Fenestration Testing Laboratory, Inc.
10235 8th Street, Rancho Cucamonga, CA 91730

Report #: T23-111

REPORT SUMMARY

REPORT #
T23-111

TESTED FOR
Fleetwood Windows and Doors
1 Fleetwood Way
Corona, CA 92879

SERIES & PRODUCT TYPE
450-T - THERMALLY BROKEN ALUMINUM CASEMENT COMPOSITE WINDOW

CONFIGURATION
X/O

FRAME SIZE
914.40 mm x 3048.00 mm (36.00" x 120.00")

SPECIFICATION
NAFS - North American Fenestration Standard/specification for windows, doors, and skylights
AAMA/WDMA/CSA 101/I.S.2/A440-22

CSA A440S1:19 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440

PRIMARY DESIGNATOR
CLASS LC-PG40 914.40 x 3048.00 mm (36.00 x 120.00 in) Type: C

TEST COMPLETION DATE
December 28, 2023

REPORT DATE
January 3, 2024

1.0 Tested For: Fleetwood Windows and Doors
1 Fleetwood Way
Corona, CA 92879

2.0 Purpose:
The purpose of this report is to present the testing methods employed and the test results obtained during the performance testing of one (1) THERMALLY BROKEN ALUMINUM CASEMENT COMPOSITE WINDOW described in paragraph 5.0 of this report.

3.0 Test References:
3.1 NAFS - North American Fenestration Standard/specification for windows, doors, and skylights AAMA/WDMA/CSA 101/I.S.2/A440-22
3.2 CSA A440S1:19 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440
3.3 ASTM F 588-17 Forced Entry Resistance Tests for Windows
3.4 CAWM 301-90(1995) Forced Entry Test for Windows (CMBSO 1-79)

4.0 Compliance Statement: The test results in paragraph 6.0 indicate that the test sample described in paragraph 5.0 of this report met the performance requirements of the above specifications for the performance grade shown in 4.1 below.
4.1 CLASS LC-PG40 914.40 x 3048.00 mm (36.00 x 120.00 in) Type: C

5.0 Sample Sumbitted:
5.1 Product Type: THERMALLY BROKEN ALUMINUM CASEMENT COMPOSITE WINDOW
5.2 Series: 450-T
5.3 Configuration: X/O
5.4 Product Dimensions:

	Millimeters	Inches
Total Frame:	914.40 x 3048.00	36.00 x 120.00
Active (Vent) sash:	901.70 x 1511.30	35.50 x 59.50
Fixed DLO:	850.90 x 1460.50	33.50 x 57.50

5.5 Glass and Glazing: (Applies to fixed and active lites)

IGU Thickness	*Spacer Size*	*Interior Lite*	*Exterior Lite*	*Glazing method*
1" overall wide	5/8"	3/16" Annealed	3/16" Annealed	Outside glazed onto hollow bulb vinyl. A 5" long bead of sealant was applied parallel to the bulb vinyl 5" each way at each corner. Rubber setting blocks 3/8" high were set at quarter points on the vent bottom rail for the casement and at the sill for the fixed lite. Aluminum glazing stop was applied full perimeter of each IGU. Each stop contained a strip of hollow bulb vinyl.

5.6 Weepage:

Fixed Window			
Drainage Method	*Size*	*Quantity*	*Location*
Weep notch	1" x 3/16"	One (1) at each end	Sill – the two outer sill legs were notched. The sill glass stop was notched in line with each sill weep notch.

5.6 Weepage:

Casement Window			
Drainage Method	***Size***	***Quantity***	***Location***
Vertical weep	Approximately 3/8" x 1/8"	One (1) at each end	Horizontal mullion. Water drains down the jamb to fixed lite below.

