

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

September 3, 2020

Anchor Calculations:
Installation of Single Hung Window
In Aluminum, Wood or Concrete and Masonry Openings

Window Series: SH-201
Single Hung Window insulated glass

Reference: Test report AIR-INS AI-02982-C Report Date: 05/30/07,
Reissue Date: 7/21/15 NAMI# NI012772

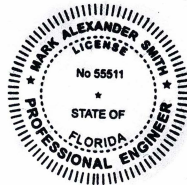
Testing Facility: AIR-INS
1320 boul. Lionel-Boulet
Varenes, Quebec, Canada J3X1P7

Test Standards: AAMA/WDMA/CSA 101/I.S. 2/A440-05
AAMA/WDMA/CSA 101/I.S. 2/A440-08
AAMA/WDMA/CSA 101/I.S. 2/A440-11

Specimen: 53" x 75" Vinyl Double Hung,

Glazing: 3/4" overall thickness, 2 lites of 1/8" annealed glass

Design Pressure: +75PSF/-75PSF



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signed by
Mark Smith
Date:
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-05'00'

Mark A. Smith, P.E.
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3738 Kingswood Drive
Sarasota, FL 34232

Window Craftsmen, Inc.
SH-201 Vinyl Single Hung

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 counter-sunk sheet metal screws were used to fasten the head into a wooden test buck. Four (4) in the frame head and sill located at 12.4" O.C. measuring from right frame jamb to left frame jamb. The Jambs each had six (6) #8 Phillips flat head counter-sunk sheet metal screws located at 12.4" O. C.

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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Window Craftsmen, Inc.
SH-201 Vinyl Single Hung

75R Series Vinyl Single Hung

Load on 53" header or sill:
Area=702 square in=4.88 square feet
Design pressure= 75psf
Total load = 366 pounds

Load on 75" Jambs:
Area=1285 square in=8.92 square feet
Design Pressure= 75psf
Total load= 669 pounds

Minimum Anchors required, #10 wood screw:

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

Head or Sill:	13.67"	4 Locations	6" End Distance	1 Anchor/Loc
Frame Jambs:	12.60"	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.	>	366 lbs.	OK
Jamb Capacity:	726 lbs.	>	669 lbs.	OK

#12 Tek Screw:

Head or Sill:	488 lbs.	>	366 lbs.	OK
Jamb Capacity:	732lbs .	<	669 lbs.	OK

Dade Shear and Bending Load on lesser screw

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

$$\text{Head or Sill: } (0.398)+(0.067) = (0.465) < 1.0$$

$$\text{Jambs: } (0.485)+(0.010) = (0.585) < 1.0$$

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Window Craftsmen, Inc.
SH-200 Vinyl Single Hung

Minimum Anchors required, 3/16 Tapcon:

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

Head or Sill:	13.7"	4 Locations	6" End Distance	1 Anchors/Loc
Frame Jambs:	12.6"	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.	>	366 lbs	OK
Jamb Capacity:	1020 lbs.	>	669 lbs.	OK

Dade Shear and Bending Load on screw

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

$$\text{Head or Sill: } (0.353)+(0.051)=(0.404) < 1.0$$

$$\text{Jambs: } (0.431)+(0.075)=(0.506) < 1.0$$

Anchor Locations Required (44" X 77") # 10 wood screw, 3/16" Tapcon and #12

Tek Screw:

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

Head or Sill:	13.7"	4 Locations	6" End Distance	1 Anchors/Loc
Frame Jamb:	12.6"	6 Locations	6" End Distance	1 Anchors/Loc

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