

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

September 29, 2023

Anchor Calculations:
Installation of Horizontal Window
In Aluminum, Wood or Concrete and Masonry Openings
Window Series:
40R and 45R series Horizontal Slider Window

Reference: Test reports CTLA-1245W, CTLA-1245W-1/W-1965

Testing Facility: Certified Testing Laboratories
7252 Narcoossee Rd.
Orlando, Florida 32822

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

Specimen +/-40 PSF Design Pressure: 72" wide x 72" high Aluminum Horizontal Slider
Specimen +/-45 PSF Design Pressure: 72" wide x 63" high Aluminum Horizontal Slider

Glazing: 1/4" annealed glass

Tested Installation Anchor Information
40R 72" x 72"

Eighteen (20) #8 x 1.50" hex head sheet metal screws were fastened into a wooden test buck. The Jambs each had four (5) #8 screws 2.5" (max) from the top and bottom 16" max on center. The Sill had (5) #8 screws starting 2" from the corner and spaced 19.75" on center max spacing. The Head had (5) #8 screws starting 2" from the corner and spaced 18.25" on center max spacing.

45R 72" x 63"

Eighteen (18) #8 x 1.50" hex head sheet metal screws were fastened into a wooden test buck. The Jambs each had four (4) #8 screws 2.5" (max) from the top and bottom 16" max on center. The Sill had (5) #8 screws starting 2" from the corner and spaced 19.75" on center max spacing. The Head had (5) #8 screws starting 2" from the corner and spaced 18.25" on center max spacing.

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Smith
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Window Craftsmen, Inc.
40R and 45R Aluminum Horizontal Slider

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, #10 Tek screw of sufficient length to allow full thread engagement through aluminum. Reference Aluminum Design Manual, Allowable stress design, 5.4.
- 5) Tek screw will also qualify #10 sheet metal screw into steel.
- 6) Maximum allowable shim thickness shall be 1/4". A load bearing shim shall be located at each anchor.
- 7) Anchor calculations and analysis comply with the current Florida Building Code including High Velocity Hurricane Zone.

Anchors to be qualified:

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

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40R & 45R Aluminum Horizontal Slider

Anchor Calculations:

#10 wood screw
1-1/2" embedment

Allowable Bearing of 6063-T5 aluminum frame=
 $(F_{by}/1.65)(D)(t) = (16,000/1.65)(.190)(.050) = 92 \text{ lbs.}$

Head & Sill

Shear:

Proof load 80 ksi
Root diameter = .150 in.
Shear=353 pounds
Allowable shear under load with aluminum in wood is 84.8 pounds
NDS min lateral load in wood for #10 wood screw is 123 pounds

Bending:

Allowable bending stress=64 ksi
Cantilever=.390" , Moment arm=.195
Allowable bending load=111 pounds

Jamb

Shear:

Proof load 80 ksi
Root diameter = .150 in.
Shear=353 pounds
Allowable shear under load with aluminum in wood is 84.8 pounds
NDS min lateral load in wood for #10 wood screw is 123 pounds

Bending:

Allowable bending stress=64 ksi
Cantilever=.446" , Moment arm=.223
Allowable bending load=97 pounds

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40R & 45R Aluminum Horizontal Slider

3/16" Tapcon

1-1/4" embedment
2000psi concrete

Allowable Bearing of 6063-T5 aluminum frame=
 $(F_{by}/1.65)(D)(t) = (16,000/1.65)(.188)(.050) = 92 \text{ lbs.}$

Head & Sill

Shear:

Yield Strength = 92 ksi
Allowable shear= 285 pounds

Bending:

Root dia=.123
Allowable bending stress=73.6 ksi
Cantilever=.390" , Moment arm=.195
Allowable bending load=72 pounds

Jambs

Shear:

Yield Strength = 92 ksi
Allowable shear= 285

Bending:

Root dia=.123
Allowable bending stress=73.6 ksi
Cantilever=.446" , Moment arm=.223
Allowable bending load=63 pounds

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Window Craftsmen, Inc.
40R & 45R Aluminum Impact Horizontal Slider

#10 TEK or Sheet Metal Screw

Min .040" thick aluminum or steel Note that the min yield strength of steel is 36,000 psi

Allowable Bearing of 6063-T5 aluminum frame=
 $(F_{by}/1.65)(D)(t) = (16,000/1.65)(.190)(.050) = 92 \text{ lbs.}$

Pullout: $K_s \times D \times t^2 \times F_{ty} = (1.01)(.19)(.040)(16000/1.65) = 74.4 \text{ lbs}$

Head & Sill

Shear:

Proof load 80 ksi

Root diameter = .150 in.

