Micah Swartz, P.E.	Project Number:	MS24-06001	
	Project Name:	Contours Steel - Sidelight (OSW)	
	Date:	6/3/2024	Page:

Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design

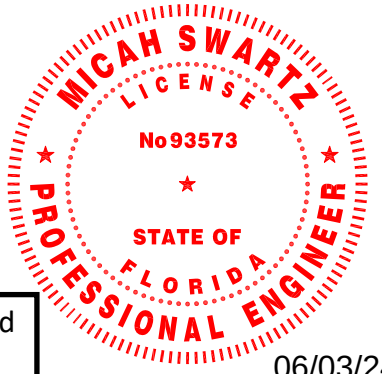
Project Number: MS24-06001

Drawing Number: D015000

Reference Test Report: CTLA969W

Product Name: Contours Steel Wood Edge Opaque Outswing

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



06/03/24

Prepared by:
Micah Swartz, P.E.

Digitally signed by Micah Swartz, P.E.

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.

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Micah Swartz, P.E.

Project Number:	MS24-06001
Project Name:	Contours Steel - Sidelight (OSW)
Date:	6/1/2024
Page:	

Scope:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: Contours Steel Wood Edge Opaque Outswing. This evaluation is based on testing performed by Certified Testing Laboratories in Orlando, FL, test report no.: CTLA969W and dated 11/01/01.

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

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

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: MS24-06001
Project Name: Contours Steel - Sidelight (OSW)
Date: 6/1/2024 Page:

Design Summary:

The table below summarizes the product: Contours Steel Wood Edge Opaque Outswing 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
Contours Steel Wood Edge Opaque Outswing	CTLA969W (11/01/01)	107 x 82	+57 psf / -57 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 Lateral: **106** 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: MS24-06001
Project Name: Contours Steel - Sidelight (OSW)
Date: 6/1/2024 Page:

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

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

Z_{II}: 114 lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ (EQ 12.3 − 3)

Z_{IIIm}: 111 lbs $Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1+2R_e)R_d}$ (EQ 12.3 − 4)

Z_{IV}: 82 lbs $Z_{IV} = \frac{D^2}{R_d}\sqrt{\frac{2F_{em}F_{yb}}{3(1+R_e)}}$ (EQ 12.3 − 6)

Z_{MIN}: 82 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.

Micah Swartz, P.E.

Project Number:	MS24-06001
Project Name:	Contours Steel - Sidelight (OSW)
Date:	6/1/2024
Page:	

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': **132** 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

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

Z_n/Ω: **106** 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}/Ω: **140** lbs

Micah Swartz, P.E.

Project Number: MS24-06001
Project Name: Contours Steel - Sidelight (OSW)
Date: 6/1/2024 Page:

Subject: Wood Screw Lateral Design - Single Shear

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

Z_{II}: 114 lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ (EQ 12.3 − 3)

Z_{IIIm}: 111 lbs $Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1+2R_e)R_d}$ (EQ 12.3 − 4)

Z_{IV}: 82 lbs $Z_{IV} = \frac{D^2}{R_d}\sqrt{\frac{2F_{em}F_{yb}}{3(1+R_e)}}$ (EQ 12.3 − 6)

Z_{MIN}: 82 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.

Micah Swartz, P.E.

Project Number: MS24-06001
Project Name: Contours Steel - Sidelight (OSW)
Date: 6/1/2024 Page:

Subject: 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': **132** 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

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

Z_n/Ω: **106** 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}/Ω: **140** lbs

Micah Swartz, P.E.

Project Number: MS24-06001
Project Name: Contours Steel - Sidelight (OSW)
Date: 6/1/2024 Page:

Subject: Tapcon Lateral Design

Input:
Calculation:

Tapcon Size:

Size:	3/16		
D:	0.1875	in	Nominal Diameter
D_{sh}:	0.145	in	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	Maximum Shim Gap	Ω: 3.00
D_{sh}:	0.145	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: 239 lbs

Bearing Strength of Masonry Straps - AISI S100

Size:	3/16		Tapcon Size	Ω: 3.00
D_{sh}:	0.145	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: 155 lbs