Corporate Offices / Laboratories

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Rochester, NY 14624
(585) 328-7668
Fax: (585) 328-7777

ETC Laboratories

Measuring Up To Your Standards And More

Report Number: ETC-08-1014-21317.0
Test Start Date: 01/16/2009
Test Finish Date: 01/20/2009
Report Date: 01/21/2009
Dade County Notification Number: ETC09003

TAS 201, TAS 202, TAS 203 Combined Test Report
Rendered To:

Four Seasons Solar Products
5005 Veterans Memorial Highway
Holbrook, NY 11741

Hurricane Impact Roof Window

Summary of Results

Item	Unit	
Overall Design Pressure, Pos./Neg.	psf	70.00
Air Leakage Rate	$scfm/ft^2$	0.01
Maximum Water Pressure Achieved	psf	10.50
Maximum Structural Pressure Achieved, Pos./Neg.	psf	105.00
Missile Resisted	-	Large
Nominal Missile Speed Resisted	ft/sec	50.00
Maximum Cyclic Pressure Achieved Pos./Neg.	psf	70.00
FER Test	-	Pass

Summary Description:

The tested unit was a fixed aluminum roof window constructed with mechanically fastened frame corners. Three specimens of identical construction were tested, measuring 39-3/8 in. wide by 66 inches high by 6-1/2 inches deep. The IG unit used had a nominal thickness of 7/8 inch an exterior lite of 1/8 inch tempered glass and an interior lite consisting of 1/8 inch annealed glass to either face of a 0.090 inch PVB interlayer and glazed with DOW 995.

Joseph Labora Doldan, P.E.
Florida P.E. #42929
6-03-09

Test Specifications

The testing was conducted in accordance with Florida Building Code test Protocols for High Velocity Hurricane Zones TAS 201-94, TAS 202-94 and TAS 203-94 without deviations.

Note: Safety glass permanent marker identified before testing began

TAS 202-04 Results

	Results	Allowed
Specimen 1		
1. Air Infiltration Test – ASTM E283 @ 1.57 psf	0.01 scfm/ft^2	0.3 scfm/ft^2
2. Uniform Static Air Pressure Test - ASTM E 330		
Design Pressure – 70.00 psf		
Design Load: **70.0 psf** (100% x DP)		
Center of rafter, between fasteners		
Positive Deflection	0.059 in.	0.366 in. **(L/180)**
Negative Deflection	0.081 in.	0.366 in. **(L/180)**
3. Water Resistance Test – ASTM E331		
Design Pressure – 70.00 psf		
Test pressure – **10.50 psf**	Pass	No Leakage
Water spray was delivered to the specimen and maintained a rate of 5 gallons per hour per square foot of specimen area for the duration of the water resistance test.		
No water infiltration past the inner most plane of the test specimen occurred during the water resistance test.		
4. Uniform Static Air Pressure Test - ASTM E 330		
Design Pressure – 70.00 psf		
Full Test Load: **105.00 psf** (150% x DP)		
Center of rafter, between fasteners		
Positive Permanent Set	0.014 in.	0.264 in. **(.4%)**
Negative Permanent Set	0.031 in.	0.264 in. **(.4%)**
5. Forced Entry Resistance – ASTM F588		
Grade: 10		
Disassembly Test	Pass	No Entry
Sash Manipulation Test	Pass	No Entry

Test notes:

The specimen remained in place throughout the tests and no damage to the fasteners was observed.

The specimen successfully completed all testing as prescribed by Test Protocol TAS 202-94 and the associated Frequently Asked Questions and sections of the Florida Building Code.

No change in the specimen was observed that could be indicative of incipient failure.

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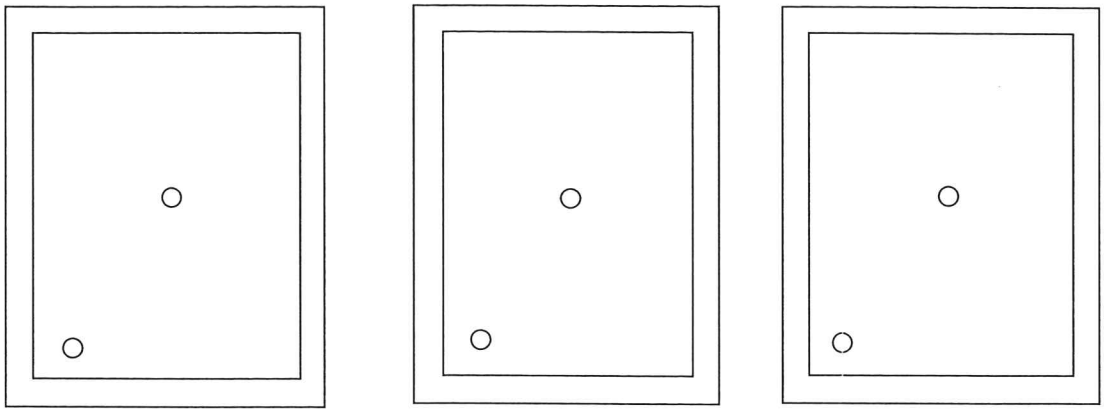
TAS 201-04 & 203-04 Test Results



Specimen 1 **Specimen 2** **Specimen 3**

Notes: The circles on the diagrams above indicate the impact locations for that specimen.

The X measurement stated below is taken from the left edge of the specimen,

The Y measurement stated below is taken from the top edge of the specimen.

The large missile used was a piece of #2 southern yellow pine, 2 x 4 dimensional lumber, 97 inches long and weighing 9.2 lbs.

Impact Location	Missile Speed (ft/sec)	X Measurement (in.)	Y Measurement (in.)
Specimen 1			
Center of Glass	49.9	20	32
Lower left glass corner	49.8	7-1/2	57
Specimen 2			
Center of glass	50.3	19-1/2	33
Lower left glass corner	51.8	9	57
Specimen 3			
Center of Glass	50.4	19	32
Lower left glass corner	49.8	8-1/2	56-1/2

Cyclic Wind Pressure Loading Tests:

Notes: The specimen was subjected to pressure cycles of the same sequences, duration and pressure differentials stated below in the Tabulation of Pressure Differences

The maximum inward and outward acting pressures exerted on the specimens were equivalent to the design pressures stated below in the Tabulation of Pressure Differences.

The maximum deflection and permanent set were recorded using a straight edge and steel scale and represent the average deflection over several cycles at maximum pressure differential and the difference between measurements taken before cycling and after cycling respectively.

Joseph Labora Doldan

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6-03-09

TAS 201-04 & 203-04 Tests Results (cont.)

Tabulation of Pressure Differences:

Number of Cycles	Pressure Range of Cycles Inward Acting Cycles –DP = 70.00 psf				Specimen 1	Specimen 2	Specimen 3
	% of DP	Pa (psf)	% of DP	Pa (psf)	(sec/cycle)		
3500	20	14.0	50	35.0	2.6	2.0	2.0
300	0	0.0	60	42.0	2.6	4.2	4.2
600	50	35.0	80	56.0	2.9	1.4	1.4
100	30	21.0	100	70.0	2.6	2.6	2.6
Number of Cycles	Pressure Range of Cycles Outward Acting Cycles –DP = 70.00 psf				Specimen 1	Specimen 2	Specimen 3
					(sec/cycle)		
50	30	21.0	100	70.0	3.0	3.0	3.0
1050	50	35.0	80	56.0	2.6	2.0	2.0
50	0	0.0	60	42.0	2.7	3.4	3.4
3350	20	14.0	50	35.0	2.3	2.0	2.0

Maximum Deflection and Permanent Set from Pressure Cycling:

Location of Measurement		Cycle	Maximum Deflection (in.)	Permanent Set (in.)
Specimen 1	Between rafter fasteners	Inward Acting Pressure	0	0
		Outward Acting Pressure	0	0
Specimen 2	Between rafter fasteners	Inward Acting Pressure	0	0
		Outward Acting Pressure	0	0
Specimen 3	Between rafter fasteners	Inward Acting Pressure	0	0
		Outward Acting Pressure	0	0

Condition of Test Specimens:

The specimens remained in place throughout the tests and no damage to the fasteners was observed.
After testing, the specimens exhibited many fractures to the impacted light of glass.
These specimens average recovery over maximum deflection was 100%.
All three specimens passed impact with no missile penetration and no openings after cyclic testing.
No change in the specimen was observed that could be indicative of incipient failure.

