Molimo™
Architectural Product Testing

TEST REPORT

AAMA/WDMA/CSA 101/I.S.2/A440-11

REPORT NO.: 1391.04-106-11

RENDERED TO: GAMCO CORPORATION
Flushing, New York

PRODUCT TYPE: Aluminum Outswing Casement Window

SERIES / MODEL: W250C

Test	Summary of Results
Primary Product Designator	Class CW – PG30 813 x 1524 (32 x 60)-C
Design Pressure	±1440 Pa (±30.08 psf)
Air Infiltration	0.5 L/s/m^2 (0.10 cfm/ft^2)
Water Penetration Resistance Test Pressure	220 Pa (4.60 psf)

Test Completion Date: 11/21/2017

Reference must be made to Report No. 1391.04-106-11, dated 1/8/2018 for complete test specimen description and detailed test results.

CLIENT INFORMATION: GAMCO CORPORATION
131-10 Maple Avenue
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: W250C

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 rating achieved for the specimen tested are shown in the table below.

SPECIMEN	SPECIFICATION	PRODUCT RATING
1	101/I.S.2/A440-11	Class CW – PG30 813 x 1524 (32 x 60)-C

PROJECT DETAILS:

Test Dates: 11/20/2017 – 11/21/2017

Test Record Retention End Date: 11/21/2021

Test Location: Crystal Window and Door Systems, Ltd. test facility in Flushing, New York. In accordance with AAMA 205.01, calibration of manufacturers' test equipment is documented under Report No. 1391.01-106-11.

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 D of this report.

WITNESSES:

The following representatives witnessed all or part of the testing.

Name	Company
Qi Zhang	Gamco Corporation
Charles Ng	Crystal Window & Doors
Matt Hollinger	Molimo, LLC

TEST METHOD:

AAMA/WDMA/CSA 101/I.S.2/A440-11, *NAFS 2011 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights*

TEST SPECIMEN DESCRIPTION:

PRODUCT SIZES:

Test Specimen:

Overall Size:	813 mm x 1524 mm (32" x 60")
Overall Area:	1.24 m^2 (13.33 ft^2)
Vent Size:	768 mm x 1480 mm (30-1/4" x 58-1/4")

FRAME CONSTRUCTION:

Material:	Thermally improved, poured and debridged, extruded aluminum
Corner Details:	Miter-cut, sealed with sealant and secured with two interior aluminum corner keys with one lanced stake per key per member end

VENT CONSTRUCTION:

Material:	Thermally improved, poured and debridged, extruded aluminum
Corner Details:	Miter-cut, sealed with sealant and secured with two interior aluminum corner keys with one lanced stake per key 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.*

Glass Type: 1" IG

Glazing Construction: (exterior to interior)

1/8" thick annealed glass

3/4" spacer

1/8" thick annealed glass

Glazing Method: Set from the interior against a glazing compound and secured with snap-in aluminum glazing beads with a gasket against the glass.

Glazing Bite: 1/2"

Daylight Opening:

Vent: 641 mm x 1351 mm (25-1/4" x 53-3/16")

WEATHERSTRIPPING:

Description	Quantity	Location
0.250" diameter foam-filled hollow bulb seal	1 Row	Head, sill and jambs
0.250" diameter foam-filled hollow bulb seal	1 Row	Vent stiles and rails

DRAINAGE:

Description	Quantity	Location
7/8" wide by 1/8" high weepnotch	2	Sill, 4-1/2" from each corner

TEST SPECIMEN DESCRIPTION: (Continued)

HARDWARE:

Description	Quantity	Location
Locks/latches	2	Lock jamb, 12" from each end
Hinges	4	Hinge jamb, 6" from each end and spaced 16" on center
Rotary handle	1	Sill, 4-1/2" from hinge jamb

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, sill, and jambs	#8 x 2-1/2" pan head screws	8" from corners and spaced 16" on center, through the frame into the wood buck

TEST RESULTS: The temperature during testing was 10 °C (50 °F).

OPERATING FORCE: (per ASTM E 2068)

Test	Results	Allowable
Initiate Motion	42 N (9.5 lbf)	Report Only
Maintain Motion (Opening)	9 N (2 lbf)	45 N (10 lbf)
Maintain Motion (Closing)	22 N (5 lbf)	45 N (10 lbf)
Locks / Latches	34 N (7.7 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: (per ASTM E 283)

Test	Results	Allowable
Infiltration @ 75 Pa (1.57 psf)	0.5 L/s/m^2 (0.10 cfm/ft^2)	1.5 L/s/m^2 (0.30 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: (per ASTM E 547)

Test	Results	Allowable
220 Pa (4.60 psf)	Pass	No Leakage

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

UNIFORM LOAD TESTING: (per ASTM E 330)

Design Pressure Test	Results	Allowable
Deflection measured at the vent lock stile +1440 Pa (+30.08 psf) -1440 Pa (-30.08 psf)	 <0.3 mm (<0.01") <0.3 mm (<0.01")	 5.3 mm (0.21") 5.3 mm (0.21")

Structural Test	Results	Allowable
Permanent Set measured at the vent lock stile +2160 Pa (+45.11 psf) -2160 Pa (-45.11 psf)	 <0.3 mm (<0.01") <0.3 mm (<0.01")	 2.8 mm (0.11") 2.8 mm (0.11")

Note 4: The deflections reported are not limited by AAMA/WDMA/CSA 101/I.S.2/A440 for this product designation and is recorded for information purposes only.