5.7 Pressure balancing: None

5.8 Weather-stripping:

Type	*Quantity*	*Location*
Hollow bulb vinyl (BOM item 7)	Two (2) strips	Casement frame inside leg - one strip full perimeter facing out. Vent sash – one strip full perimeter facing in.
Hollow bulb vinyl (BOM item 6)	See "Location"	Same as listed under "Glass and Glazing". One strip was on the vent inside glazing leg full perimeter facing out and one strip on fixed frame glazing leg full perimeter facing out. The vent stops and fixed stops all had one strip facing in.
Foam seal bulb (BOM item 8)	One (1) strip	Casement opening - one strip on the sill, head, and hinge jamb.

5.9 Sealants:

Sealant was applied at the following locations:
-Vent and frame corners were sealed full profile.
-The mullion was sealed to the frame at each end, except for vertical weep holes.
-Aluminum sill pan was set in sealant to the rough opening and the window sill was set into the sill pan on a bead of sealant.
-The lock was sealed with adhesive foam gasket to the lock jamb.
-All staked locations were sealed.
-Sealant at glazing described under "Glass and Glazing"

5.10 Hardware:

Type	*Quantity*	*Location*
Metal cam lock/pull handle and strike	One (1)	Located on vent lock stile 19.5" from the bottom of stile. It was fastened with a pair of #10 x 3/8" PFH screws applied from the outside prior to glass installation. When locked, the tongue of the lock engaged a metal strike with PVC pad that was fastened to the lock jamb with a pair of #6 screws.
Metal three point lock	One (1)	The lock jamb - One two point lock was located 9.25" up from the bottom of the lock jamb. The lock housing fit into a fabricated hole in the lock jamb and was fastened to it with a pair of #10 x 3/8" PH screws applied from the outside, through an aluminum retainer and into screw races in the lock housing. The lock had a cam handle linked to a metal slide rod. The slide rod was supported by six (6) nylon retainer/guides. Each retainer was fastened to the lock jamb with a pair of #8 x 3/4" PPH screws. The slide rod contained three lock pins that engaged their respective metal keeper located at 4", 27.38", and 50.25" from the bottom of the stile. Each keeper was fastened to the stile with four #8 x 1/2" PFH screws.

5.10 Hardware: (Continued)

Type	*Quantity*	*Location*
4 bar friction hinge	Two (2)	The sash was supported in the frame with a 4 bar friction hinge in the sill and head. Each hinge was fastened to the frame with three #10 x 3/8" PPH screws. A 1/8" aluminum shim plate was set between each hinge and the vent top and bottom rails. Each hinge was fastened to its respective vent top or bottom rail with four #10 x 1/2" PPH screws.
Metal snubbers	Two (2) pair	A pair of snubbers was located on the vent hinge stile and frame hinge jamb 12.75" from each end. Each snubber on the frame was fastened with a pair of #10 x 1/2" PPH screws and each snubber on vent hinge stile was fastened with a pair of #10 x 3/8" PPH screws.
Pivot Shims	One (1) pair	A PVC pivot shim was fastened to the sill 1.75" from the locking side with a single screw #8 x 3/4" PFH screw and its corresponding pivot shim pair was fastened to the vent bottom rail to level the sash as it closed.

5.11 Construction:

Location	*Joinery Type*	*Number of Fasteners*	*Fastener Size*
Frame corners	Mitered, keyed with two keys, staked. Also, each corner had 1" weld bead.	N/A	N/A
Vent sash corners	Mitered, keyed with two keys, staked. Also, each corner had 1" weld bead.	N/A	N/A
Horizontal mullion to jambs	Welded with a 1" weld bead on both sides	N/A	N/A

5.12 Reinforcement: None

5.13 Installation:

Location on frame	*Anchor type*	*Spacing*
The rough opening was constructed with 2" x 6" lumber doubled on all four sides. The window was fastened to it with screws through the nail on fins full perimeter.	#8 x 1.5" PFH	6.5" from each end and 16" on center.

6.0 - Test procedures and results: All testing procedures were performed in accordance with the performance requirements of the test specifications referenced in paragraph 3.0 of this report. The number preceding each test listed below refer to the corresponding sections in the NAFS.