Joseph Labora Doldan

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Florida P.E. #42929
6-03-09

Product Description of Test Specimen

Specimen Item	Laboratory Verification
Frame:	
Model/Series	Hurricane Impact Roof Window
Size	39-3/8 in. W. x 66 in. H. x 6-1/2 in. D.
Daylight Opening	34-7/8 in. W. x 61-1/2 in. H.
Material	Aluminum
Construction	Two aluminum rafters 2 in. W. x 5 in. D. x 66 in. high forms the sides. The rafters have [2] 3 legged rubber fins set into extruded T-slot profiles on their top edge. Extruded aluminum muntins (38-3/4 inches) wide are laid on top of the rafters (horizontally) forming top and bottom members, they are fastened at each corner with [2] 10-24 x 3/8 in. machine screws. Aluminum end cover plates 4-1/2 in. D. x 1/8 in. thick are bent at 90 degree angles at either end and the newly formed 1-1/4 inch legs are inserted into the interior ends of the rafters against their outer edges, [2] #8 x 1 in. L. self drilling pan heads are driven horizontally from exterior lateral edges of rafter, 1/2 in. from ends and spaced 3 in. apart into legs of cover plate securing its position.
Glazing:	
Overall IG thickness	7/8 in. glass from Cardinal
Thickness of lites	Exterior – 1/8 in. tempered Interior – 1/8 in. ann. / 0.090 in. PVB / 1/8 in. ann.
Interlayer	0.090 in. PVB, Cardinal, Sea Storm
Number of lites	2
Spacer ID	SS-D
Glazing Method:	
Type	IG sets on top of frame from exterior, compressing 3 legged rubber fins on top edge of vertical rafters and sealed with a cap bead of DOW 995 structural sealant to the interior and exterior edge of the rafters. An aluminum glazing cap with 3 legged rubber fin facing the IG is placed to the exterior and fastened with [7] #10 x 1-1/2 in. L. screws with bushings located 3 in. from ends and spaced on 10 in. centers driven from the exterior, with a snap in aluminum beauty cap covering screws the full length of either rafter.

Joseph Labora Doldan

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Florida P.E. #42929
6-03-09

Product Description of Test Specimen

Specimen Item	Laboratory Verification
Glazing Method (con't):	
	IG unit is sealed to the horizontal muntin bars with dual sided glazing tape 3/8 in. W, x 1/16 in. D. and DOW 995 structural sealant to the edge of the IG and the interior face. An aluminum muntin cap with single sided glazing tape 3/8 in. W, x 1/16 in. D. facing the IG is set on top of unit sandwiching a 5/16 in. W. x 3/16 in. H. x 36 in. L. pieces of steel stock, [11] 10-24 x 3/4 in. machine screws with bushings, located 2-1/2 in. from ends, then 3-1/16 in on center spacing are driven from the interior of the muntin bars through the steel stock and into the pocket of the muntin caps completing the fastening, with a snap in vinyl cap covering screw heads the full width of either muntin. A 7/8 in. square wood spacer is placed along the exterior perimeter of the unit and sandwiched in position; imitating additional IG units if this were a complete roof system.
Bite depth	1/2 in.
Reinforcement:	5/16 in. W. x 3/16 in. H. x 36 in. L. steel stock centered in muntin bars
Weather-stripping:	[2] Rows of rubber compression seal with 3 legs, 0.365 in. W. x 0.265 in. H. with a 0.187 in. T-extrusion on bottom face of each glazing cap [2] Rows of rubber compression seal with 3 legs, 0.365 in. W. x 0.265 in. H. with a 0.187 in. T-extrusion on top face of rafters
Drainage:	[2] oval slots 7/16 in. W. X 3/16 in. D. through ends of muntin bar at rafter intersection
Test Buck:	
Mounting Gap	0 in. at the head, jambs and sill
Shims	Located on lateral edges of rafters, see test buck drawing
Sealant	Silicone
Material	2 x 6, SPF, #2
Anchorage of Frame to Test Buck:	
Type	1/4 in. x 2-1/2 in. L. lag bolt
Quantity	[2] at each corner, horizontal orientation
Location	1-1/4 in. from ends of rafters, spaced 2-3/8 in. apart

Joseph Labora Doldan

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Florida P.E. #42929
6-03-09

Statement of Compliance: The results of the testing demonstrate the products tested **Meets** the requirements of Chapters 1606, 1619 and 1626 of the Florida Building Code and the requirements of Florida Building Code test Protocols for High Velocity Hurricane Zones TAS 201-94, TAS 202-94 and TAS 203-94

Review of Bill of Materials: As Supplied

Review of Assembly and Detail Drawings: Plan view, Rafter section, Muntin assembly 2 pages, Steel stock, Bucking, Glazing cap, Rafter, Muntin, Beauty cap, Muntin cap.

Components changed or altered during testing to achieve stated results - None

This report, in its original form contains product drawings and a Bill of Materials.

Persons Witnessing Tests:

Joe Doldan, PE.
Josh Reindl, ETC Laboratories
Mark Sennett, ETC laboratories
Gurjinder Singh Dhami, ETC Laboratories

Joseph Labora Doldan, P.E.
Florida P.E. #42929
6-03-09

Conditions, Terms, and General Notes Regarding These Tests

The product tested **Has Been** compared to the detailed drawings, bill of materials and fabrication information supplied by the client so named herein. Our analysis, which includes dimensional and component description comparisons, indicate the tested product and engineering information supplied by the client **"Are Equivalent"**. The report and representative samples will be retained for four years from the date of initial test.

These test results were obtained by employing all requirements of the designated test methods with no deviations. The test results and specimen supplied for testing are in compliance with the referenced specifications. The test results are specific to the product tested by this laboratory and of the sample supplied by the client named herein, and they relate to no other product either manufactured by the client, a Fabricator of the client or of installed field performance.
This report does not constitute a certified product. The program administrator may only grant product certification.

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Limitation of Liability: Due diligence was used in rendering this professional opinion. By acceptance of this report, this client agrees to hold harmless and indemnify ETC Laboratories, its employees and offices and owners against all claims and demands of any kind whatsoever, which arise out of or in any manner connected with the performance of work referred to herein.

Revision History

Date	Rev. #	Pages Affected	Revisions
01/21/09	.0	N/A	Original report issue

For ETC Laboratories

Josh Reindl, Testing Technician

Mark Sennett

Mark Sennett, Senior Test Technician

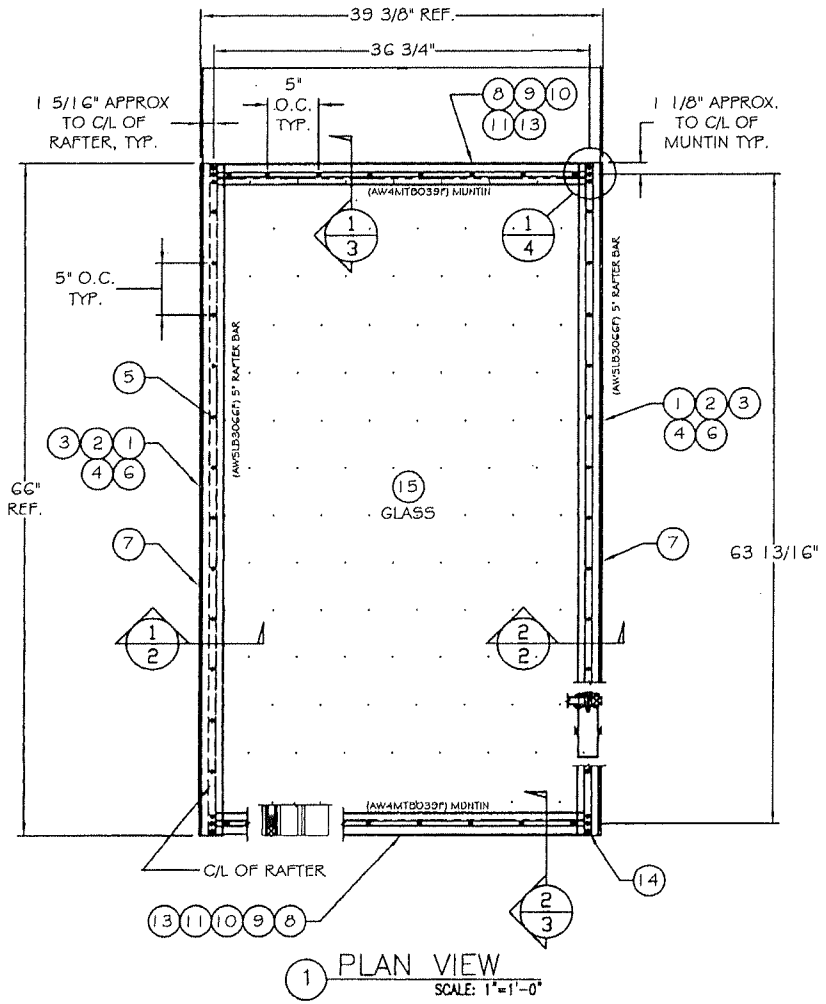
Gurjinder Singh Dhami, Director of Testing
Person in Responsible Charge

