

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
	Page:	1 of 13

Product Approval Supporting Calculations Alternative Anchorage Analysis & Design

Project Number: MS24-12002

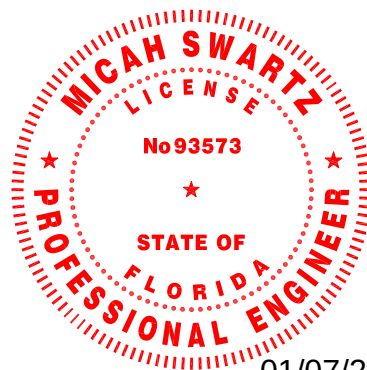
Drawing Number: D014677

Reference Test Report: G6556.02-301-44

Product Name: V-4500 Sliding Vinyl Door 280.6875" x 120.0625"

Prepared for:

Jeld-Wen Windows & Doors
3737 Lakeport Blvd.
Klamath Falls, OR



01/07/25

Prepared by:
Micah Swartz, P.E.

Micah Swartz

Micah Swartz, PE
Florida License No. PE 93573

This item has been digitally signed and sealed by Micah Swartz, P.E. on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
	Page:	2 of 13

Scope:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: V-4500 Sliding Vinyl Door 280.6875" x 120.0625". This evaluation is based on testing performed by Architectural Testing Inc. in Fresno, CA, test report no.: G6556.02-301-44 and dated 4/11/2017, revised on 6/12/17.

This evaluation does not include the air infiltration, water resistance or water penetration of the installation method or the installed product. In addition, the design of the building substrate to resist the superimposed loads is by others.

Reference Standards:

Florida Building Code, Building, 2023 Edition

ANSI/AWC NDS 2018 - National Design Specification (NDS) for Wood Construction

ANSI S100-16 (2020) North American Specification for the Design of Cold-Formed Steel Structural Members

ICC-ES Report ESR-1976 ITW Buildex TEKS Self-Drilling Fasteners

ICC-ES Report ESR-2196 Hilti Self Drilling Screws to connect cold-formed steel

NOA 24-0102.06 Tapcon Concrete and Masonry Anchors with Advanced Threadform Technology

Certification of Independence:

In accordance with Rule 61G20-3 Florida Administrative Code, Micah Swartz, P.E. hereby certifies the following:

(1) Micah Swartz, P.E. does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested or labeled by the agency.

(2) Micah Swartz, P.E. is not owned, operated or controlled by any company manufacturing or distributing products it tests or labels.

(3) Micah Swartz, P.E. does not have, nor will acquire, a financial interest in any company manufacturing or distributing products for which the reports are being issued.

(4) Micah Swartz, P.E. does not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
	Page:	3 of 13

Design Summary:

The table below summarizes the product: V-4500 Sliding Vinyl Door 280.6875" x 120.0625" and their corresponding performance levels as established by testing.

Table 1: Summary of Test Results

Series/Model	Test Report Number	Size (W x H)	Performance
V-4500 Sliding Vinyl Door 280.6875" x 120.0625"	G6556.02-301-44 (4/11/2017, revised on 6/12/17)	280.6875x120.0625	+60 psf / -60 psf

As Tested Design:

Screw Information:

Screw Size: 8 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Lateral: 106 lbs

Alternative Fasteners:

Screw Information:

Screw Size: 8 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Withdrawal: 197 lbs

Wood Screw Lateral: 106 lbs

TEK Screw Information:

Screw Size: 8-18

TEK Withdrawal: 125 lbs

TEK Lateral: 131 lbs

Tapcon Information:

Tapcon Size: 3/16 Embedment: 1-1/4 in (minimum) Edge Distance: 2-1/2 in (minimum)

Tapcon Lateral (Concrete): 155 lbs

Tapcon Lateral (CMU): 135 lbs

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
		Page: 4 of 13

Summary of Test Results - Plastics Checklist

Table 2: Summary of Test Results - Plastics Checklist

Product	Test Report Number	Test Standard	Performance
SMC Skin (fiberglass material)	ESP010982P	ASTM D638 (before and after G155)	-2.2% (averaged)
		ASTM D1929	770 °F (410 °C)
		ASTM D2843	62
		ASTM D635	Classification HB

The testing summarized in the table above was conducted by Element Materials Technology in St Paul, MN on 02/26/13 and meets the requirements listed in Miami-Dade County Checklist #0445, For the approval of: Plastic and Foam Plastic.

