

Prepared with Cooperation from:

December 16, 2020

Window Craftsmen Inc.
6031 Clark Center Avenue
Sarasota, FL 34238

Anchor Calculations,:
Installation of Prime Door
In Aluminum, Wood or Concrete and Masonry Openings

Door Series: Aluminum Prime Entry Outswing Door

Reference: Test Report CTLA 1297W/W=1965 Report Date: 10/18/04;

NAMI# NI005907

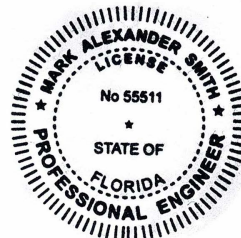
Testing Facility: Certified Testing Laboratories
7252 Narcoossee Road
Orlando, FL 32822

Test Standards: E330-02/14/ E547-00

Specimen: 37.50" x 80.75" Prime Entry Outswing Door,

Glazing: 1/8" Tempered Glass

Design Pressure: +55psf/-55psf



Digitally
signed by Mark
Smith
Date:
2020.12.23
20:39:54[®]
-05'00'

Mark A. Smith, P.E.
Florida No. 55511
3738 Kingswood Drive
Sarasota, FL 34232

Window Craftsmen, Inc.
Prime Entry Door

Notes:

Anchor calculations are based on approved installation instructions and:

- 1) Concrete or masonry substrate where one by, non-structural, wood bucking is employed, use 3/16" ITW Tapcon anchors of sufficient length to achieve a minimum embedment of 1-1/4" into concrete or masonry.
- 2) Concrete substrate where wood bucking is not employed, use 3/16" ITW Tapcon anchors of sufficient length to achieve a minimum embedment of 1-1/4" into concrete or masonry.
- 3) Wood Frame substrate, use #10 wood screws of sufficient embedment of 1-1/2" into wood framing.
- 4) Aluminum Frame substrate, #12 Tek screw of sufficient length to allow full thread engagement through aluminum. Reference Aluminum Design Manual, Allowable stress design, 5.4.
- 5) Maximum allowable shim thickness shall be 1/4". A load bearing shim shall be located at each anchor.
- 6) Anchor calculations and analysis comply with the current Florida Building Code.

Tested Installation Anchor Information

- Three (3) #10 x 1.50" Phillips flat head S.M.S. fasteners located in the sill at 3.50", 17.50" and 32.00" measuring from the hinge jamb. Two (2) #10 x 1.50" Phillips F.H. S.M.S. fasteners were used to secure the frame head located at 6", and 30" measured from the hinge jamb. Five (5) #10 x 1.50" Phillips F.H.S.M.S. fasteners used to fasten lock stile jamb located at 5.75", 22.75", 39.50", 56.50" and 73.50" measuring from sill to frame head. Three (3) #8 x 1.50" Phillips F.H.S.M.S. fasteners were used located at 8.00", 39.50" and 71.00" measuring from frame sill to frame head.

Anchors to be qualified:

1. #10 wood screws for installation in wood substrates.
2. 3/16" ITW Tapcons for installation in concrete and masonry substrates.
3. #12 Tek screws for installation into aluminum substrates.

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Anchor Calculations:

#10 wood screw
1-1/2" embedment

Head & Sill

Shear:

Proof load 80 ksi
Root diameter = .150 in.
Allowable Shear=353 pounds
NDS min lateral load in wood with metal for #10 wood screw is 121 pounds

Bending:

Allowable bending stress=64 ksi
Cantilever=.156" , Moment arm=.094
Allowable bending load=230 pounds

Jamb

Shear:

Proof load 80 ksi
Root diameter = .150 in.
Shear=353 pounds
NDS min lateral load in wood with metal for #10 wood screw is 121 pounds

Bending:

Allowable bending stress=64 ksi
Cantilever=.156" , Moment arm=.094
Allowable bending load=230 pounds

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3/16" Tapcon
1-1/4" embedment
2000psi concrete

Head & Sill

Shear:

Yield Strength = 92 ksi
Allowable shear stress 23 ksi
Allowable shear load = 406 pounds
Allowable lateral load = 170 pounds

Bending:

Root dia=.150
Allowable bending stress=73.6 ksi
Cantilever=.156" , Moment arm=.094
Allowable bending load=259 pounds

Jambs

Shear:

Yield Strength = 92 ksi
Allowable shear stress 23 ksi
Allowable shear load = 406 pounds
Allowable shear= 170 pounds

Bending:

Root dia=.150
Allowable bending stress=73.6 ksi
Cantilever=.209" , Moment arm=.094
Allowable bending load=259 pounds

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#12 TEK Screw

Min .045" thick aluminum

Head & Sill

Shear:

Proof load 80 ksi

Root diameter = .171 in.

