

PRODUCT APPROVAL SUPPORTING CALCULATIONS

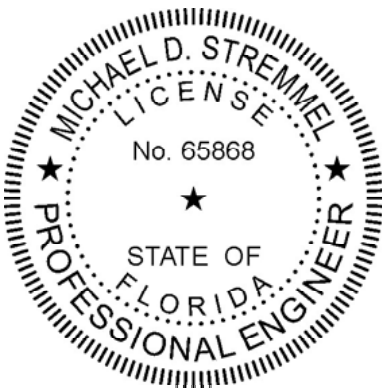
1618 Sliding Glass Door - XXX, 144 x 96, non-Impact

REPORT TO:

**MI WINDOWS AND DOORS, LLC
702 WEST MARKET ST
GRATZ, PENNSYLVANIA 17030**

REPORT NUMBER: 27488.13-107-16-R0

REPORT DATE: 12/12/23



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This item has been digitally signed and sealed by Michael D. Stremmel, PE on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

A handwritten signature in black ink, appearing to read "Michael D. Stremmel".

Michael D. Stremmel, PE
FL PE 65868
FL REG 37122

Scope

Molimo, LLC was contracted by MI Windows and Doors, LLC to evaluate glazing, installation methods and alternate installation methods for their Series 1618 Sliding Glass Doors. The evaluation is based on physical testing and product certifications.

The products considered in this report satisfy the requirements of the *Florida Building Code, Building 8th Edition (2023)* for the overall sizes and design pressures of the following product certifications and the installation methods presented in this report.

Table 1 Summary of Product Certifications and Limitations of Use

Series/Model	Product Certification	Overall Size (W x H)	Performance
1618 SGD (XXX) (non-Impact)	CPD 20481	144" x 96"	+50/-50 psf 8.36 psf Water Test

Notes: 1. See page 7 for sizes qualified by comparative analysis.

Reference standards utilized in this project include:

Florida Building Code, Building, 8th Edition (2023). International Code Council, 2023.

ANSI/AWC NDS-2018 National Design Specification (NDS) for Wood Construction. American Wood Council, 2018.

AISI S100-16 North American Specification for the Design of Cold-Formed Steel Structural Members, 2016. American Iron and Steel Institute, 2016.

ADM1-2020, 2020 Aluminum Design Manual. The Aluminum Association, Inc., 2020.

ICC-ES Report ESR-1976 *ITW Buildex TEKS Self-Drilling Fasteners*. ICC Evaluation Service. 07/2022.

NOA 21-0201.06 *Tapcon Concrete and Masonry Anchors with Advanced Threadform Technology*. Miami-Dade County Product Control Section. 02/01/21.

AAMA TIR A9-14 *Design Guide for Metal Cladding Fasteners*. American Architectural Manufacturers Association, 2014.

ASTM E1300-12ae1 Standard Practice for Determining Load Resistance of Glass in Buildings. ASTM International, 2012.

The anchorage analyses presented herein do not address the water resistance, water penetration or air infiltration performance of the installation method or the installed product. In addition, the analyses rely on the assumption that the building substrate is capable of withstanding incurred loads.

Certification of Independence

In accordance with Rule 61G20-3 Florida Administrative Code, Molimo, LLC hereby certifies the following:

- Molimo, 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 agency.
- Molimo, LLC is not owned, operated or controlled by any company manufacturing or distributing products it tests or labels.
- Michael D. Stremmel, 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.
- Michael D. Stremmel, P.E. does not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

Analyses

Summary of Test Results

The following table summarizes the various 1618 Sliding Glass Door products and their corresponding performance levels which have been established by testing or product certification.

Table 2 Summary of Test Results

Series/Model	Test Report Number	Product Certification	Size (W x H)	Performance
1618 SGD (XXX) (non-Impact)	11982.01-106-11 (Revision -, 12/01/22)	CPD 20481	144" x 96"	+50/-50 psf 8.36 psf Water Test

Testing documented in Table 1 was conducted by Molimo, LLC. in York, Pennsylvania. (Florida Department of Business & Professional Regulation Test Lab No. TST11282, IAS Laboratory Certification TL-678).

