

TEST REPORT

AAMA/WDMA/CSA 101/I.S.2/A440-17

REPORT NO.: 1931.03-106-11

RENDERED TO: GAMCO CORPORATION
Flushing, New York

PRODUCT TYPE: Aluminum Outswing Casement Window

SERIES / MODEL: W250HC

Test	Summary of Results
Primary Product Designator	Class AW – PG40 914 x 1524 (36 x 60)-C
Design Pressure	±1920 Pa (±40.10 psf)
Air Infiltration at 300 Pa (6.24 psf)	0.5 L/s/m ² (0.10 cfm/ft ²)
Air Exfiltration at 75 Pa (1.57 psf)	0.2 L/s/m ² (0.03 cfm/ft ²)
Water Penetration Resistance Test Pressure	440 Pa (9.19 psf)

Test Completion Date: 5/30/2019

Reference must be made to Report No. 1931.03-106-11, dated 8/23/2019 for complete test specimen description and detailed test results.

CLIENT INFORMATION: GAMCO CORPORATION
131-10 Maple Ave.
Flushing, New York 11355

TEST LABORATORY: Molimo, LLC
1410 Eden Road
York, Pennsylvania 17402
717-900-6034

PROJECT SUMMARY:

PRODUCT TYPE: Aluminum Outswing Casement Window

SERIES/MODEL: W250HC

PROJECT SUMMARY:

Molimo, LLC was contracted to perform testing on the above referenced product. The results are tested values and were secured by using the designated test methods. A summary of the ratings achieved for the specimen tested are shown in the table below.

SPECIMEN	SPECIFICATION	PRODUCT RATING
1	101/I.S.2/A440-17	Class AW – PG40 914 x 1524 (36 x 60)-C

PROJECT DETAILS:

Test Dates: 5/14/2019 – 5/30/2019

Test Record Retention End Date: 5/30/2023

Test Location: Molimo, LLC test facility in York, Pennsylvania.

Test Specimen Source: The test specimen was provided by the client. Representative samples of the test specimen will be retained by Molimo for a minimum of four years from the test completion date.

Drawing Reference: The test specimen drawings were supplied by the client. The test specimen construction was verified by Molimo and was found to be representative of the product tested. Test specimen drawings are located in Appendix C of this report.

WITNESSES:

The following representatives witnessed all or part of the testing.

Name	Company
Joe Allison	Molimo, LLC
Michael D. Stremmel, P.E.	Molimo, LLC
Joseph Enriquez	Molimo, LLC

TEST METHODS:

AAMA/WDMA/CSA 101/I.S.2/A440-11, *NAFS 2017 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights*

AAMA 910-10, *Voluntary "Life Cycle" Specifications and Test Methods for AW Class Architectural Windows and Doors*

TEST SPECIMEN DESCRIPTION:**PRODUCT SIZES:**

Overall Size: 914 mm x 1524 mm (36" x 60")
Overall Area: 1.39 m² (15.0 ft²)
Sash Size: 870 mm x 1456 mm (34-1/4" x 57-5/16")

FRAME CONSTRUCTION:

Material: Poured and debridged, thermally improved, extruded aluminum
Corner Details: Coped and butted, sealed with sealant and secured with four #8 x 2" pan head screws per corner

VENT CONSTRUCTION:

Material: Poured and debridged, thermally improved, extruded aluminum
Corner Details: Miter-cut, sealed with sealant and secured with two internal aluminum corner keys with one lanced stack per member end

REINFORCEMENT: No reinforcement was utilized.

TEST SPECIMEN DESCRIPTION: (Continued)

GLAZING DETAILS: *No conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen can be made.*

Description	Detail
Glass Type	1" IG
Glazing Construction (exterior to interior)	1/8" thick tempered glass 3/4" desiccant filled, aluminum box type spacer 1/8" thick tempered glass
Glazing Method	Set from the interior glazed against a bead of sealant and secured with aluminum snap-fit glazing beads with a gasket against the glass
Glazing Bite	1/2"
Daylight Opening Vent:	730 mm x 1313 mm (28-3/4" x 51-11/16")

WEATHERSTRIPPING:

Description	Quantity	Location
3/16" diameter foam-filled vinyl bulb	1 Row	Frame and vent perimeters

DRAINAGE: No drainage was utilized.

HARDWARE:

Description	Quantity	Location
Barrel hinges	3	Hinge jamb, 5" from each end and midspan
Rotary operator	1	Sill, 5-1/2" from the hinge jamb
Multi-point lock	1	Vent lock stile, handle located 12" from the sill with two lock points located 10-1/2" from each end of the lock stile

TEST SPECIMEN DESCRIPTION: (Continued)

INSTALLATION: The specimen was installed into a Spruce-Pine-Fir wood buck. The rough opening allowed for a 1/2" shim space. The exterior perimeter of the specimen was sealed with sealant.

Location	Anchor Description	Anchor Spacing
Head and sill	#8 x 3" wood screw	5" from each end and midspan, through the frame into the wood buck
Jambs	#8 x 3" wood screw	5" from each end and spaced 16" on center, through the frame into the wood buck

TEST RESULTS: The temperature during testing was 21.7 °C (71 °F).

OPERATING FORCE: First Half (per ASTM E 2068)

Test	Results	Allowable
Initiate Motion	18 N (4 lbf)	70 N (15 lbf)
Maintain Motion (Opening)	18 N (4 lbf)	45 N (10 lbf)
Maintain Motion (Closing)	18 N (4 lbf)	45 N (10 lbf)
Locks / Latches	22 N (5 lbf)	100 N (22.5 lbf)

Note #1: The operating force results listed above represent the maximum force measured among all sash tested.