8.3.1 – Operation Force (ASTM E2068-00(2016))

Test Description	Results	Allowed	Comments
Maximum force to initiate or maintain motion	68.50 N (15.40 lbf)	155 N (35.0 lbf)	1
Latching device force	75.61 N (17.00 lbf)	100 N (22.48 lbf)	

8.3.2 – Air Infiltration (ASTM E283-04(2012))

Test Description	Results	Allowed	Comments
75 Pa differential pressure	0.15 L/s*m²	1.5 L/s*m²	
1.57 psf differential pressure	0.03 cfm/ft²	0.30 cfm/ft²	
The tested specimen exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance.			
The tested specimen exceeds Canadian Supplement CSA A440S1:19 A2 level for air leakage resistance.			

8.3.2 – Air Exfiltration (ASTM E283-04(2012))

Test Description	Results	Allowed	Comments
75 Pa differential pressure	0.00 L/s*m²	1.5 L/s*m²	
1.57 psf differential pressure	0.00 cfm/ft²	0.30 cfm/ft²	
The tested specimen exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance.			
The tested specimen exceeds Canadian Supplement CSA A440S1:19 A2 level for air leakage resistance.			

8.3.3 – Water Penetration (ASTM E547-00(2016))

Test Description	Results	Allowed	Comments
DP40 - 290 Pa (6.06 psf)	No water penetration	No water penetration	2

8.3.4.2 – Uniform Load Deflection at Design Pressure (ASTM E330-14)

Test Description	Results	Allowed	Comments
DP40 - 1920 Pa (40.10 psf)Pos	0.25 mm (0.01")	Report only	3
DP40 - 1920 Pa (40.10 psf)Neg	0.25 mm (0.01")	Report only	3

8.3.4.3 – Uniform Load Structural Overload (OL) at 1.5 x Design Pressure (ASTM E330-14)

Test Description	Results	Allowed	Comments
OL for DP40 - 2880 Pa (60.15 psf)Pos	0.00 mm (0.00")	3.56 mm (0.14")	3
OL for DP40 - 2880 Pa (60.15 psf)Neg	0.00 mm (0.00")	3.56 mm (0.14")	3

8.3.5 – Forced Entry Resistance (ASTM F588-17 & CAWM 301-90(1995))

Test Description	Results	Allowed	Comments
ASTM F588 Type B and CAWM 301 Type II	No Entry	No Entry	4

8.3.6.6 – Casement Hardware Load Test

Test Description	Results	Allowed	Comments
LC - 300 Pa (6.27 lbf) per unit area of vent.	Pass	No damage & continues to operate normally	

Comment #1 - The window met the requirements of the Canadian Supplement CSA A440S1:19 for operating force.
Comment #2 - Internal screen not a factor in test.The window met the requirements of the Canadian Supplement CSA A440S1:19 for Water penetration resistance.
Comment #3 – Deflection measurement taken from bottom rail.
Comment #4 – Forced entry resistance per ASTM F588 grade 10.
Testing was witnessed by: Jim Cruz with FTL.

For a complete description of the tested sample, refer to the attached three (3) pages consisting of bill of materials, cross section drawings, and die drawings. This report is complete only when all the above referenced bill of materials and drawings are attached.

The bill of materials, cross section drawings, and die drawings of frame and sash members are on file and have been compared to the sample submitted. Test sample sections, bill of materials, drawings and a copy of this report will be retained at the test laboratory for four years.

This test report may not be modified in any way without the written consent of Fenestration Testing Laboratory, Inc (FTL).

The preceding test results relate only to the tested specimen and were obtained by using the applicable test methods listed in section 3.0 and 6.0 above. This report does not constitute certification of this product or an endorsement by this laboratory. It is the property of the client named in section 1.0 above. Certification can only be granted by an approved administrator and/or validator.

