

Vivid Certified Mulls

P.E. Sign-Off

Prepared by: Robert Jenson

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Lucas Turner
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9/5/2025
LUCAS TURNER, FL PE 58201
TURNER ENGINEERING &
CONSULTING, INC.
2428 OLD NACHEZ TRACE TRL.
CAMDEN, TN, 38320
PH 941-380-1574



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1 Mull Testing Summary

Tested Product	Assembly Width (in.)	Assembly Height (in.)	Mull Orientation	Mull Span (in.)	Mull Tributary Width (in.)	Design Pressure
VCAP 2W1H	144.000	96.000	Vertical Continuous	96.000	72.000	DP 25
VCAP 2W1H	144.500	96.000	Vertical Continuous	96.000	72.500	DP 40
VCAP 2W1H	112.500	96.000	Vertical Continuous	96.000	56.500	DP 50
VCAP 2W2H	96.000	96.000	Vertical Continuous, Horizontal Non-Continuous	96.000	48.250	DP 50
VNRECT-DG / VNOFD 1W2H	71.250	99.500	Horizontal Continuous	71.250	44.380	DP 25

2 Frame Profile Properties (Sign-Off No. 1)

Product	Profile	Doc No.	<i>I</i>	<i>E</i>	<i>c</i>	<i>S</i>
VCA, VAWN, VCAP	Frame	00136652	0.5150	1.506	1.666	0.309
	Frame Liner	00136653	0.0588	1.91	0.718	0.082
	Frame Backer	00140676	0.1039	1	0.890	0.117
	Exterior Sash	00133289	0.0786	1.506	0.808	0.097
	Interior Sash	00133596	0.012	1.52	0.281	0.043
	Sash Backer	00140711	0.0322	1	0.448	0.072
VDG	Frame	00133954	1.1886	1.506	1.887	0.630
	Frame Backer	00140717	0.1776	1	0.840	0.211
VNRECT-DG	Frame	00063667	1.0147	1.506	1.856	0.547
	Glazing Bead	00117432	0.0552	0.6	1.030	0.054
VNOFD	Head Jamb & Jamb	00121768	0.5402	1.506	1.701	0.318
	Jamb Liner	00137599	1.3324	1	1.565	0.851
	Frame Backer	00043820	0.0277	10	0.763	0.036
VNIFD	Head Jamb	00082947	1.1316	1.506	1.946	0.582
	Head Jamb Liner	00101358	2.5183	1	1.965	1.282
VNSFD, VNSPD	Head Jamb & Jamb	00087481	2.7739	1.506	2.713	1.023
	Head Jamb Liner	00097036	0.0509	1	0.545	0.093
	Mulling Header Backer	00098682	0.1310	1	0.777	0.169

I = Moment of Inertia (in.⁴)

E = Modulus of Elasticity ($\times 10^6$ psi)

c = Centroid of the cross section (in.)

S = Section Modulus (in.³)

3 Composite Section Properties

Consider the frames as being assembled from two or more shapes which are not fastened together securely enough to act as one integral section, but which all deflect the same amount under load. This gives the bending stiffness of a given assembled frame as the sum of the bending stiffness of each of its constituent members: $EI_a = \sum_{i=1}^n E_i \cdot I_i$, where n is the number of members making up the frame.

Similarly, the effective section modulus of the assembled frame is given by $ES_a = EI_a/c_{max}$, where c_{max} is taken from the member of the assembly having the largest c value.

The results are tabulated below:

Product	EI_a	ES_a
VCA, VAWN, VCAP	1.325	0.796
VNRECT-DG	1.561	0.841
VDG	1.968	1.043
VNOFD	2.422	1.424
VNIFD	4.222	2.149
VNSFD, VNSPD	4.359	1.607

EI_a = Bending stiffness of the assembled frame ($\times 10^6$ lbf · in.²)

ES_a = Effective section modulus of the assembled frame ($\times 10^6$ lbf · in)

4 Product and Mull Groupings

4.1 Casement / Awning / Picture Grouping (Sign-Off No. 2)

Casement Picture (stationary) units will certify the Casement and Awning operators of equal or lesser mull span and tributary width due to identical sill, jamb, and head jamb profiles. These profiles when mulled together vertically or horizontally use identical mull reinforcement, fasteners, and air/water sealing components.

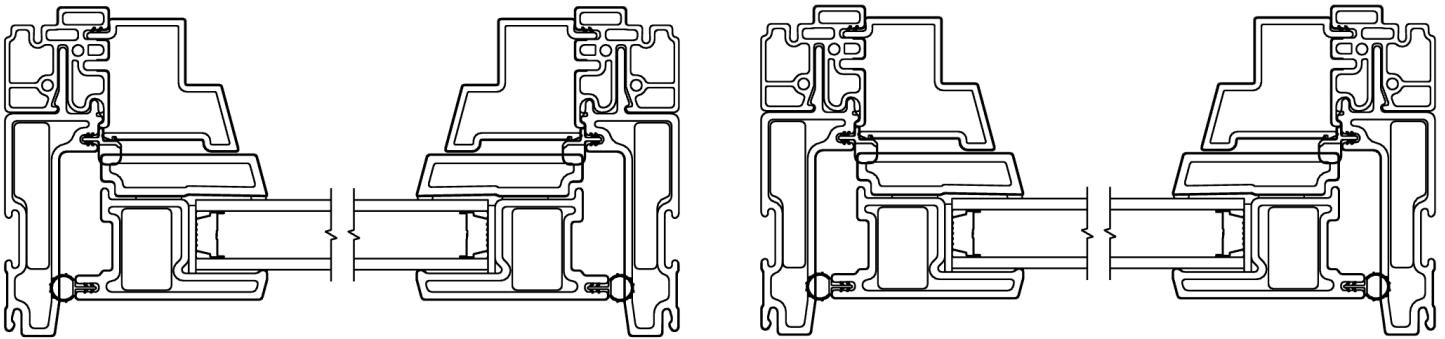


Figure 1: Horizontal cross sections of stationary (left) and operator (right) units

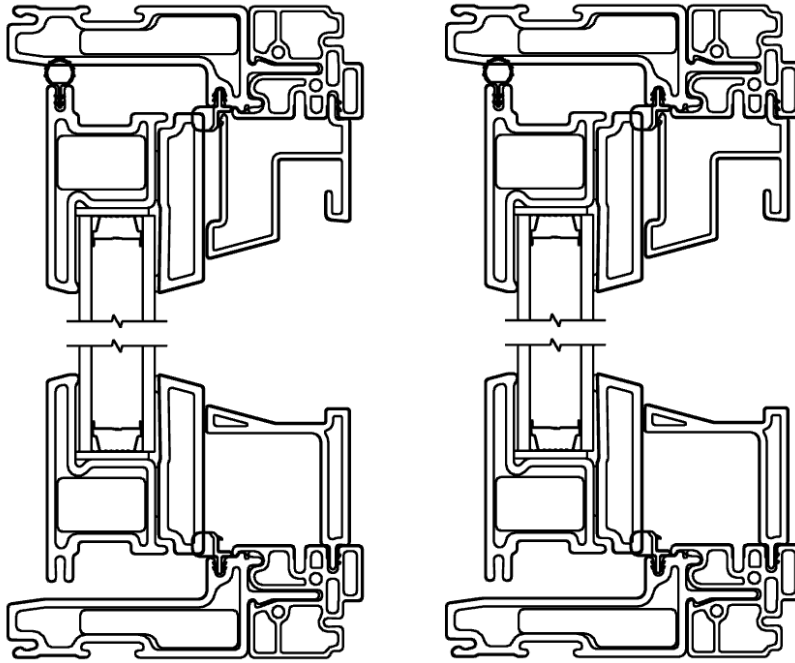


Figure 2: Vertical cross sections of stationary (left) and operator (right) units

4.2 Casement Picture Mull Grouping (Sign-Off No. 3)

A VCAP mull will certify any combination of VCA, VAWN, and/or VDG units in any of the following mull configurations so long as the mull span and tributary width are less than or equal to the VCAP mulls that were certified.