Glazing Evaluation

The glazing is evaluated with ASTM E1300-12ae1 *Standard Practice for Determining Load Resistance of Glass in Buildings* assuming four-sided support. Glazing constructions are listed in Table 3. Glazing analyses are presented on page 9 and summarized in Table 4.

Table 3 Glazing Constructions

Glass Type	Glazing Construction
7/8" IG	3/16" Tempered Glass (Exterior) 1/2" Aluminum Reinforced Butyl Spacer 3/16" Tempered Glass (Interior)

Table 4 Glazing Analyses

Product	Glass Type	Glass Size	Load Resistance
1618 SGD – non-Impact	7/8" IG	42-1/4" x 85"	210 psf

Calculated load resistances exceed the claimed design pressures thereby validating the glazing.

As-Tested Installation Analysis

For air/water/structural testing, the test specimens were secured to a pine buck as summarized in Table 5. The as-tested installation methods are evaluated on page 10 to page 13 and the established design capacities are presented in Table 5.

Table 5 As-tested Anchorage Design Capacities

Test	Connection	Capacity
1618 SGD (XXX) Air/Water/Structural Tests	<u>Sill</u> Strap anchor secured to frame with one (1) #8 x 5/8" screws and secured to the pine buck with one (1) #8 x 1-1/2" screw. Placed approximately 12" on center.	156 lb
	<u>Jambs</u> #10 x 2" screw placed 12" on center	156 lb (per screw)
	<u>Head</u> #10 x 3" screw pairs placed 12" on center	

The capacities presented in Table 5 will be used to prove acceptable alternate anchors and substrates for the doors.

Alternate Anchorages

Calculations on page 14 through page 16 determine the design capacity of alternate strap anchor installation anchorages for the door. The alternate anchorage capacities are summarized in Table 6.

Table 6 Alternate Anchorage Capacities for Strap Anchor Installation

Substrate	Anchor	Capacity	Comments
18 Gauge Steel Stud	#10-16 TEKS Screw	155 lb	1. 33 KSI yield strength stud. 2. Full penetration +3 threads. 3. Limited by bending capacity.
Concrete	3/16" Tapcon	164 lb	1. Minimum $f'_c = 3,000$ psi. 2. 1-1/2" Minimum Embedment. 3. 2" Min. Edge Distance. 4. Limited by shear capacity. 5. Maximum 1x buck strip.
CMU	1/4" Tapcon	161 lb	1. Minimum ASTM C90 CMU. 2. 1-1/2" Minimum Embedment. 3. 2" Min. Edge Distance. 4. Limited by shear capacity. 5. Maximum 1x buck strip.

Note: 18-gauge steel strap anchor (part 9859).

Calculations on page 17 through page 19 determine the design capacity of alternate through-frame installation anchorages for the door. The alternate anchorage capacities are summarized in Table 7.

Table 7 Alternate Anchorage Capacities for Through-Frame Installation

Substrate	Anchor	Capacity	Comments
18 Gauge Steel Stud	#10-16 TEKS Screw	155 lb	1. 33 KSI yield strength stud. 2. Full penetration +3 threads. 3. Limited by bending capacity.
Concrete	3/16" Tapcon	186 lb	1. Minimum $f'_c = 3,000$ psi. 2. 1-1/2" Minimum Embedment. 3. 2" Min. Edge Distance. 4. Limited by shear capacity. 5. Maximum 1x buck strip.
CMU	1/4" Tapcon	161 lb	1. Minimum ASTM C90 CMU. 2. 1-1/2" Minimum Embedment. 3. 2" Min. Edge Distance. 4. Limited by shear capacity. 5. Maximum 1x buck strip.