Test Completion Date: December 28, 2023

Report Completion Date: January 3, 2024

Pete Cruz - Test Engineer

Jim Cruz – Laboratory Testing Manager

TEST SPECIMEN DESCRIPTIONS

1. SERIES / MODEL: Series 450-T
2. PRODUCT TYPE: AWNING, CASEMENT, FIXED.

GENERAL NOTES

1. BUCKING OPENINGS & BUCKING FASTENERS MUST BE PROPERLY DESIGNED & INSTALLED TO TRANSFER LOADS TO THE STRUCTURE AND TO BE REVIEWED BY BUILDING OFFICIAL.
2. ALL HARDWARE & FASTENERS SHALL BE IN ACCORDANCE WITH THESE DRAWINGS & MAY NOT VARY UNLESS SPECIFICALLY MENTIONED ON THE DRAWINGS.
3. MATERIALS, INCLUDING BUT NOT LIMITED TO STEEL SCREWS, THAT COME INTO CONTACT WITH OTHER DISSIMILAR MATERIALS SHALL MEET THE REQUIREMENTS OF AAMA AND FLORIDA BUILDING CODE.

SPECIFICATIONS

1. AAMA/WDMA/CSA 101/I.S.2/A440
2. A440 S1 (CANADIAN SUPPLEMENT)

PAGE #
DETAIL #

CORNERS CONSTRUCTION

1.SERIES 450-T
1.1. MITERED, WELD ALONG INNER MITER, AND CRIMPED AT THE OUTER CORNERS. SEE BOM ITEM 19 & 20.

ANCHOR SCHEDULE

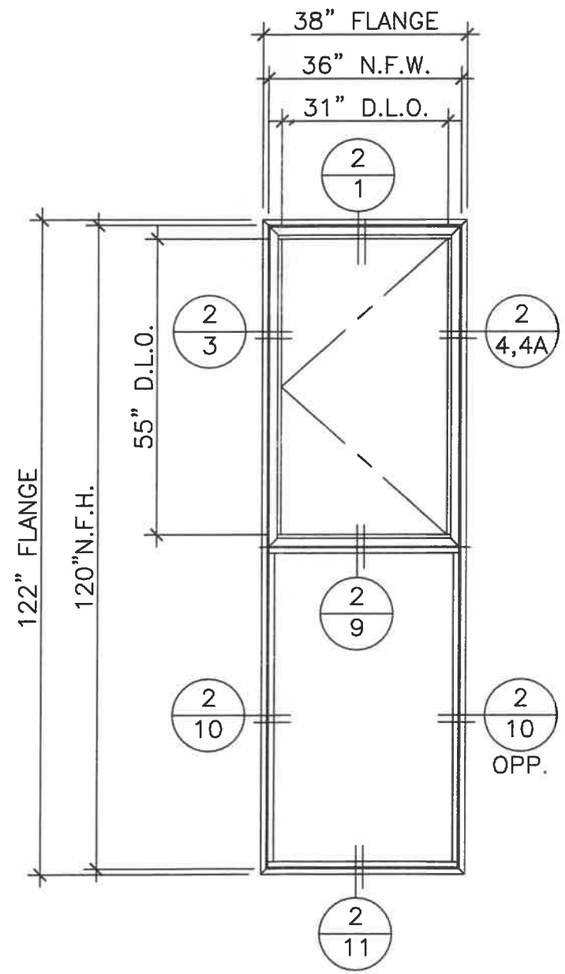
1. OPENING TYPE (SUBSTRATE): 2X- WOOD FRAME, STEEL STUD, CONCRETE
2. FRAME: NO. 10 SCREW, 8" FROM END, 16" O.C. MAX.
   MINIMUM EMBEDMENT: 1 1/2"
   MINIMUM EDGE DISTANCE: 3/4"