AIR LEAKAGE TESTING: First Half (per ASTM E 283)

Test	Results	Allowable
Infiltration @ 300 Pa (6.24 psf)	0.5 L/s/m ² (0.10 cfm/ft ²)	0.5 L/s/m ² (0.10 cfm/ft ²)
Exfiltration @ 75 Pa (1.57 psf)	0.2 L/s/m ² (0.03 cfm/ft ²)	0.5 L/s/m ² (0.10 cfm/ft ²)

Note #2: The specimen tested meets (or exceeds) the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance.

TEST RESULTS: (Continued)

WATER PENETRATION TESTING: First Half (per ASTM E 331 and ASTM E 547)

Test	Results	Allowable
440 Pa (9.19 psf)	Pass	No Leakage

Note #3: Water Penetration testing was performed without an insect screen.

VENT CYCLE TESTING:

Test	Results	Allowable
Vent Cycling 2000 cycles (first half)	Pass	No Damage
Misuse Testing per AAMA 910	Pass	No Damage
Vent Cycling 2000 cycles (second half)	Pass	No Damage

Observations: Normal signs of wear was visible on the locks after cycling.

OPERATING FORCE: Second Half (per ASTM E 2068)

Test	Results	Allowable
Initiate Motion	18 N (4 lbf)	70 N (15 lbf)
Maintain Motion (Opening)	18 N (4 lbf)	45 N (10 lbf)
Maintain Motion (Closing)	18 N (4 lbf)	45 N (10 lbf)
Locks / Latches	22 N (5 lbf)	100 N (22.5 lbf)

Note #4: The operating force results listed above represent the maximum force measured among all sash tested.

THERMAL CYCLING: (per AAMA 501.5)

Note #5: Per AAMA 910-10 family grouping rules, reference must be made to Molimo Report No. 1931.04-106-11 for thermal cycling test results.

TEST RESULTS: (Continued)

UNIFORM LOAD TESTING: (per ASTM E 330)

Design Pressure Test	Results	Allowable
Deflection measured at the lock stile +1920 Pa (+40.10 psf) -1920 Pa (-40.10 psf)	0.8 mm (0.03") 0.8 mm (0.03")	5.3 mm (0.21") 5.3 mm (0.21")

Note #6: All loads were held for 10 seconds.

Note #7: Tape and film were used to seal against air leakage. In our opinion, the tape and film did not influence the results of the test.

AIR LEAKAGE TESTING: Second Half (per ASTM E 283)

Test	Results	Allowable
Infiltration @ 300 Pa (6.24 psf)	0.1 L/s/m ² (0.01 cfm/ft ²)	0.5 L/s/m ² (0.10 cfm/ft ²)
Exfiltration @ 75 Pa (1.57 psf)	0.1 L/s/m ² (0.02 cfm/ft ²)	0.5 L/s/m ² (0.10 cfm/ft ²)

Note #8: The specimen tested meets (or exceeds) the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance.

WATER PENETRATION TESTING: Second Half (per ASTM E 331 and ASTM E 547)

Test	Results	Allowable
440 Pa (9.19 psf)	Pass	No Leakage

Note #9: Water Penetration testing was performed without an insect screen.

UNIFORM LOAD TESTING: (per ASTM E 330)

Structural Test	Results	Allowable
Permanent Set measured at the lock stile +2880 Pa (+60.10 psf) -2880 Pa (-60.10 psf)	<0.3 mm (<0.01 ") 1.0 mm (0.04")	1.8 mm (0.07") 1.8 mm (0.07")

Note #10: All loads were held for 10 seconds.

Note #11: Tape and film were used to seal against air leakage. In our opinion, the tape and film did not influence the results of the test.

TEST RESULTS: (Continued)**SECONDARY TESTING:**

Test	Results	Allowable
FORCED ENTRY RESISTANCE per ASTM F 588 Type: B – Grade: 10	Pass	No Entry
SASH/LEAF TORSION 90 N (20 lbf)	57.2 mm (2.25")	65.8 mm (2.59")
SASH VERTICAL DEFLECTION 270 N (60 lbf)	13.2 mm (0.52")	17.5 mm (0.69")
SASH HARDWARE LOAD TEST 300 Pa (6.27 psf)	Pass	No Damage

General Note: All testing was performed in accordance with reference test methods.

A copy of this report, detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Molimo, LLC for the entire test record retention period. At the end of this retention period, the service life of this report will expire.

Results obtained are tested values and were secured by using the designated test methods. This test 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 permission of Molimo, LLC.

For MOLIMO, LLC:

Joseph W. Enriquez
Project Manager

Michael D. Stremmel, P.E.
Senior Project Engineer

MDS:jld

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix-A: Alteration Addendum (1)

Appendix-B: Air Seal Location (1)

Appendix-C: Drawings (7)

This report was produced from controlled document template MMO 00013, Rev 2, 8/28/2018.