Allowable shear stress 20 ksi

Shear=353 pounds

Shear shall not exceed the least of:

$2 \times F_{tu1} / (D \times t_1 / \nu) = (2)(22000)(.19)(.050/1.95) = 214 \text{ lbs}$

$2 \times F_{tu2} \times D \times t_2 / \nu = (2)(22000)(.19)(.040/1.95) = 171 \text{ lbs}$

$4.2 \times ((t_2)^3 \times D)^{1/2} \times F_{tu2} / \nu$ for $t_2 \leq t_1$ $4.2(((.040)^3)(.19))^{1/2}(22000/3) = 107 \text{ lbs}$

$P_{ns} / 1.25 \nu = 265 / (1.25 \times 3) = 70.8$

Bending:

Allowable bending stress=64 ksi

Cantilever=.390" , Moment arm=.195

Allowable bending load=111 pounds

Jamb

Shear:

Proof load 80 ksi

Root diameter = .150 in.

Shear=353 pounds

Shear shall not exceed the least of:

$2 \times F_{tu1} / (D \times t_1 / \nu) = (2)(22000)(.19)(.050/1.95) = 214 \text{ lbs}$

$2 \times F_{tu2} \times D \times t_2 / \nu = (2)(22000)(.19)(.040/1.95) = 171 \text{ lbs}$

$4.2 \times ((t_2)^3 \times D)^{1/2} \times F_{tu2} / \nu$ for $t_2 \leq t_1$ $4.2(((.040)^3)(.19))^{1/2}(22000/3) = 107 \text{ lbs}$

$P_{ns} / 1.25 \nu = 265 / (1.25 \times 3) = 70.8$

Bending:

Allowable bending stress=64 ksi

Cantilever=.446" , Moment arm=.223

Allowable bending load=97 pounds

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40R Series Horizontal Slider 72" X 72"

Load on 72" header and sill:

Area=1276 square in=9 square feet

Design pressure= 40psf

Total load = 360 pounds

Load on 72" Jambs:

Area=1276 square in=9 square feet

Design Pressure= 40psf

Total load= 360 pounds

45R Series Horizontal Slider 72" X 63"

Load on 72" header and sill:

Area=1276 square in=8.86 square feet

Design pressure= 45psf

Total load = 399 pounds

Load on 63" Jambs:

Area=992 square in=6.89 square feet

Design Pressure= 45psf

Total load= 310 pounds

**Minimum Anchors required, #10 wood screw and #10 Tek & sheet metal screw,
3/16" Tapcon:**

72" x 72" 40R

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

Head & Sill:	13.6"	6 Locations	2" End Distance	1 Anchors/Loc
Frame Jambs:	13.6"	6 Locations	2" End Distance	1 Anchors/Loc

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

Head & Sill:	6 Locations Required >	5 Locations Tested
Frame Jambs:	6 Locations Required>	5 Locations Tested

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Window Craftsmen, Inc.
40 & 45R Aluminum Horizontal Slider

72" x 63" 45R

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

Head & Sill:	13.6"	6 Locations	2" End Distance	1 Anchors/Loc
Frame Jambs:	14.75"	5 Locations	2" End Distance	1 Anchors/Loc

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

Head & Sill:	6 Locations Required >	5 Locations Tested
Frame Jambs:	5 Locations Required >	4 Locations Tested

#10 Wood Anchor:

72" x 72" 40R

Head & Sill Capacity:	505 lbs.	>	360 lbs.	OK
Jamb Capacity:	505 lbs.	>	360 lbs.	OK

72" x 63" 45R

Head & Sill Capacity:	505 lbs.	>	399 lbs.	OK
Jamb Capacity:	339 lbs.	>	310 lbs.	OK

3/16" Tapcon:

72" x 72" 40R

Head & Sill Capacity:	432 lbs.	>	360 lbs.	OK
Jamb Capacity:	378 lbs.	>	360 lbs.	OK

72" x 63" 45R

Head & Sill Capacity:	432 lbs.	>	399 lbs.	OK
Jamb Capacity:	315 lbs.	>	310 lbs.	OK

#10 Tek & Sheet Metal Screw:

72" x 72" 40R

Head & Sill Capacity:	425 lbs.	>	360 lbs.	OK
Jamb Capacity:	425 lbs.	>	360 lbs.	OK

72" x 63" 45R

Head & Sill Capacity:	425 lbs.	>	399 lbs.	OK
Jamb Capacity:	354 lbs.	>	310 lbs.	OK

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45R Aluminum Horizontal Slider

Conclusion:

Anchor Locations Required 40R (72" X 72") :

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

Head & Sill:	13-5/8	6 Locations	2" End Distance	1 Anchors/Loc
Frame Jamb:	13-5/8"	6 Locations	2" End Distance	1 Anchors/Loc

Anchor Locations Required 45R (72" X 63" OR SMALLER):

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

Head & Sill:	13-5/8"	6 Locations	2" End Distance	2 Anchors/Loc
Frame Jamb:	14-3/4"	5 Locations	2" End Distance	2 Anchors/Loc

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