Prepared with Cooperation from: November 17, 2020

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

**Anchor Calculations:**
**Installation of Impact Picture Window**
**In Aluminum, Wood or Concrete and Masonry Openings**

**Window Series: PW-300**
**Picture Window Impact glass**

Reference: Test report NCTL-110-146-14728-1,2,3,4,5,6 Report Dates: 1/28/11

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

**Test Standards**: TAS 201/202/203-94
AAMA/WDMA/CSA 101/I.S.2/A440-05
AAMA/WDMA/CSA 101/I.S.2/A440-08
ASTM E1886-02/05/13a/E1996-02/05/14a

**Specimen:** 53" x 77" Vinyl Picture Window

**Glazing:** 1" overall thickness, 5/32 annealed – 7/16" AS – 5/32" annealed x.090" PVB x 5/32" annealed laminated glass.

**Design Pressure:** +70PSF/-70PSF

MARK ALEXANDER SMITH
LICENSE
No 55511
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

Digitally signed by Mark Smith
Date: 2020.11.17 06:37:40 -05'00'

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Window Craftsmen, Inc.
PW-300 Vinyl Impact 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 ¼". 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 x Ftu1/ x D x t1/nu= (2)(22000)(.206)(.045/1.95)=209 lbs
2 x Ftu2 x D x t2/nu=(2)(22000)(.206)(.045/1.95)=209 lbs
4.2 x ((t2)^3 x D)^1/2 x Ftu2/ns for t2<or=t1.4.2(((.045^3)(.206))^1/2)(22000/3)=127 lbs
Pns/1.25ns=459/(1.25x3)=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 x Ftu1/ x D x t1/nu= (2)(22000)(.206)(.045/1.95)=209 lbs
2 x Ftu2 x D x t2/nu=(2)(22000)(.206)(.045/1.95)=209 lbs
4.2 x ((t2)^3 x D)^1/2 x Ftu2/ns for t2<or=t1.4.2(((.045^3)(.206))^1/2)(22000/3)=127 lbs
Pns/1.25ns=459/(1.25x3)=122.4
**Bending:**
Allowable bending stress=64 ksi
Cantilever=.203" , Moment arm=.102
Allowable bending load=538 pounds

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PW-300 Vinyl Impact Picture Window

**Vinyl Impact 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=<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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Window Craftsmen, Inc.
SH-300 Vinyl Impact 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=<1.0

| | |
|---|---|
| Head or Sill: | (0.367)+(0.046)=(0.414)<1.0 |
| 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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