Joseph Labora Doldan

Joseph Labora Doldan, P.E.
Florida P.E. #42929
6-03-09

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

E.C.O. #:	REV.	DESCRIPTION:	DATE:	APPROVED
	A	INITIAL RELEASE AS SINGLE LITE ONLY (7 G2G)	03/25/08	
	B	MUNTIN LENGTHS CHANGED FROM 38 3/4" TO 36"	03/25/08	



	HVHZTEST5LB5 - BILL OF MATERIALS		
	PART NUMBER	DESCRIPTION	QTY.
1	AW5LB506GF	5" RAFTER BAR, GG 1/16"	2
2	AW5GC06GF	EXTR'D ALUM. GLAZING CAP, GG 1/16"	2
3	AW4BC06GF	EXTR'D ALUM. BEAUTY CAP, GG 1/16"	2
4	RK5NGL288U	FIN GLAZING CHORD 4-PART	1
5	HN2004-36	#10-24 x 1 1/2" PP MS NS	2
6	CN4201	THERMAL BREAK BUSHING-BAG OF 100	1
7	----	7/8" x 7/8" x 64" LONG WOOD BLOCK	2
8	AW4MXB039F	EXTR'D ALUM. MUNTIN CAP, 36"	2
9	AW4MTB039F	EXTR'D ALUM. MUNTIN, 38 3/4"	2
10	HK1023B-12	BL H-SETTING BLOCK	1
11	HK1009ACR	1/16" THK. x 3/8" x 40FT. GLAZING TAPE	1
12	HN2008-20	#10-24 x 3/4" PP MS NS	2
13	RW4MI037F	EXTR'D RUBBER MUNTIN COVER	5
14	HN2011-20	#10-24 x 3/8" PP MS NS	20
15	CX679371001G	36" x 63" x 7/8" 0.90 LAMI GLASS	1
16	SeaStorm	.090" PVB by Cardinal	1
17	----	DOW 995 STRUCTURAL SEALANT, 5M. TUBE	2
18	8895K67	5/16" x 3/16" x 36" LNG. STEEL STOCK	2
19	-----	38-7/8" x 5" x 1/8" THK ALUM. SHEET	2

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FILE FORMAT: .DWG

TOLERANCES:
FRACTIONAL ± 1/16
ANGULAR: MACH ± 1.0°
BEND ± .5°
DECIMALS: .XX ± .1
.XX ± .32
.XXX ± .030
ALL SHARP CORNERS TO BE .010R MAX, UNLESS SPECIFIED

	NAME	DATE
DRAWN BY:	RL	03/25/07
CHECKED BY:		
ENG. APPR:		
MFG. APPR:		
Q.C.:		

MATERIAL: DO NOT SCALE DRAWING

DESCRIPTION: HURRICANE IMPACT ROOF GLASS TEST BUILD

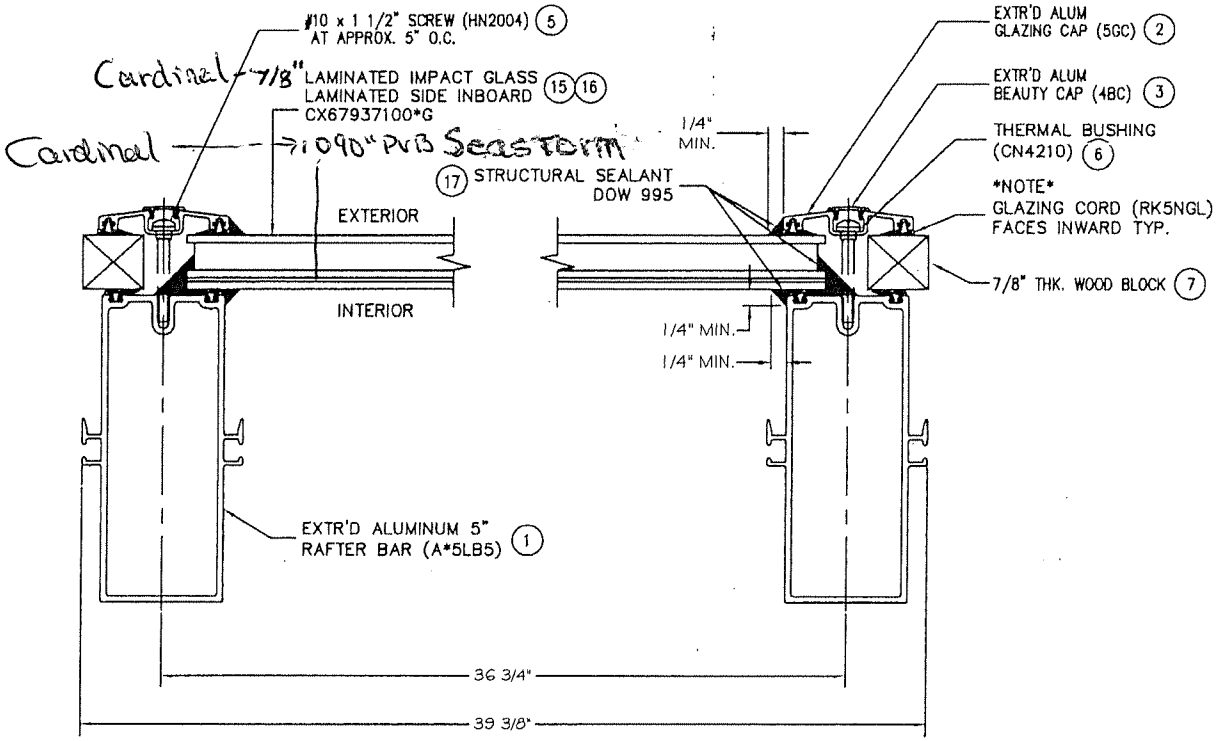
North America's Premier Sunroom Manufacturer
FOUR SEASONS SUNROOMS
Outdoor Living...Indoors
A.L. VETERAFRAME PRODUCTS

5005 VETERANS MEMORIAL HIGHWAY
HOLBROOK, N.Y. 11741
PHONE: (631) 563 4000 FAX: (631) 218 9076

SIZE: B | FILE NAME: 7-625 | REV: B
SCALE: 1 : 8 | PAGE:

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

E.C.O. #:	REV.	DESCRIPTION:	DATE:	APPROVED
	A	ORIG. RELEASE	3/25/08	
	B	NOTES, SEALANT DETAIL UPDATED	05/01/08	



1 RAFTER SECTION
SCALE: 6"=1'-0"

2 RAFTER SECTION
SCALE: 6"=1'-0"

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ANGULAR: MACH ± 1.0°
BEND ± .5°
DECIMALS: X.X ± .1
X.XX ± .02
X.XXX ± .005
ALL SHARP CORNERS TO BE 0.15R UNLESS SPECIFIED.

	NAME	DATE
DRAWN BY:	RL	03/25/08
CHECKED BY:		
ENG. APPR:		
MFG. APPR:		
Q.C.:		

MATERIAL: DO NOT SCALE DRAWING

DESCRIPTION: HURRICANE IMPACT GLASS TEST BUILD

North America's Premier Sunroom Manufacturer
FOUR SEASONS SUNROOMS
Outdoor Living...Indoors
AN ULTRAFRAME PRODUCT