Mull Cross Section	Document Number
VCAP, DP 25	00134597
VCAP, DP 40/50	00134598

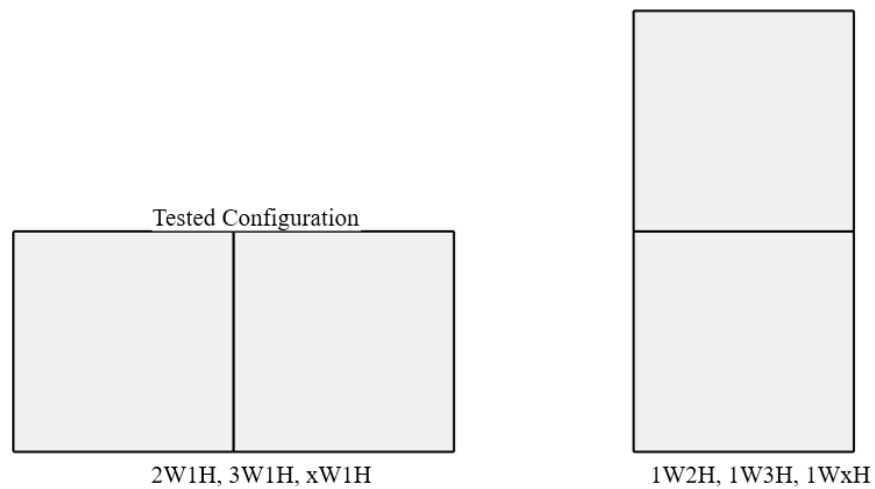


Figure 3: Ribbon Mull grouping ($xW1H$, $1WxH$)

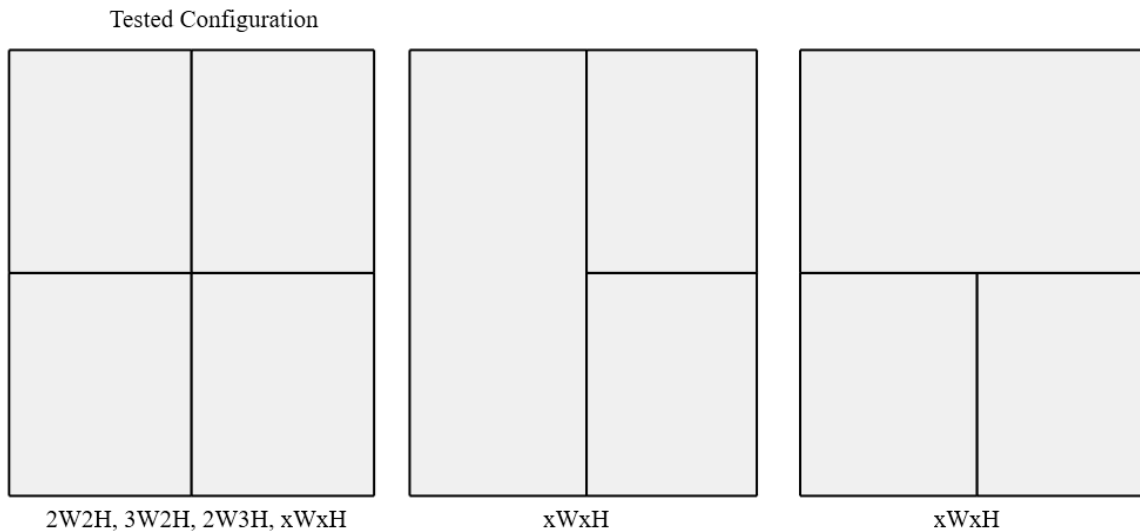


Figure 4: 2W2H mull grouping (2W2H to xWxH)

4.3 Performance Justification for Casement Product Grouping

These product groupings can be done because of the following:

4.3.1 Air/Water Sealing

- All products in the groupings listed above use the same method/materials to seal the mull from air/water infiltration (refer to 00142787 for DP25 mulls and 00143473 for DP40/50 mulls)
 - DP25 mulls include mull foam tape toward the exterior of the frames the full length of the assembly
 - DP40/50 mulls incorporate a flexible weatherstrip applied to the mull reinforcement that seals to both frames at the exterior, as well as silicone injected into plugs both at the mull ends and the center joints of 2W2H units
- Exterior portions of all frame types are identical where the air/water seal is located
- Frame and sash construction is identical on all four sides

4.3.2 Structural Performance

- All products in the groupings listed above use the same mull construction
 - DP25 Mulls: Frame exteriors are joined by an aluminum mulling pin
 - DP40/50 Mulls: Frame exteriors are joined by aluminum mulling pins with interlocking high-density fiberglass mull reinforcements. The HDF reinforcements are fastened to the exterior frames with screws and secured to each other with screws.
- Installation is identical for all products
- Mulls are anchored to the rough opening with two mull brackets per mull end and two screws through the unit frames into the rough opening per end
- Frame and sash construction is identical on all four sides

4.4 Outswing French Door Stationary Grouping (Sign-Off No. 4)

The VNOFD stationary (O) will certify the VNOFD operator configuration (X) of equal or lesser mull span and tributary width due to similar sill, jamb, and head jamb profiles. The X configuration utilizes a continuous aluminum screw backer in the vertical direction that is not present in the O configuration. This is present in both jambs of the X configuration

which makes the O configuration the structurally weaker option. These profiles when mull together use identical mull reinforcement, fasteners, and air/water sealing components.

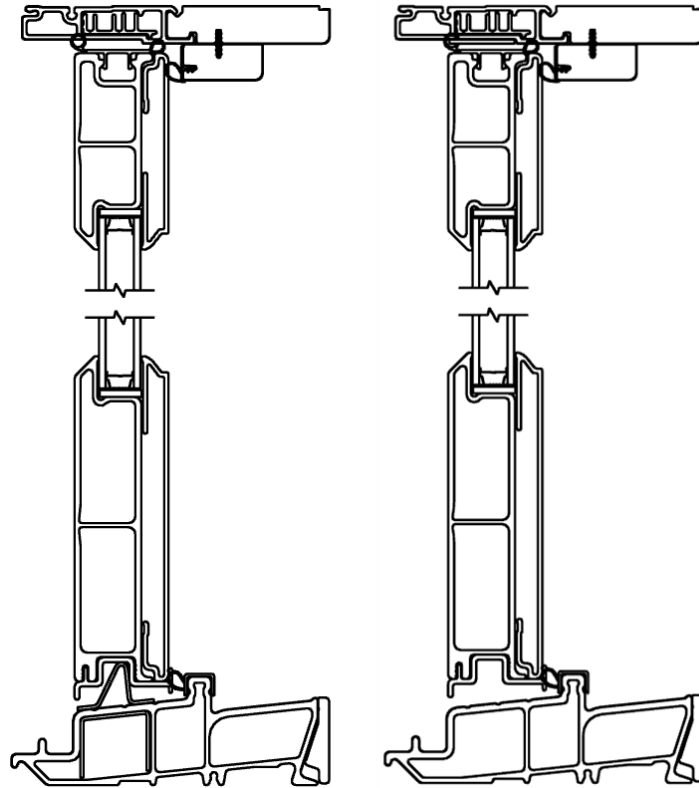


Figure 5: Vertical cross sections of stationary (left) and operator (right)

