Edward C. Robison, PE

02 April 2019

C.R. Laurence Co., Inc.
2503 East Vernon
Los Angeles, CA 90058

SUBJ: CR LAURENCE AND HANSEN SERIES 1100 SYSTEM
ALUMINUM FRAMED GLASS WIND WALLS AND FENCES

The series 1100 System is an engineered system designed for the following criteria:
The design loading conditions are:
Concentrated load = 200 lbs (1 sf area) @ 42" above grade or,
Distributed load = 50 plf @ 42" above finish grade or,
Concentrated load = 50 lbs on 1 sf area any location or,
Uniform load = 10 psf or,
Seismic loads will not affect design because of the small dead loads.
Wind load as calculated based on ASCE/SEI 7-05 or 7-10 and as limited for the specific configuration as shown in tables 2 - 50 as applicable.

For these conditions the system will meet all applicable requirements of the 2006, 2009, 2012, 2015 and 2018 International Building Codes and International Residential Codes along with state codes adopting the IBC and IRC and 2015 Aluminum Design Manual. The system will meet all requirements for a swimming pool enclosure when installed as recommended and in compliance with IBC Section 3109. When fall protection is required a top rail or a grab rail must be installed at 42" (36" for IRC compliance) above the walking surface or minimum 9/16" laminated tempered glass must be used. Refer to the appropriate tables herein to determine allowable post spacing, heights and allowable stress design wind loads. The supporting structure shall be designed by others and be adequate to support the posts with all imposed loads. It is the specifier's responsibility to verify suitability for any specific applications or installations based on specific conditions and requirements.

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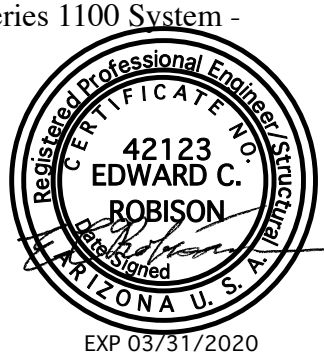

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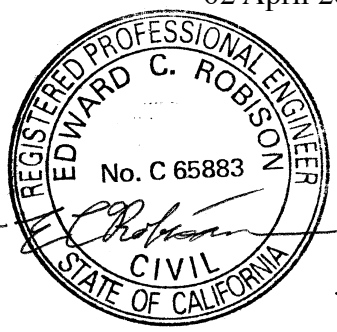

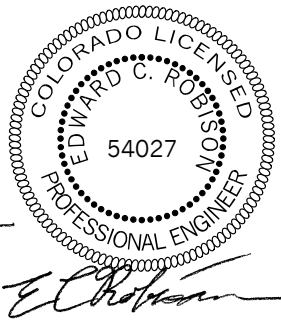

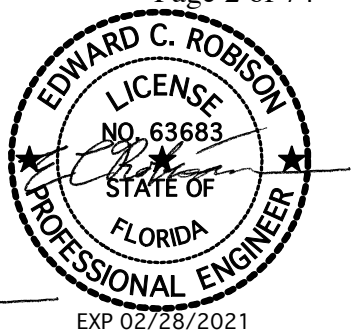

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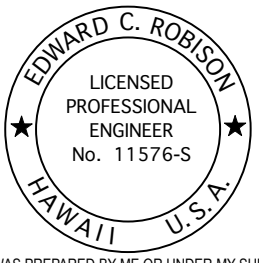

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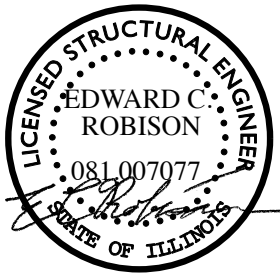

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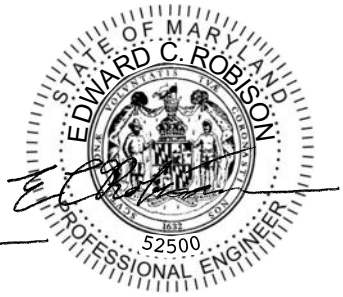