5005 VETERANS MEMORIAL HIGHWAY
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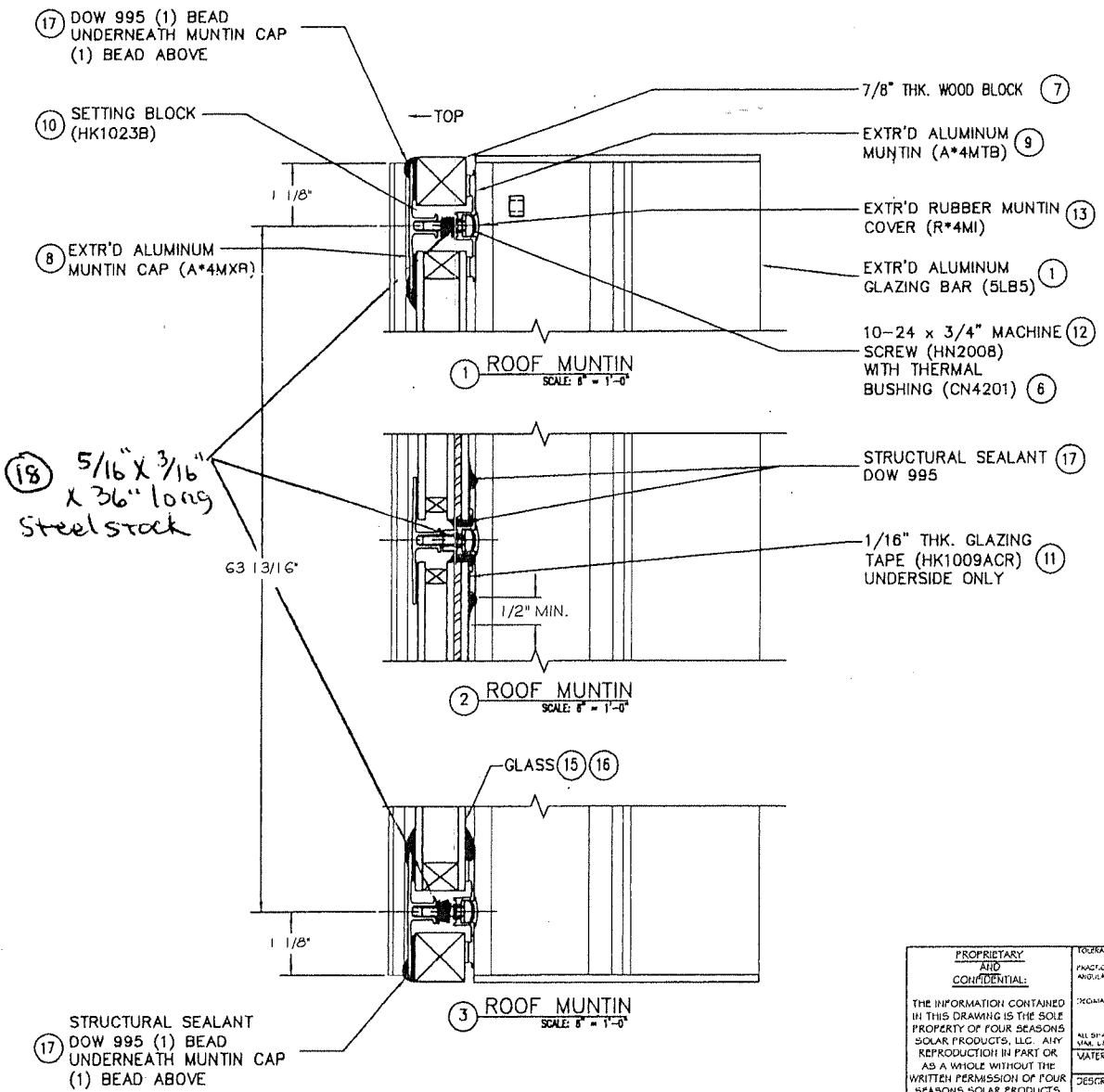
	A	ORIGINAL RELEASE	3/26/08	



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DECIMALS: .XX ± .1 .XXX ± .02 .XXXX ± .005
ALL SHARP CORNERS TO BE .0-5X UNLESS SPECIFIED.

	NAME	DATE
DRAWN BY:	R.	03.25.08
CHECKED BY:		
ENG. APPR.:		
MFG. APPR.:		
Q.C.:		

MATERIAL: DO NOT SCALE DRAWING

DESCRIPTION: HURRICANE IMPACT GLASS TEST BUILD

FOUR SEASONS SUNROOMS
Outdoor Living...Indoors
5005 VETERANS MEMORIAL HIGHWAY
HOLBROOK, N.Y. 11741
PHONE: (631) 563-4000 FAX: (631) 218 9076

SIZE: B | FILE NAME: 7-G25 | REV: A
SCALE: 1 : 2 | PAGE: 3

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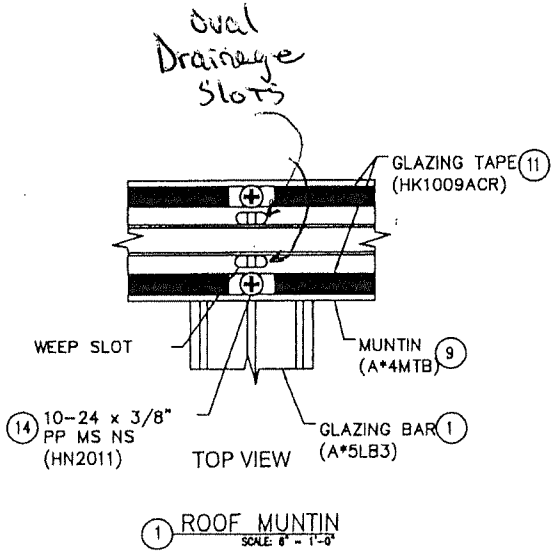
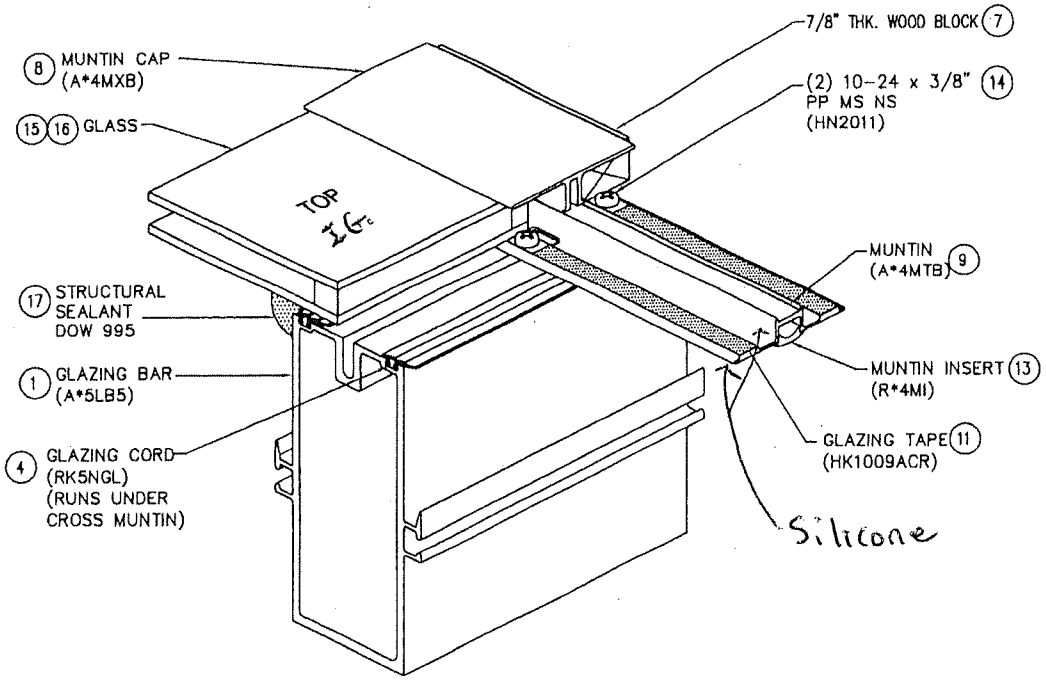
Verified By: MS	Date:	04/10/2009

E.C.O. #:	REV.	DESCRIPTION:	DATE:	APPROVED
	A	ORIGINAL RELEASE	3/28/08	



(1) ROOF MUNTIN
SCALE: 6" = 1'-0"



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FILE FORMAT: .DWG

TOLERANCES:
FRACTIONAL ± 1/16"
ANGULAR: MACH ± 1.0°
BEND ± 5°
DECIMALS: X.X ± .1
X.XX ± .02
X.XXX ± .009
ALL SHARP CORNERS TO BE BREAK UNLESS SPECIFIED.

MATERIAL:

DESCRIPTION: HURRICANE IMPACT GLASS TEST BUILD

	NAME	DATE
DRAWN BY:	RL	03.28.08
CHECKED BY:		
ENG. APPR:		
MFG. APPR:		
Q.C.:		

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FOUR SEASONS SUNROOMS
Outdoor Living...Indoors
5005 VETERANS MEMORIAL HIGHWAY
HOLBROOK, N.Y. 11741
PHONE: (631) 563 4000 FAX: (631) 218 9076