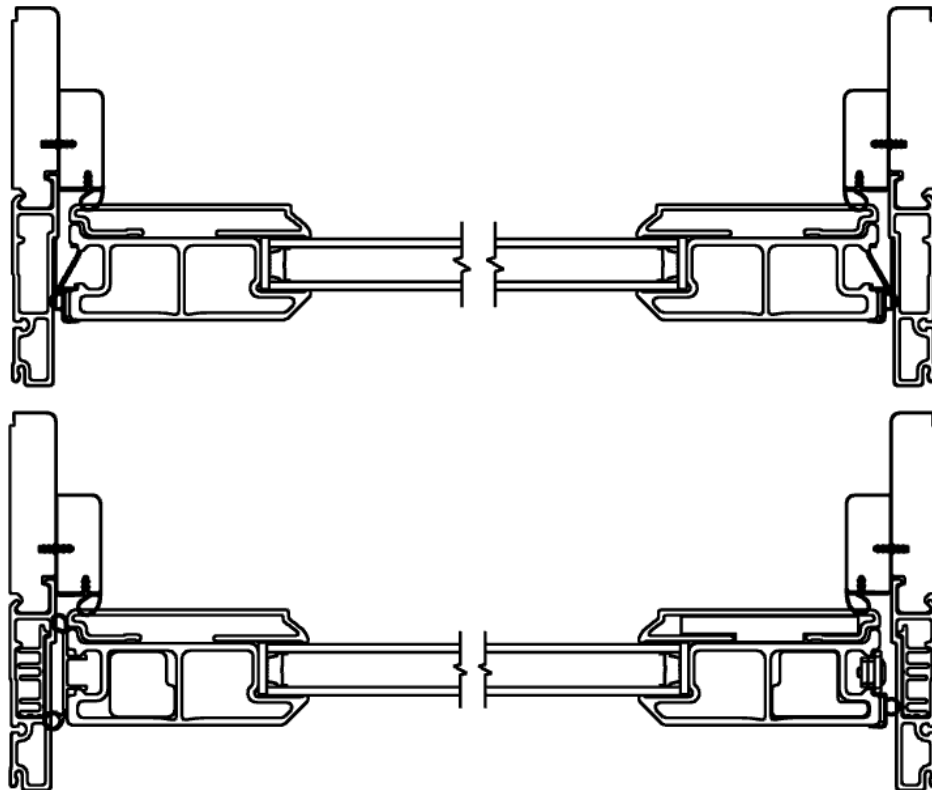


Figure 6: Horizontal cross sections of stationary (top) and operator (bottom)

4.5 Outswing French Door Mull Grouping (Sign-Off No. 5)

A VNRECT-DG over a VNOFD mull will certify a VNRECT-DG over any VNIFD, VNSFD, or VNSPD unit in the following mull configuration so long as the mull span and tributary width are less than or equal to the VNRECT-DG / VNOFD mull that was certified.



Figure 7: 1W2H VNRECT-DG transom over door grouping

4.6 Performance Justification for Outswing French Door Product Grouping

4.6.1 Air/Water Sealing

- All products listed above use the same method/materials to seal the mull from air/water infiltration
 - Mull foam tape is applied to the exterior of the mull joint the length of the assembly
 - Silicone is applied at the mull ends to merge the foam tape seal to the installation weather seal
- Exterior portions of all frame types are identical where the air/water seal is located