Note: Maximum available length of 3/16" Tapcon anchor is 3-1/4". Use 1/4" x 4" Tapcon anchors for through-frame installations with 1x buck strip.

Anchorage Requirements

Because all alternate strap anchor anchorages and alternate through-frame anchorages evaluated by this report have equal or higher design capacities than the tested anchorages, the alternate strap anchorages and alternate-through frame anchorages proposed by this report may be used for the doors at the as-tested spacing.

Comparative Analysis

The compared products are an alternate-size version of the tested products. Calculations are performed to establish design pressures for the compared products that would cause the same proportional deflection of spanning members (stiles), concentrated loads and member stresses as proven by the tested products as required by Florida Building Code §1709.5.1.3.i. Several potential design pressures are calculated and the proposed design pressure of the compared product shall be the least of the calculated design pressures. Compared panel areas may not exceed the panel area of the tested product. Calculations are presented on page 20 and summarized in the following tables.

Table 8 Results of Comparative Analysis

1618 XXX Horizontal Sliding Door (non-Impact) Doors Installed with 8390 Sill Extender						
Panel Height (in)	Design Pressure (psf) for Panel Width (inch)					
	24	30	36	42	48	54
75 (80 Door Height)	+55.0 -85.0	+55.0 -85.0	+55.0 -77.9	+55.0 -70.8	+55.0 -65.8	+55.0 -62.4
79 (84 Door Height)	+55.0 -85.0	+55.0 -82.8	+55.0 -72.8	+55.0 -65.9	+55.0 -61.0	+55.0 -57.5
85 (90 Door Height)	+55.0 -85.0	+55.0 -75.6	+55.0 -66.2	+55.0 -59.7	+55.0 -55.0	-
91 (96 Door Height)	+55.0 -83.0	+55.0 -69.6	+55.0 -60.7	+/-54.5	+/-50.0	-

Notes: 1. Positive design pressure is limited by water test to 55 psf with 8390 sill extender.
 2. Structural design pressures are not limited by glass strength (see page 21).

Table 9 Results of Comparative Analysis – Installed Under Overhang

1618 XXX Horizontal Sliding Door (non-Impact) Doors Installed Under Overhang In Accordance with FBC §1709.5.1.2						
Panel Height (in)	Design Pressure (psf) for Panel Width (inch)					
	24	30	36	42	48	54
75 (80 Door Height)	+/-85.0	+/-85.0	+/-77.9	+/-70.8	+/-65.8	+/-62.4
79 (84 Door Height)	+/-85.0	+/-82.8	+/-72.8	+/-65.9	+/-61.0	+/-57.5
85 (90 Door Height)	+/-85.0	+/-75.6	+/-66.2	+/-59.7	+/-55.0	-
91 (96 Door Height)	+/-83.0	+/-69.6	+/-60.7	+/-54.5	+/-50.0	-

Notes: 1. Door installed where the overhang ratio ≥ 1 are not limited by water test pressure in accordance with FBC §1709.5.1.2.
 2. Structural design pressures are not limited by glass strength (see page 21).

Attachments

Appendix A – Revision Log (1 page)

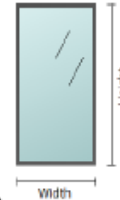
Glazing Analyses

non- Impact Glass

February 02, 2023

Glazing Information

Supported Edges:	Four sides simply supported
Shape:	Rectangular
Lite Width:	42.2 in.
Lite Height:	85.0 in.
Glazing Angle:	90.0 °



Glazing Construction (Double Glazed Insulating Unit)

- Exterior Lite (Monolithic 3/16 in. Fully Tempered)
 Airspace (0.500 in.)
- Interior Lite (Monolithic 3/16 in. Fully Tempered)

Comparisons

Short Duration	
50.0 psf 3.00 sec ≤ 210 psf	OK
Approximate center of glass deflection	
Exterior Lite	0.58 in.
Interior Lite	0.58 in.