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SCALE: 1 : 2 | PAGE: 4

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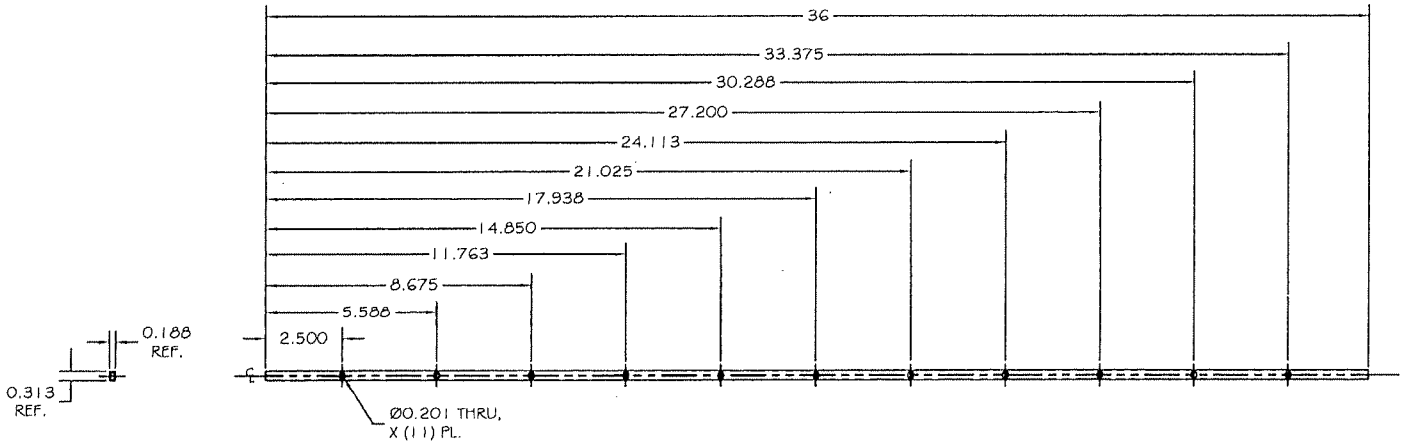
Verified By: MS	Date:	04/10/2009

E.C.O. #:	REV.	DESCRIPTION:	DATE:	APPROVED
	A	ORIGINAL RELEASE	06/16/08	



1 STEEL INSERT
SCALE: 3" = 1'-0"

NOTES:

1. MATERIAL IS: W1 TOOL STEEL, McMASTER-CARR PNR: 8895K67
2. PART MUST BE PAINTED AFTER DRILLING TO PREVENT CORROSION.

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FILE FORMAT: .DWG

TOLERANCES:
FRACTIONAL ± 1/16"
ANGULAR: MACH ± 1/2° BEND ± 1°
DECIMALS: X.X ± .1
X.XX ± .02
X.XXX ± .005
ALL SHARP CORNERS TO BE .010" MAX. UNLESS SPECIFIED.

	NAME	DATE
DRAWN BY:	RL	06/16/08
CHECKED BY:		
ENG. APPR.:		
MFG. APPR.:		
Q.C.:		

MATERIAL: DO NOT SCALE DRAWING

DESCRIPTION:
IMPACT GLASS TEST BUILD
STEEL INSERT

5005 VETERANS MEMORIAL HIGHWAY
HOLBROOK, N.Y. 11741
PHONE: (631) 563 4000 FAX: (631) 218 9076

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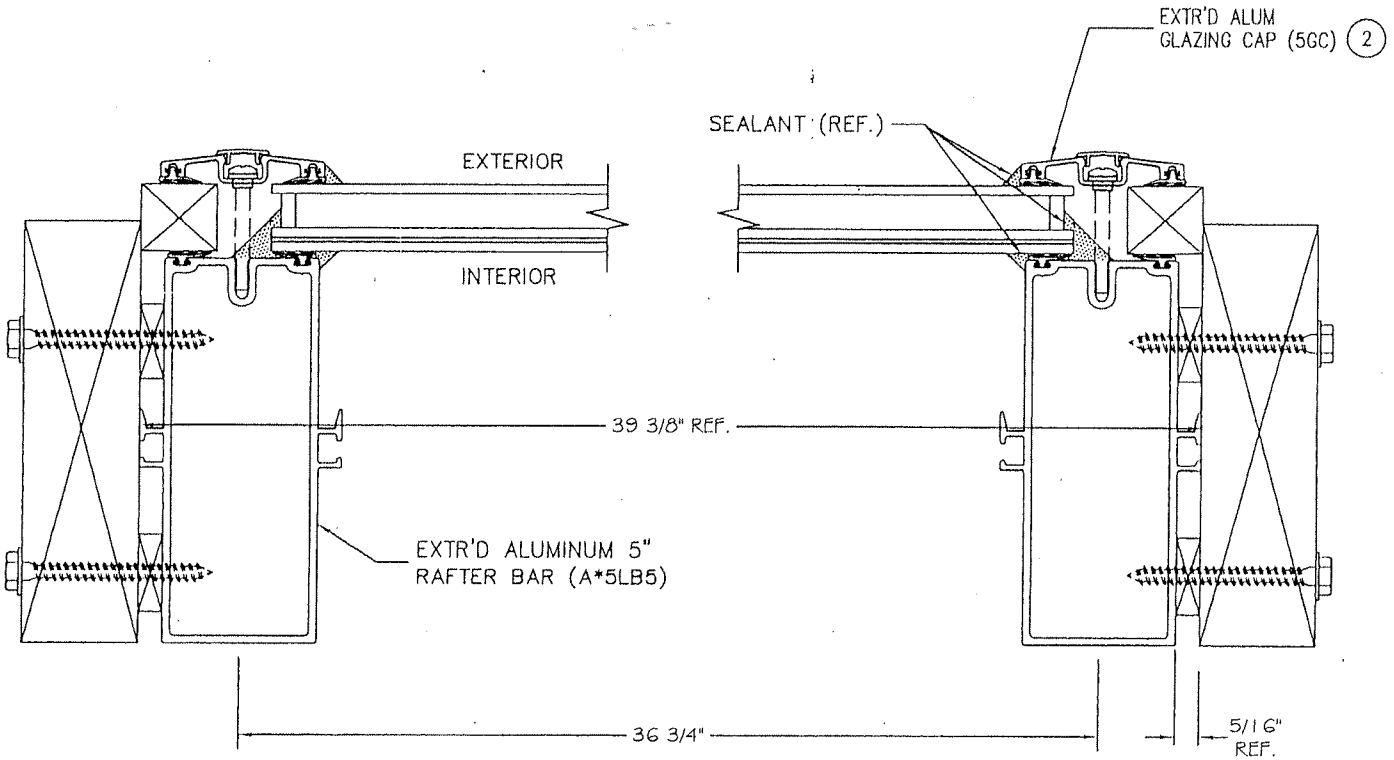


1 RAFTER SECTION
SCALE: 6"=1'-0"

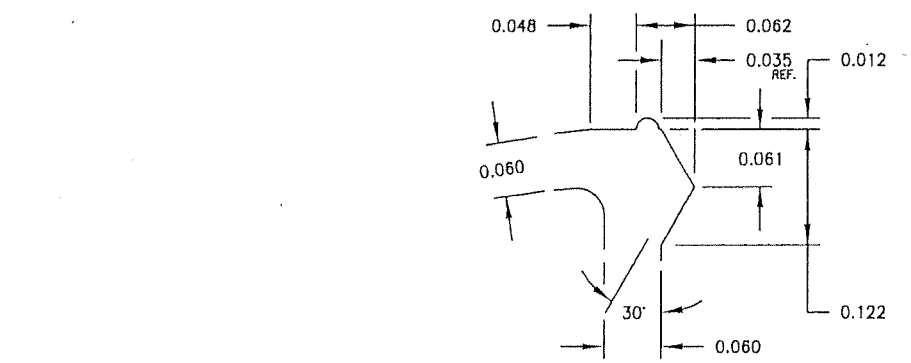
2 RAFTER SECTION
SCALE: 6"=1'-0"

