

Prepared with Cooperation from:
Window Craftsmen Inc.
6031 Clark Center Avenue
Sarasota, FL 34238

November 17, 2020

Anchor Calculations:
Installation of Insulated Glass Vinyl Picture Window
In Aluminum, Wood or Concrete and Masonry Openings

Window Series: PW-400
Vinyl Picture Window Insulated glass

Reference: Test report NCTL-110-14728-7 Report Date: 2/17/11

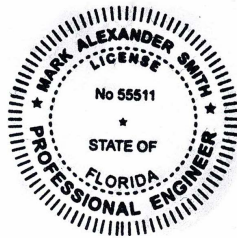
Testing Facility: NCTL
5 Leigh Drive
York, PA, 17406

Test Standards: AAMA/WDMA/CSA 101/I.S.2/A440-08
AAMA/WDMA/CSA 101/I.S.2/A440-05

Specimen: 53" x 77" Vinyl Picture Window

Glazing: 7/8" overall thickness, 1/4 annealed – 3/8" AS – 1/4" annealed glass.

Design Pressure: +70PSF/-70PSF



Digitally
signed by
Mark Smith
Date:
2020.11.17
06:43:30[®]
-05'00'

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Window Craftsmen, Inc.
PW-400 Vinyl Insulated Picture Window

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

Four (4) #8 x 1.5" Phillips flat head wood screws were used to fasten the head and sill into a wooden test buck. Four (4) in the frame head and sill located at 6.00", 19", 34", 47" measuring from right frame jamb to left frame jamb. The Jambs each had four (4) #8 x 1-1/2 flat head wood screws located at 6", 19", 32", 45", 58", 71".

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=.203", Moment arm=.102
Allowable bending load=212 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=.203", Moment arm=.102
Allowable bending load=212 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=.203" , Moment arm=.102
Allowable bending load=239 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=.203" , Moment arm=.102
Allowable bending load=239 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=.203" , Moment arm=.102

Allowable bending load=538 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

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Allowable bending load=538 pounds

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PW-400 Vinyl Insulated Picture Window

Vinyl Insulated Picture Window

Load on 53" header or sill:
Area=703 square in=4.88 square feet
Design pressure= 70psf
Total load = 341 pounds

Load on 77" Jambs:
Area=1338 square in=9.29 square feet
Design Pressure= 70psf
Total load= 650 pounds

Minimum Anchors required, #10 wood screw:

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

Head or Sill:	13.69"	4 Locations	6" End Distance	1 Anchor/Loc
Frame Jambs:	13.00"	6 Locations	6" End Distance	1 Anchors/Loc

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

Head or Sill:	4 Locations Required =>	4 Locations Tested
Frame Jambs:	6 Locations Required =>	6 Locations Tested

#10 Wood Anchor:

Head or Sill Capacity:	484 lbs.	>	341 lbs.	OK
Jamb Capacity:	726 lbs.	>	650 lbs.	OK

#12 Tek Screw:

Head or Sill:	488 lbs.	>	341 lbs.	OK
Jamb Capacity:	732lbs .	<	650 lbs.	OK

Dade Shear and Bending Load on lesser screw

$(fb/Fb)+(fv/Fv)^2 \leq 1.0$
Head or Sill: $(0.416)+(0.058)=(0.474) < 1.0$
Jambs: $(0.511)+(0.094)=(0.605) < 1.0$

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SH-400 Vinyl insulated Picture Window

Minimum Anchors required, 3/16 Tapcon:

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

Head or Sill:	13.69" 4 Locations	6" End Distance	1 Anchors/Loc
Frame Jambs:	13.00" 6 Locations	6" End Distance	1 Anchors/Loc

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

Head or Sill:	4 Locations Required =>	4 Locations Tested
Frame Jambs:	6 Locations Required =>	6 Locations Tested

3/16" Tapcon:

Head or Sill Capacity:	680 lbs.	>	351 lbs	OK
Jamb Capacity:	1020 lbs.	>	650 lbs.	OK

Dade Shear and Bending Load on screw

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

$$\text{Head or Sill: } (0.367)+(0.046)=(0.414) < 1.0$$

$$\text{Jambs: } (0.453)+(0.071)=(0.524) < 1.0$$

Anchor Locations Required (53" X 77") # 10 wood screw, 3/16" Tapcon and #12

Tek Screw:

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

Head or Sill:	13-11/16"	4 Locations	6" End Distance	1 Anchors/Loc
Frame Jamb:	13"	6 Locations	6" End Distance	1 Anchors/Loc

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