Notes

Load resistance values are computed in accordance with ASTM E1300-12 Section 6

As-Tested Installation – Strap Anchor to Wood

#10 x 1-1/2" Wood Screw securing strap anchor to wood

(1) #8 x 5/8" screws securing strap to PVC frame.

18 gauge (0.043" thick) steel strap anchor ($F_y = 33,000$ psi, $F_u = 45,000$ psi)

1/4" Maximum Shim Space

Spruce-Pine-Fir Wood Substrate Minimum ($G=0.42$)

Allowable Shear of #10 x 1-1/2" Wood Screw

$Z' = 156$ lb (Limited by Mode III_s, See Following 2 Pages)

Allowable Shear of #8 Grade 2 Screw

$V_a = 177$ lb per screw (AAMA TIR A9-14)

Bearing of #8 Screw on Strap Anchor

$V_a = 2.7DtF_{tw}/\Omega$
 $V_a = 2.7(0.164")(0.043")(45,000 \text{ psi})/3.0$
 $V_a = 286$ lb per screw

Bearing of #8 Screw on PVC Frame

$V_a = DtF_p = (0.164")(0.100")(10,000 \text{ psi}) = 164$ lb per screw

Bending of #10 x 1-1/2" Wood Screw

$L = 1/4"$ (maximum shim space)
 $S = \pi d^3/32 = \pi(0.152)^3/32 = 0.000345 \text{ in}^3$
 $F_b = (1.3)(0.6F_y) = (1.3)(0.6)(80,000 \text{ psi}) = 62,400$ psi (1.3 for weak axis bending)
 $F_b = M/S = (VL/2)/S$ ($L/2$ for guided bending)
 $V = 2SF_b/L = (2)(0.000345 \text{ in}^3)(62,400 \text{ psi})/0.25" = 172$ lb.

Capacity of Connection is 156 lb

As-Tested Installation – Strap Anchor to Wood (Continued)

Lateral Design Strength of Wood Connections

Data

Fastener			
Fastener	=	#10 Wood Screw	
Shank Dia	=	0.190	in.
Root Dia.	=	0.152	in.
F_{yb}	=	80,000	psi
Fastener length	=	1.500	in.
Main Member			
Material	=	SPF	
G	=	0.42	
θ	=	90	$\leq$ (Angle of load to grain $0^\circ \leq \theta \leq 90^\circ$)
F_e	=	3,350	psi
Thickness	=	1.500	in.
Side Member			
Material	=	ASTM A 653, Grade 33 Steel	
G	=	N/A	
θ	=	90	$\leq$ (Angle of load to grain $0^\circ \leq \theta \leq 90^\circ$)
F_{es}	=	61,850	psi
Thickness	=	0.043	in.

Calculations

Lateral Bearing Factors

D	=	0.152	in.
ℓ_m	=	1.077	in.
K_θ	=	1.25	
K_D	=	2.20	
R_e	=	0.054	
R_t	=	25.05	
k_1	=	0.5560	
k_2	=	0.5684	
k_3	=	20.16	

As-Tested Installation – Strap Anchor to Wood (Continued)

Yield Mode	R_d
I_m, I_s	2.20
II	2.20
III_m, III_s, IV	2.20

Lateral Design Values, Z

Mode I_m	=	249	lbf
Mode I_s	=	184	lbf
Mode II	=	102	lbf
Mode III_m	=	128	lbf
Mode III_s	=	98	lbf
Mode IV	=	137	lbf
C_D	=	1.6	