Allowable shear stress 20 ksi

Shear=459 pounds

Shear shall not exceed the least of:

$$2 \times F_{tu1} / x D \times t_1 / \nu = (2)(22000)(.206)(.045/1.95) = 209 \text{ lbs}$$

$$2 \times F_{tu2} \times D \times t_2 / \nu = (2)(22000)(.206)(.045/1.95) = 209 \text{ lbs}$$

$$4.2 \times ((t_2)^3 \times D)^{1/2} \times F_{tu2} / \nu \text{ for } t_2 \leq t_1. 4.2(((.045^3)(.206))^{1/2})(22000/3) = 127 \text{ lbs}$$

$$P_{ns} / 1.25 \nu = 459 / (1.25 \times 3) = 122.4$$

Bending:

Allowable bending stress=64 ksi

Cantilever=.156" , Moment arm=.094

Allowable bending load=584 pounds

Jamb

Shear:

Proof load 80 ksi

Root diameter = .171 in.

Allowable shear stress 20 ksi

Shear=459 pounds

Shear shall not exceed the least of:

$$2 \times F_{tu1} / x D \times t_1 / \nu = (2)(22000)(.206)(.045/1.95) = 209 \text{ lbs}$$

$$2 \times F_{tu2} \times D \times t_2 / \nu = (2)(22000)(.206)(.045/1.95) = 209 \text{ lbs}$$

$$4.2 \times ((t_2)^3 \times D)^{1/2} \times F_{tu2} / \nu \text{ for } t_2 \leq t_1. 4.2(((.045^3)(.206))^{1/2})(22000/3) = 127 \text{ lbs}$$

$$P_{ns} / 1.25 \nu = 459 / (1.25 \times 3) = 122.4$$

Bending:

Allowable bending stress=64 ksi

Cantilever=.156" , Moment arm=.094

Allowable bending load=584 pounds

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Load on 37.50" header or sill:
Area=703 square in=4.88 square feet
Design pressure= 55psf
Total load = 268 pounds

Load on 80.75" Jambs:
Area=1163 square in=8.07 square feet
Design Pressure= 55psf
Total load= 444 pounds

Minimum Anchors required, #10 wood screw:

Spacing, Locations End Distance & # of Anchors/Location:

Head or Sill: 14.75"	3 Locations	4" End Distance	1 Anchor/Loc
Frame Jambs: 17.1"	5 Locations	5.75" End Distance	1 Anchors/Loc

Verify Anchor Locations Required exceeds # of Anchor Locations during Testing:

Head or Sill:	3 Locations Required >	2/3 Locations Tested
Frame Jambs:	5 Locations Required >	5/3 Locations Tested

#10 Wood Anchor:

Head or Sill Capacity:	361 lbs.	>	268 lbs.	OK
Jamb Capacity:	605 lbs.	>	444 lbs.	OK

#12 Tek Screw:

Head or Sill:	381 lbs.	>	268 lbs.	OK
Jamb Capacity:	635lbs .	<	444 lbs.	OK

Dade Shear and Bending Load on lesser screw

$$(fb/Fb)+(fv/Fv)^2=<1.0$$

$$\text{Head or Sill: } (0.345)+(0.064)=(0.452)<1.0$$

$$\text{Jambs: } (0.386)+(0.063)=(0.449)<1.0$$

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Minimum Anchors required, 3/16 Tapcon:

Spacing, Locations End Distance & # of Anchors/Location:

Head or Sill: 14-3/4"	3 Locations	4" End Distance	1 Anchors/Loc
Frame Jambs: 17 1/8"	5 Locations	5.75" End Distance	1 Anchors/Loc

Verify Anchor Locations Required exceeds # of Anchor Locations during Testing:

Head or Sill:	3 Locations Required =	3 Locations Tested
Frame Jambs:	5 Locations Required =	5 Locations Tested

3/16" Tapcon:

Head or Sill Capacity:	510 lbs.	>	268 lbs	OK
Jamb Capacity:	850 lbs.	>	444 lbs.	OK

Dade Shear and Bending Load on screw

$$(fb/Fb)+(fv/Fv)^2 \leq 1.0$$

$$\text{Head or Sill: } (0.388)+(0.048)=(0.436) < 1.0$$

$$\text{Jambs: } (0.571)+(0.048)=(0.619) < 1.0$$

Anchor Locations Required (37-1" X 80.75") # 10 wood screw, 3/16" Tapcon and #12 Tek Screw:

Spacing, Locations End Distance & # of Anchors/Location:

Head or Sill: 14-3/4"	3 Locations	4" End Distance	1 Anchors/Loc
Frame Jamb: 17-1/8"	5 Locations	5.75" End Distance	1 Anchors/Loc

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