GLAZING : SEE PAGE 3

*FRAME ANCHOR REQUIREMENTS TABLE

OPENING TYPE (SUBSTRATE)	FRAME TO OPENING FASTENER TYPE	MINIMUM EMBEDMENT	MINIMUM EDGE DIST.
2X_ WOOD FRAME OR BUCK	(1) NO. 8 SMS SCREW	1 1/2"	3/4"
MIN. 18 GA. 33 KSI STEEL STUD	(1) NO. 8 SMS SCREW	FULL	3/8"
CMU/CONCRETE	(2) 3/16" CONCRETE SCREWS	1 1/4"	2 5/8"

(1) SMS SCREWS
(2) CONCRETE SCREWS SHALL BE 3/16" ITW TAPCON



3 C/O-PROJECTED
Series 450-T
QTY: 1
GLASS: 1"; 5mm, A.S., 5mm-R

NOTES:
1. NAIL-ON FRAME
2. 4-BAR HINGES
3. MULTI-POINT, CAM HANDLE
4. (2) SNUBBERS

SPEC 3: A440

FENESTRATION TESTING LAB
REPORT NO: T23-111
DATE: 1/3/24

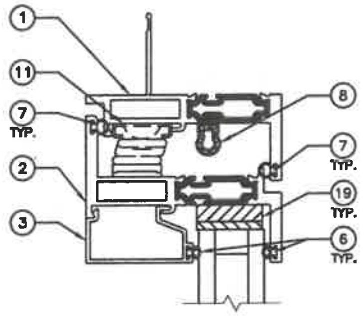
COMMENTS | DRAWN BY | DATE | REVISIONS

DRAWN BY: CJ
DATE: 12/7/23
JOB NUMBER: 566766

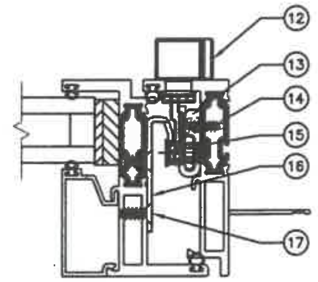
NOTES: PROJECT #:
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: 450-T TESTING

FLEETWOOD WINDOWS & DOORS
1 FLEETWOOD WAY
CORONA, CA 92879
www.fleetwoodusa.com

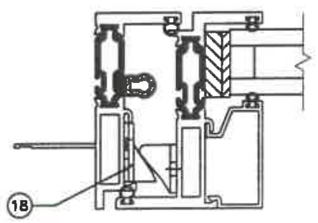
SCALE : N.T.S.
DRAWING NO. : (1)
SHEET : 1 OF 3