Micah Swartz, P.E.	Project Number: MS24-12002
	Project Name: Premium Vinyl V-4500 - Pocket
	Date: 1/7/2025 Page: 5 of 13

Subject: As Tested - Wood Screw Lateral Design - Single Shear

Input:
 Calculation:

Screw Information:

Screw Size: 8
 Screw Embed: 1.5 in

Root Diameter: 0.131 in

Main Member Type: S-P-F

G: 0.42

F_{em}: 3,350 psi

thickness (t_m): 1.5 in

Side Member Type: PVC

G: N/A

F_{es}: 13,750 psi

thickness (t_s): 0.125 in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

D:	0.131	in	Diameter
F _{yb} :	100	ksi	Dowel Bending Yield Strength
F _{em} :	3,350	psi	Main Member dowel bearing strength
F _{es} :	13,750	psi	Side Member dowel bearing strength
l _m :	1.5	in	Main Member dowel bearing length
l _s :	0.125	in	Side Member dowel bearing length
R _d :	2.2		Reduction term - Table 12.3.1B (NDS 2018)
R _e :	0.2436		= F _{em} /F _{es}
R _t :	12.0		= l _m /l _s
k ₁ :	1.135		See Table
k ₂ :	0.647		See Table

Reference Lateral Design Values - Table 12.3.1A (NDS 2018)

Z_{I_m}: 299 lbs

$Z_{Im} = \frac{D l_m F_{em}}{R_d} \text{ (EQ 12.3 - 1)}$

Z_{II}: 116 lbs

$Z_{II} = \frac{k_1 D l_s F_{es}}{R_d} \text{ (EQ 12.3 - 3)}$

Z_{III_m}: 130 lbs

$Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1 + 2R_e) R_d} \text{ (EQ 12.3 - 4)}$

Z_{IV}: 105 lbs

$Z_{IV} = \frac{D^2}{R_d} \sqrt{\frac{2 F_{em} F_{yb}}{3(1 + R_e)}} \text{ (EQ 12.3 - 6)}$

Z_{MIN}: 105 lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{I_s} and Z_{III_s} are not applicable to the calculation.

Subject: As Tested - Wood Screw Lateral Design - Single Shear Cont.**Adjusted Lateral Design Values**

$$Z' = Z * C_D * C_M * C_t * C_g * C_{\Delta} - \text{As per table 11.3.1 NDS 2018}$$

C_D :	1.6	Load Duration Factor - Table 2.3.2 (NDS 2018)
C_M :	1.0	Wet Service Factor - Table 11.3.3 (NDS 2018)
C_t :	1.0	Temperature Factor - Table 11.3.4 (NDS 2018)
C_g :	1.0	Group Action Factor - Section 11.3.6 (NDS 2018)
C_{Δ} :	1.0	Geometry Factor - Section 12.5.1.1 (NDS 2018)

$$Z': \boxed{167} \text{ lbs}$$

Fastener Bending Across Shim Space

Ω :	1.67	
L :	0.25	in Maximum Shim Gap
D :	0.131	in Diameter
F_{yb} :	100	ksi Dowel Bending Yield Strength

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16ZL}{\pi D^3} \Leftrightarrow Z = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

$$\text{Where } M = \frac{ZL}{2} \text{ (Guided Bending)}$$

$$Z_n/\Omega: \boxed{106} \text{ lbs}$$

Bearing on Masonry Strap

Ω :	3.00	
F_u :	33	ksi Tensile Strength of strap
t :	20	GA
t :	0.036	in thickness of strap
D :	0.131	in

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 4, AISI S100)$$

$$P_{nv}/\Omega: \boxed{140} \text{ lbs}$$

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
	Page:	7 of 13

Subject:	Wood Screw Withdrawal	Input:	
		Calculation:	

Screw Information:

Screw Size:	8	Root Diameter:	0.131	in
Screw Embed:	1.5			in

Main Member Type: S-P-F G: 0.42 F_{em}: 3,350 psi

$W' = W * C_D * C_M^2 * C_t$ – As per table 11.3.1 NDS 2018

C _D :	1.6	Load Duration Factor - Table 2.3.2 (NDS 2018)
C _M :	1.0	Wet Service Factor - Table 11.3.3 (NDS 2018)
C _t :	1.0	Temperature Factor - Table 11.3.4 (NDS 2018)

W:	82	lbs/in - Table 12.2B (NDS 2018)
W:	123	lbs

W':	197	lbs
-----	-----	-----

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
		Page: 8 of 13

Subject: Wood Screw Lateral Design - Single Shear

Input:
 Calculation:

Screw Information:

Screw Size: 8
 Screw Embed: 1.5 in

Root Diameter: 0.131 in

Main Member Type: S-P-F

G: 0.42

F_{em}: 3,350 psi

thickness (t_m): 1.5 in

Side Member Type: PVC

G: N/A

F_{es}: 13,750 psi

thickness (t_s): 0.125 in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

D:	0.131	in	Diameter
F _{yb} :	100	ksi	Dowel Bending Yield Strength
F _{em} :	3,350	psi	Main Member dowel bearing strength
F _{es} :	13,750	psi	Side Member dowel bearing strength
l _m :	1.5	in	Main Member dowel bearing length
l _s :	0.125	in	Side Member dowel bearing length
R _d :	2.2		Reduction term - Table 12.3.1B (NDS 2018)
R _e :	0.2436		= F _{em} /F _{es}
R _t :	12.0		= l _m /l _s
k ₁ :	1.135		See Table
k ₂ :	0.647		See Table

Reference Lateral Design Values - Table 12.3.1A (NDS 2018)

Z_{I_m}: 299 lbs

$$Z_{I_m} = \frac{D l_m F_{em}}{R_d} \text{ (EQ 12.3 - 1)}$$

Z_{II}: 116 lbs

$$Z_{II} = \frac{k_1 D l_s F_{es}}{R_d} \text{ (EQ 12.3 - 3)}$$

Z_{III_m}: 130 lbs

$$Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1 + 2R_e) R_d} \text{ (EQ 12.3 - 4)}$$

Z_{IV}: 105 lbs

$$Z_{IV} = \frac{D^2}{R_d} \sqrt{\frac{2 F_{em} F_{yb}}{3(1 + R_e)}} \text{ (EQ 12.3 - 6)}$$

Z_{MIN}: 105 lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{I_s} and Z_{III_s} are not applicable to the calculation.

Subject: Wood Screw Lateral Design - Single Shear Cont.**Adjusted Lateral Design Values**

$$Z' = Z * C_D * C_M * C_t * C_g * C_{\Delta} - \text{As per table 11.3.1 NDS 2018}$$

C_D :	1.6	Load Duration Factor - Table 2.3.2 (NDS 2018)
C_M :	1.0	Wet Service Factor - Table 11.3.3 (NDS 2018)
C_t :	1.0	Temperature Factor - Table 11.3.4 (NDS 2018)
C_g :	1.0	Group Action Factor - Section 11.3.6 (NDS 2018)
C_{Δ} :	1.0	Geometry Factor - Section 12.5.1.1 (NDS 2018)

$$Z': \boxed{167} \text{ lbs}$$

Fastener Bending Across Shim Space

Ω :	1.67	
L :	0.25	in Maximum Shim Gap
D :	0.131	in Diameter
F_{yb} :	100	ksi Dowel Bending Yield Strength

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16ZL}{\pi D^3} \Leftrightarrow Z = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

$$\text{Where } M = \frac{ZL}{2} \text{ (Guided Bending)}$$

$$Z_n/\Omega: \boxed{106} \text{ lbs}$$

Bearing on Masonry Strap

Ω :	3.00	
F_u :	33	ksi Tensile Strength of strap
t :	20	GA
t :	0.036	in thickness of strap
D :	0.131	in

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 4, AISI S100)$$

$$P_{nv}/\Omega: \boxed{140} \text{ lbs}$$

Micah Swartz, P.E.

Project Number: MS24-12002

Project Name: Premium Vinyl V-4500 - Pocket

Date: 1/7/2025

Page: 10 of 13

Subject: TEK Withdrawal

Input:

Calculation:

Shear Strength of Fastener - ESR 2196

Screw Size: 8-18

P_{nv}/Ω : 335 lbs See ESR 2196

Tensile Pullout - ESR 2196

Screw Size: 8-18

F_u : 45 ksi

t: 16 GA

t: 0.0598 in

Tensile Strength of material NOT in contact with screw head

Thickness of material NOT in contact with screw head

P_{nv}/Ω : 125 lbs See ESR 2196

Tensile Pullover

Note: The tensile pullover analysis checks the material IN contact with the screw head. This material is part of the Jeld-Wen assembly and has been verified by testing. Below is a check to ensure the head size of the TEK screw is equal to or larger than the head of the tested fastener, ensuring compliance.