Note 5: All loads were held for 10 seconds.

Note 6: Tape and film were not used to seal against air leakage.

SECONDARY TESTING:

Test	Results	Allowable
FORCED ENTRY RESISTANCE per ASTM F 588 Type: B Grade: 10	 Pass	 No Entry
SASH VERTICAL DEFLECTION 270 N (60 lbf)	0.8 mm (0.03")	1.5 mm (0.06")
DISTRIBUTED LOAD 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:

Matthew Hollinger
Senior Technician

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: Photograph (1)
- Appendix-D: Drawings (5)

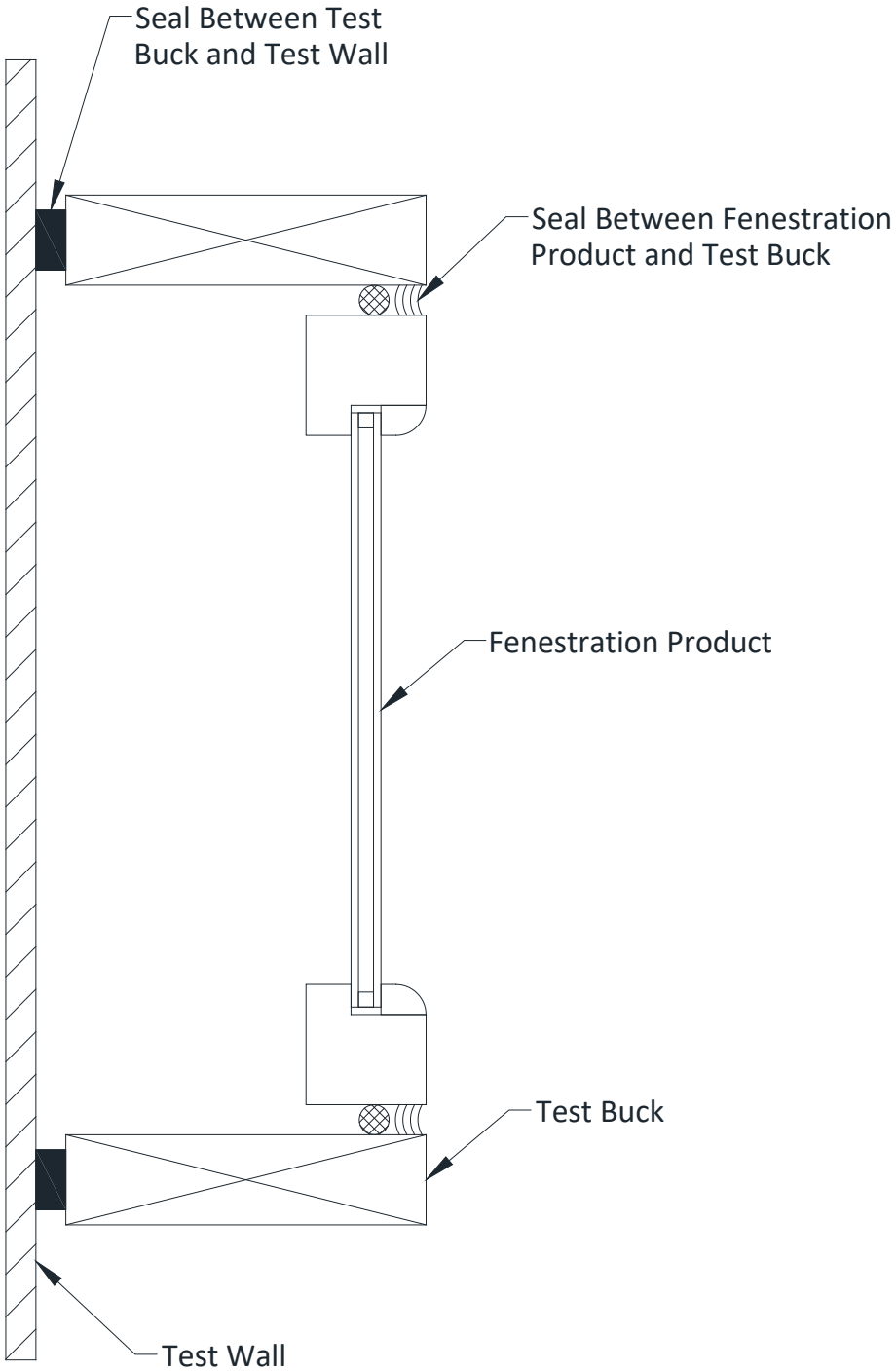
Appendix A

Alteration Addendum

No alterations were performed.