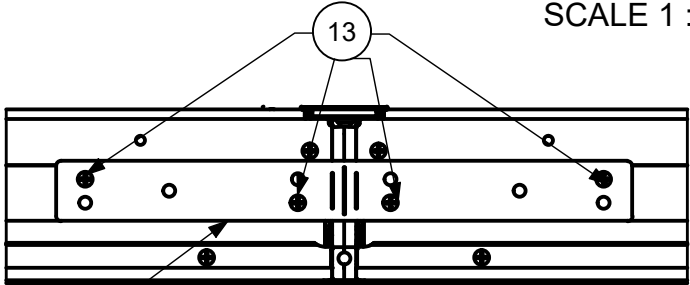
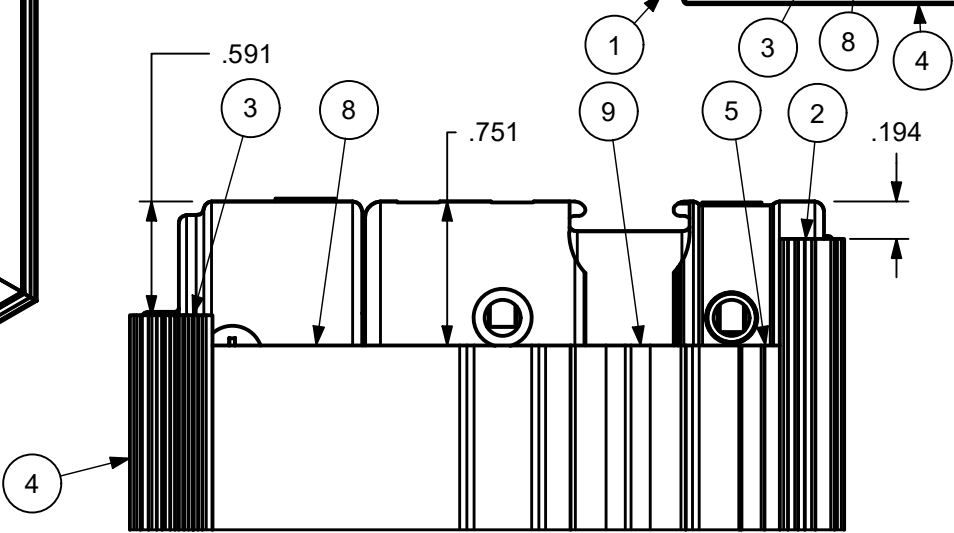
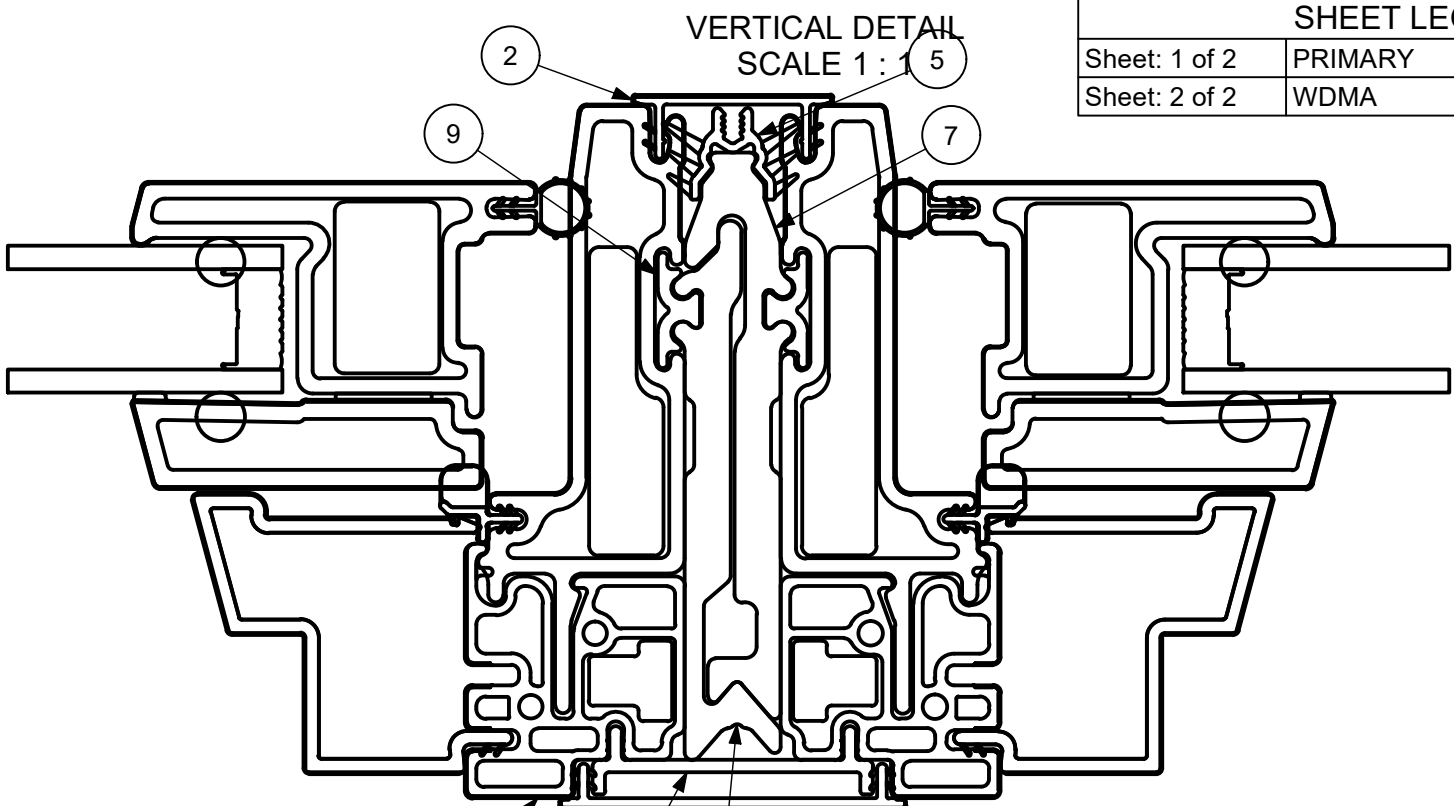
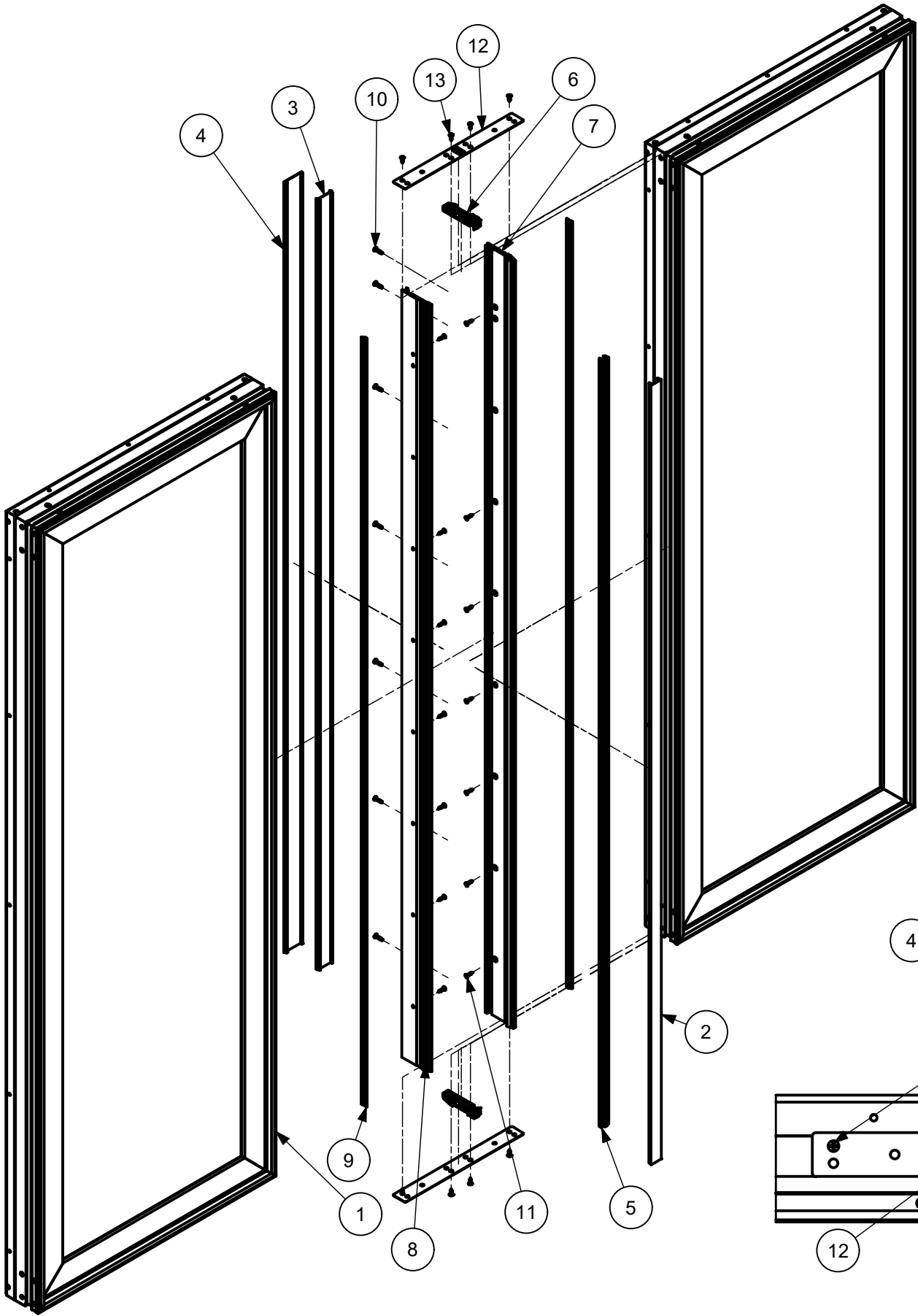
4.6.2 Structural Performance

- Mull construction is identical for all products listed in the grouping above
 - Frame exteriors are joined by an aluminum mulling pin
- Mulling anchoring is identical for all products; unit installation is similar.
 - Installation screws are used as determined by size and operation type
 - Mulls are anchored to the rough opening with two screws through the unit frames into the rough opening per end

5 Assembly and Cross Section Drawings

See following pages for drawings.