<===== Minimum Value

Wet Service Factor

Fabrication/In-Service Dry/Dry

C_M = 1.0

In service temperature $T \leq 100^\circ\text{F}$

C_t = 1.0

C_g = 1.0

C_{Δ} = 1.0

Is fastener installed in end grain? No

C_{eg} = 1.00

Is fastener part of a diaphragm? No

C_{di} = 1.0

Is fastener toe-nailed? No

C_{tn} = 1.00

Z' = 156 lbf

As-Tested – Through-Frame to Wood

#10 x 3" Wood Screw through-frame to wood

PVC Frame; 0.100" thickness at fastener location

1/4" Maximum Shim Space

Spruce-Pine-Fir Wood Substrate Minimum (G=0.42)

Allowable Shear of #10 x 3" Wood Screw

$Z' = 156 \text{ lb}$ (See page 8 to page 9)

Bearing of #10 x 3" Wood Screw on Frame

$$V_a = DtF_p$$

$$V_a = (0.190")(0.100")(10,000 \text{ psi})$$

$$V_a = 190 \text{ lb}$$

Bending of #10 x 3" Wood Screw

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3/32 = \pi(0.152)^3/32 = 0.000345 \text{ in}^3$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(80,000 \text{ psi}) = 62,400 \text{ psi (1.3 for weak axis bending)}$$

$$F_b = M/S = (VL/2)/S \text{ (L/2 for guided bending)}$$

$$V = 2SF_b/L = (2)(0.000345 \text{ in}^3)(62,400 \text{ psi})/0.25" = 172 \text{ lb}$$

Capacity of Connection is 156 lb per screw

Alternate Installation – Strap Anchor to Steel Stud

#10-16 TEKS Screw securing strap anchor to steel stud

18 gauge (0.0428" thick) steel stud ($F_y = 33,000$ psi, $F_u = 45,000$ psi)

18 gauge (0.043" thick) steel strap anchor ($F_y = 33,000$ psi, $F_u = 45,000$ psi)

1/4" Maximum Shim Space

Allowable Shear of #10-16 TEKS Screw

$$P_{ss}/\Omega = 573 \text{ lb (ESR-1976)}$$

Bearing of #10-16 TEKS Screw on Strap Anchor

$$\begin{aligned} V_a &= 2.7DtF_{tu}/\Omega \\ V_a &= 2.7(0.190")(0.043")(45,000 \text{ psi})/3.0 \\ V_a &= 331 \text{ lb.} \end{aligned}$$

Bearing of #10-16 TEKS Screw on Steel Stud

$$\begin{aligned} V_a &= 2.7DtF_{tu}/\Omega \\ V_a &= 2.7(0.190")(0.0428")(45,000 \text{ psi})/3.0 \\ V_a &= 329 \text{ lb.} \end{aligned}$$

Tilting of #10-16 TEKS Screw in Steel Stud

$$\begin{aligned} V_a &= 4.2(t_2^3 D)^{1/2} F_{tu2}/n_s \\ V_a &= 4.2(0.0428''^3 \times 0.190'')^{1/2} (45,000 \text{ psi})/3.0 \\ V_a &= 243 \text{ lb.} \end{aligned}$$

Bending of #10-16 TEKS Screw

$$\begin{aligned} L &= 1/4" \text{ (Maximum Shim Space)} \\ S &= \pi d^3/32 = \pi(0.140)^3/32 = 0.000269 \text{ in}^3 \\ F_b &= (1.3)(0.6F_y) = (1.3)(0.6)(92,000 \text{ psi}) = 71,760 \text{ psi (1.3 for weak axis bending)} \\ F_b &= M/S = (VL/2)/S \text{ (L/2 for guided bending)} \\ V &= 2SF_b/L = (2)(0.000269 \text{ in}^3)(71,760 \text{ psi})/0.25" = 155 \text{ lb.} \end{aligned}$$

Capacity of Connection is 155 lb.

