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

REPORT SUMMARY

REPORT #
T23-106

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

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

CONFIGURATION
XX

FRAME SIZE
1524.00 mm x 1828.80 mm (60.00" x 72.00")

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 1524.00 x 1828.80 mm (60.00 x 72.00 in) Type: C

TEST COMPLETION DATE
December 12, 2023

REPORT DATE
December 15, 2023

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 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 1524.00 x 1828.80 mm (60.00 x 72.00 in) Type: C

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

	Millimeters	Inches
Total Frame:	1524.00 x 1828.80	60.00 x 72.00
Active (Vent) sash (both same size):	749.30 x 1816.10	29.50 x 71.50

5.5 Glass and Glazing: (applies to both active sash)

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 sealant bead 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 . Aluminum glazing stop applied full perimeter on the outside of the IGU. Each stop contained a strip of hollow bulb vinyl.

5.6 Weepage:

Drainage Method	*Size*	*Quantity*	*Location*
Weep notch	1" x 3/16"	Four (4)	Sill - one weep at each end of sill for each casement. The bulb vinyl on the vent was notched in line with each sill weep notch.
Vertical round weep	0.31" diameter	One (1) at each end	Each vent bottom rail.

5.7 Pressure balancing: None

5.8 Weather-stripping:

Type	*Quantity*	*Location*
Hollow bulb vinyl (BOM item 7)	See "Location"	Frame inside leg - one strip full perimeter facing out at each casement opening. Each 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 each vent glazing leg facing out and the other strip on the glass stops for each vent.
Foam seal bulb (BOM item 8)	See "Location"	Each vent sash contained a strip of "Foam seal" bulb full perimeter. The "Foam seal" bulb was discontinuous at all butt hinges.

5.9 Sealants:

Sealant was applied at the following locations:
-Vent corners, frame corners, and vertical mullion to frame joints were sealed full profile.
-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.
-Each roto-operator housing was sealed to the sill with a rubber gasket.
-Each lock was sealed with adhesive foam gasket to its respective opening in the vertical mullion.
-All staked locations were sealed.
-Sealant at glazing described under "Glass and Glazing"

5.10 Hardware:

Type	*Quantity*	*Location*
Metal four point lock system	Two (2)	One per casement – The description applies to each four-point lock system. The lock was located 9" up from the bottom of the window. The lock housing fit into a fabricated hole in the lock vertical mullion and was fastened to it with a pair of #10 x 3/8" pan head 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 eight PVC retainer/guides. Each retainer was fastened to the lock jamb with a pair of #8 x 3/4" PPH screws. The slide rod contained four lock pins that engaged their respective metal keeper located at 3.63", 23.25", 42.5" and 62.38" from the bottom of the lock stile. Each keeper was fastened to the stile with four #8 x 1/2" PFH screws.
Roto-operator, Single arm	Two (2)	One per casement – The description applies to each roto-operator. Located on the sill, the roto-operator fit into a fabricated hole in the sill inside leg and was fastened to it with four #10 x 0.5" pan head screws applied from the outside through the sill leg and into screw races in the operator housing. The roller at the end of the operator arm engaged a metal track fastened to the bottom of the vent with three (3) #10 x 3/8" PPH screws.
3" metal two-leaf butt hinge	Four (4) per vent sash	Each vent sash was supported in the frame with four (4) butt hinges to a jamb. The description applies to each set of four butt hinges. A hinge was located at 5.75" and 17.75" from each end. Each leaf was fastened to the jamb or vent hinge stile with three (3) #10 x 0.5" PFH screws.
Pivot Shims	One (1) pair per vent sash	For each vent sash - 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

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	22.24 N (5.00 lbf)	60 N (14.0 lbf)	1
Latching device force	82.29 N (18.50 lbf)	100 N (22.48 lbf)	

8.3.2 – Air Infiltration (ASTM E283-19)

Test Description	Results	Allowed	Comments
75 Pa differential pressure	0.70 L/s*m²	1.5 L/s*m²	
1.57 psf differential pressure	0.14 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 E283-19)