Tested Fastener Head Size:

Screw Size: 8

Head Size: 0.312 in

Tested fastener is a

TEK Screw Head Size:

Screw Size: 8-18

Head Size: 0.335 in

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
		Page: 11 of 13

Subject: TEK Lateral Design

Input:

Calculation:

Shear Strength of Fastener - ESR 2196

Screw Size:

P_{nv}/Ω : lbs See ESR 2196

Bearing Strength of Material NOT in Contact with Screw Head - AISI S100

Screw Size:	8-18	Ω :	3.00
D:	0.123 in	Root Diameter of TEK Screw	
F_u :	45 ksi	Tensile Strength of material NOT in contact with screw head	
t:	18 GA		
t:	0.0478 in	Thickness of material NOT in contact with screw head	

$$\frac{P_{nv1}}{\Omega} = 2.7 * t * D * F_u - (EQ. J4.3.1 - 3, AISI S100)$$

$$\frac{P_{nv2}}{\Omega} = 4.2 * \sqrt{t^3 * D * F_u} - (EQ. J4.3.1 - 1, AISI S100)$$

P_{nv1}/Ω : lbs

P_{nv2}/Ω : lbs

P_{nv}/Ω : lbs

Bearing Strength of Material IN in Contact with Screw Head

Note: Material IN contact with the screw head is part of the Jeld-Wen assembly and has been verified by testing.

Fastener Bending Across Shim Space

L:	0.25 in	Maximum Shim Gap	Ω :	3.00
D:	0.123 in	Root Diameter of TEK Screw		
F_{yb} :	100 ksi	Yield Strength of TEK Screw		

$$\frac{F_{yb}}{\Omega} = \frac{M}{I} = \frac{16P_n L}{\pi D^3} \Leftrightarrow P_n = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

P_n/Ω : lbs

Where $M = \frac{P_n L}{2}$ (Guided Bending)

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
	Page:	12 of 13

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025

Bearing Strength of Masonry Straps - AISI S100

Screw Size:	8-18	
D:	0.123	in
F _u :	33	ksi
t:	20	GA
t:	0.0359	in

TEK Screw
Root Diameter of TEK Screw
Tensile Strength of Masonry Strap
Thickness of Masonry Strap

Ω : 3.00

D:	0.123	in
F_u :	33	ksi
t:	20	GA
t:	0.0359	in

Root Diameter of TEK Screw

Tensile Strength of Masonry Strap

Thickness of Masonry Strap

F _u :	33	ksi	Tensile Strength of Masonry Strap
t:	20	GA	
t:	0.0359	in	Thickness of Masonry Strap

Tensile Strength of Masonry Strap

Thickness of Masonry Strap

t:	20	GA
t:	0.0359	in

Thickness of Masonry Strap

t: 0.0359 in Thickness of Masonry Strap

$$P_{nv}/\Omega = \frac{P_{nv}}{1.31} = 27 \text{ kips} \times D \times F_u = (EQ.J4.3.1 - 3, \text{AISI S100})$$

Micah Swartz, P.E.	Project Number:	MS24-12002
	Project Name:	Premium Vinyl V-4500 - Pocket
	Date:	1/7/2025
		Page: 13 of 13

Subject: Tapcon Lateral Design

Input:

Calculation:

Tapcon Size:

Size: 3/16
 D: 0.1875 in
 D_{sh}: 0.145 in

Nominal Diameter
 Shank Diameter

Fastener Shear Capacity - 3,000 psi Concrete

P_{nv}/Ω: 181 lbs

See Table 1B of NOA 24-0102.06

Fastener Shear Capacity - Medium-Weight CMU

P_{nv}/Ω: 135 lbs

See Table 3 of NOA 24-0102.06

Note:

- Critical anchor spacing is 16D
- Minimum Anchor Embedment is 1-1/4"
- Minimum Edge Distance is 2-1/4"

Fastener Bending Across Shim Space

L: 0.25 in
 D_{sh}: 0.145 in
 F_{yb}: 100 ksi

Maximum Shim Gap
 Shank Diameter of Tapcon
 Yield Strength of Tapcon

Ω:

3.00

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16P_n L}{\pi D^3} \Leftrightarrow P_n = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

Where $M = \frac{P_n L}{2}$ (Guided Bending)

P_n/Ω: 239 lbs

Bearing Strength of Masonry Straps - AISI S100

Size: 3/16
 D_{sh}: 0.145 in
 F_u: 33 ksi
 t: 20 GA
 t: 0.0359 in

Tapcon Size
 Shank Diameter of Tapcon Screw
 Tensile Strength of Masonry Strap
 Thickness of Masonry Strap

Ω:

3.00

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ. J4.3.1 - 3, AISI S100)$$

P_{nv}/Ω: 155 lbs