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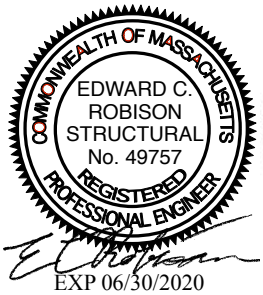

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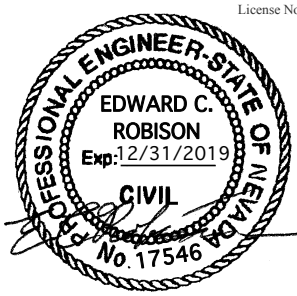

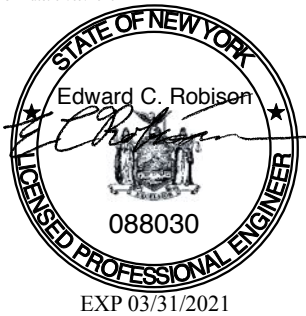

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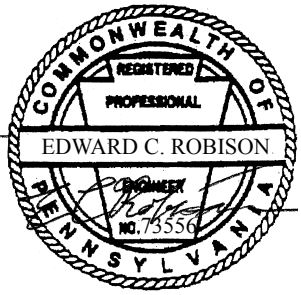

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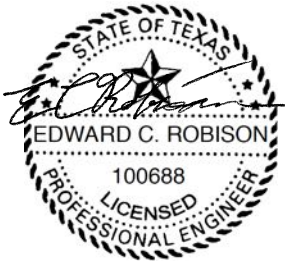

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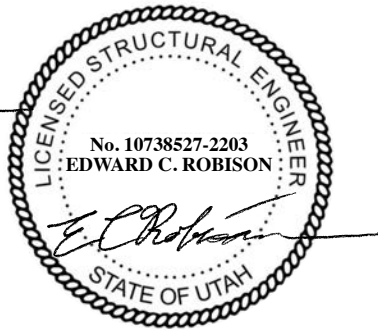