Appendix A

Alteration Addendum

Alteration #1

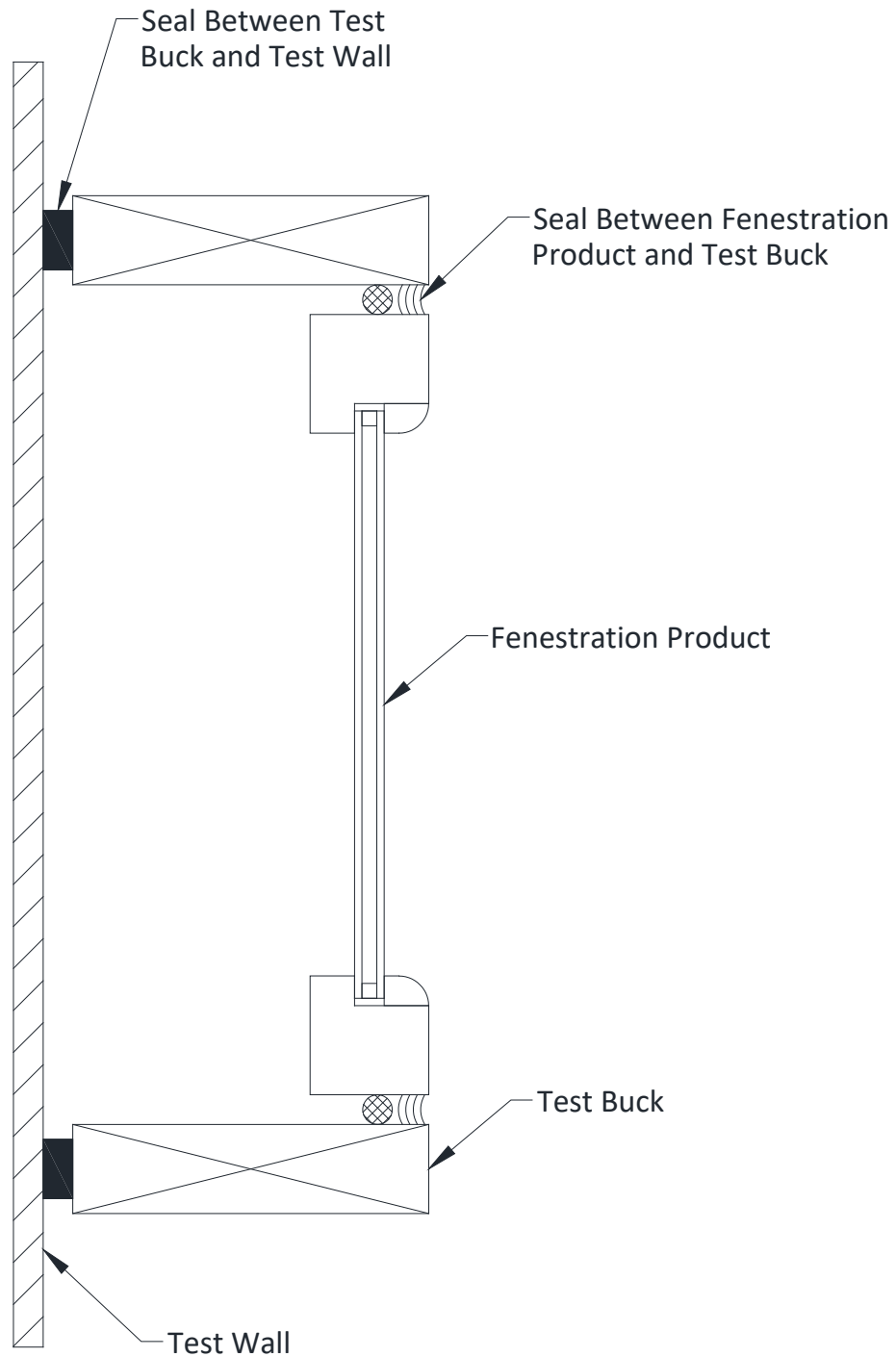
Date: 5/24/2019

Reason: Failed Air Leakage testing after thermal cycling and design loads

Remedial Work: Sealed the exterior weep holes and continued the testing with no weep holes