Appendix B

Air Seal Location



Appendix C

Photograph

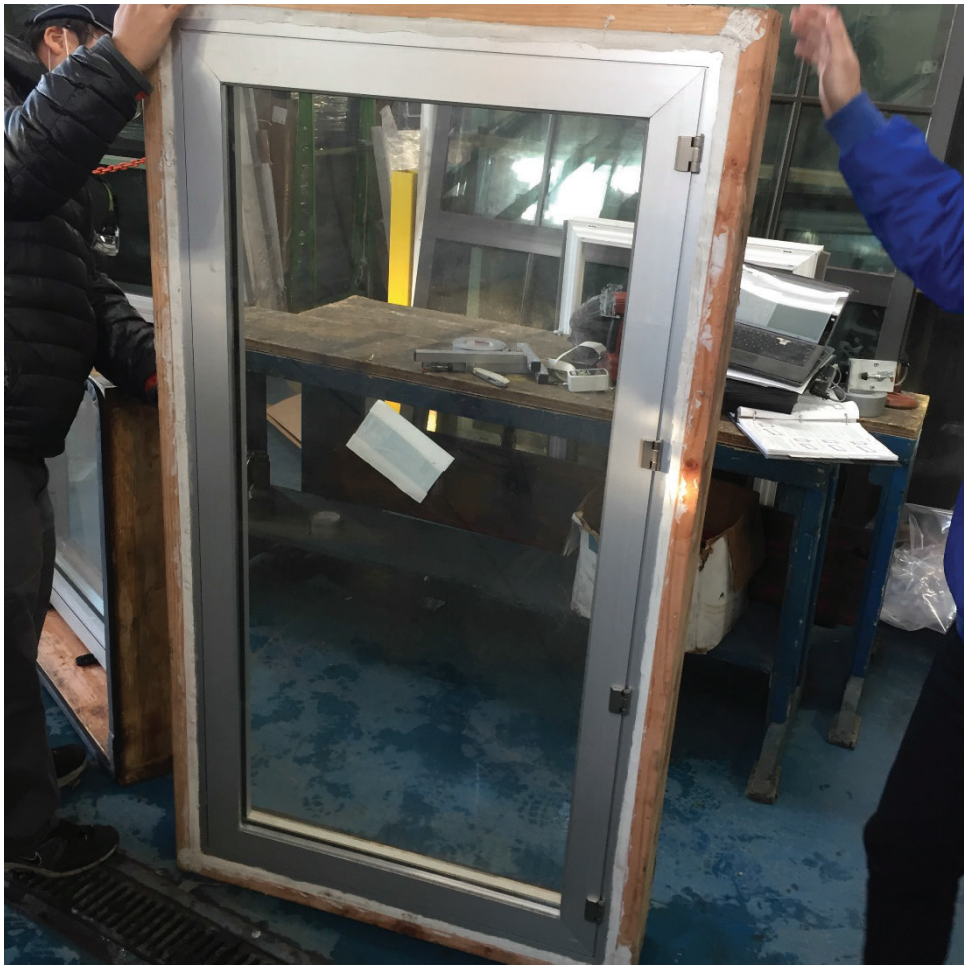
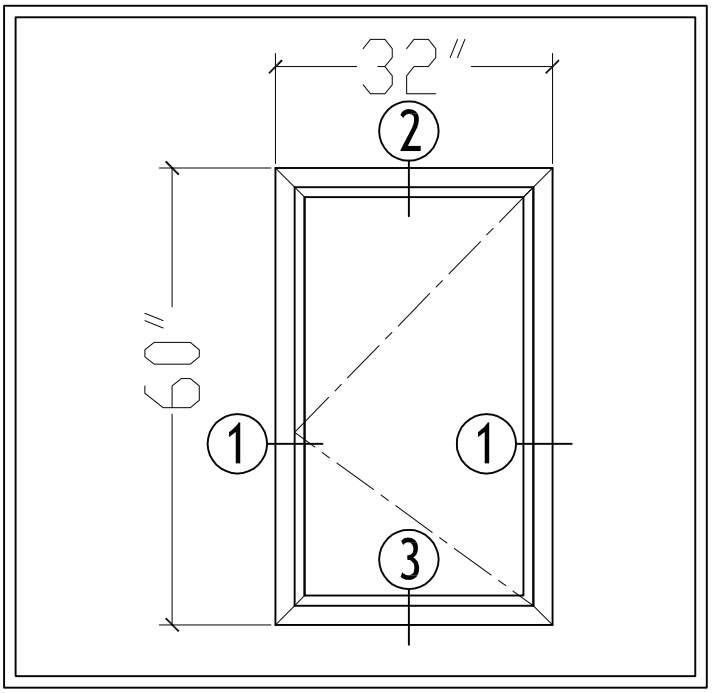


