Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design

Project Number: MS24-05002

Drawing Number: D1000384

Reference Test Report: q9100.01-303-44-r2

Product Name: LaCantina - Aluminum Swinging Door

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

MICAH SWARTZ LICENSE No 93573 STATE OF FLORIDA PROFESSIONAL ENGINEER

06/29/24

Prepared by:
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Scope:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: LaCantina - Aluminum Swinging Door. This evaluation is based on testing performed by Intertek in Lake Forest, CA, test report no.: q9100.01-303-44-r2 and dated 2/23/2024.

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.

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(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: LaCantina - Aluminum Swinging Door 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
LaCantina - Aluminum Swinging Door	q9100.01-303-44-r2 (2/23/24)	89.76 x 144	+ 35 psf / - 35 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

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

Input: [ ]
Calculation: [ ]

Screw Information:

Screw Size:	10	Root Diameter:	0.152 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:	Alum	G:	N/A	F_{es}:	22,000 psi	thickness (t_s):	0.0625 in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

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}:	22,000	psi	Side Member dowel bearing strength
l_m:	1.5	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:	0.1523		$= F_{em}/F_{es}$
R_t:	24.0		$= l_m/l_s$
k_1:	1.454		See Table
k_2:	0.595		See Table

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

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.

Z_{Im}: 347 lbs

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

Z_{II}: 138 lbs

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

Z_{IIIm}: 158 lbs

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

Z_{IV}: 139 lbs

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

Z_{MIN}: 138 lbs

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': **221** 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

Subject: Wood Screw Lateral Design - Single Shear

Input: | Calculation:

Screw Information:

Screw Size:	10		Root Diameter:	0.152	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:	Alum	G:	N/A	F_{es}:	22,000 psi	thickness (t_s):	0.0625 in

Lateral Design Factors - Table 12.3.1A (NDS 2018)

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}:	22,000	psi	Side Member dowel bearing strength
l_m:	1.5	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:	0.1523		$= F_{em}/F_{es}$
R_t:	24.0		$= l_m/l_s$
k_1:	1.454		See Table
k_2:	0.595		See Table

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

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.

Z_{Im}: 347 lbs

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

Z_{II}: 138 lbs

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

Z_{IIIm}: 158 lbs

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

Z_{IV}: 139 lbs

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

Z_{MIN}: 138 lbs

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': **221** 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

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

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

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

Ω: 3.00

L:	0.25	in	Maximum Shim Gap
D_{sh}:	0.19	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: 539 lbs

Bearing Strength of Masonry Straps - AISI S100

Ω: 3.00

Size:	1/4		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

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

P_{nv}/Ω: 203 lbs