Appendix B


Air Seal Location

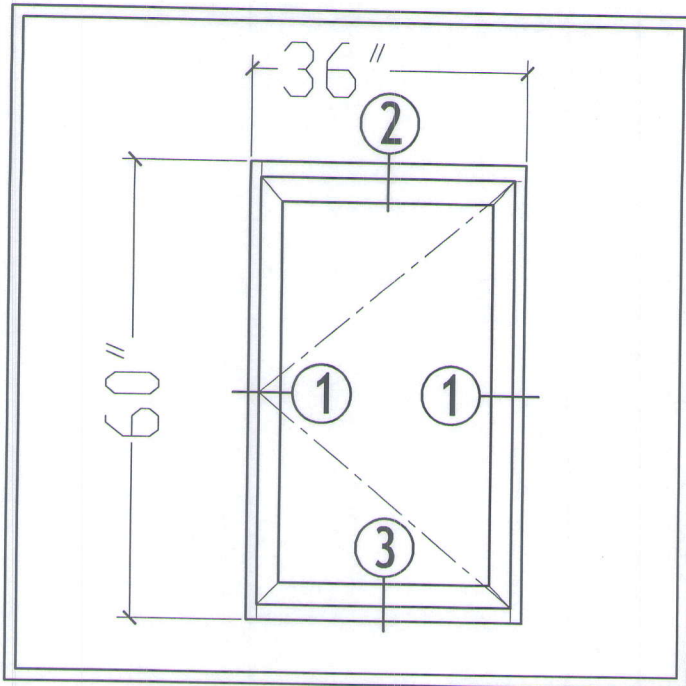


Appendix C

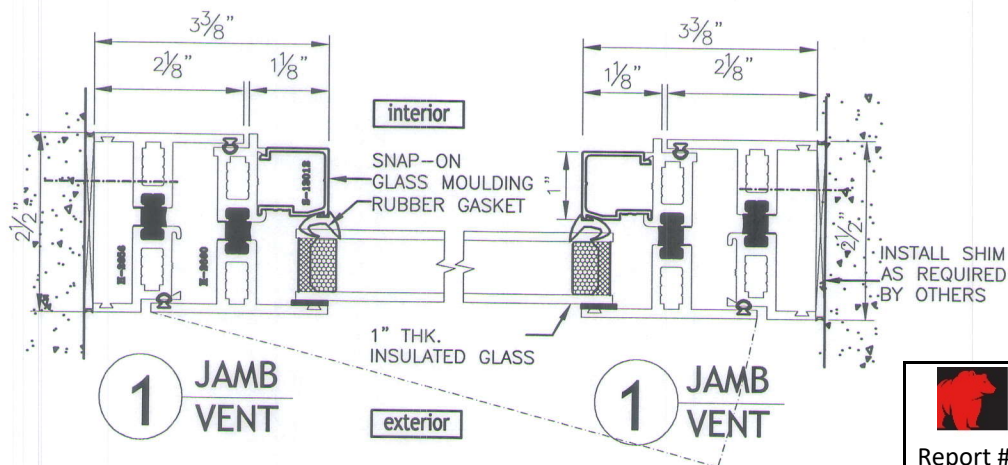
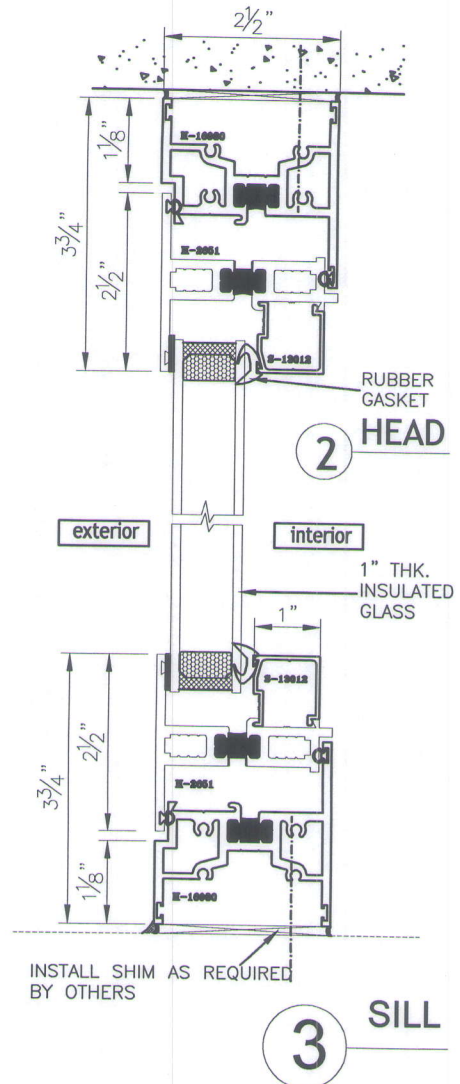
Drawings

BOM: W250HC-SWING-OUT CASEMENT			
ITEM	DESCRIPTION	PART NO.	QTY.
1	250C/HC Window Head/Sill	H-16980	2
2	250HC Main Frame	H-2656	2
3	250HC Project-out	H-2660	4
4	250 Corner Key	S-13020	8
5	250 1" Glazing Bead	S-13014	4
6	Casement Hinge, Stainless Steel	WH1H4395	3
7	Casement Cam Lock	WH2L241G	1
8	Casement Lock Handle	WH2L242G	1
9	Lock Keeper	WH7K2108	2
10	Casement Stainless track	WH7T1325	1
11	Crank/Knob Handle	WH7H105G	1
12	Rotary Operatoer 13.5" right hand	WH3R348G	1
13	Setting Block	WH6N582	2
14	Butyl Tape for 1" I.G.	WH5G3654	4
15	Rubber Apply for 1" I.G.	WH6U3175	4
16	T-slot Bulb Seal Rubber	WH5T175B	8
17	Insulated Glass 1"	1/8" x 1/8"	-
18	Locking Block	WH7B2011	1
19	Anti-Drop	WH7B1630	1

 Molimo™ Architectural Product Testing	Report #:	1931.03-106-11
	Date:	8/23/2019
	By:	M. Stremmel



W250HC SERIES WINDOW SWING-OUT CASEMENT



Molimo
Architectural Product Testing

Report #: 1931.03-106-11

Date: 8/23/2019

By: M. Stremmel

SHEET #

Drawn by: C. CHAN

Customer

Checked by:

Date: 6-2-16

Scale: 3/4"=1'-0"