SHEET LEGEND	
Sheet: 1 of 2	PRIMARY
Sheet: 2 of 2	WDMA



- NOTES:**
- 1. FOR GENERAL SPECIFICATIONS, REFER TO DOC 00003952
 - 2. 2W1H CASEMENT MULL UNIT SHOWN

13	00129348	CROSS RECESSED FLAT UC No. 8-15 X .500 A _
12	00143257	MULL STRAP
11	00140853	CROSS RECESSED FLAT No. 7-19 X .625 AB 17
10	00140853	CROSS RECESSED FLAT No. 8-15 X .750 A TEK-2
9	00090503	MRF T-SLOT CONNECTION
8	00142738	MRF, 1/2", HEADER OR RH JAMB
7	00142683	MRF, 1/2", SILL OR LH JAMB
6	00140386	END PLUG, MULL, 1/2 INCH
5	00103296	MULL WEATHERSTRIP, 1/2"
4	00143064	INTERIOR MULL COVER, MRF
3	00143063	INTERIOR MULL CARRIER, MRF
2	00143025	MRF MULL COVER, EXTERIOR
1	00138798	UNIT

ITEM	DWG NO	DESCRIPTION
PARTS LIST		

MARVIN**RESEARCH & DEVELOPMENT**

COLLECTION: VIVID

DWG TYPE: ASSEMBLY
DESCRIPTION: MULL DETAIL, CASEMENT, MRF

SHEET NAME: PRIMARY (1 OF 2)

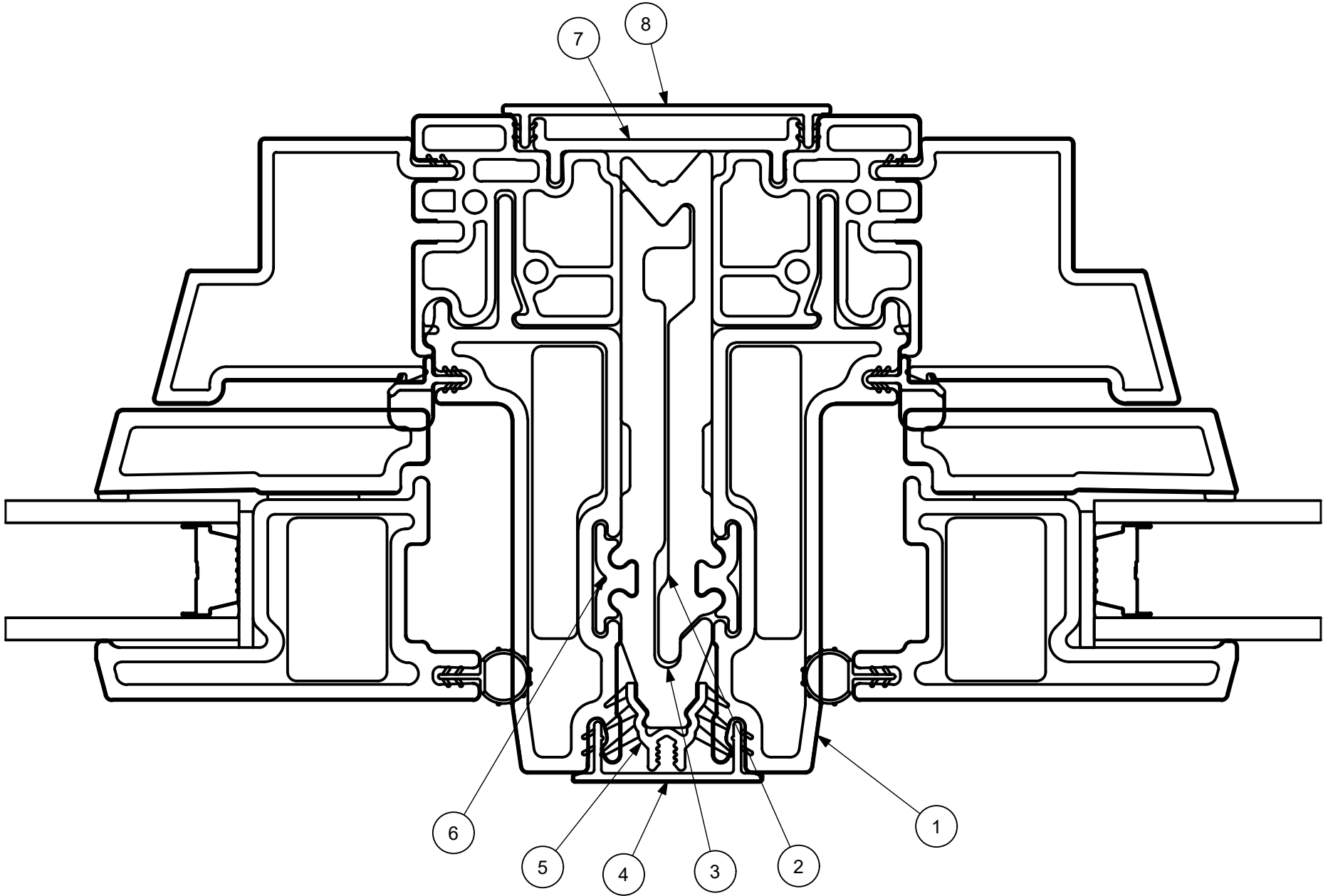
CHK: 08/06/25	SIZE: B	CLASS: ASSY	DWG NO: 00143473	REV: 0.2
APP: 08/07/25	SCALE: 1 : 10	DATE: 12/4/2024	DWG BY: Natalie Fischer	

0.2	CHANGED HOLE DIAMETER ON MULL STRAP DOC. 143257 FROM .261 TO .250	27638	08/06/2025	JDD
REV	DESCRIPTION / REQUESTOR	ECN NO	DATE	REV BY

CATEGORY: CASEMENT,
UNIT TYPE: VCA, VAWN, VCAP

UNSPECIFIED TOLERANCES	
DECIMALS: XX ±.03 XXX±.016	ANGLE DEG: ±.5
LINEAL: +NA -NA	FAB LINEAL: ±.016
MATERIAL: NA	

SHEET LEGEND	
Sheet: 1 of 2	PRIMARY
Sheet: 2 of 2	WDMA



- NOTES:**
- 1. FOR GENERAL SPECIFICATIONS, REFER TO DOC 00003952
 - 2. CA TO CA SHOWN

8	00143064	INTERIOR MULL COVER, MRF
7	00143063	INTERIOR MULL CARRIER, MRF
6	00090503	MRF T-SLOT CONNECTION
5	00103296	MULL WEATHERSTRIP, 1/2"
4	00143025	MRF MULL COVER, EXTERIOR
3	00142595	MRF, 1/2", HEADER OR RH JAMB
2	00142592	MRF, 1/2", SILL OR LH JAMB
1	00133488	CROSS SECTION, HORIZONTAL, 3/4" IG

ITEM	DWG NO	DESCRIPTION
PARTS LIST		

MARVIN



RESEARCH & DEVELOPMENT

COLLECTION: VIVID

DWG TYPE: SECTION
DESCRIPTION: MRF MULL, HORIZ/VERT

SHEET NAME: PRIMARY (1 OF 2)

