

Micah Swartz, P.E.	Project Number:	MS24-08007
	Project Name:	ID 364 HLOS HP - Envision
	Date:	8/25/2025

**Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design
R1: Administrative Update**

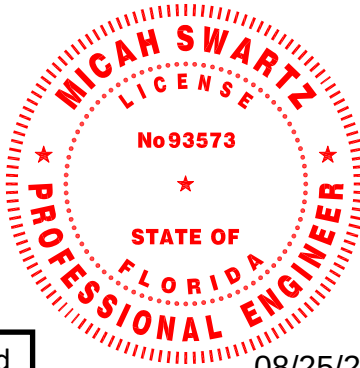
Project Number: MS24-08007

Drawing Number: 364-1

Reference Test Report: N4811.01-901-44 R0

Product Name: ID 364 HLOS HP - Envision 44x101.5

Prepared for:
VPI Quality Windows
3420 E. Ferry Avenue
Spokane, WA 99202



Prepared by:
Micah Swartz, P.E.

A handwritten signature in blue ink, appearing to read "Micah Swartz", written over a horizontal line.

08/25/25 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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Scope:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: ID 364 HLOS HP - Envision 44x101.5. This evaluation is based on testing performed by Intertek Building & Construction in Kent, WA, test report no.: N4811.01-901-44 R0 and dated 8/19/22.

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: ID 364 HLOS HP - Envision 44x101.5 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
ID 364 HLOS HP - Envision 44x101.5	N4811.01-901-44 R0 (8/19/22)	44" x 101.5"	+40 psf / -40 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: 10 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)
Wood Screw Lateral: 149 lbs

TEK Screw Information:

Screw Size: 10-16
TEK Withdrawal: 145 lbs
TEK Lateral: 147 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: 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)

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} :	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 :	0.538		See Table

Reference Lateral Design Values - Table 12.3.1A (NDS)

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

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

Z_{MIN}: lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{I_s} 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': **178** 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

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

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

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Subject: 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)

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_I: lbs $Z_{Im} = \frac{Dl_m F_{em}}{R_d}$ (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}: 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_{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)

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

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

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

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

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: TEK Lateral Design

Input:
 Calculation:

Shear Strength of Fastener - ESR 1976
 Screw Size: 10-16

 P_{nv}/Ω : 573 lbs See ESR-1976

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

Screw Size: 10-16
 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

Ω : 3.00

$$\frac{P_{nv1}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 3, AISI S100)$$

$$\frac{P_{nv2}}{\Omega} = 4.2 \sqrt{t^3 * D} * F_u - (EQ.J4.3.1 - 1, AISI S100)$$

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 VPI assembly and has been verified by testing.

Fastener Bending Across Shim Space

L: 0.25 in Maximum Shim Gap
 D: 0.138 in Root Diameter of TEK Screw
 F_{yb}: 100 ksi Yield Strength of TEK Screw

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 : 206 lbs

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Bearing Strength of Masonry Straps - AISI S100

Screw Size:	10-16	TEK Screw	Ω:	3.00
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	

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

P_{nv}/Ω: 147 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 TapconF_{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 Tapcon Size

D_{sh}: 0.19 in Shank Diameter of Tapcon ScrewF_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