Project: W250HC
CASEMENT WINDOW

Revisions

No.	Date	Description
01	10-29-18	UPDATED DIMENSIONS



GAMCO CORPORATION

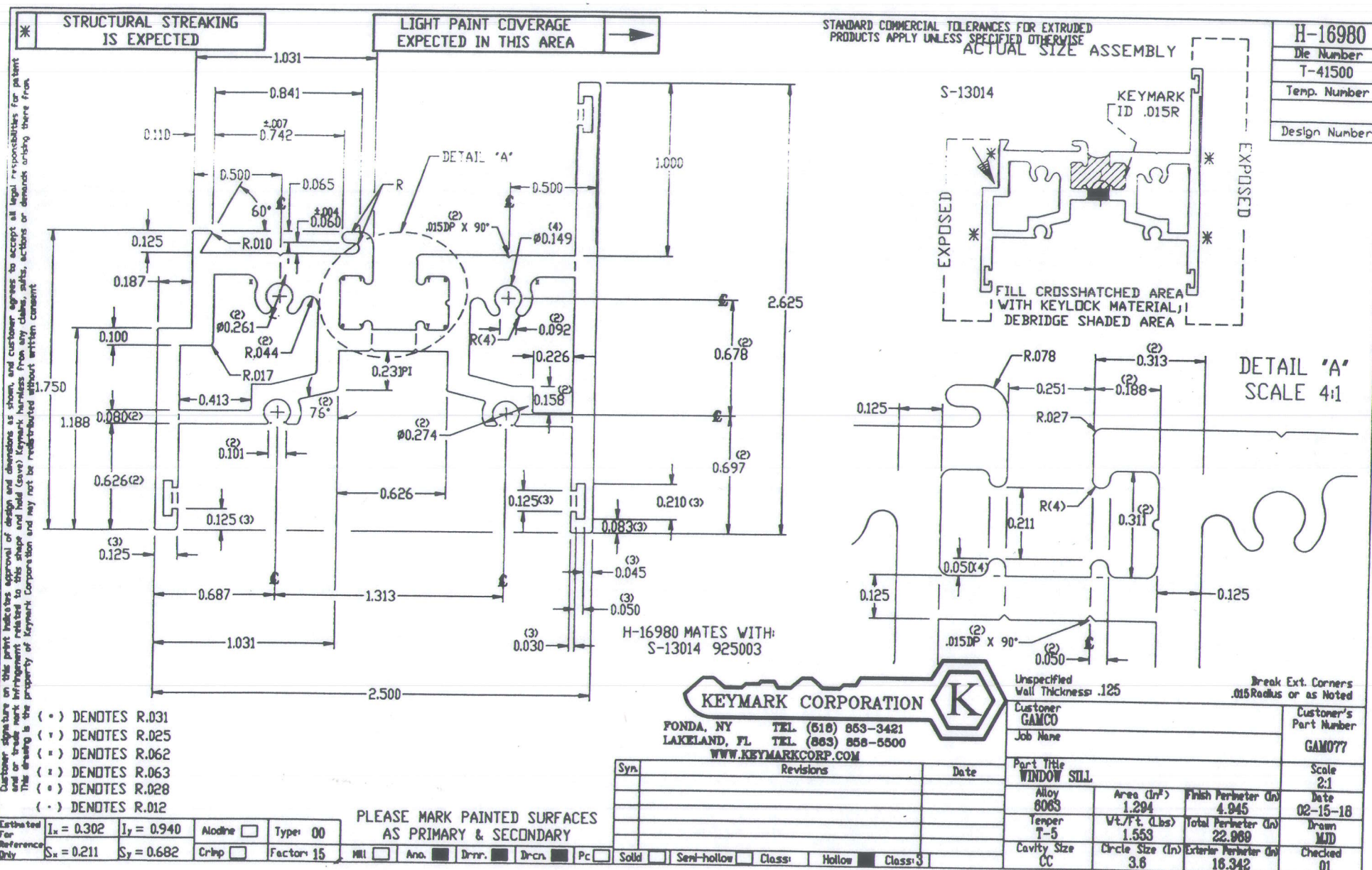
MANUFACTURERS OF FENESTRATION PRODUCTS

131-10 MAPLE AVE. FLUSHING, N.Y. 11355

TEL: (718)359-8833 FAX: (718)359-8861

info@gamcocorp.com www.gamcocorp.com

2A



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STRUCTURAL STREAKING IS EXPECTED

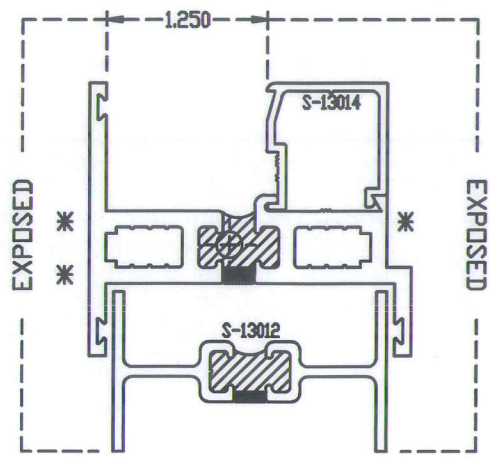
UNIFORM PAINT COVERAGE NOT EXPECTED IN THIS AREA

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

H-02656
Die Number
Temp. Number
Design Number

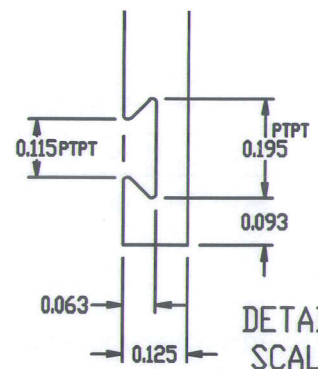
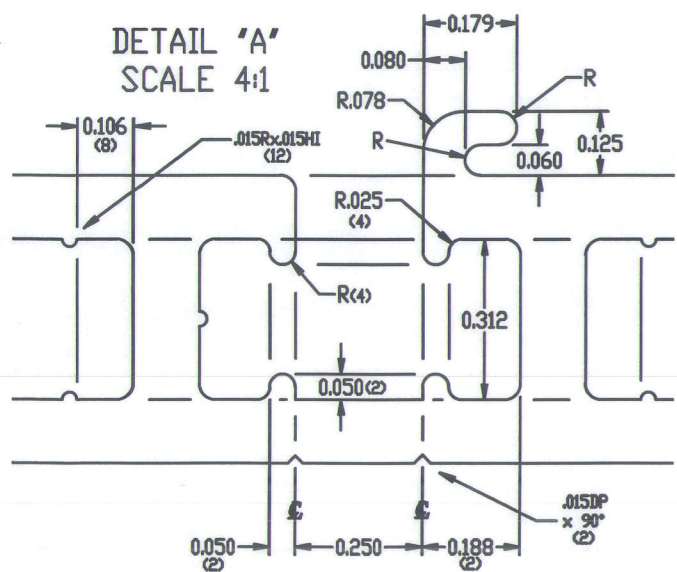
ACTUAL SIZE ASSEMBLY

