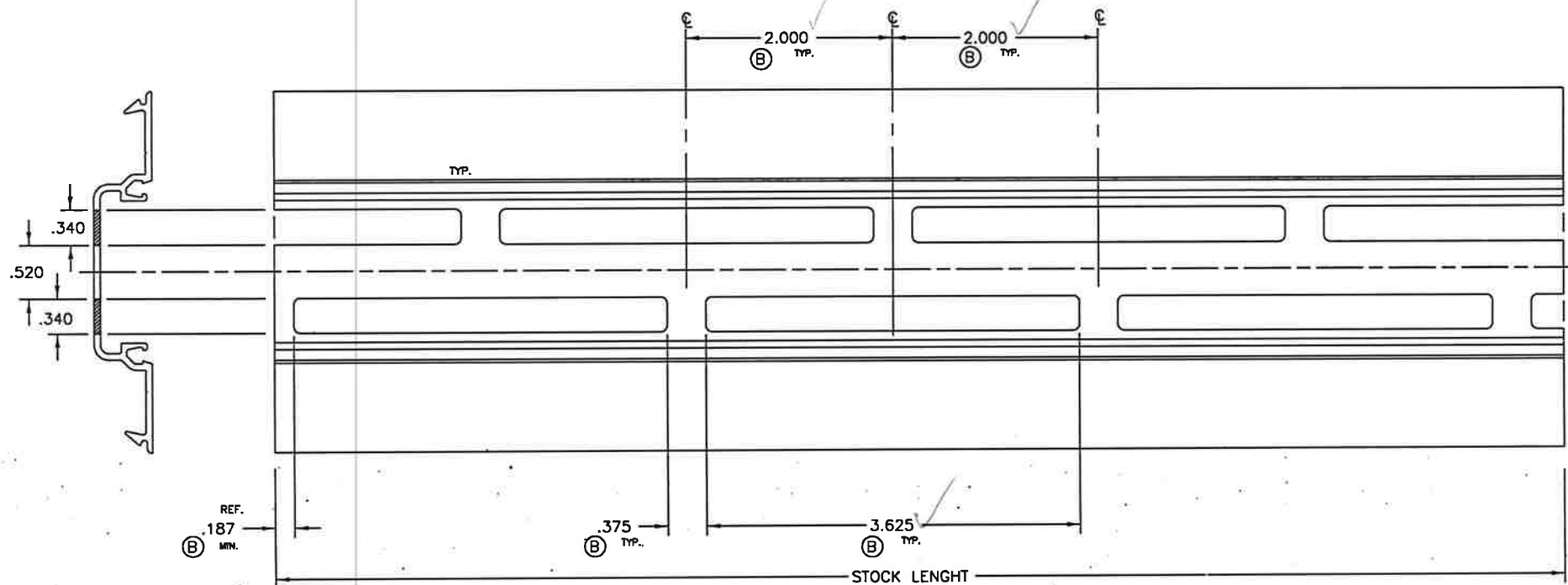
~~ATI~~

Report # A2570

Date 10/5/10

Simulator

USA-776 B



Architectural Testing
Test scenarios compliant with these details
and sections are noted.

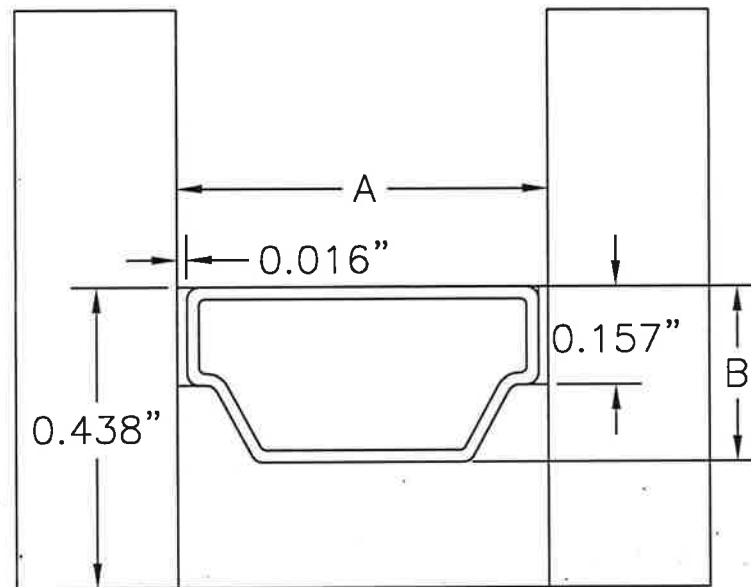
Report# C4347
Date 12/7/12 Tech MB

MADE FROM: IS200

U.S. ALUMINUM CORP.

| | | | | | | |
|---|--|--------|-----|---------------------|----------------|-----------|
| | | | | U.S. ALUMINUM CORP. | | |
| | | | | MAMO | FABRICATION | |
| B | REV. TO TOP-LOAD, SLOT SIZE & SPACING ECN 2000-110 | B-3-00 | GLH | 2/1/90 | PART NO. IX200 | USA-77B B |
| | | | | FULL SIZE | | |

Stainless Steel Spacer



ATI
Report # A2570
Date 10/5/10
Simulator James A. Mifflin



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# C4347
Date 12/7/12 Tech MB

Offset: None
Primary Sealant: Polyisobutylene
Secondary Sealant: Silicone
Material: Stainless Steel
Width (A): 0.500
Height (B): 0.295
Wall Thickness: 0.016