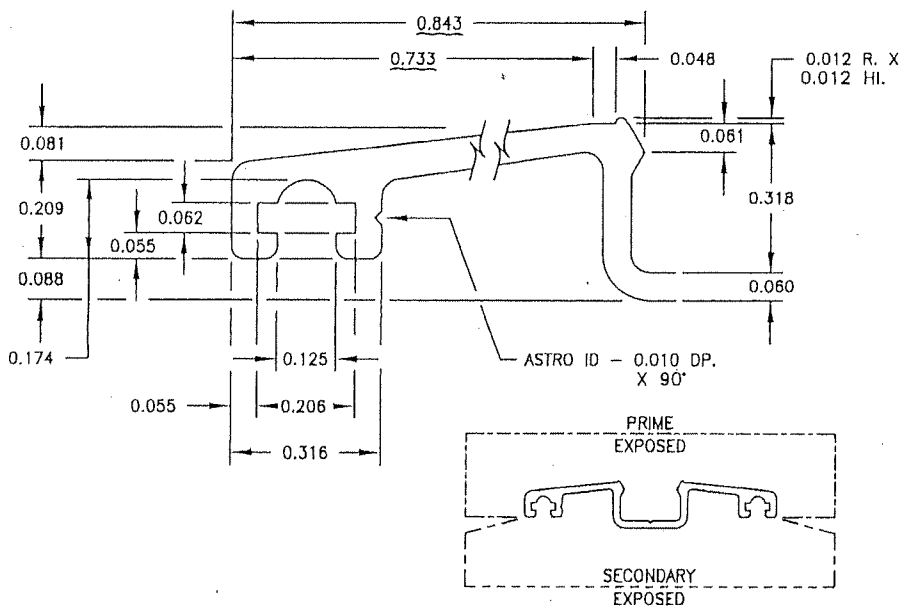
1 TEST BUCKING

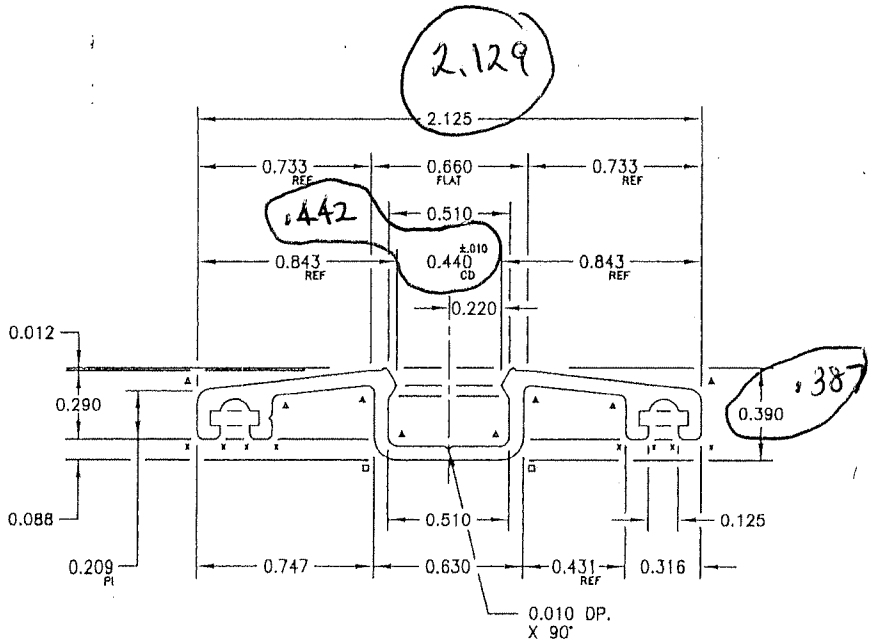
SCALE: 3" = 1'-0"

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

AS-08948/03300	REV. 0	This is not an Astro design. It is Astro's interpretation of the section designed and requested by its Customer. Customer should thoroughly check the drawing and test the design before using. AS ASTRO ACCEPTS NO RESPONSIBILITY OR LIABILITY FOR THE PERFORMANCE OF GOODS OR PRODUCTS PRODUCED THEREFROM. ASTRO MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH REGARD TO EXTRUSIONS/PRODUCTS PRODUCED PURSUANT TO THIS DRAWING. ASTRO'S ONLY WARRANTY SHALL BE AS STATED ON ASTRO'S SALES ACKNOWLEDGMENT FORM.	AS-08948 AS REF. NO.	STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED BAR AND SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE	8265 ASTRO DIE NO.







(x) INDICATES 0.015 R (8)
(▲) INDICATES 0.040 R (8)
(□) INDICATES 0.100 R (2)
ALL UNSPECIFIED WALL THICKNESS TO BE 0.060 IN.
ALL UNSPECIFIED CORNERS & FILLETS TO BE 0.015 R

PAINTED FINISH

PRIMARY ALLOY & TEMPER : 6063-T5

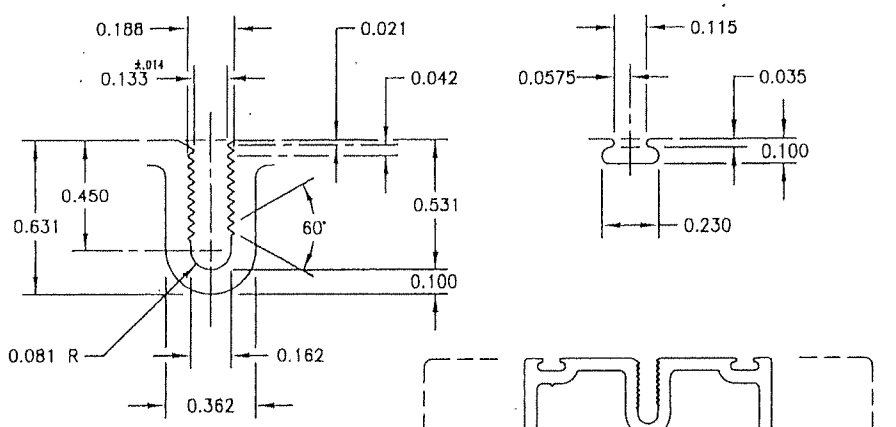
EST. AREA	0.221 SQ.IN.	EST. WT./FT.	0.266 LBS.	SOLID	ASTRO SHAPES, INC.
EST. O.S. PER.	7.010 IN.	EST. TOT. PER.	7.010 IN.	CLASS 110	65 MAIN STREET STRUTHERS, OHIO 44471
CIRCLE DIA.	2.13 IN.	FACTOR	26	APP. NO.	DESCRIPTION 2 1/8" GLAZING CAP
REVISIONS					SCALE 2=1 DRAWN LLL DATE 08/21/97
					CUSTOMER FOUR SEASONS SOLAR STATE NY
					CUST. PART NO. 5GC

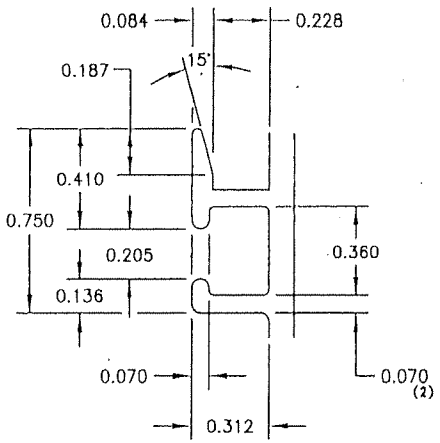
ASTRO DIE NO.: 8265

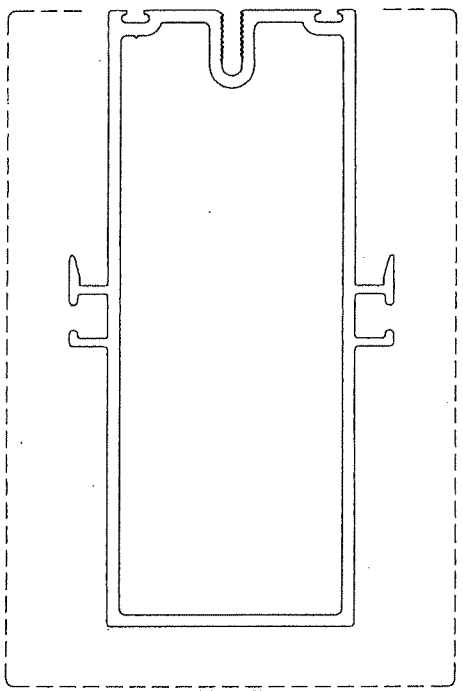
TITLE BLOCK TB0002 02/24/99 Revision 0 02/24/99 Approval Number 56218-801

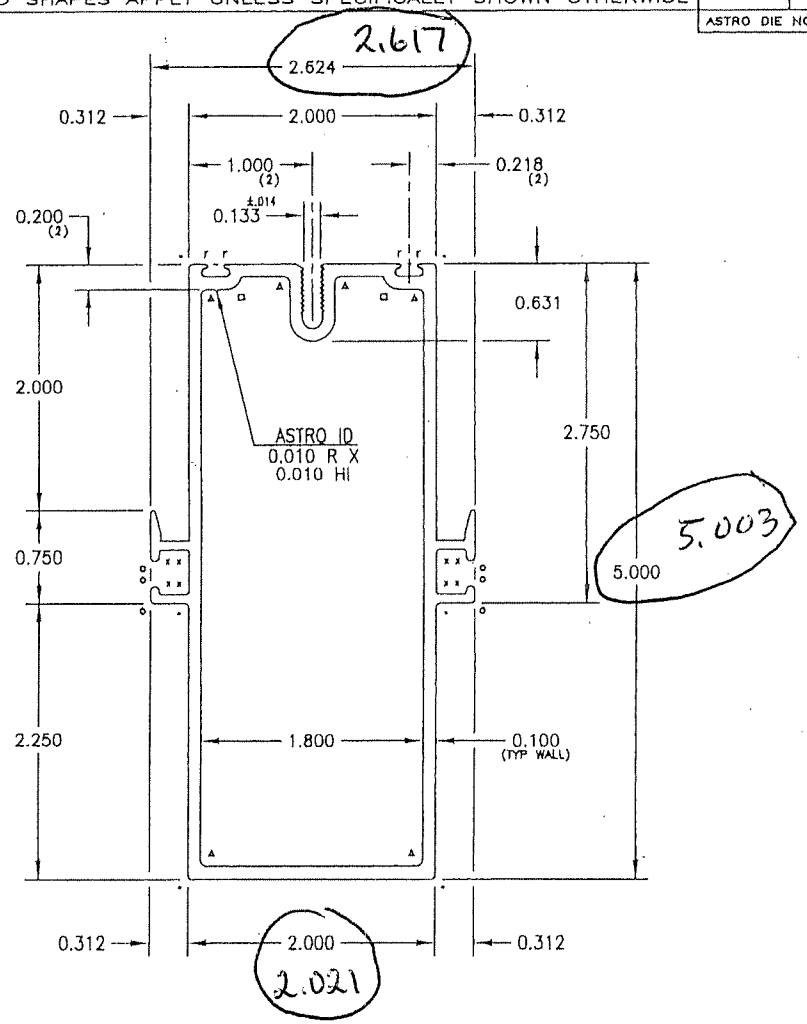
ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