Test Description	Results	Allowed	Comments
75 Pa differential pressure	1.15 L/s*m²	1.5 L/s*m²	
1.57 psf differential pressure	0.23 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	3.05 mm (0.12")	Report only	3
DP40 - 1920 Pa (40.10 psf)Neg	5.84 mm (0.23")	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	0.76 mm (0.03")	7.11 mm (0.28")	3
OL for DP40 - 2880 Pa (60.15 psf)Neg	3.30 mm (0.13")	7.11 mm (0.28")	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	

ADDITIONAL TESTING:

8.3.2 – Air Infiltration (ASTM E283-19) at 6.27 psf pressure differential

Test Description	Results	Allowed	Comments
300 Pa differential pressure	0.35 L/s*m²	1.5 L/s*m²	
6.27 psf differential pressure	0.07 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.			

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 at the vertical mullion.
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 12, 2023
Report Completion Date: December 15, 2023

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

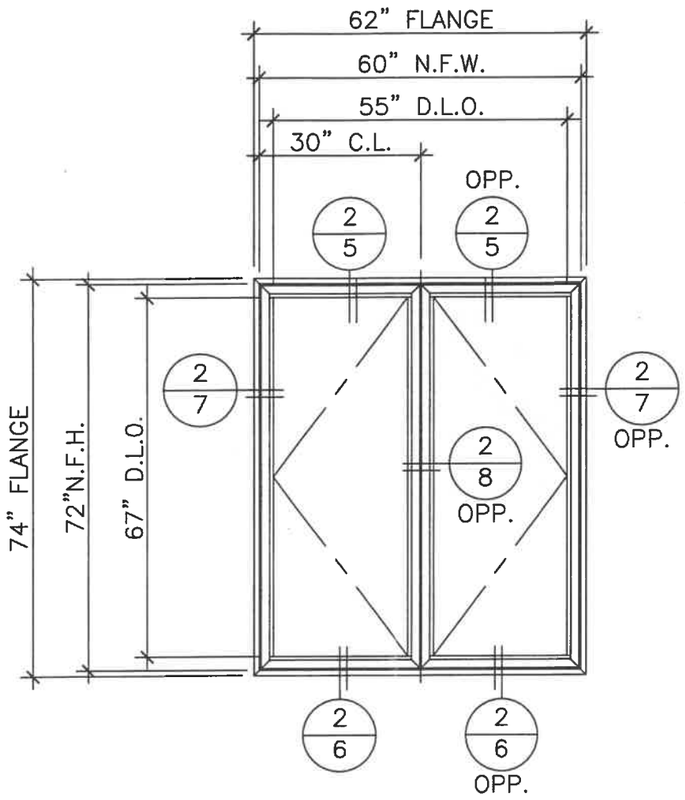
1. OPENING TYPE (SUBSTRATE): 2X- WOOD FRAME, STEEL STUD, CONCRETE
2. FRAME: NO. 10 SCREW, 8" FROM END, 16" O.C. MAX.
   MINIMUM EMBEDMENT: 1 1/2"
   MINIMUM EDGE DISTANCE: 3/4"

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	#3/16" CONCRETE SCREWS	1 1/4"	2 5/8"

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



2 CC-PROJECTED
Series 450-T
QTY: 1
GLASS: 1"; 5mm, A.S., 5mm-R

NOTES:
1. NAIL-ON FRAME
2. BUTT HINGES
3. ROTO OPERATOR, MULTI-POINT

SPEC 2: A440

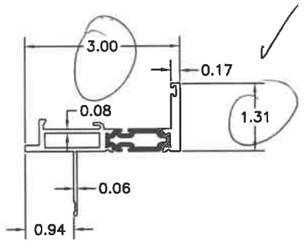
FENESTRATION TESTING LAB
REPORT NO: T23-106
DATE: 12/15/23

COMMENTS | DRAWN BY | DATE | REVISIONS

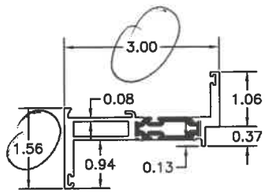
DRAWN BY: CJ
DATE: 12/7/23
JOB NUMBER: 566766
NOTES: PROJECT #:
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: 450-T TESTING

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

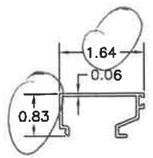
SCALE : N.T.S.
DRAWING NO. : (1)
SHEET : 1 OF 3