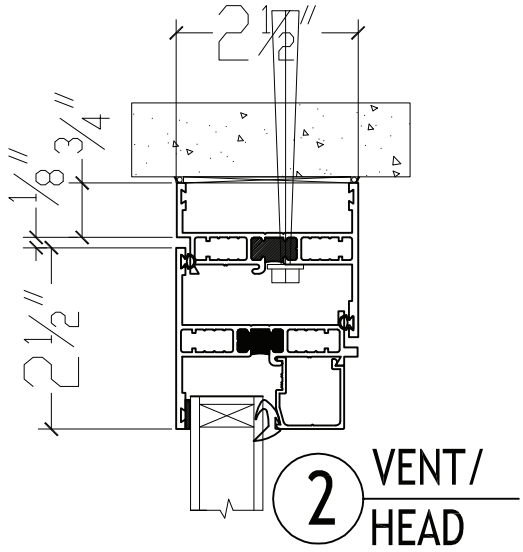
Photo 1
Series W250C Casement Window

Appendix D

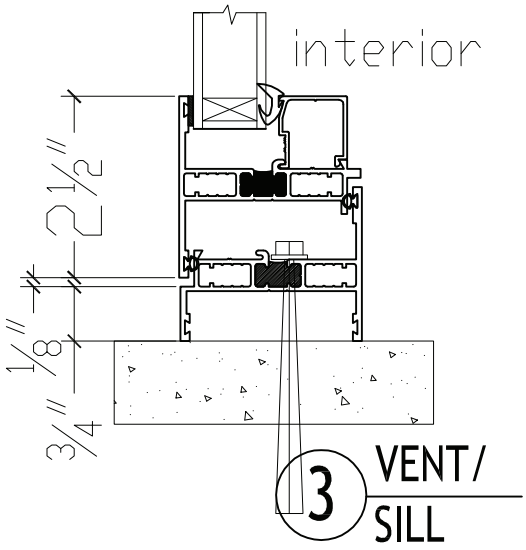
Drawings



W250C SWING-OUT CASEMENT



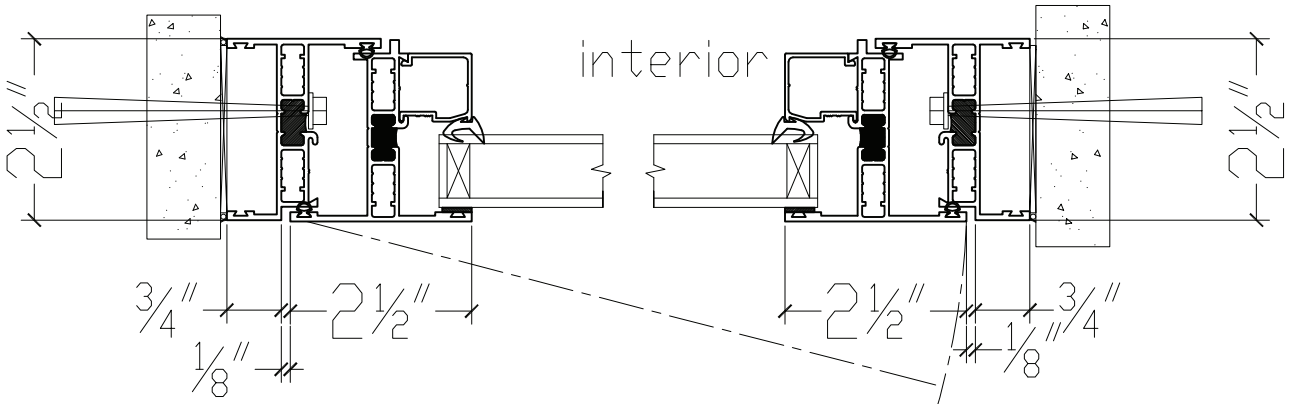
2 VENT/ HEAD



3 VENT/ SILL

Molimo™ Architectural Product Testing

Report #:	1391.04-106-11
Date:	1/8/2018
By:	M. Stremmel

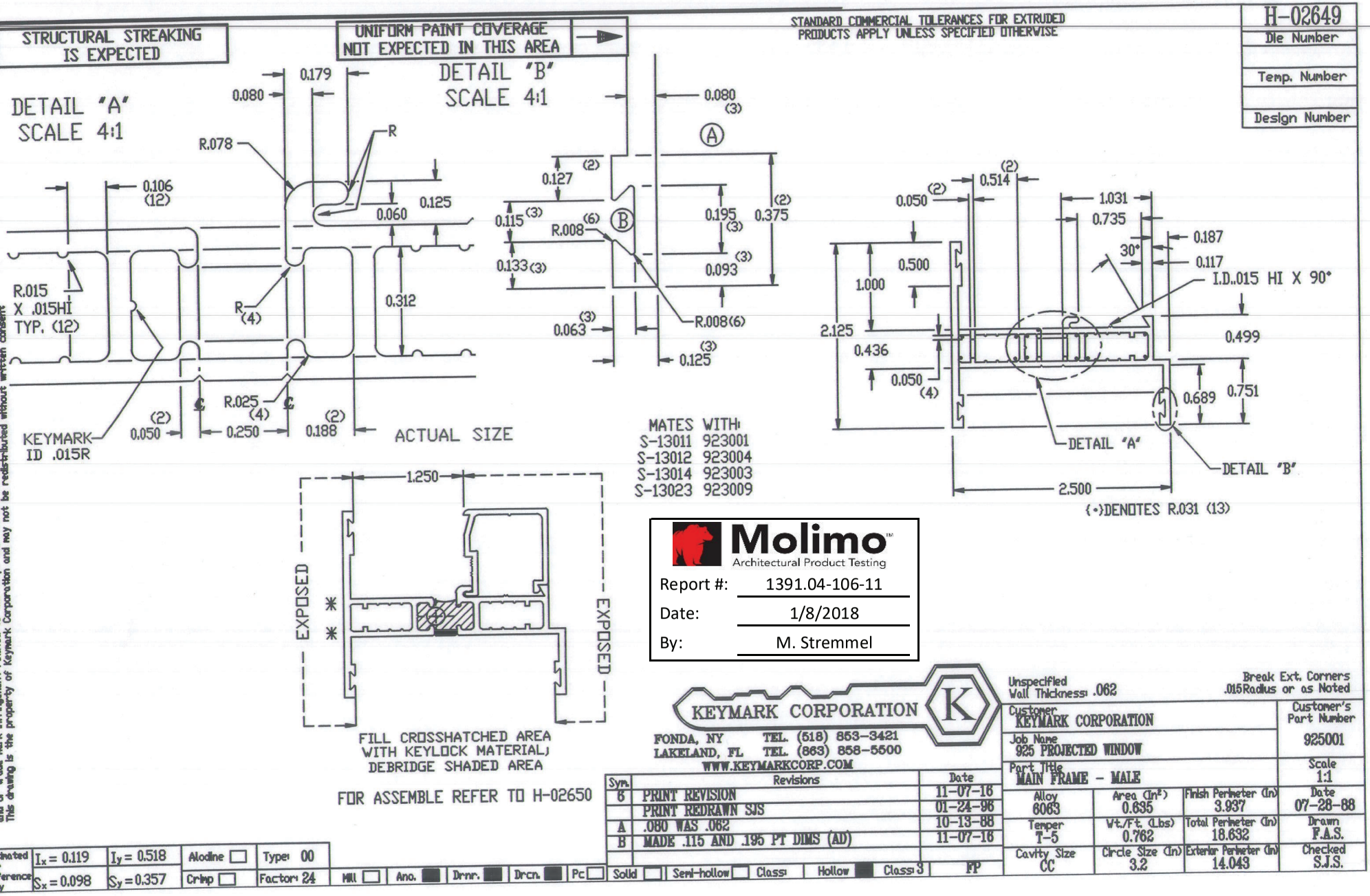


1 VENT/ JAMB

1 VENT/ JAMB

SHEET # 1A	Drawn by: C. CHAN	Customer	Revisions		
	Checked by:		No.	Date	Description
	Date: 4-7-16	Project : W250C CASEMENT WINDOW	01	5-20-16	UPDATED DIMENSIONS
	Scale: 3″:1′-0″				

GAMCO CORPORATION
MANUFACTURERS OF FENESTRATION PRODUCTS
131-10 MAPLE AVE. FLUSHING, N.Y.11355
TEL: (718)359-8833 FAX: (718)359-8661
info@gamcocorp.com www.gamcocorp.com