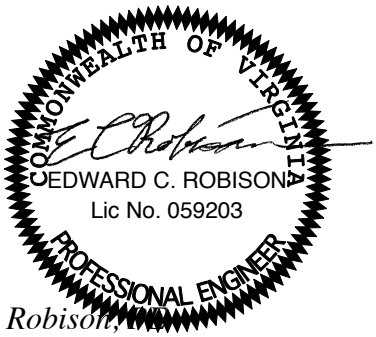

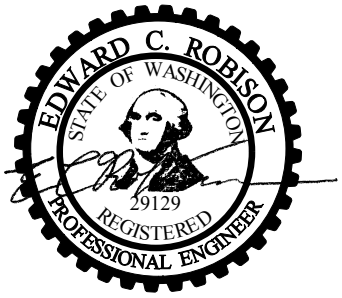

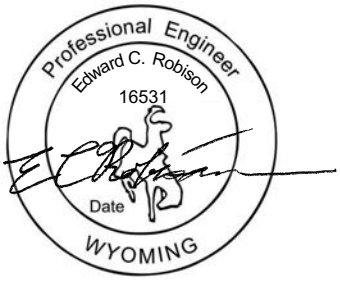

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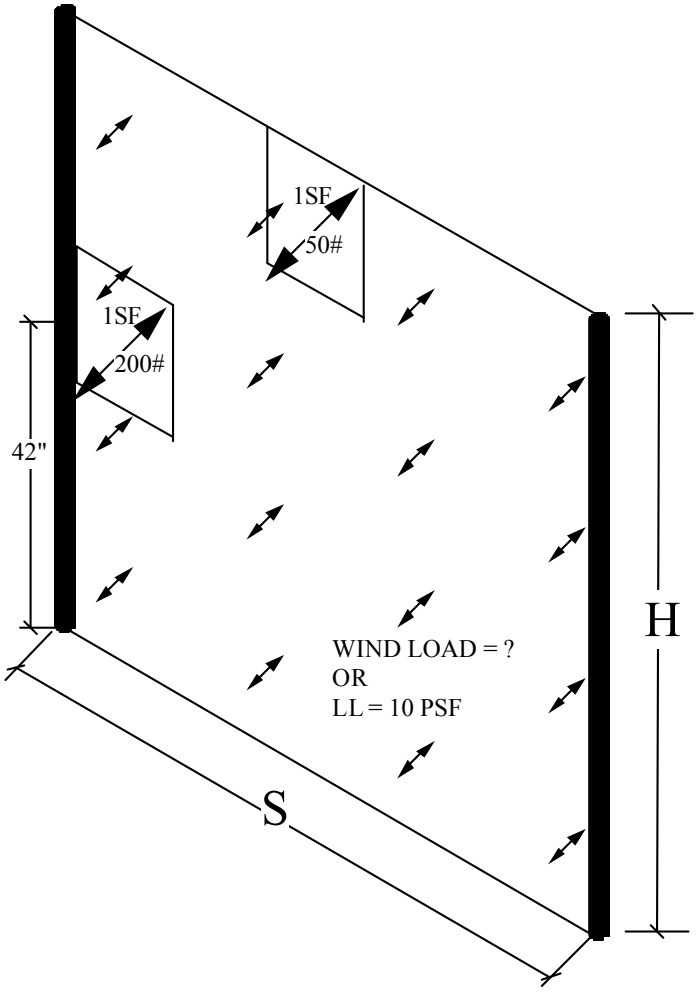
Loading to Posts:
Live load = 200# @ 42" height
Any location along wall
(42" above finish floor)
Or:
50 lb on one square foot at any location on glass.
Or:
Wind load on solid area
Or:
10 psf live load on entire area including voids.



M_{200} = 200#x42" = 8,400"#

M_{50plf} = 50*42"*S
Maximum spacing when fall protection is required:
S = M_a/2,100"#/ft

M_{50}= 50lb x H*12"/ft
(will not govern post design)

M_{LL} = 10psf*(S)*(H^2/2)*12"/ft

M_{WL}= W*(S)*(H^2*0.55)('#)
Wind loading typically controls post design.
Wind loads are based on allowable stress design, strength level wind loads as specified in 2012 IBC - ASCE 7-10 must be adjusted to ASD levels by using 0.6W.
Determine the maximum post heights
M_a = Allowable post moment
for Wind load:
M_{WL}= W*(S)*(H^2*0.55) = M_a
Solving for S
S = M_a/(0.55*W*H^2)

Solving for H
H = [M_a/(0.55*W*S)]$^{1/2}$

Allowable wind load:
W = M_a/(0.55*S*H^2)

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WIND LOADING ON FENCES OR GUARDS

For wind load surface area is full area of fence or guard:
Calculated in accordance with ASCE/SEI 7-05 Section 6.5.14 *Design Wind Loads on Solid Freestanding Walls and Solid Signs* **(or ASCE/SEI 7-10 Chapter 29.4)**. This section is applicable for free standing building guardrails, wind walls and balcony railings that return to building walls. Section 6.5.12.4.4 (29.6) *Parapets* may be applicable when the rail is along a roof perimeter. **Wind loads must be determined by a qualified individual for a specific installation.**

$p = q_p(GC_p) = q_zGC_f$ (ASCE 7-05 eq. 6-26 or 7-10 eq. 29.4-1)
G = 0.85 from section 6.5.8.2 (sec 26.9.4.)
C_f = 2.5*0.8*0.6 = 1.2 Figure 6-20 (29.4-1) with reduction for solid and end returns, will vary.
$q_z = K_zK_{zt}K_dV^2I$ Where:

- I = 1.0
- K_z from Table 6-3 (29.3-1) at the height z of the railing centroid and exposure.
- K_d = 0.85 from Table 6-4 (Table 26-6).
- K_{zt} From Figure 6-4 (Fig 26.8-1) for the site topography, typically 1.0.
- V = Wind speed (mph) 3 second gust, Figure 6-1 (Fig 26.5-1A) or per local authority.

Simplifying - Assuming $1.3 \le C_f \le 2.6$ (Typical limits for fence or guard with returns.)