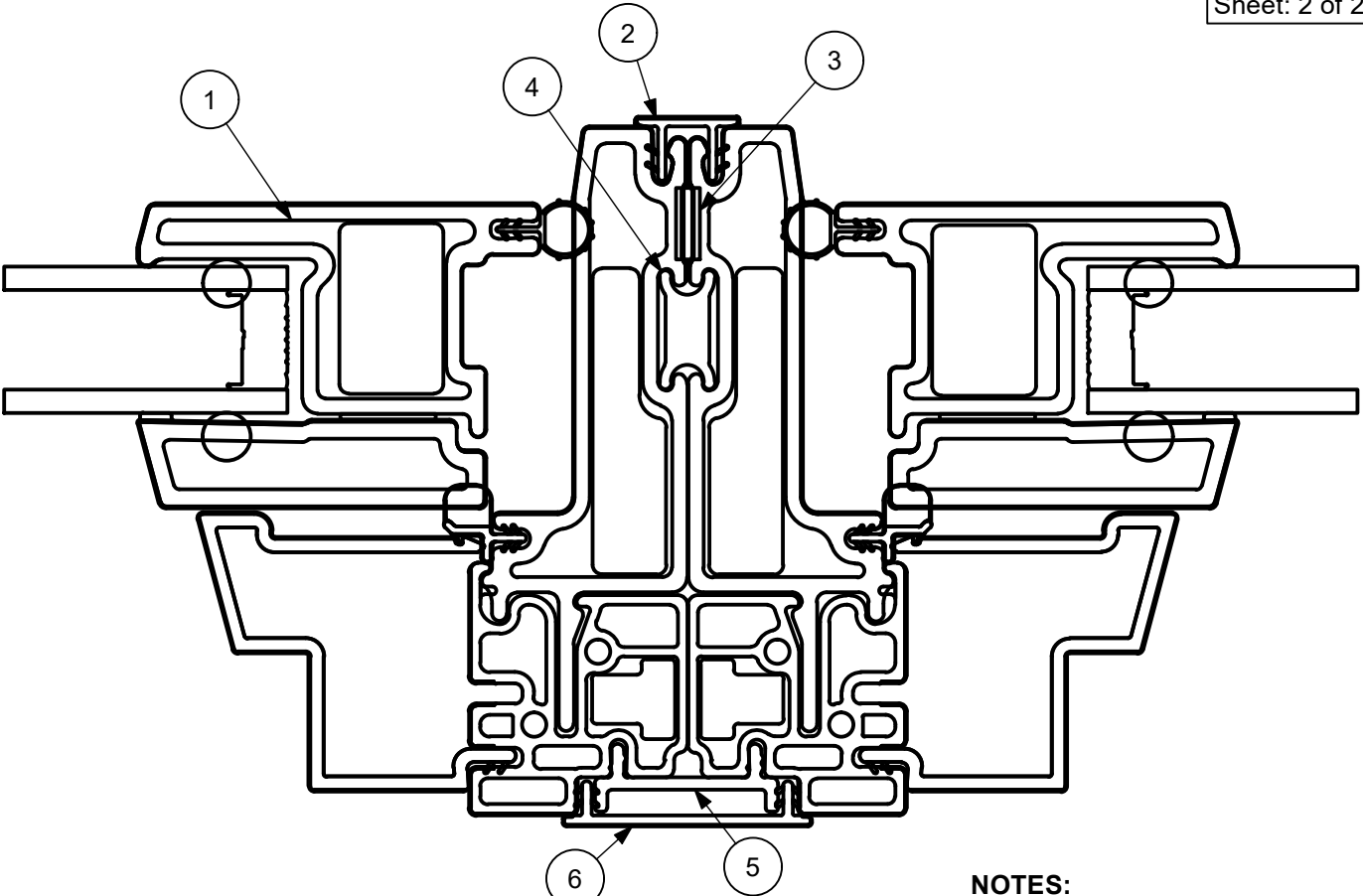
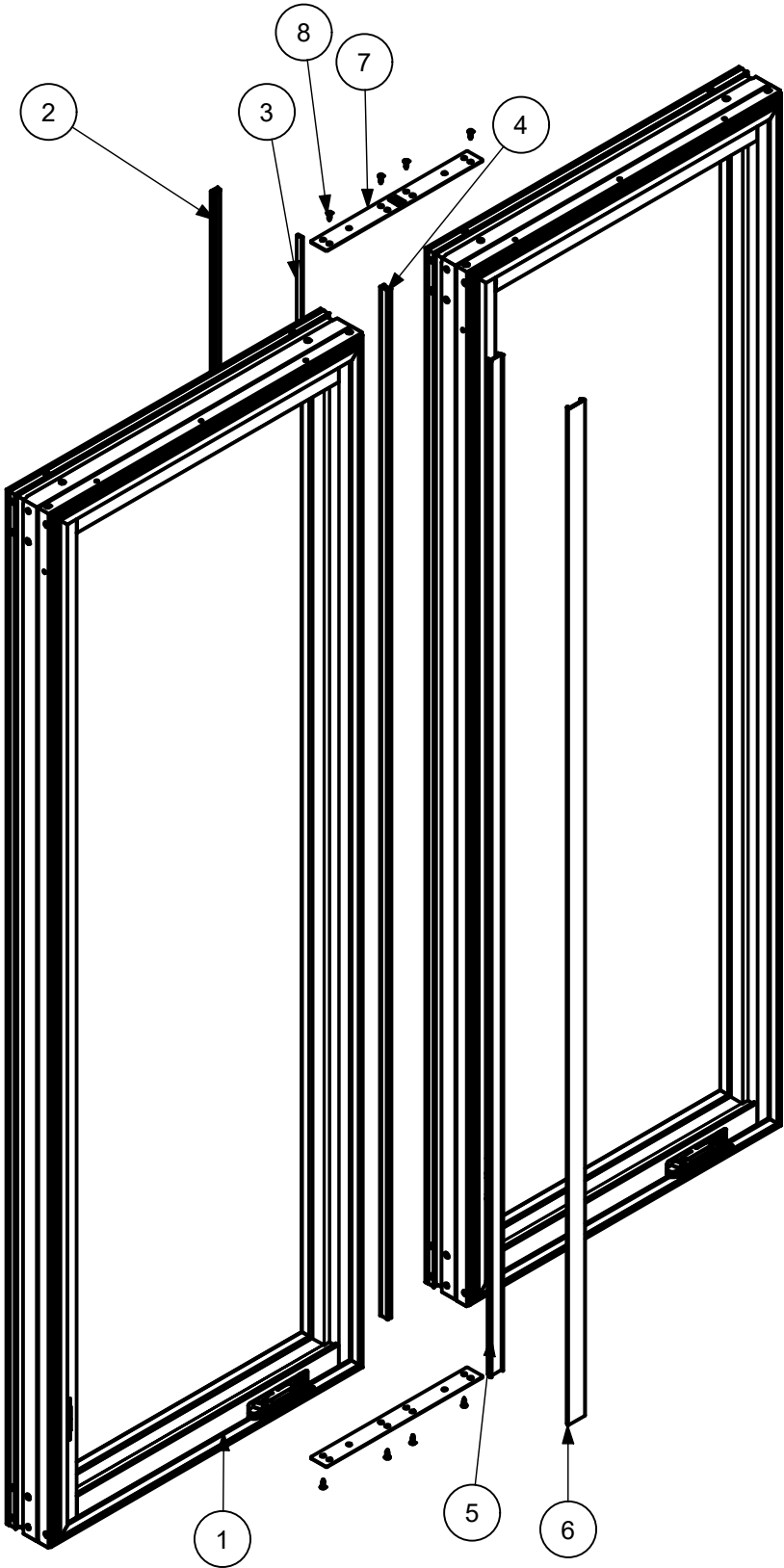
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APP: RAJ 05/28/25	SCALE: 4:3	DATE: 5/28/2024	DWG BY: Lake DeWitz	