H-02656 MATES WITH
S-13011 923001
S-13012 923004
S-13014 923003
S-13023 923009

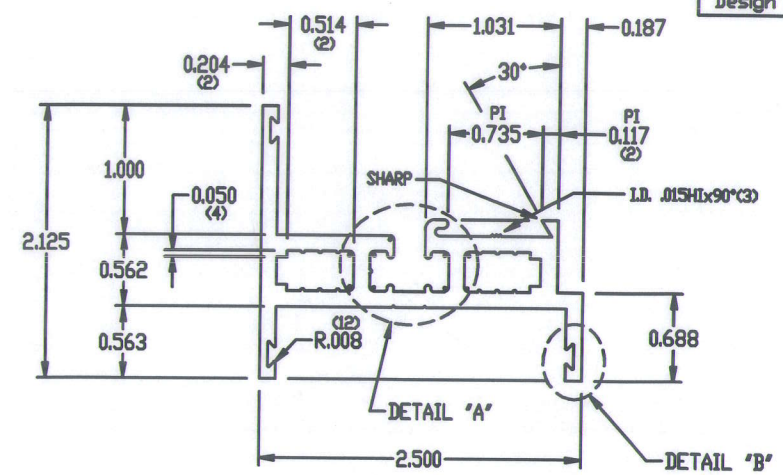


FILL CROSSHATCHED AREA WITH KEYLOCK MATERIAL, DEBRIDGE SHADED AREA

DETAIL 'A' SCALE 4:1



DETAIL 'B' SCALE 4:1 (TYP 3)



(·) DENOTES R .031 (9)



Molimo
Architectural Product Testing

Report #: 1931.03-106-11
Date: 8/23/2019
By: M. Stremmel

KEYMARK CORPORATION



FONDA, NY TEL. (518) 853-3421
LAKELAND, FL TEL. (883) 858-5500
WWW.KEYMARKCORP.COM

Syn.	Revisions	Date
6	PRINT REVISION	06-20-16
	MADE .115 AND .195 PT DIMENSIONS (AD)	06-20-16

Unspecified Wall Thickness: .125		Break Ext. Corners .015 Radius or as Noted	
Customer KEYMARK CORPORATION		Customer's Part Number 930001	
Job Name 930 PROJECTED WINDOW		Scale 1:1	
Part Title MAIN FRAME (MALE)		Date 08-01-88	
Alloy 6063	Area (in ²) 1.020	Finish Perimeter (in) 3.937	Date 08-01-88
Temper T-5	Wt./Ft. (Lbs) 1.224	Total Perimeter (in) 17.434	Drawn C.J.T.
Cavity Size CC	Circle Size (in) 3.3	Exterior Perimeter (in) 13.680	Checked S.J.S.

Estimated For Reference Only	I _x = 0.148	I _y = 0.738	Alodine <input type="checkbox"/>	Type 00
	S _x = 0.117	S _y = 0.522	Crimp <input type="checkbox"/>	Factor 14

MIL ☐ Ano. ☐ Drnr. ☐ Drcn. ☐ Pt ☐ Solid ☐ Semi-hollow ☐ Class ☐ Hollow ☐ Class 3 ☐ PP

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STRUCTURAL STEAKING
IS EXPECTED

UNIFORM PAINT COVERAGE
NOT EXPECTED IN THIS AREA

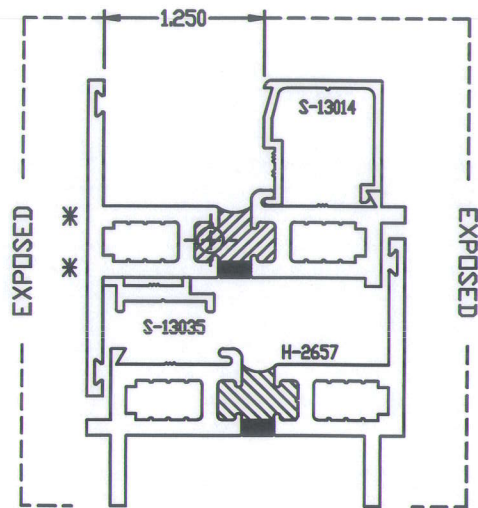
STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED
PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