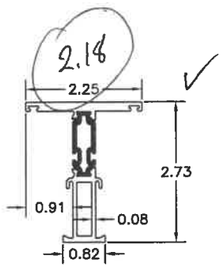
1 FRAME



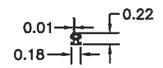
2 VENT



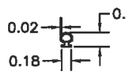
3 1" VENT GLASS STOP



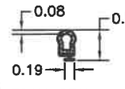
5 TDL BAR



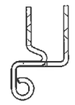
6 MINI BULB VINYL



7 FLEXIBLE BULB VINYL



8 FOAM SEAL



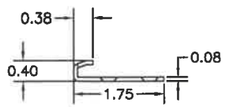
11 BUTT HINGE

12 MULTIPOINT LOCK

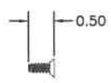
13 TIE BAR GUIDE

14 #8 SCREW

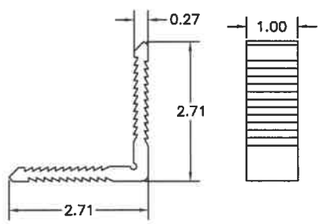
15 TIE BAR



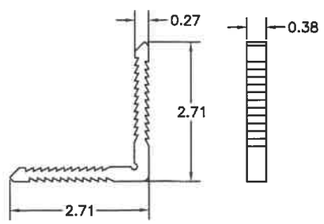
16 TIE BAR



14 #8 SCREW



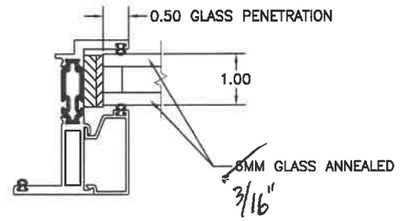
19 1" CORNER KEY



20 3/8" CORNER KEY

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
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		
11	26057	BUTT HINGE	D&B	232–200–316SS
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	VARIES	ROTO OPERATOR	TRUTH	
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

FENESTRATION TESTING LAB
REPORT NO: T23-106
DATE: 12/15/23

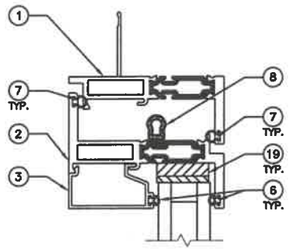
COMMENTS	DRAWN BY	DATE	REVISIONS

DRAWN BY: CJ
DATE: 12/7/23
JOB NUMBER: 565766

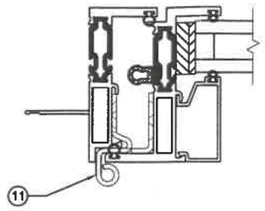
NOTES:
PROJECT #:
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: 450-T TESTING

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

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



5 NAIL–FIN BUTT HINGE HEAD
SCALE: FULL SIZE



7 NAIL–FIN BUTT HINGE JAMB
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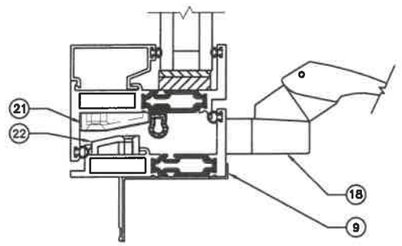

6 NAIL–FIN ROTO OPERATOR SILL
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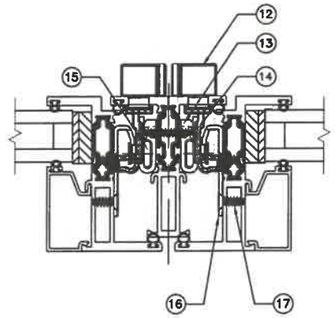

8 NAIL–FIN BUTT HINGE HEAD
SCALE: FULL SIZE

FENESTRATION TESTING LAB
REPORT NO: T23-106
DATE: 12/15/23

REVISIONS	DATE	DRAWN BY	COMMENTS

NOTES: PROJECT #:
DRAWN BY: CJ
DATE: 12/7/23
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: 450-T TESTING
JOB NUMBER: 566766

1 FLEETWOOD WAY
CORONA, CA 92879
www.fleetwoodusa.com

FLEETWOOD WINDOWS & DOORS

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