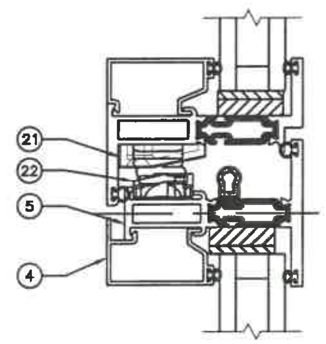
1 NAIL–FIN 4–BAR HEAD
SCALE: FULL SIZE



4A NAIL–FIN CAM HANDLE JAMB
SCALE: FULL SIZE



3 NAIL–FIN 4–BAR JAMB
SCALE: FULL SIZE



9 OPERABLE OVER FIXED TDL
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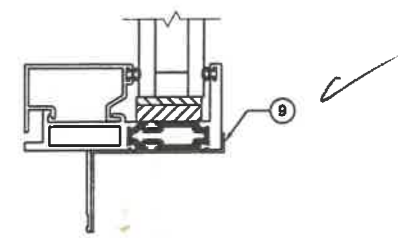
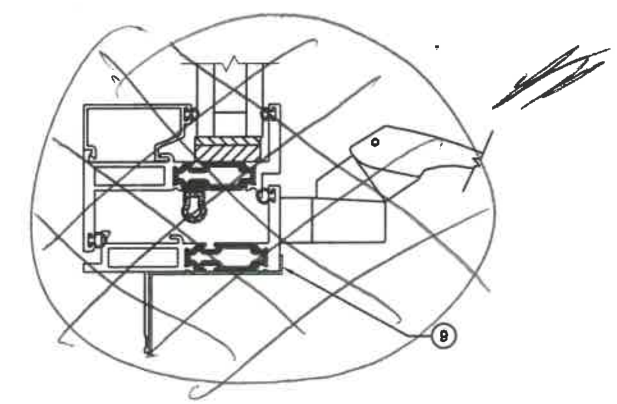
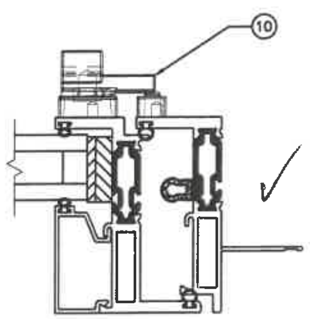
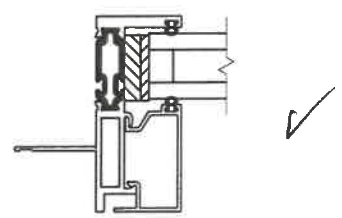


11 FIXED SILL
SCALE: FULL SIZE





4 NAIL–FIN CAM HANDLE JAMB
SCALE: FULL SIZE



10 FIXED JAMB
SCALE: FULL SIZE

FENESTRATION TESTING LAB
REPORT NO: T23-111
DATE: 1/3/24

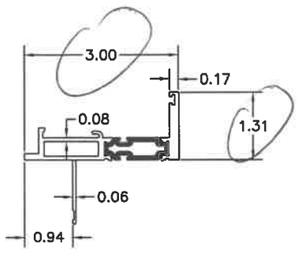
COMMENTS	DRAWN BY	DATE	REVISIONS

DATE: 12/7/23
DRAWN BY: CJ
JOB NUMBER: 566766

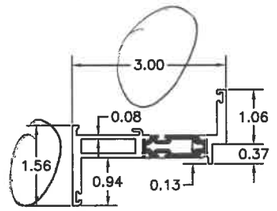
NOTES:
PROJECT #:
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: 450-T TESTING

FLEETWOOD WINDOWS & DOORS
1 FLEETWOOD WAY
CORONA, CA 92879
www.fleetwoodusa.com

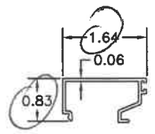
SCALE: N.T.S.
DRAWING NO.: (2)
SHEET: 2 OF 3