Alternate Installation – Strap Anchor to Concrete

3/16" Tapcon Anchor; 1-1/2" Minimum Embedment; 2" Minimum Edge Distance

PVC Frame, 0.100" thickness at fastener location

Minimum $f'_c = 3,000$ psi Concrete

18 gauge (0.043" thick) steel strap anchor ($F_y = 33,000$ psi, $F_u = 45,000$ psi)

1/4" Maximum Shim Space

Allowable Shear of 3/16" Tapcon Anchor

$$V_a = 186 \text{ lb} \quad (\text{NOA-No. 16-1222.06})$$

Bearing of 3/16" Tapcon Anchor on Strap Anchor

$$\begin{aligned} V_a &= 2.7D_tF_{tu}/\Omega \\ V_a &= 2.7(0.188")(0.043")(45,000 \text{ psi})/3.0 \\ V_a &= 327 \text{ lb.} \end{aligned}$$

Bending of 3/16" Tapcon

$$\begin{aligned} L &= 1/4" \text{ (Maximum Shim Space)} \\ S &= \pi d^3/32 = \pi(0.145")^3/32 = 0.000299 \text{ in}^3 \\ F_b &= (1.3)(0.6F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \text{ (1.3 for weak axis bending)} \\ F_b &= M/S = (VL/2)/S \text{ (L/2 for guided bending)} \\ V &= 2SF_b/L = (2)(0.000299 \text{ in}^3)(106,860 \text{ psi})/0.25" = 256 \text{ lb.} \end{aligned}$$

Capacity of Connection is 186 lb

Limited to 164 lb capacity of one (1) #8 x 5/8" screw securing strap to frame.

Qualifies 1/4" Tapcon if longer length anchor is required to achieve minimum embedment.

Alternate Installation – Strap Anchor to CMU

1/4" Tapcon Anchor; 1-1/2" Minimum Embedment, 2" Minimum Edge Distance

PVC Frame, 0.100" thickness at fastener location

Minimum ASTM C90 Concrete Masonry Unit

18 gauge (0.043" thick) steel strap anchor ($F_y = 33,000$ psi, $F_u = 45,000$ psi)

1/4" Maximum Shim Space

Allowable Shear of 1/4" Tapcon Anchor

$$V_a = 161 \text{ lb} \quad (\text{NOA-No. 16-1222.06})$$

Bearing of 1/4" Tapcon Anchor on Strap Anchor

$$\begin{aligned} V_a &= 2.7D_tF_{tu}/\Omega \\ V_a &= 2.7(0.250")(0.043")(45,000 \text{ psi})/3.0 \\ V_a &= 435 \text{ lb.} \end{aligned}$$

Bending of 1/4" Tapcon

$$\begin{aligned} L &= 1/4" \text{ (Maximum Shim Space)} \\ S &= \pi d^3/32 = \pi(0.190")^3/32 = 0.000673 \text{ in}^3 \\ F_b &= (1.3)(0.6F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \text{ (1.3 for weak axis bending)} \\ F_b &= M/S = (VL/2)/S \text{ (L/2 for guided bending)} \\ V &= 2SF_b/L = (2)(0.000673 \text{ in}^3)(106,860 \text{ psi})/0.25" = 575 \text{ lb.} \end{aligned}$$

