

Micah Swartz, P.E.	Project Number:	MS24-06003	
	Project Name:	Opaque Energy Saver/Contour	
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**Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design
R2 - Admin Update**

Project Number: MS24-06003

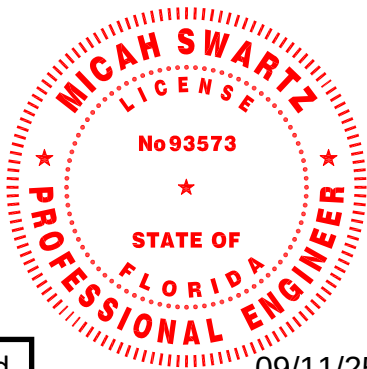
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Reference Test Report: SJW2009-200

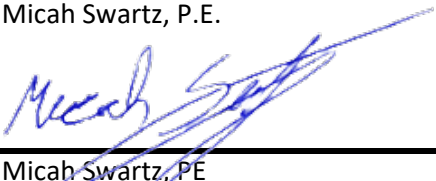
Product Name: Opaque Energy Saver/Contour (ISW&OSW)

Prepared for:

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



Prepared by:
Micah Swartz, P.E.



Micah Swartz, PE
Florida License No. PE 93573

09/11/25

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:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: Opaque Energy Saver/Contour (ISW&OSW). This evaluation is based on testing observed by National Certified Testing Laboratories (NCTL) at the Jeld Wen Research & Development test facility in Klamath Falls, Oregon, test report no.: SJW2009-200 and dated 1/18/2012 (Revised 02/17/2014). 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, Building

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

AISI S100 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.

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Design Summary:

The table below summarizes the product: Opaque Energy Saver/Contour (ISW&OSW) 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
Opaque Energy Saver/Contour (ISW&OSW)	SJW2009-200 (1/18/2012 (Revised 02/17/2014))	64-1/2 x 95-1/4	+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

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

Input:
 Calculation:

Screw Information:

Screw Size: 10
 Screw Embed: 1.5 in

Root Diameter: 0.152 in

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

Side Member Type: Steel G: N/A F_{es}: 36,000 psi thickness (t_s): 0.06 in

Lateral Design Factors - Table 12.3.1A (NDS)

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} :	36,000 psi	Side Member dowel bearing strength
l _m :	1.5 in	Main Member dowel bearing length
l _s :	0.06 in	Side Member dowel bearing length
R _d :	2.2	Reduction term - Table 12.3.1B (NDS)
R _e :	0.0931	= F _{em} /F _{es}
R _t :	25.0	= l _m /l _s
k ₁ :	0.939	See Table
k ₂ :	0.551	See Table

Reference Lateral Design Values - Table 12.3.1A (NDS)

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

Z_{Im}:
347 lbs

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

Z_{II}:
140 lbs

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

Z_{III_m}:
161 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_{IV}:
142 lbs

$Z_{MIN} = \text{140 lbs}$

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.

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

Adjusted Lateral Design Values

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

C _D :	1.6	Load Duration Factor - Table 2.3.2 (NDS)
C _M :	1.0	Wet Service Factor - Table 11.3.3 (NDS)
C _t :	1.0	Temperature Factor - Table 11.3.4 (NDS)
C _g :	1.0	Group Action Factor - Section 11.3.6 (NDS)
C _Δ :	1.0	Geometry Factor - Section 12.5.1.1 (NDS)

$$Z': \quad 224 \text{ lbs}$$

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

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

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

$$Z_n/\Omega: \quad 149 \text{ lbs}$$

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:	0.152	in

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

$$P_{nv}/\Omega: \quad 162 \text{ lbs}$$

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Subject: Wood Screw Lateral Design - Single Shear

Input:
 Calculation:

Screw Information:

Screw Size: 10
 Screw Embed: 1.5 in

Root Diameter: 0.152 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): 1.25 in

Lateral Design Factors - Table 12.3.1A (NDS)

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 :	1.25 in	Side Member dowel bearing length
R _d :	2.2	Reduction term - Table 12.3.1B (NDS)
R _e :	1	= F _{em} /F _{es}
R _t :	1.2	= l _m /l _s
k ₁ :	0.459	See Table
k ₂ :	1.133	See Table

Reference Lateral Design Values - Table 12.3.1A (NDS)

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

Z_{Im}:
347 lbs

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

Z_{II}:
133 lbs

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

Z_{III_m}:
131 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_{IV}:
105 lbs

$Z_{MIN} = \text{105 lbs}$

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.

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Subject: Wood Screw Lateral Design - Single Shear Cont.

Adjusted Lateral Design Values

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

C _D :	1.6	Load Duration Factor - Table 2.3.2 (NDS)
C _M :	1.0	Wet Service Factor - Table 11.3.3 (NDS)
C _t :	1.0	Temperature Factor - Table 11.3.4 (NDS)
C _g :	1.0	Group Action Factor - Section 11.3.6 (NDS)
C _Δ :	1.0	Geometry Factor - Section 12.5.1.1 (NDS)

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

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

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

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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

D_{sh}:

0.19

in

Shank Diameter of Tapcon

F_{yb}:

100

ksi

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:

539

lbs

Bearing Strength of Masonry Straps - AISI S100

Size:

1/4

in

Tapcon Size

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

Ω:

3.00

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

P_{nv}/Ω:

203

lbs