AS–08075/03300 REF. NO.	This is not an Astro design. It is Astro's interpretation of the section designed and requested by its Customer. Customer should thoroughly check the drawing and test the design before using. AS ASTRO ACCEPTS NO RESPONSIBILITY OR LIABILITY FOR THE PERFORMANCE OF GOODS OR PRODUCTS PRODUCED THEREFROM. ASTRO MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH REGARD TO EXTRUSIONS/PRODUCTS PRODUCED PURSUANT TO THIS DRAWING. ASTRO'S ONLY WARRANTY SHALL BE AS STATED ON ASTRO'S SALES ACKNOWLEDGMENT FORM.	AS–08075 AS REF. NO.	STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED BAR AND SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE	7767 ASTRO DIE NO.	A









(r) INDICATES 0.017 R (4)
(x) INDICATES 0.020 R (8)
(·) INDICATES 0.031 R (2)
(o) INDICATES 0.035 R (6)
(△) INDICATES 0.050 R (6)
(□) INDICATES 0.132 R (2)
ALL UNSPECIFIED WALL THICKNESS TO BE 0.100 IN.
ALL UNSPECIFIED CORNERS & FILLETS TO BE 0.015 R

Ⓐ PRIMARY ALLOY & TEMPER : 6005–T5

EST. AREA	1.619 SQ.IN.	EST. WT./FT.	1.943 LBS.	HOLLOW	ASTRO SHAPES, INC.
EST. O.S. PER.	19.831 IN.	EST. TOT. PER.	33.720 IN.	CLASS 110	85 MAIN STREET STRUTHERS, OHIO 44471
CIRCLE DIA.	5.37 IN.	FACTOR	17	APP. NO.	DESCRIPTION 5" GLAZING BAR
REVISIONS	A) CHANGE PRIMARY ALLOY – 6005 WAS 6063				SCALE 1=1 DRAWN NKM DATE 10/24/96
			04/14/97 N.K.M.		CUSTOMER FOUR SEASONS SOLAR STATE NY
					CUST. PART NO. 5LB5

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

AS-05638/03300 (REF. NO.)

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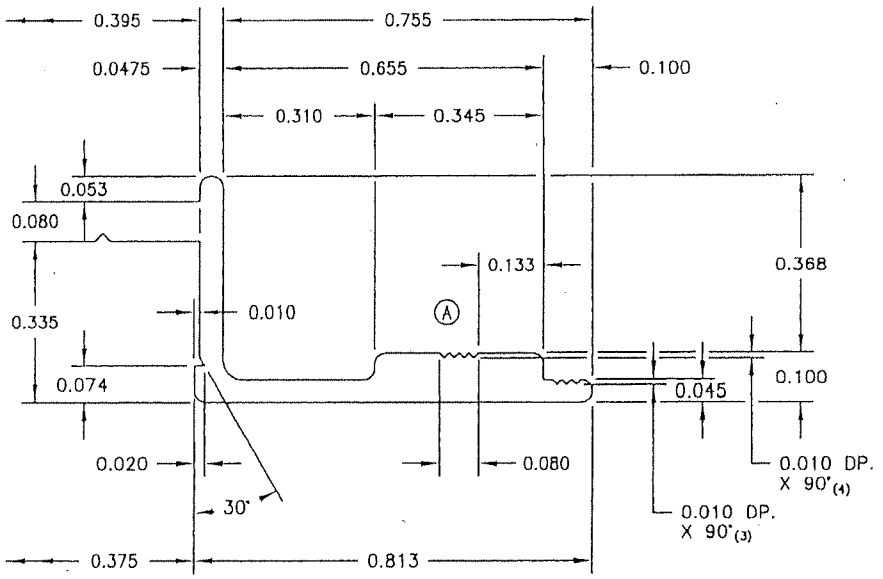
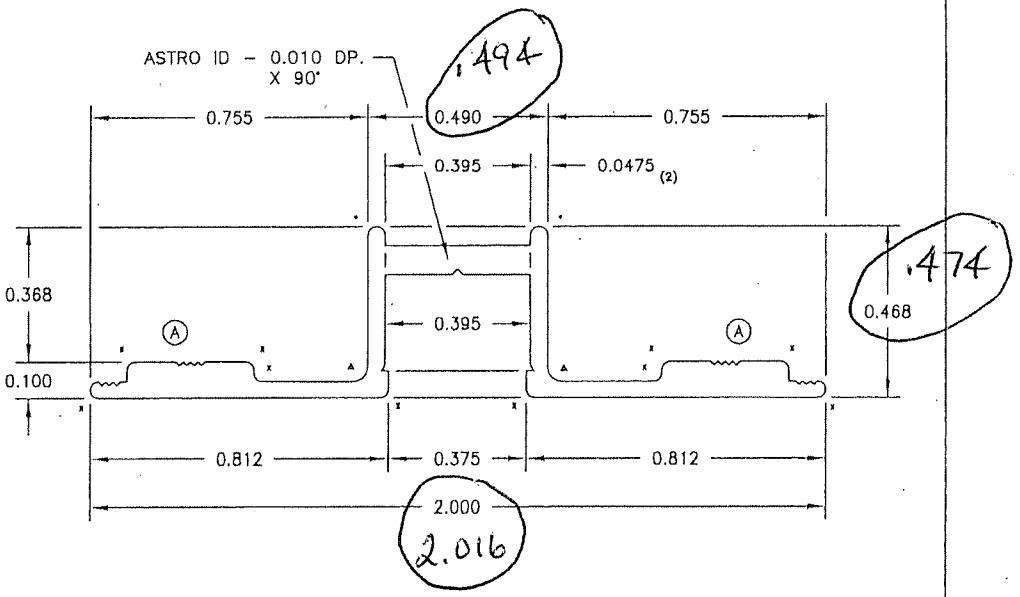
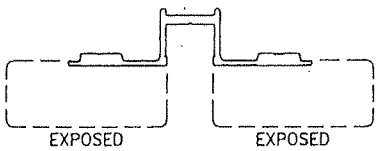
AS-05638 (AS REF. NO.)

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED BAR AND SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE

6627 A (ASTRO DIE NO.)







(x) INDICATES 0.022 R (10)
(·) INDICATES 0.023 R (2)
(▲) INDICATES 0.040 R (2)
ALL UNSPECIFIED WALL THICKNESS TO BE A/S IN.
ALL UNSPECIFIED CORNERS & FILLETS TO BE 0.015 R

PRIMARY ALLOY & TEMPER : 6063-T5

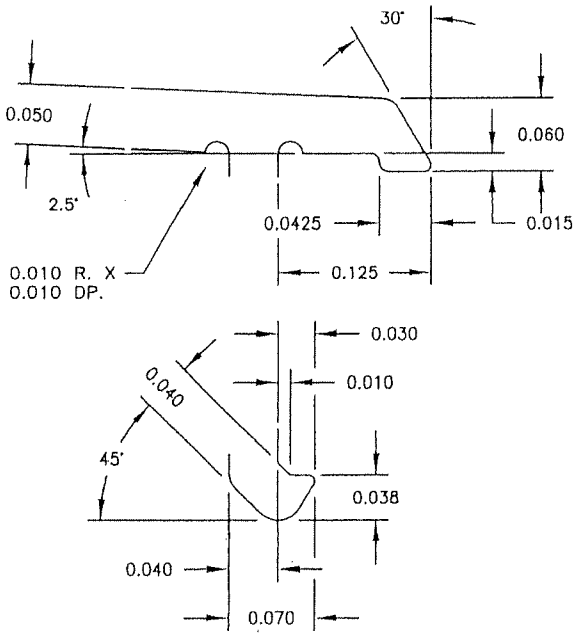
EST. AREA	0.181 SQ.IN.	EST. WT./FT.	0.217 LBS.	SOLID CLASS	ASTRO SHAPES, INC.
EST. O.S. PER.	5.936 IN.	EST. TOT. PER.	5.936 IN.	110	65 MAIN STREET STRUTHERS, OHIO 44471
CIRCLE DIA.	2.00 IN.	FACTOR	27	APP. NO.	DESCRIPTION MUNTIN
REVISIONS	A) REVISE QTY OF V-GROOVES – QTY (4) WAS QTY (14) 2-PLACES AS SHOWN				SCALE 3=1 DRAWN KMM DATE 01/05/95
	8/8/95 N.K.M.				CUSTOMER FOUR SEASONS SOLAR STATE NY
					CUST. PART NO. 4MTB