CATEGORY:
CASEMENT,

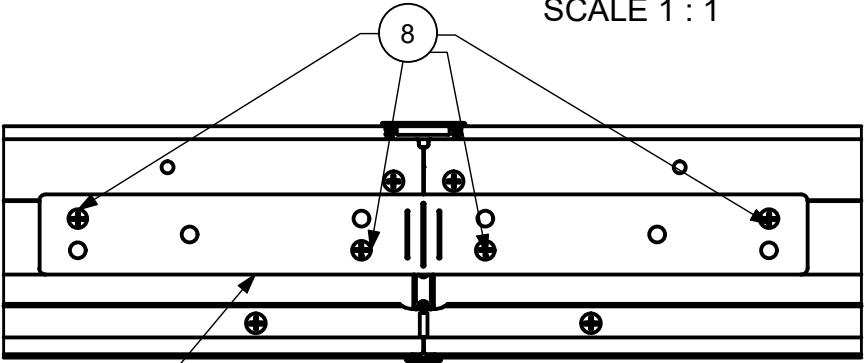
UNIT TYPE:
VCA, VAWN, VCAP

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0.2	ADDED WDMA SHEET	27638	03/11/2025	CLE
REV	DESCRIPTION / REQUESTOR	ECN NO	DATE	REV BY

SHEET LEGEND	
Sheet: 1 of 2	PRIMARY
Sheet: 2 of 2	WDMA



VERTICAL DETAIL
SCALE 1 : 1



MULL STRAP VIEW
SCALE 1:3

- NOTES:**
- 1. FOR GENERAL SPECIFICATIONS, REFER TO DOC 00003952
 - 2. 2W1H CASEMENT MULL UNIT SHOWN

8	00140853	CROSS RECESSED FLAT No. 7-16 X .500 A 17
7	00143257	MULL STRAP
6	00143050	INTERIOR MULL COVER, STANDARD
5	00143010	INTERIOR MULL CARRIER, STANDARD
4	00134449	MULL PIN, STANDARD
3	00022926	.375 X .125 FOAM TAPE
2	00143024	STANDARD MULL COVER, EXTERIOR
1	00138798	UNIT

ITEM	DWG NO	DESCRIPTION
PARTS LIST		

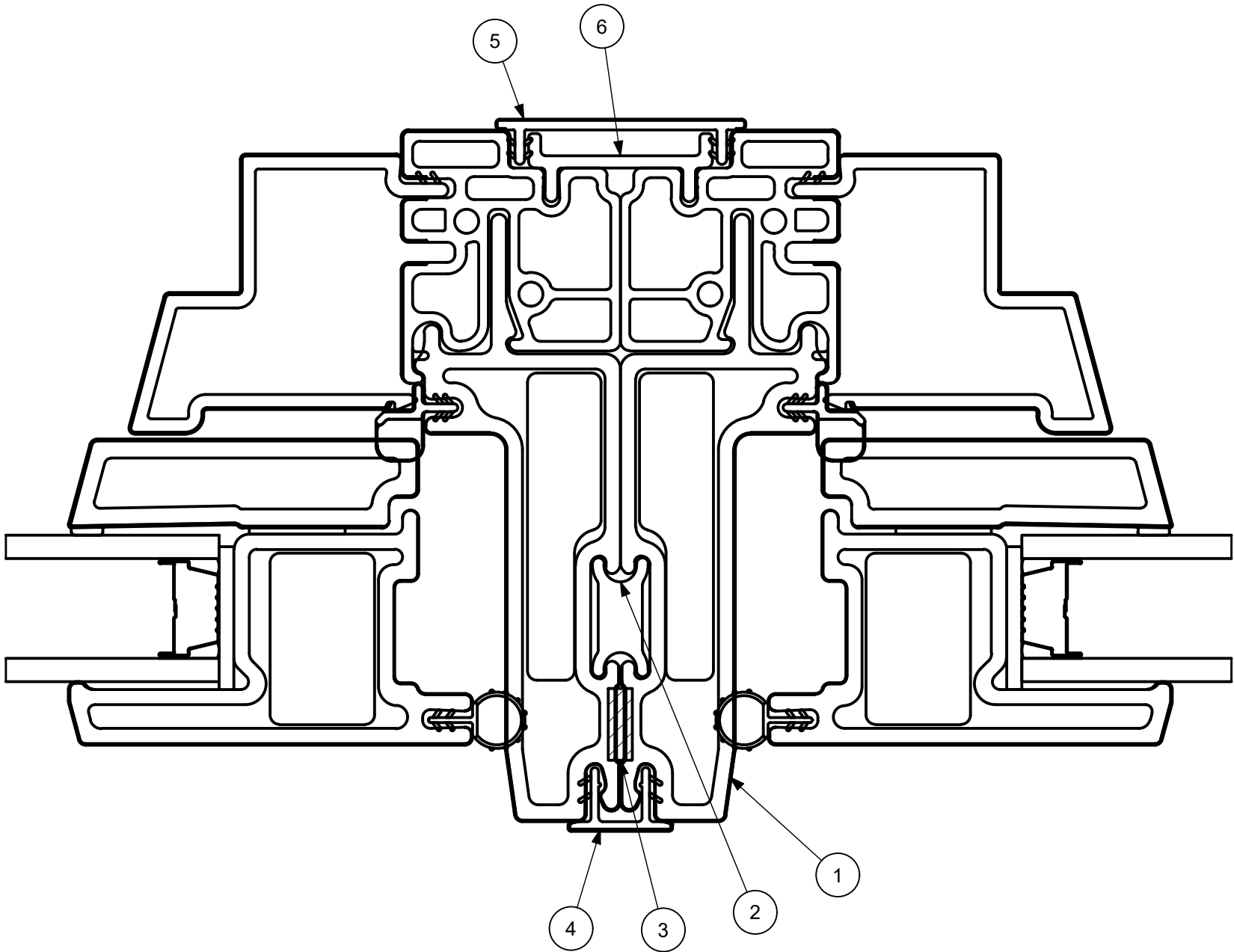
MARVIN  RESEARCH & DEVELOPMENT				
COLLECTION: VIVID				
DWG TYPE: ASSEMBLY DESCRIPTION: MULL DETAIL, CASEMENT, STANDARD				
SHEET NAME: PRIMARY (1 OF 2)				
CHK: CLE	SIZE: B	CLASS: ASSY	DWG NO: 00142787	REV: 0.4
APP: RAJ	SCALE: 1 / 14	DATE: 9/12/2024	DWG BY: Jackie Hernandez	

0.4	CHANGED HOLE DIAMETER ON MULL STRAP DOC. 143257 FROM .261 TO .250	27638	08/06/2025	JDD
0	ORIGINAL ISSUE	27638	11/25/2024	NRF
REV	DESCRIPTION / REQUESTOR	ECN NO	DATE	REV BY