Capacity of Connection is 161 lb

Alternate Installation – Trough-Frame to Steel Stud

#10-16 TEKS Screw

PVC Frame; 0.100" thickness at fastener location

1/4" Maximum Shim Space

Minimum 18 gauge 33 KSI Steel Stud

Allowable Shear of #10-16 TEKS Screw

$$P_{ss}/\Omega = 573 \text{ lb (ESR-1976)}$$

Bearing of #10-16 TEKS Screw on Frame

$$V_a = DtF_p$$

$$V_a = (0.190")(0.100")(10,000 \text{ psi})$$

$$V_a = 190 \text{ lb}$$

Bearing of #10-16 TEKS Screw on Steel Stud

$$V_a = 2.7DtF_{tu}/\Omega$$

$$V_a = 2.7(0.190")(0.0428")(45,000 \text{ psi})/3.0$$

$$V_a = 329 \text{ lb.}$$

Tilting of #10-16 TEKS Screw in Steel Stud

$$V_a = 4.2(t_2^3 D)^{1/2} F_{tu2}/n_s$$

$$V_a = 4.2(0.0428''^3 \times 0.190'')^{1/2} (45,000 \text{ psi})/3.0$$

$$V_a = 243 \text{ lb.}$$

Bending of #10-16 TEKS Screw

$$L = 1/4" \text{ (Maximum Shim Space)}$$

$$S = \pi d^3/32 = \pi(0.140)^3/32 = 0.000269 \text{ in}^3$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(92,000 \text{ psi}) = 71,760 \text{ psi (1.3 for weak axis bending)}$$

$$F_b = M/S = (VL/2)/S \text{ (L/2 for guided bending)}$$

$$V = 2SF_b/L = (2)(0.000269 \text{ in}^3)(71,760 \text{ psi})/0.25" = 155 \text{ lb.}$$

Capacity of Connection is 155 lb.

Alternate Installation – Through-Frame to Concrete

3/16" Tapcon Anchor

1-1/2" Minimum Embedment; 2" Minimum Edge Distance

1/4" Maximum Shim Space

PVC Frame, 0.100" thickness at fastener location

Minimum $f'_c = 3,000$ psi Concrete

Allowable Shear of 3/16" Tapcon Anchor

$$V_a = 186 \text{ lb} \quad (\text{NOA-No. 16-1222.06})$$

Bearing of 3/16" Tapcon Anchor on Frame

$$\begin{aligned} V_a &= DtF_p \\ V_a &= (0.188")(0.100")(10,000 \text{ psi}) \\ V_a &= 188 \text{ lb} \end{aligned}$$

Bending of 3/16" Tapcon

$$\begin{aligned} L &= 1/4" \text{ (Maximum Shim Space)} \\ S &= \pi d^3/32 = \pi(0.145")^3/32 = 0.000299 \text{ in}^3 \\ F_b &= (1.3)(0.6F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \text{ (1.3 for weak axis bending)} \\ F_b &= M/S = (VL/2)/S \text{ (L/2 for guided bending)} \\ V &= 2SF_b/L = (2)(0.000299 \text{ in}^3)(106,860 \text{ psi})/0.25" = 256 \text{ lb.} \end{aligned}$$

Capacity of Connection is 186 lb

Qualifies 1/4" Tapcon if longer length anchor is required to achieve minimum embedment.

Alternate Installation – Through-Frame to CMU

1/4" Tapcon Anchor

1-1/2" Minimum Embedment, 2" Minimum Edge Distance

1/4" Maximum Shim Space

PVC Frame, 0.100" thickness at fastener location

Minimum ASTM C90 Concrete Masonry Unit

Allowable Shear of 1/4" Tapcon Anchor

$$V_a = 161 \text{ lb} \quad (\text{NOA-No. 16-1222.06})$$

Bearing of 1/4" Tapcon Anchor on Frame

$$\begin{aligned} V_a &= DtF_p \\ V_a &= (0.250")(0.100")(10,000 \text{ psi}) \\ V_a &= 250 \text{ lb} \end{aligned}$$

Bending of 1/4" Tapcon

$$\begin{aligned} L &= 1/4" \text{ (Maximum Shim Space)} \\ S &= \pi d^3/32 = \pi(0.190")^3/32 = 0.000673 \text{ in}^3 \\ F_b &= (1.3)(0.6F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \text{ (1.3 for weak axis bending)} \\ F_b &= M/S = (VL/2)/S \text{ (L/2 for guided bending)} \\ V &= 2SF_b/L = (2)(0.000673 \text{ in}^3)(106,860 \text{ psi})/0.25" = 575 \text{ lb.} \end{aligned}$$

Capacity of Connection is 161 lb

Comparative Analyses

Sliding Door Comparative Analysis

AAMA 2502-19
 Florida Building Code 1709.5.1
 International Building Code 1709.5
 International Residential Building Code R609.3.1