H-02660

Die Number

Temp. Number

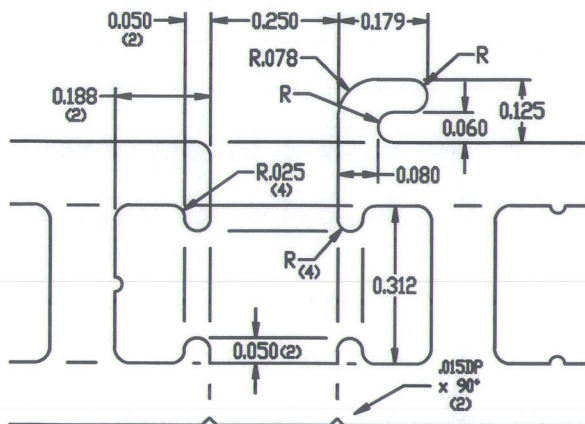
Design Number



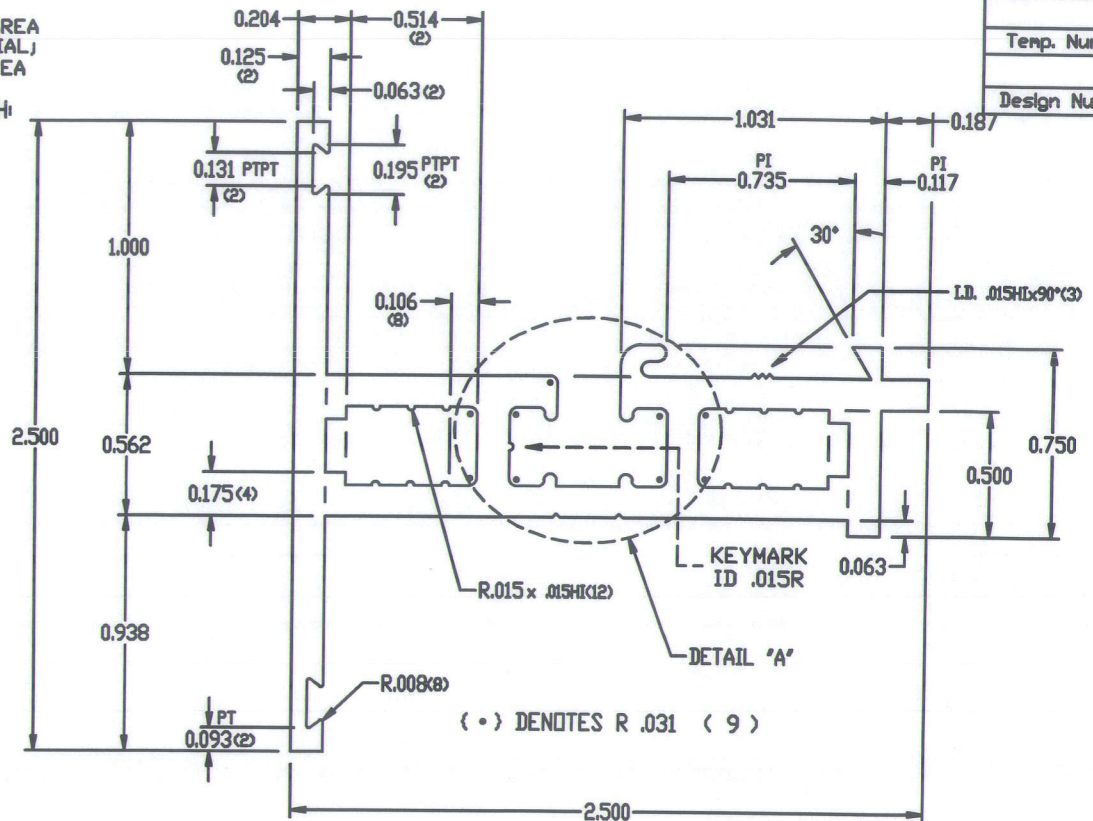
FILL CROSSHATCHED AREA
WITH KEYLOCK MATERIAL;
DEBRIDGE SHADED AREA

H-02660 MATES WITH:
S-13011 923001
S-13014 923003

ACTUAL SIZE ASSEMBLY



DETAIL "A"
SCALE 4:1



KEYMARK CORPORATION

FONDA, NY TEL. (518) 863-3421
LAKELAND, FL TEL. (863) 858-5500
WWW.KEYMARKCORP.COM



Unspecified
Wall Thickness .125

Break Ext. Corners
.015 Radius or as Noted

Customer
KEYMARK CORPORATION

Customer's
Part Number

Job Name
930 PROJECTED WINDOW

930005

Part Title
VENT SASH PROJECT OUT

Scale
2:1

Alloy
6063

Area (in²)
1.013

Finish Perimeter (in)
3.874

Date
08-01-88

Temper
T-5

Wt./Ft. (Lbs)
1.216

Total Perimeter (in)
16.905

Drawn
C.J.T.

Cavity Size
CC

Circle Size (in)
3.1

Exterior Perimeter (in)
13.131

Checked
S.J.S.

Estimated For Reference Only	$I_x = 0.172$	$I_y = 0.671$	Modline <input type="checkbox"/>	Type: 00
	$S_x = 0.135$	$S_y = 0.438$	Crimp <input type="checkbox"/>	Factor: 14

MIL <input type="checkbox"/>	Ano. <input type="checkbox"/>	Drnr. <input type="checkbox"/>	Drn. <input type="checkbox"/>	Pc <input type="checkbox"/>	Solid <input type="checkbox"/>	Semi-hollow <input type="checkbox"/>	Class: <input type="checkbox"/>	Hollow <input type="checkbox"/>	Class: <input type="checkbox"/>	FP <input type="checkbox"/>
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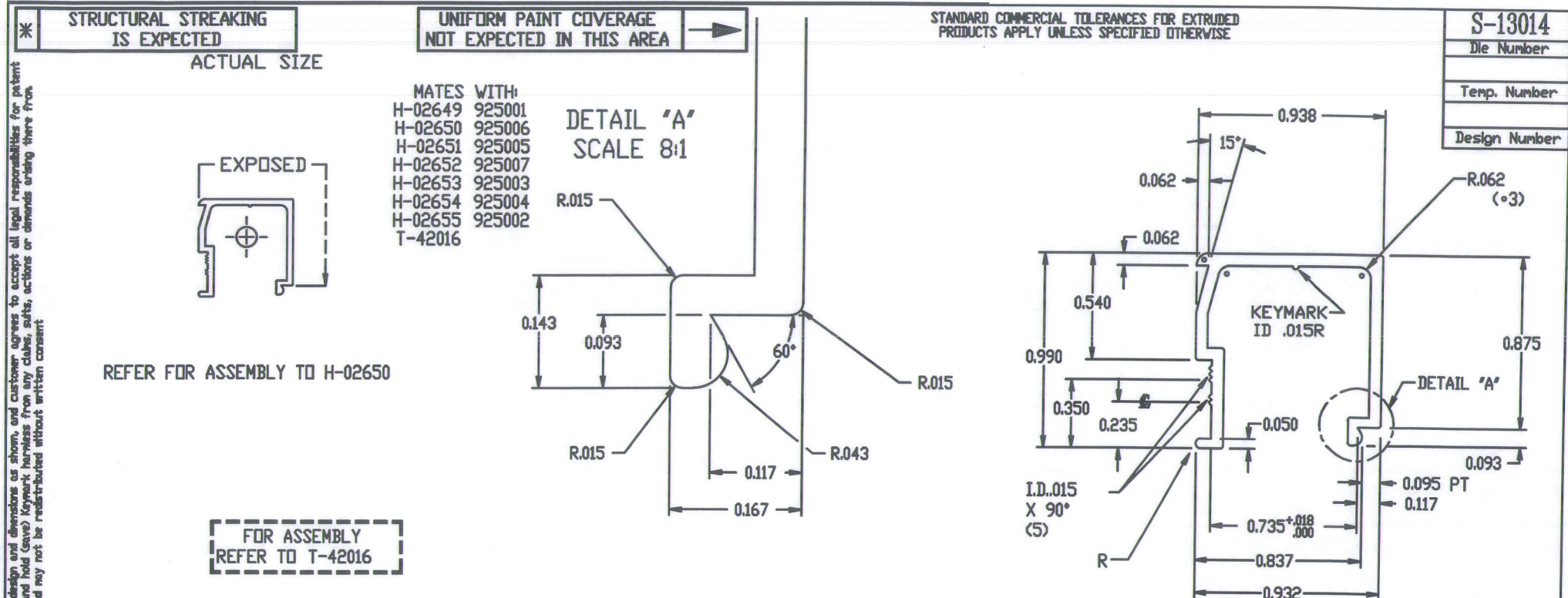
Molimo
Architectural Product Testing


