

SWARTZ
CONSULTING ENGINEERS LLC

Project Number:	SCE 25-04002
Project Name:	Custom Clad Wood Double Hung
Date:	5/2/2025
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Product Evaluation Report: Revision 1

Project Number: SCE 25-04002

Product Name: Custom Clad Wood Double Hung Window

Product Dimensions: 41.5" x 76"

Installation Instructions: D009737

Method: 1-D (Engineering Evaluation)

Category: Windows

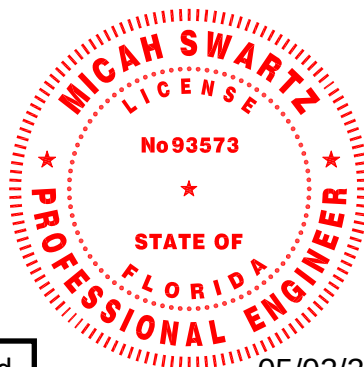
Subcategory: Double Hung

Prepared for:

Jeld-Wen Windows & Doors

3737 Lakeport Blvd.

Klamath Falls, OR



05/02/25

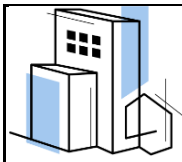
Prepared by:
Swartz Consulting Engineers LLC

Micah Swartz

Micah Swartz, PE
Florida License No. PE 93573
Florida Registry No. 38420

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.



Scope:

This is a product evaluation report issued by Micah Swartz, P.E. (FL# 93573) for Jeld-Wen Windows & Doors based on Method 1D of the State of Florida Product Approval, Florida Department of Business and Professional Regulation - Florida Building Commission.

This product has been evaluated for use in locations adhering to the current Florida Building Code.

See Installation Instructions D009737, signed and sealed by Micah Swartz, P.E. (FL# 93573) for specific use parameters including size and design pressure limitations.

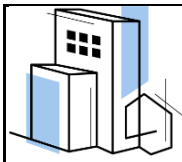
Certification of Independence:

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
- (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.

Limits of Use:

- (1) Product anchors shall be as listed and spaced on installation instructions. Anchors shall be embedded into the substrate the full embedment depth beyond stucco or wall cladding.
- (2) Site conditions that deviate from the details of drawing D009737 must be verified and designed by a licensed engineer or registered architect.

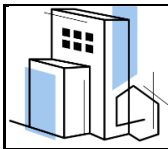


Testing Summary:

The table below summarizes the product: Custom Clad Wood Double Hung 41.5" x 76" and their corresponding performance levels as established by testing. Testing was observed by Intertek in Klamath Falls, OR. Test report was signed by Tyler Westerling, P.E. (FL# 72012)

Table 1: Summary of Test Results

Series/Model	Test Report Number	Standards Tested	Size (W x H)	Performance
Custom Clad Wood Double Hung 41.5" x 76"	M4128.01-301-47 R1 (6/24/21 Revised 02/10/22)	AAMA/WDMA/CSA 101/I.S.2/A440-2011, ASTM E1886/ ASTM E1996	41.5" x 76"	+50 psf / -50 psf



Design Summary:

As Test: Product Evaluation Report: Revision 1

Applied Load (psf): -60 psf Width: 37.5 in Height: 76 in Window Area: 19.8 ft²

Total Load: -1188 lbs Number of Fasteners: 14 ft Load Per Fastener (Nailfin): -85 lbs
Load Per Fastener (Thru Frame): -85 lbs

Screw Information:

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

Wood Screw Withdrawal: 197 lbs Unity: 0.43
Wood Screw Lateral: 106 lbs Unity: 0.80

Alternative Fasteners:

Screw Information:

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

Wood Screw Withdrawal: 197 lbs Unity: 0.43
Wood Screw Lateral: 106 lbs Unity: 0.80

Nail Information:

Nail Size: 6d Nail Type: Common Edge Distance: 3/4 in (minimum)

Total Load: -1188 lbs Number of Nails: 24 Load Per Fastener (Nailfin): -49 lbs

Nail Withdrawal: 55 lbs Unity: 0.90
Nail Lateral: 113 lbs Unity: 0.44

Design Summary Continued:

TEK Screw Information:

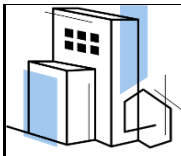
Screw Size: 10-16

TEK Withdrawal: 145 lbs Unity: 0.58
TEK Lateral: 147 lbs Unity: 0.58

Tapcon Information:

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

Tapcon Lateral (Concrete): 155 lbs Unity: 0.55
Tapcon Lateral (CMU): 135 lbs Unity: 0.63



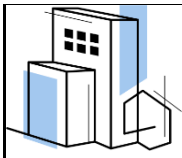
Summary of Test Results - Plastics Checklist

Table 2: Summary of Test Results - Plastics Checklist

Product	Test Report Number	Test Standard	Performance
White PVC 1476 5110	P6504.04-106-18 R0	ASTM D638 (before and after G155)	+9.5%
		ASTM D1929	824 °F (440 °C)
		ASTM D2843	71.8
		ASTM D635	Classification CC1
		ASTM 256	-3.3%
White PVC 1476 5290	P6504.04-106-18 R0	ASTM D638 (before and after G155)	+9.5%
		ASTM D1929	806 °F (430 °C)
		ASTM D2843	72.6
		ASTM D635	Classification CC1
		ASTM 256	-35.5%

The testing summarized in the table above was conducted by Intertek in York, PA dated 08/23/23 and meets the requirements listed in Miami-Dade County Checklist #0445, For the approval of: Plastic and Foam Plastic.

The Saflex FlySafe 3D interlayer meets the requirements listed in Miami-Dade County Checklist #0445, For the approval of: Plastic and Foam Plastic as shown by NOA 23-0713.19



Subject: As Tested - Wood Screw Withdrawal

Input:

Calculation:

Screw Product Evaluation Report: Revision 1

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

$$W' = W * C_D * C_M^2 * C_t - \text{As per table 11.3.1 NDS 2018}$$

C_D: 1.6 Load Duration Factor - Table 2.3.2 (NDS 2018)

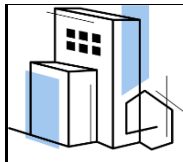
C_M: 1.0 Wet Service Factor - Table 11.3.3 (NDS 2018)

C_t: 1.0 Temperature Factor - Table 11.3.4 (NDS 2018)

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

W: 123 lbs

W': 197 lbs



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

Input:
Calculation:

Screw Product Evaluation Report: Revision 1

Screw Size:
Screw Embed: in

Root Diameter: in

Main Member Type: G: F_{em} : psi thickness (t_m): in

Side Member Type: G: F_{es} : psi thickness (t_s): 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} :	3,350 psi	Side Member dowel bearing strength
l_m :	1.5 in	Main Member dowel bearing length
l_s :	1.25 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 :	1.2	$= l_m/l_s$
k_1 :	0.459	See Table
k_2 :	1.111	See Table

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

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

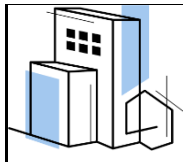
Z_{II} : lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ (EQ 12.3 - 3)

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

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

Z_{MIN} : lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{Is} 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)

$$Z': \boxed{132} \text{ lbs}$$

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

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

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

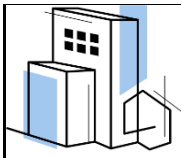
$$Z_n/\Omega: \boxed{106} \text{ lbs}$$

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

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

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



Subject: Nail Withdrawal

Input:
Calculation:

Nail Product Evaluation Report: Revision 1

Nail Size: Nail Length: in
Nail Type: Nail Diameter: in Nail Embedment: in

Main Member Type: G: F_{em} : psi thickness (t_m): in

Side Member Type: G: F_{es} : psi thickness (t_s): in

$$W' = W * C_D * C_M^2 * C_t - \text{As per table 11.3.1 NDS 2018}$$

C_D : Load Duration Factor - Table 2.3.2 (NDS 2018)

C_M : Wet Service Factor - Table 11.3.3 (NDS 2018)

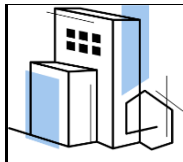
C_t : Temperature Factor - Table 11.3.4 (NDS 2018)

W: lbs/in

W: lbs

$$W = 1380G^{5/2}D - \text{Carbon Steel Nails (EQ. 12.2 - 3, NDS 2018)}$$

W': lbs



Subject: Nail Lateral Design - Single Shear

Input:
Calculation:

Nail Product Evaluation Report: Revision 1

Nail Size: Nail Length: in
Nail Type: Nail Diameter: in Nail Embedment: in

Main Member Type: G: F_{em} : psi thickness (t_m): in

Side Member Type: G: F_{es} : psi thickness (t_s): in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

D:	0.113 in	Diameter
F_{yb} :	100 ksi	Dowel Bending Yield Strength
F_{em} :	3,350 psi	Main Member dowel bearing strength
F_{es} :	21,000 psi	Side Member dowel bearing strength
l_m :	1.6875 in	Main Member dowel bearing length
l_s :	0.0625 in	Side Member dowel bearing length
R_d :	2.2	Reduction term - Table 12.3.1B (NDS 2018)
R_e :	0.1595	$= F_{em}/F_{es}$
R_t :	27.0	$= l_m/l_s$
k_1 :	1.713	See Table
k_2 :	0.561	See Table

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

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

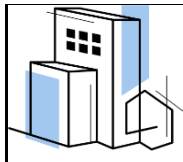
Z_{II} : lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ (EQ 12.3 - 3)

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

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

Z_{MIN} : lbs

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



Subject: Nail 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)

$$Z': \boxed{129} \text{ lbs}$$

Fastener Bending Across Shim Space

Ω :	1.67	
L :	0.25	in Maximum Shim Gap
D :	0.113	in Diameter
F_{yb} :	100	ksi Dowel Bending Yield Strength

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

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

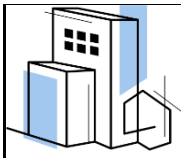
$$Z_n/\Omega: \boxed{113} \text{ lbs}$$

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 :	0.113	in

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

$$P_{nv}/\Omega: \boxed{120} \text{ lbs}$$



Subject: TEK Withdrawal

Input:
Calculation:

She Product Evaluation Report: Revision 1

Screw Size: 10-16

P_{nv}/Ω : 885 lbs See ESR 2196

Tensile Pullout - ESR 1976

Screw Size: 10-16

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 : 145 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

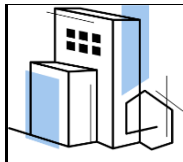
Head Size: 0.312 in

Tested fastener is a

TEK Screw Head Size:

Screw Size: 10-16

Head Size: 0.365 in



Subject: TEK Lateral Design

Input:
Calculation:

She Product Evaluation Report: Revision 1

Screw Size: 10-16

P_{nv}/Ω : 573 lbs See ESR 2196

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

Screw Size: 10-16

Ω : 3.00

D: 0.138 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 : 267 lbs

P_{nv2}/Ω : 245 lbs

P_{nv}/Ω : 245 lbs $\frac{P_{nv}}{\Omega} = \text{smallest of } \frac{P_{nv1}}{\Omega} \text{ and } \frac{P_{nv2}}{\Omega}$

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

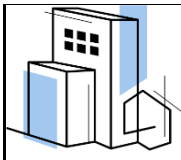
D: 0.138 in Root Diameter of TEK Screw

F_{yb} : 100 ksi Yield Strength of TEK Screw

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

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

P_n/Ω : 206 lbs



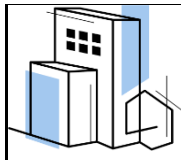
Bearing Strength of Masonry Straps - AISI S100

Screw Size: **10-16** TEK Screw
D: **0.138** in Root Diameter of TEK Screw
F_u: **33** ksi Tensile Strength of Masonry Strap
t: **20** GA
t: **0.0359** in 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: **147** lbs



Subject: Tapcon Lateral Design

Input:
Calculation:

Tap Product Evaluation Report: Revision 1

Size:
D: in Nominal Diameter
D_{sh}: in Shank Diameter

Fastener Shear Capacity - 3,000 psi Concrete

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

Fastener Shear Capacity - Medium-Weight CMU

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

Ω:

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

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

P_n/Ω: lbs

Bearing Strength of Masonry Straps - AISI S100

Size: Tapcon Size
D_{sh}: in Shank Diameter of Tapcon Screw
F_u: ksi Tensile Strength of Masonry Strap
t: GA
t: in Thickness of Masonry Strap

Ω:

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

P_{nv}/Ω: lbs