Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design

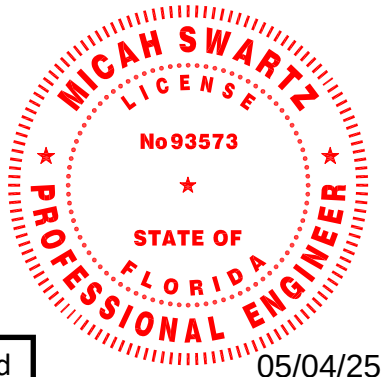
Project Number: SCE 25-04026

Drawing Number: D1000182

Reference Test Report: 210-3918-01 & SJW2013-196

Product Name: F-3500 Swinging Door - Opaque 112.125" x 97.938"

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



05/04/25

Prepared by:
Swartz Consulting Engineers LLC

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

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Scope:

Swartz Consulting Engineers LLC is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: F-3500 Swinging Door - Opaque 112.125" x 97.938". This evaluation is based on testing observed by National Certified Testing Laboratories in Klamath Falls, OR, test report no.: 210-3918-01 & SJW2013-196 and dated 10/04/2013 & 09/13/2013 respectively.
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:

Current edition of the Florida Building Code

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

AISI 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, Swartz Consulting Engineers LLC hereby certifies the following:

(1) Swartz Consulting Engineers LLC 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) Swartz Consulting Engineers LLC 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.

Design Summary:

The table below summarizes the product: F-3500 Swinging Door - Opaque 112.125" x 97.938" 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
F-3500 Swinging Door - Opaque 112.125" x 97.938"	210-3918-01 & SJW2013-196 (10/04/2013 & 09/13/2013 respectively)	112.125" x 97.938"	+50 psf / -50 psf

As Tested Design:

Screw Information:

Screw Size: 10 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Lateral: 149 lbs

Alternative Fasteners:

Screw Information:

Screw Size: 10 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Lateral: 149 lbs

Tapcon Information:

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

Tapcon Lateral (Concrete): 203 lbs
Tapcon Lateral (CMU): 161 lbs

Summary of Test Results - Plastics Checklist

Table 2: Summary of Test Results - Plastics Checklist

Product	Test Report Number	Test Standard	Performance
DYLITE Expandable Polystyrene	3113726SAT-001 R1	ASTM E84	Flame Spread Index: 35
			Smoke Density Index: 450

The testing summarized in the table above was conducted by Intertek ETL SEMKO in Elmendorf, TX dated 03/13/09 and meets the requirements listed in Miami-Dade County Checklist #0445, For the approval of: Plastic and Foam Plastic.

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.

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

Input:
Calculation:

Screw Information:

Screw Size: 10 Root Diameter: 0.152 in
Screw Embed: 1.5 in

Main Member Type: S-P-F G: 0.42 F_{em}: 3,350 psi thickness (t_m): 1.5 in

Side Member Type: S-P-F G: 0.42 F_{es}: 3,350 psi thickness (t_s): 1 in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

D:	0.152	in	Diameter
F_{yb}:	90	ksi	Dowel Bending Yield Strength
F_{em}:	3,350	psi	Main Member dowel bearing strength
F_{es}:	3,350	psi	Side Member dowel bearing strength
l_m:	1.5	in	Main Member dowel bearing length
l_s:	1	in	Side Member dowel bearing length
R_d:	2.2		Reduction term - Table 12.3.1B (NDS 2018)
R_e:	1		$= F_{em}/F_{es}$
R_t:	1.5		$= l_m/l_s$
k_1:	0.535		See Table
k_2:	1.133		See Table

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

Z_{Im}: 347 lbs $Z_{I_m} = \frac{Dl_m F_{em}}{R_d}$ (EQ 12.3 − 1)

Z_{II}: 124 lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ $(EQ\ 12.3 - 3)$

Z_{IIIm}: 131 lbs $Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1+2R_e)R_d}$ (EQ 12.3 − 4)

Z_{IV}: 105 lbs $Z_{IV} = \frac{D^2}{R_d}\sqrt{\frac{2F_{em}F_{yb}}{3(1+R_e)}}$ $(EQ\ 12.3 - 6)$

Z_{MIN}: 105 lbs

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

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

Adjusted Lateral Design Values

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

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': **168** lbs

Fastener Bending Across Shim Space

Ω:	1.67		
L:	0.25	in	Maximum Shim Gap
D:	**0.152**	in	Diameter
F_{yb}:	**90**	ksi	Dowel Bending Yield Strength

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16ZL}{\pi D^3} \Leftrightarrow Z = \frac{F_{yb}\pi D^3}{16\Omega L} \qquad Where\ M = \frac{ZL}{2}\ (Guided\ Bending)$$

Z_n/Ω: **149** 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:	**0.152**	in	

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

P_{nv}/Ω: **162** lbs

Subject: Tapcon Lateral Design

Input:
Calculation:

Tapcon Size:

Size:	1/4		
D:	0.25	in	Nominal Diameter
D_{sh}:	0.19	in	Shank Diameter

Fastener Shear Capacity - 3,000 psi Concrete

P_{nv}/Ω: 237 lbs See Table 1B of NOA 24-0102.06

Fastener Shear Capacity - Medium-Weight CMU

P_{nv}/Ω: 161 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	Maximum Shim Gap	Ω: 3.00
D_{sh}:	0.19	in	Shank Diameter of Tapcon	
F_{yb}:	100	ksi	Yield Strength of Tapcon	

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16P_nL}{\pi D^3} \Leftrightarrow P_n = \frac{F_{yb}\pi D^3}{16\Omega L} \qquad Where\ M = \frac{P_nL}{2}\ (Guided\ Bending)$$

P_n/Ω: 539 lbs

Bearing Strength of Masonry Straps - AISI S100

Size:	1/4		Tapcon Size	Ω: 3.00
D_{sh}:	0.19	in	Shank Diameter of Tapcon Screw	
F_u:	33	ksi	Tensile Strength of Masonry Strap	
t:	20	GA		
t:	0.0359	in	Thickness of Masonry Strap	

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

P_{nv}/Ω: 203 lbs