Report #: 1931.03-106-11

Date: 8/23/2019

By: M. Stremmel

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 **Molimo**
Architectural Product Testing

Report #: 1931.03-106-11

Date: 8/23/2019

By: M. Stremmel

KEYMARK CORPORATION 

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LAKELAND, FL TEL (863) 858-5500
WWW.KEYMARKCORP.COM

Syn.	Revisions	Date
A	.063 WAS .050	09-28-88

Unspecified Wall Thickness: .062			Break Ext. Corners .015 Radius or as Noted	
Customer KEYMARK CORPORATION			Customer's Part Number 925003	
Job Name 925/930 PROJECTED WINDOW			Scale 2:1	
Part Title GLAZING BEAD FOR 1" GLASS			Date 07-08-88	
Alloy 6063	Area (in ²) 0.188	Finish Perimeter (in) 1.851	Date 07-08-88	
Temper T-5	Wt./Ft. (Lbs) 0.226	Total Perimeter (in) 6.179	Drawn F.A.S.	
Cavity Size	Circle Size (in) 1.3	Exterior Perimeter (in) 6.179	Checked S.J.S. 05	

Estimated For Reference Only	I _x = 0.020	I _y = 0.026	Alodine <input type="checkbox"/>	Type: 00
	S _x = 0.033	S _y = 0.055	Crimp <input type="checkbox"/>	Factor: 27

MIL ☐ Ano. ☒ Drnr. ☒ Drcn. ☒ Pc ☐ Solid ☒ Semi-hollow ☐ Class ☐ Hollow ☐ Class ☐

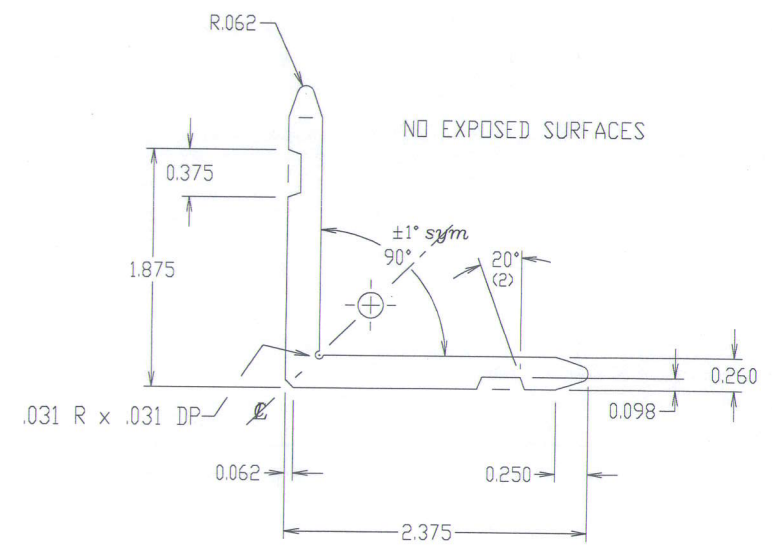
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✱

STRUCTURAL STREAKING
IS EXPECTED

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED
PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

S-13020
Die Number
Temp. Number
Design Number



Report #:	1931.03-106-11
Date:	8/23/2019
By:	M. Stremmel

KEYMARK CORPORATION
FONDA, NEW YORK

FAX ENG.(518)853-3435 SALES(518)853-3130
TEL. (518) 853-3421 E-MAIL engny@keymarkcorp.com

Sym.	Revisions	Date

Unspecified Wall Thickness: .260		Break Ext. Corners Radius or as Noted .015	
Customer: KEYMARK CORPORATION		Customer's Part Number: 925000	
Job Name: 915/922/923/925/930 PROJECTED WINDOW			
Part Title: CORNER KEY		Scale: 1:1	
Alloy: 6105	Est. Area: 1.052 In ²	Finish Perimeter: 0.000 In	Date: 07-28-88
Temper: T-5	Est. Wt./Ft.: 1.262 Lbs	Est. Perimeter: 9.490 In	Drawn: F.A.S.
Cavity Size	Circle Size: 3.2 In	Exterior Perimeter: 9.490 In	Checked: S.J.S. 03

Estimated For Reference Only	I _x = 0.505	I _y = 0.505	Alodine <input type="checkbox"/>	Type: 00
	S _x = 0.294	S _y = 0.294	Crimp	Factor 8
Mill <input checked="" type="checkbox"/> Ano. <input type="checkbox"/> Drnr. <input type="checkbox"/> Drcn. <input type="checkbox"/> Pc <input type="checkbox"/> Solid <input checked="" type="checkbox"/> Semi-hollow <input type="checkbox"/> Class <input type="checkbox"/> Hollow <input type="checkbox"/> Class <input type="checkbox"/>				