

**SWARTZ**  
CONSULTING ENGINEERS LLC

|                 |                               |
|-----------------|-------------------------------|
| Project Number: | SCE 25-01005                  |
| Project Name:   | Contours (S-2500) OSW 2-Panel |
| Date:           | 2/13/2025                     |
| Page:           | 1 of 9                        |

## Product Approval Supporting Calculations Alternative Anchorage Analysis & Design

**Project Number:** SCE 25-01005

**Drawing Number:** D1000367

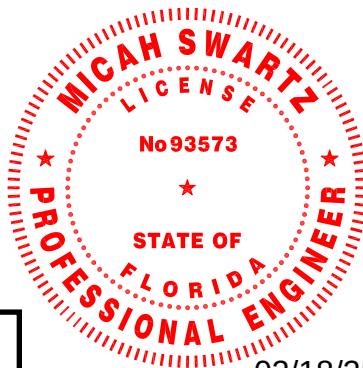
**Reference Test Report:** NCTL 210-3196-1

**Product Name:** Contours (S-2500) OSW 2-Panel 74" x 98"

**Revision 2:** Plastics Checklist Expanded

**Prepared for:**

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



Prepared by:  
Swartz Consulting Engineers LLC

**Micah Swartz**

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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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02/18/25



**Scope:**

Swartz Consulting Engineers LLC is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: Contours (S-2500) OSW 2-Panel 74" x 98". This evaluation is based on testing performed by National Certified Testing Laboratories in Orlando, FL, test report no.: NCTL 210-3196-1 and dated 9/26/05.

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*

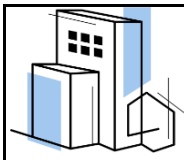
*ICC-ES Report ESR-2196 Hilti Self Drilling Screws to connect cold-formed steel*

*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, 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.



**Design Summary:**

The table below summarizes the product: Contours (S-2500) OSW 2-Panel 74" x 98" 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 (S-2500) OSW 2-Panel 74" x 98" | NCTL 210-3196-1 (9/26/05) | 74" x 98"    | +50 psf / -50 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)

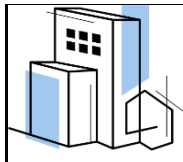
Wood Screw Lateral: 106 lbs

**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



### Summary of Test Results - Plastics Checklist

**Table 2:** Summary of Test Results - Plastics Checklist

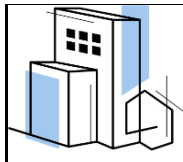
| Product             | Test Report Number | Test Standard                     | Performance        |
|---------------------|--------------------|-----------------------------------|--------------------|
| White PVC 1476 5110 | P6504.04-106-18 R0 | ASTM D638 (before and after G155) | +9.5%              |
|                     |                    | 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.

|                               |                   |          |                          |
|-------------------------------|-------------------|----------|--------------------------|
| 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.

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 Lateral Design - Single Shear

Input:   
Calculation:

**Screw Information:**

Screw Size:  Root Diameter:  in  
Screw Embed:  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:         | <input type="text" value="0.131"/> in  | Diameter                                  |
| $F_{yb}$ : | <input type="text" value="100"/> ksi   | Dowel Bending Yield Strength              |
| $F_{em}$ : | <input type="text" value="3,350"/> psi | Main Member dowel bearing strength        |
| $F_{es}$ : | <input type="text" value="3,350"/> psi | Side Member dowel bearing strength        |
| $l_m$ :    | <input type="text" value="1.5"/> in    | Main Member dowel bearing length          |
| $l_s$ :    | <input type="text" value="1.25"/> in   | Side Member dowel bearing length          |
| $R_d$ :    | <input type="text" value="2.2"/>       | Reduction term - Table 12.3.1B (NDS 2018) |
| $R_e$ :    | <input type="text" value="1"/>         | $= F_{em}/F_{es}$                         |
| $R_t$ :    | <input type="text" value="1.2"/>       | $= l_m/l_s$                               |
| $k_1$ :    | <input type="text" value="0.459"/>     | See Table                                 |
| $k_2$ :    | <input type="text" value="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)

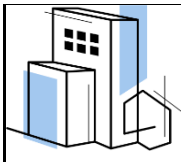
$Z_{II}$ :  lbs  $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$  (EQ 12.3 - 3)

$Z_{III_m}$ :  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  $Z_{IIs}$  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) |
| $C_{\Delta}$ : | 1.0 | Geometry Factor - Section 12.5.1.1 (NDS 2018)   |

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

### Fastener Bending Across Shim Space

|            |       |                                  |
|------------|-------|----------------------------------|
| $\Omega$ : | 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

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

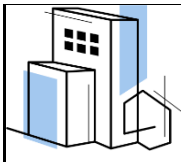
$Z_{II}$ : 114 lbs  $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$  (EQ 12.3 - 3)

$Z_{III_m}$ : 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  $Z_{III_s}$  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) |
| $C_{\Delta}$ : | 1.0 | Geometry Factor - Section 12.5.1.1 (NDS 2018)   |

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

**Fastener Bending Across Shim Space**

|            |       |                                  |
|------------|-------|----------------------------------|
| $\Omega$ : | 1.67  |                                  |
| L:         | 0.25  | in Maximum Shim Gap              |
| D:         | 0.131 | in Diameter                      |
| $F_{yb}$ : | 100   | ksi Dowel Bending Yield Strength |

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

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

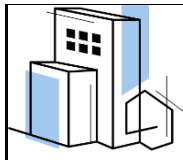
$$Z_n/\Omega: \boxed{106} \text{ lbs}$$

**Bearing on Masonry Strap**

|            |       |                               |
|------------|-------|-------------------------------|
| $\Omega$ : | 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: Tapcon Lateral Design

Input:   
Calculation:

**Tapcon Size:**

Size:   
D:  in Nominal Diameter  
D<sub>sh</sub>:  in Shank Diameter

**Fastener Shear Capacity - 3,000 psi Concrete**

P<sub>nv</sub>/Ω:  lbs See Table 1B of NOA 24-0102.06

**Fastener Shear Capacity - Medium-Weight CMU**

P<sub>nv</sub>/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<sub>sh</sub>:  in Shank Diameter of Tapcon  
F<sub>yb</sub>:  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<sub>n</sub>/Ω:  lbs

**Bearing Strength of Masonry Straps - AISI S100**

Size:  Tapcon Size  
D<sub>sh</sub>:  in Shank Diameter of Tapcon Screw  
F<sub>u</sub>:  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<sub>nv</sub>/Ω:  lbs