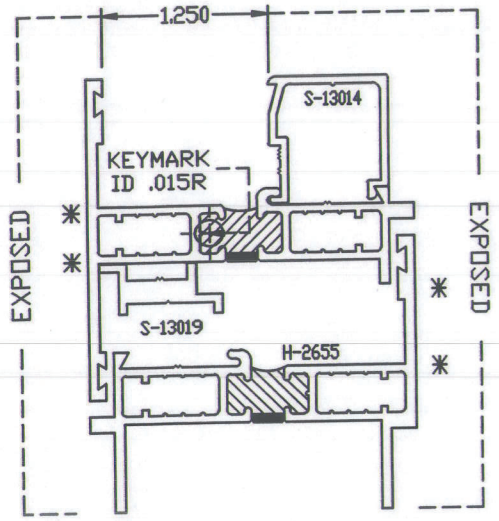

* STRUCTURAL STREAKING IS EXPECTED
UNIFORM PAINT COVERAGE NOT EXPECTED IN THIS AREA
STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE
H-02649
Die Number
Temp. Number
Design Number
DETAIL "A" SCALE 4:1
DETAIL "B" SCALE 4:1
0.179
0.080
R.078
R
0.106 (12)
0.125
0.060
R.015 X .015HI TYP. (12)
R (4)
0.312
R.025 (4)
(2) 0.050
0.250
(2) 0.188
KEYMARK ID .015R
ACTUAL SIZE
0.080 (3)
A
(2) 0.127
0.115 (3)
B
R.008 (6)
0.195 (3)
0.093 (3)
0.133 (3)
0.375 (2)
0.063 (3)
R.008 (6)
0.125 (3)
(2) 0.514
(2) 0.050
1.031
0.735
0.187
30°
0.117
I.D..015 HI X 90°
0.500
1.000
2.125
0.436
0.499
0.050 (4)
0.689
0.751
DETAIL "A"
DETAIL "B"
2.500
(•)DENOTES R.031 (13)
MATES WITH:
S-13011 923001
S-13012 923004
S-13014 923003
S-13023 923009
1.250
EXPOSED
EXPOSED
FILL CROSSHATCHED AREA WITH KEYLOCK MATERIAL; DEBRIDGE SHADED AREA
FOR ASSEMBLE REFER TO H-02650
Molimo Architectural Product Testing
Report #: 1391.04-106-11
Date: 1/8/2018
By: M. Stremmel
KEYMARK CORPORATION
FONDA, NY TEL. (518) 853-3421
LAKELAND, FL TEL. (863) 858-5500
WWW.KEYMARKCORP.COM
Unspecified Wall Thickness: .062
Break Ext. Corners .015Radius or as Noted
Customer: KEYMARK CORPORATION
Customer's Part Number: 925001
Job Name: 925 PROJECTED WINDOW
Part Title: MAIN FRAME - MALE
Scale: 1:1
Alloy: 6063
Area (In²): 0.635
Finish Perimeter (In): 3.937
Date: 07-28-88
Temper: T-5
Wt./Ft. (Lbs): 0.762
Total Perimeter (In): 18.632
Drawn: F.A.S.
Cavity Size: CC
Circle Size (In): 3.2
Exterior Perimeter (In): 14.043
Checked: S.J.S.
Sym. | Revisions | Date
6 | PRINT REVISION | 11-07-16
| PRINT REDRAWN SJS | 01-24-96
A | .080 WAS .062 | 10-13-88
B | MADE .115 AND .195 PT DIMS (AD) | 11-07-16
Estimated For Reference Only
Ix = 0.119 Iy = 0.518
Sx = 0.098 Sy = 0.357
Alodine ☐ Type: 00
Crimp ☐ Factor: 24
Mill ☐ Ano. ■ Drnr. ■ Drcn. ■ Pc ☐
Solid ☐ Semi-hollow ☐ Class: Hollow ■ Class: 3 FP
Customer signature on this print indicates approval of design and dimensions as shown, and customer agrees to accept all legal responsibilities for patent and or trade mark infringement related to this shape and hold (save) Keymark harmless from any claims, suits, actions or demands arising there from. This drawing is the property of Keymark Corporation and may not be redistributed without written consent