Manufacturer: MI Windows and Doors

Product: 1618 SGD

Test Report: 11982.01-106-11

Panel Height: 91 inch

Panel Width: 49 inch

Design Pressure: 50 psf

Test Door	DP (psf)	Panel Height (inch)	Panel Width (inch)	Load Area (ft ²)	K	B	C	DP Stress (psf)	DP Defl (psf)	DP Point Load (psf)	DP (psf)	Panel Area OK?
	50	91	49	11.31	0.27	6.465	63.18	135.5	162.9	104.3	104.3	YES
		75	25	5.43	0.17	6.923	67.06	111.5	134.5	88.3	88.3	YES
		75	31	6.40	0.21	6.726	65.36	95.8	116.0	77.9	77.9	YES
		75	37	7.26	0.25	6.552	63.90	85.1	103.4	70.8	70.8	YES
		75	43	7.99	0.29	6.402	62.67	77.5	94.6	65.8	65.8	YES
		75	49	8.59	0.33	6.275	61.68	72.2	88.5	62.4	62.4	YES
		75	55	9.07	0.37	6.172	60.92	121.7	138.8	98.0	98.0	YES
		79	25	5.77	0.16	6.968	67.45	99.9	114.4	82.8	82.8	YES
		79	31	6.84	0.20	6.775	65.78	85.6	98.3	72.8	72.8	YES
		79	37	7.77	0.23	6.604	64.33	75.8	87.3	65.9	65.9	YES
		79	43	8.59	0.27	6.454	63.09	68.8	79.5	61.0	61.0	YES
		79	49	9.27	0.31	6.325	62.06	63.7	74.0	57.5	57.5	YES
		79	55	9.84	0.35	6.217	61.24	104.6	110.9	89.9	89.9	YES
		85	25	6.29	0.15	7.029	67.98	85.7	91.0	75.6	75.6	YES
		85	31	7.48	0.18	6.843	66.37	73.2	78.0	66.2	66.2	YES
		85	37	8.54	0.22	6.676	64.94	64.5	68.9	59.7	59.7	YES
		85	43	9.48	0.25	6.527	63.69	58.2	62.4	55.0	55.0	YES
		85	49	10.29	0.29	6.397	62.63	53.6	57.7	51.5	51.5	NO
		85	55	10.98	0.32	6.284	61.75	91.0	90.0	83.0	83.0	YES
		91	25	6.81	0.14	7.083	68.45	74.3	73.7	69.6	69.6	YES
		91	31	8.13	0.17	6.904	66.89	63.3	63.0	60.7	60.7	YES
		91	37	9.31	0.20	6.742	65.50	55.6	55.4	54.5	54.5	YES
		91	43	10.38	0.24	6.595	64.26	50.0	50.0	50.0	50.0	YES
		91	49	11.31	0.27	6.465	63.18	45.8	46.0	46.6	45.8	NO
		91	55	12.13	0.30	6.350	62.26					

Product Line Glazing Analysis

Glazing Strength – 7/8" IG						
Door Height (in)	Glazing Strength (psf) for Panel Width (inch)					
	24	30	36	42	48	54
80	659	386	294	281	278	266
84	647	374	279	262	261	251
90	631	362	261	232	232	-
96	618	352	246	211	210	-
102	606	344	233	192	-	-
108	597	337	223	181	-	-
114	590	331	217	-	-	-
118	586	327	213	-	-	-
120	584	325	212	-	-	-
126	578	320	-	-	-	-
132	573	316	-	-	-	-
138	568	312	-	-	-	-
144	563	308	-	-	-	-

Notes: 1. DLO is Door Height – 11" x Panel Width – 6"

Appendix A

Revision Log

<u>Identification</u>	<u>Date</u>	<u>Page & Revision</u>
Original Issue	12/12/23	Not Applicable