CATEGORY:
CASEMENT

UNIT TYPE:
VCA, VAWN, VCAP

SHEET LEGEND	
Sheet: 1 of 2	PRIMARY
Sheet: 2 of 2	WDMA



CATEGORY:
CASEMENT,

UNIT TYPE:
VCA, VAWN, VCAP,

0.3	FRAME WEATHERSRIP 0014378 WAS 00140264	27638	05/10/2025	JDD
0.2	ADDED WDMA SHEET	27638	02/04/2025	MAF
REV	DESCRIPTION / REQUESTOR	ECN NO	DATE	REV BY

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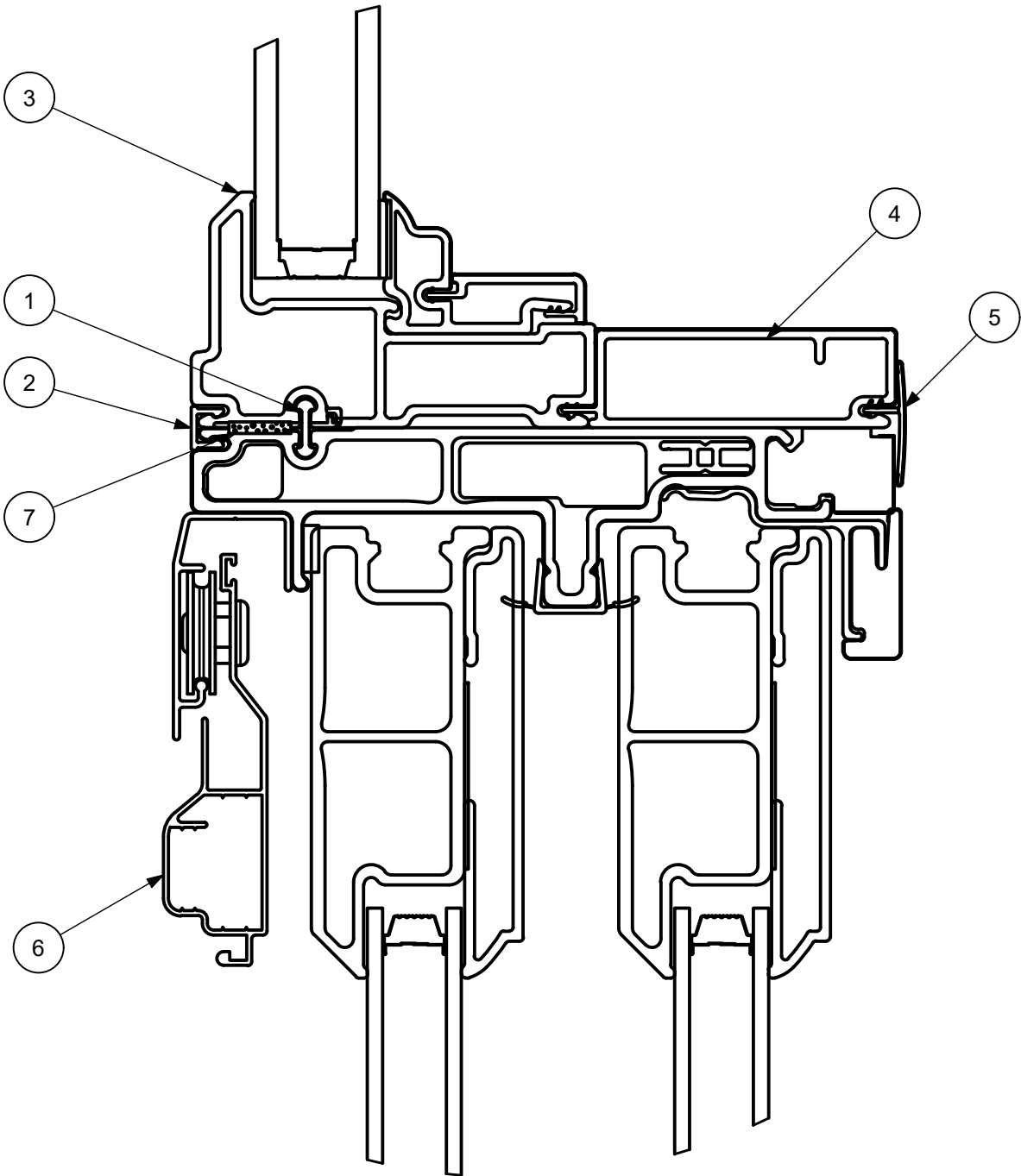
- NOTES:**
1. FOR GENERAL SPECIFICATIONS, REFER TO DOC 00003952
2. CA TO CA SHOWN

6	00143010	INTERIOR MULL CARRIER, STANDARD
5	00143050	INTERIOR MULL COVER, STANDARD
4	00143024	STANDARD MULL COVER, EXTERIOR
3	00022926	.375 X .125 FOAM TAPE
2	00134449	MULL PIN
1	00133488	CROSS SECTION, HORIZONTAL, 3/4" IG
ITEM	DWG NO	DESCRIPTION

PARTS LIST

MARVIN  RESEARCH & DEVELOPMENT				
COLLECTION: VIVID				
DWG TYPE: SECTION DESCRIPTION: STANDARD MULL, HORIZ/VERT				
SHEET NAME: PRIMARY (1 OF 2)				
CHK: CLE 05/28/25	SIZE: B	CLASS: SECT	DWG NO: 00134597	REV: 0.3
APP: RAJ 05/28/25	SCALE: 4:3	DATE: 5/28/2024	DWG BY: Lake DeWitz	

SHEET LEGEND	
Sheet: 1 of 3	PRIMARY
Sheet: 2 of 3	WDMA
Sheet: 3 of 3	REVISION HISTORY



CATEGORY:
DIRECT GLAZE, SLIDING FRENCH DOOR, SLIDING PATIO DOOR, SWINGING FRENCH DOOR,

UNIT TYPE:
NDGP, NSFD, NSPD, NOFDG3, VNDGP, VNSFD, VNSPD, VNOFD

- NOTES:**
- 1. FOR GENERAL SPECIFICATIONS, REFER TO DOC 00003952
 - 2. NDGP OVER NSFD SHOWN

7	00016331	FOAM TAPE, .5 X .094
6	00096632	CROSS SECTION VERTICAL
5	00098691	MULL CAP
4	00098683	MULL SPACER
3	00061579	CROSS SECTION, HORIZ/VERT
2	00025785	RECESSED EXT MULL COVER
1	00010055	MULLING PIN

ITEM	DWG NO	DESCRIPTION
PARTS LIST		

MARVIN

RESEARCH & DEVELOPMENT

COLLECTION: INFINITY, VIVID

DWG TYPE: DETAIL
DESCRIPTION: CROSS SECTION, HORIZONTAL MULL, NON-CERTIFIED STANDARD
SHEET NAME: PRIMARY (1 OF 3)

CHK: JH 05/01/2025	SIZE: B	CLASS: SECT	DWG NO: 00097995	REV: 2.1
APP: NRR 05/05/2025	SCALE: 3 : 4	DATE: 10/22/2015	DWG BY: TORGERSON, DUSTIN	

2.1	ADDED VIVID USAGE	28872	4/24/2025	MAF
2	ADDED WDMA SHEET	27638	02/04/2025	MAF
REV	DESCRIPTION / REQUESTOR	ECN NO	DATE	REV BY