*	STRUCTURAL STREAKING IS EXPECTED

UNIFORM PAINT COVERAGE NOT EXPECTED IN THIS AREA →

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

H-02651
Die Number
Temp. Number
Design Number

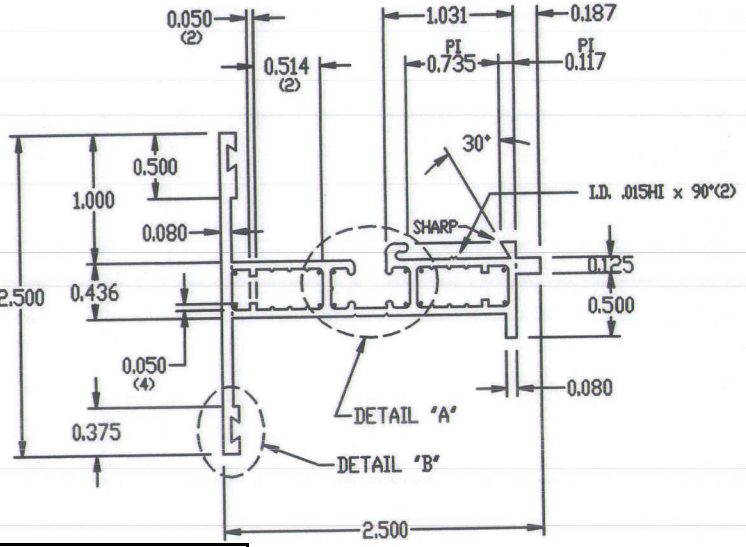


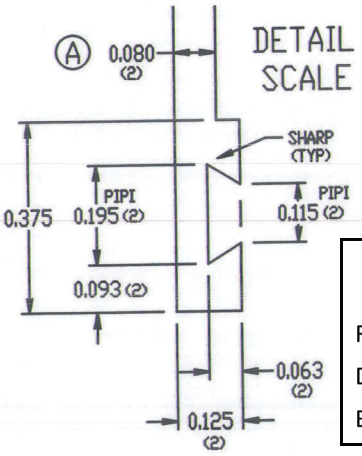
ACTUAL SIZE ASSEMBLY

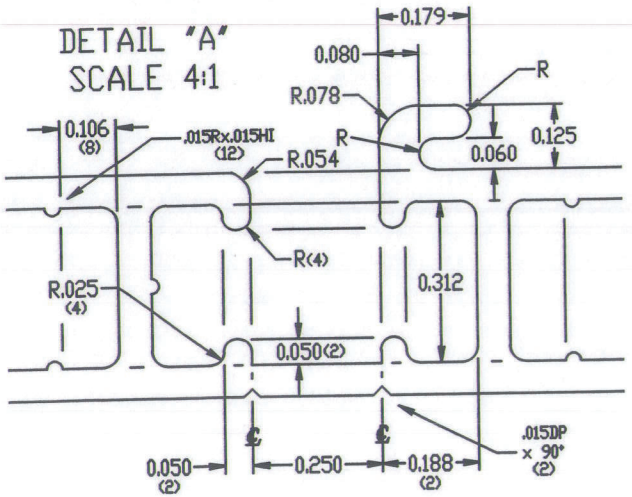
H-02651 MATES WITH:
S-13011 923001
S-13014 923003

FILL CROSSHATCHED AREA WITH KEYLOCK MATERIAL; DEBRIDGE SHADED AREA

(•) DENOTES R .031 (12)







Molimo™ Architectural Product Testing

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Date:	1/8/2018
By:	M. Stremmel

KEYMARK CORPORATION

FONDA, NY TEL. (518) 853-3421
LAKELAND, FL TEL. (863) 858-5500
WWW.KEYMARKCORP.COM

Syn.	Revisions	Date
5	PRINT REVISION	01-05-05
A	.080 WAS .062	10-23-88

Unspecified Wall Thickness: .062

Break Ext. Corners .015 Radius or as Noted

Customer: KEYMARK CORPORATION			Customer's Part Number: 925005
Job Name: 925 PROJECTED WINDOW			Scale: 1:1
Part Title: VENT SASH PROJECT OUT			Date: 07-28-88
Alloy: 6063	Area (in²): 0.629	Finish Perimeter (in): 3.874	Drawn: F.A.S.
Temper: T-5	Wt./Ft. (Lbs): 0.755	Total Perimeter (in): 18.074	Checked: S.J.S.
Cavity Size: CC	Circle Size (in): 3.1	Exterior Perimeter (in): 13.484	

Estimated For Reference Only															
$I_x = 0.139$	$I_y = 0.460$	Alodine ☐	Type: 00	Mill ☐	Ano. ■	Drnr. ■	Drcn. ■	Pc ☐	Solid ☐	Semi-hollow ☐	Class:	Hollow ■	Class: 3	FP
$S_x = 0.108$	$S_y = 0.291$	Crimp ☐	Factor: 24											

Die Number	S-13014
Temp. Number	
Design Number	

* STRUCTURAL STREAKING IS EXPECTED

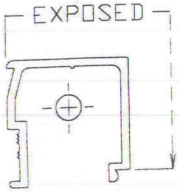
ACTUAL SIZE

UNIFORM PAINT COVERAGE NOT EXPECTED IN THIS AREA

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

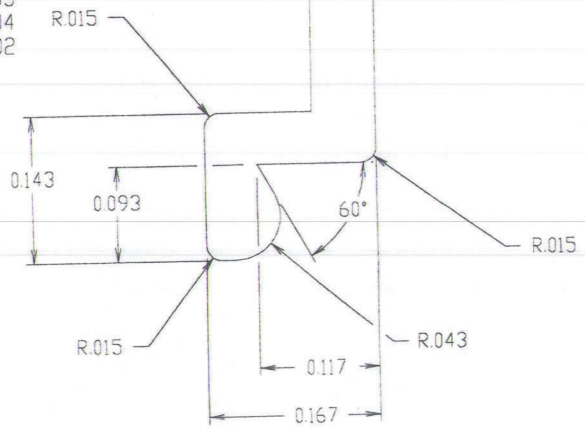
MATES WITH:

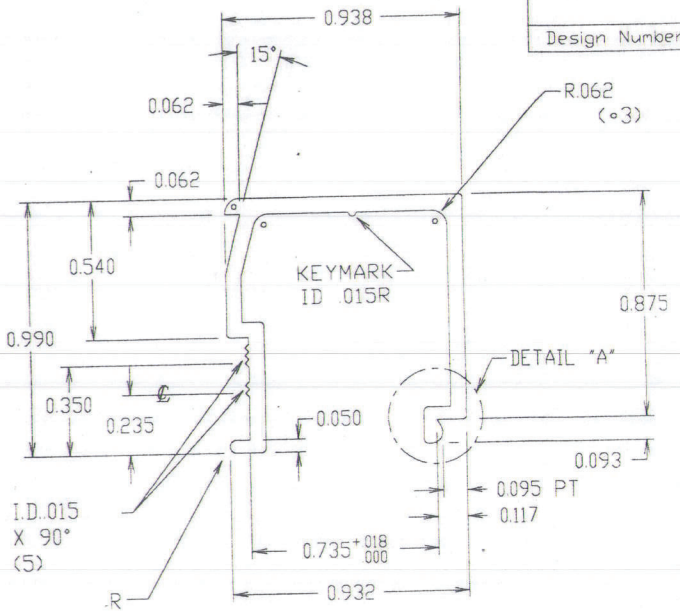
H-02649	925001
H-02650	925006
H-02651	925005
H-02652	925007
H-02653	925003
H-02654	925004
H-02655	925002



REFER FOR ASSEMBLY TO H-02650

DETAIL "A"
SCALE 8:1





Molimo™ Architectural Product Testing

Report #:	1391.04-106-11
Date:	1/8/2018
By:	M. Stremmel

KEYMARK CORPORATION
FONDA, NY TEL. (518) 853-3421
LAKELAND, FL TEL. (863) 858-5500
WWW.KEYMARKCORP.COM

Sym	Revisions	Date
A	.063 WAS .050	09-26-88

Unspecified Wall Thickness: .062

(A)

Break Ext. Corners .015Radius or as Noted

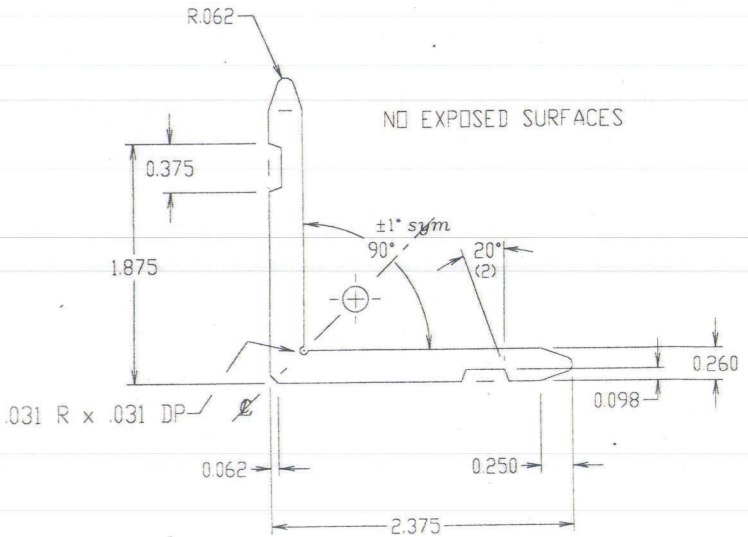
Customer: KEYMARK CORPORATION			Customer's Part Number: 925003
Job Name: 925/930 PROJECTED WINDOW			Scale: 2:1
Part Title: GLAZING BEAD FOR 1" GLASS			Date: 07-08-88
Alloy: 6063	Area (In²): 0.188	Finish Perimeter (In): 1.851	Drawn: F.A.S.
Temper: T-5	Wt./Ft. (Lbs): 0.226	Total Perimeter (In): 6.179	Checked: S.J.S. 05
Cavity Size	Circle Size (In): 1.3	Exterior Perimeter (In): 6.179	

Estimated For Reference Only	I_x = 0.020	I_y = 0.026	Alodine ☐	Type: 00	Mill ☐	Ano. ■	Drnr. ■	Drcn ■	Pc ☐	Solid ■	Semi-hollow ☐	Class:	Hollow ☐	Class:
	S_x = 0.033	S_y = 0.055	Crimp ☐	Factor: 27										

✳	STRUCTURAL STREAKING IS EXPECTED

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED PRODUCTS APPLY UNLESS SPECIFIED OTHERWISE

S-13020
Die Number
Temp. Number
Design Number



Molimo™
Architectural Product Testing

Report #: 1391.04-106-11

Date: 1/8/2018

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 .015 Break Ext. Corners Radius or as Noted

Customer			Customer's Part Number
KEYMARK CORPORATION			925000
Job Name: 915/922/923/925/930 PROJECTED WINDOW			
Part Title: CORNER KEY			Scale: 1:1
Alloy: 6105	Est. Area: 1.052 In²	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 ☐	Type: 00	Mill ■	Ano. ☐	Drnr. ☐	Drcn. ☐	Pc ☐	Solid ■	Semi-hollow ☐ Class	Hollow ☐ Class
	S_x = 0.294	S_y = 0.294	Crimp	Factor 8								