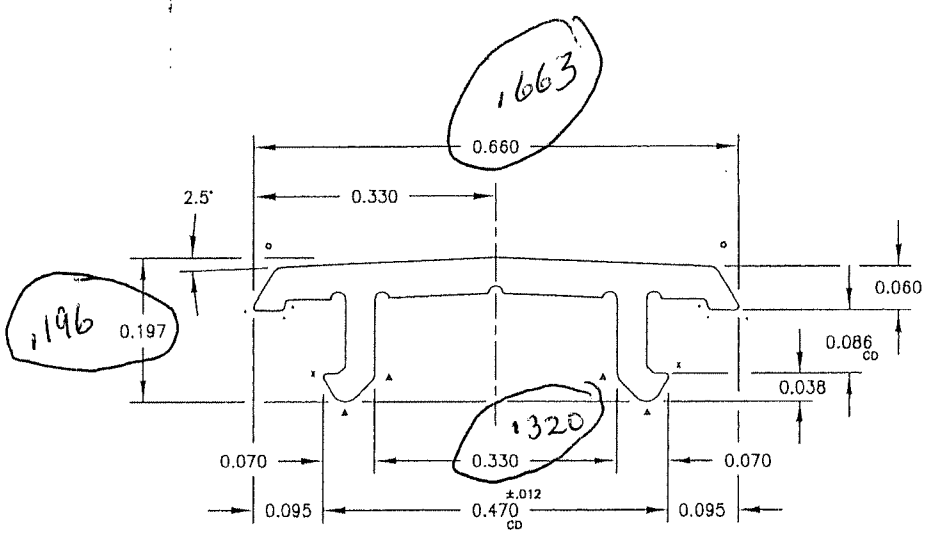
ASTRO DIE NO.: 6627 A

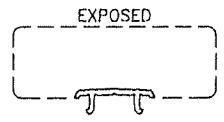
TITLE BLOCK TB0002 02/24/99 Revision 0 02/24/99 Approval Number 58215-801

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By:	Date:	04/10/2009

AS-05634/03300 REF. NO.	This is not an Astro design. It is Astro's interpretation of the section designed and requested by its Customer. Customer should thoroughly check the drawing and test the design before using. AS ASTRO ACCEPTS NO RESPONSIBILITY OR LIABILITY FOR THE PERFORMANCE OF GOODS OR PRODUCTS PRODUCED THEREFROM. ASTRO MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH REGARD TO EXTRUSIONS/PRODUCTS PRODUCED PURSUANT TO THIS DRAWING. ASTRO'S ONLY WARRANTY SHALL BE AS STATED ON ASTRO'S SALES ACKNOWLEDGMENT FORM.	AS-05634 AS REF. NO.	STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED BAR AND SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE	6625 ASTRO DIE NO.







(x) INDICATES 0.005 R. (2)
(·) INDICATES 0.007 R. (6)
(o) INDICATES 0.015 R. (2)
(Δ) INDICATES 0.020 R. (4)
ALL UNSPECIFIED WALL THICKNESS TO BE A/S IN.
ALL UNSPECIFIED CORNERS & FILLETS TO BE 0.015 R

PRIMARY ALLOY & TEMPER : 6063-T5

EST. AREA 0.043 SQ.IN.	EST. WT./FT. 0.051 LBS.	SOLID	ASTRO SHAPES, INC.		
EST. O.S. PER. 2.050 IN.	EST. TOT. PER. 2.050 IN.	CLASS 110	65 MAIN STREET STRUTHERS, OHIO 44471		
CIRCLE DIA. 0.66 IN.	FACTOR 40	APP. NO.	DESCRIPTION		
REVISIONS			SCALE 2=1	DRAWN KMM	DATE 01/07/95
			CUSTOMER FOUR SEASONS SOLAR		STATE NY
			CUST. PART NO. 4BC		

ASTRO DIE NO. : 6625

TITLE BLOCK T80002 02/24/98 Revision 0 02/24/98 Approval Number 58215-801

ETC Laboratories	Report #:	ETC-08-1014-21317
Verified By: MS	Date:	04/10/2009

AS-05352/03300 REVISED

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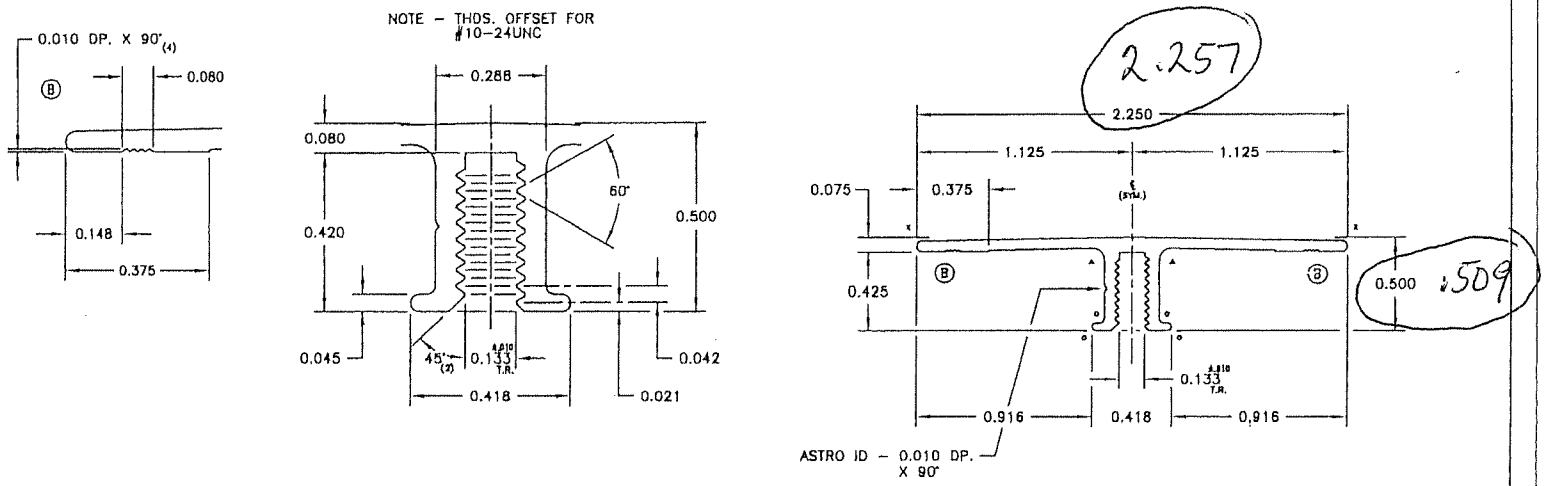
AS-05352 AS REF. NO.

STANDARD COMMERCIAL TOLERANCES FOR EXTRUDED BAR AND SHAPES APPLY UNLESS SPECIFICALLY SHOWN OTHERWISE

6414 B ASTRO DIE NO.



(•) INDICATES 0.022 R (4)
(▪) INDICATES 0.028 R (2)
(▲) INDICATES 0.060 R (2)
ALL UNSPECIFIED WALL THICKNESS TO BE 0.058 IN.
ALL UNSPECIFIED CORNERS & FILLETS TO BE 0.015 R

PRIMARY ALLOY & TEMPER : 6063-T5

TITLE BLOCK 780003 02/24/98 Revision 0 02/24/98 Approval Number 04215-801

EST. AREA 0.194 SQ.IN.	EST. WT./FT. 0.232 LBS.	SOLID	ASTRO SHAPES, INC.
EST. O.S. PER. 6.929 IN.	EST. I.D. PER. 6.929 IN.	CLASS 110	65 MAIN STREET STRUTHERS, OHIO 44471
CIRCLE DIA. 2.25 IN.	FACTOR 30	APP. NO.	DESCRIPTION WIDE MUNTIN CAP
REVISIONS: B) REVISE QTY OF V-GROOVES – QTY (4) WAS QTY (18) 2-PLACES AS SHOWN 8/8/95 N.K.M.			SCALE 2=1 DRAWN KMM DATE 08/25/94
			CUSTOMER FOUR SEASONS SOLAR STATE NY
			CUST. PART NO. 4MXB

ASTRO DIE NO.: 6414 B