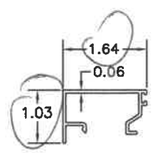
1 FRAME



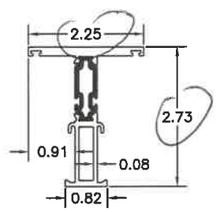
2 VENT



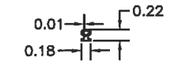
3 1" VENT GLASS STOP



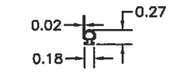
4 1" FIXED GLASS STOP



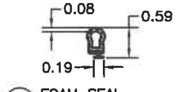
5 TDL BAR



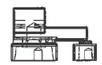
6 MINI BULB VINYL



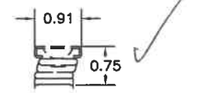
7 FLEXIBLE BULB VINYL



8 FOAM SEAL



10 CAM HANDLE AND STRIKE

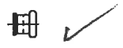


11 ~~BUTT HINGE~~ Friction Hinge

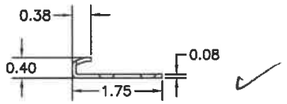
12 MULTIPOINT LOCK

13 TIE BAR GUIDE

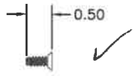
14 #8 SCREW



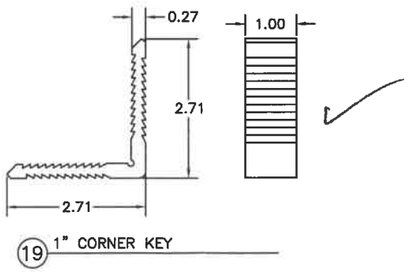
15 TIE BAR



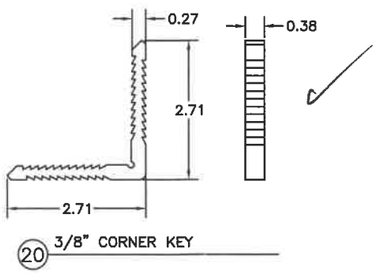
16 TIE BAR



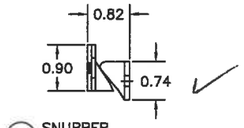
14 #8 SCREW



19 1" CORNER KEY



20 3/8" CORNER KEY

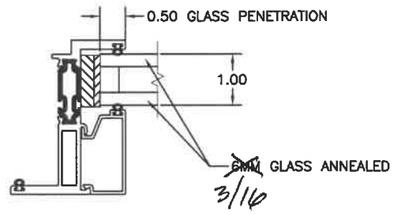


18 SNUBBER

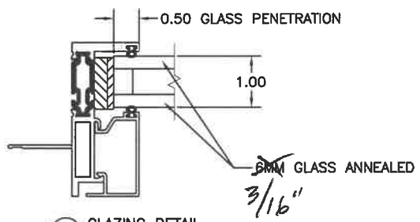
BILL OF MATERIALS

ITEM NO.	FWID	PART DESCRIPTION	VENDOR NAME	VENDOR PART NO.
		EXTRUSIONS		
1	4501	FRAME	SIERRA	905749 –905750
2	4502	VENT	SIERRA	905751 – 905752
3	4503	1" VENT GLASS STOP	SIERRA	905753
4	4507	1" FIXED GLASS STOP	SIERRA	905757
5	4506	TDL BAR	SIERRA	700526 – 905756
		HARDWARE		
6	25199	MINI BULB VINYL	TREMCO	TX20801E
7	26233	FLEXIBLE BULB VINYL	TREMCO	TR–25007P
8	26226	FOAM SEAL	AMESBURY–TRUTH	32324
9	–	SILLPAN		
10	26061	CAM HANDLE & STRIKE	D&B	227–110––316SS
11	VARIES	4–BAR HINGE	TRUTH	
12	26065	MULTIPOINT LOCK	D&B	234–100–316SS
13	24731	TIE BAR GUIDE	TRUTH	32798.00.0001
14	20314	#8 SCREW, 0.75"		
15	VARIES	TIE BAR	TRUTH	
16	26069	MULTIPOINT STRIKE	D&B	
17	20240	#8 SCREW, 0.5"		
18	25245	SNUBBER– PULL–IN BLOCK	WHS FENESTRATION	CPB1
19	05P04–1	1" CORNER KEY	MERIT	5230
20	26228	3/8" CORNER KEY	D&B	259–001
21	18770	PIVOT SHIM	STEVE HAAG	FW 800 0672 NYL
22	18771	SMALL PIVOT SHIM	STEVE HAAG	FW 800 0673 NYL

GLAZING DETAILS



G1 GLAZING DETAIL



G2 GLAZING DETAIL

FENESTRATION TESTING LAB
REPORT NO: T23-111
DATE: 1/3/24

COMMENTS | DRAWN BY | DATE | REVISIONS

NOTES: PROJECT #:

CUSTOMER: FLEETWOOD WINDOWS AND DOORS

JOB NAME: 450-T TESTING

DRAWN BY: CJ

DATE: 12/7/23

JOB NUMBER: 566766

FLEETWOOD WINDOWS & DOORS
1 FLEETWOOD WAY
CORONA, CA 92879
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SCALE : N.T.S.

DRAWING NO. : (3)

SHEET : 3 OF 3