- For C_f = 1.3: $F = q_z*0.85*1.3 = 1.11\ q_z$
- For C_f = 2.6: $F = q_z*0.85*2.6 = 2.21q_z$

Wind Load will vary along length of fence in accordance with ASCE 7-05 Figure 6-20 (29.4-1).
Typical exposure factors for K_z with height 0 to 15' above grade:

Exposure	B	C	D
K_z =	0.70	0.85	1.03

MINIMUM ASD WIND LOAD TO BE USED IS 10 PSF.
Centroid of wind load acts at 0.55h on the fence.
Typical wind load range for I = 1.0 and K_{zt} = 1.0

Table 1:	**Wind load in psf C_f = 1.3**			**Wind load in psf C_f = 2.60**		
Wind Speed	B	C	D	B	C	D
V	$0.00169V^2$	$0.00205V^2$	$0.00249V^2$	$0.00337V^2$	$0.00409V^2$	$0.00495V^2$
85	12.2	14.8	17.9	24.3	29.5	35.8
90	13.7	16.6	20.2	27.3	33.1	40.1
100	16.9	20.5	24.9	33.7	36.9	49.5
110	20.5	24.8	30.1	40.7	49.5	59.9
120	24.3	29.6	35.8	48.5	58.9	71.3
130	28.6	34.7	42.0	56.9	69.1	83.7
140	33.1	40.2	48.8	66.0	80.1	97.1

Where fence ends without a return the wind forces will be 1.667 times greater than above.
When I = 0.87 is applicable (occupancy category I) multiply above loads by 0.87.
For wind loads based on ASCE 7-10 wind speeds, figures 26.5-1A, B and C, multiply the wind loads by 0.6 to convert to Allowable Stress Design loads.
For example - Exp B with C_f = 1.3; 7-05 wind speed = 85 mph w= 12.2 psf:
7-10 wind speed= 110mph w = 0.6*20.5 = 12.3 psf (ASD wind loads used herein)

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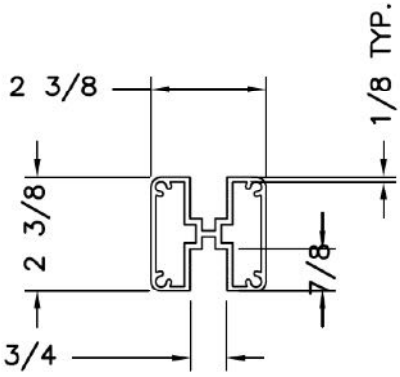
1100 Series Post – SMALL SQUARE POST –
2-3/8" SQUARE GLASSWALL POST
6005-T5 or 6061-T6 Aluminum alloy



I_{xx}: 0.933 in^4
I_{yy}: 0.801 in^4
r_{xx}: 0.846 in
r_{yy}: 0.784 in
S_{xx}: 0.782 in^3
S_{yy}: 0.673 in^3
Z_{xx}: 0.993 in^3
Z_{yy}: 0.887 in^3

Design of the aluminum post is according to the 2015 Aluminum Design Manual. 6061-T6 aluminum is assumed in the calculations. Use ADM Design Table 2-19.

Check local buckling:
b/t = 2.125"/0.125" = 17 < 20.8 local buckling does not control
F_c/Ω = 21.2ksi

$M_a = ZF_y < 1.5SF_y$

Allowable load on post:
Strong axis – XX (load perp. to glass)
$M_{all} = 0.993in^3 \bullet 21.2^{ksi} = 21{,}000"^{\#}$

Weak axis – YY (load ll glass)
$M_{all} = 0.887in^3 \bullet 21.2^{ksi} = 18{,}800"^{\#}$

Loading is normally perpendicular to the glass which creates bending about the X-axis.

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Using the equations derived on page 2 determine the allowable wind loads based on the post strength (post directly core mounted in grout or other method that will develop the fill post strength.)

Solving for S
M = 21,000"# = 1,750'#
$S = 1{,}750'\#/(0.55*W*H^2) = 3{,}180'\#/(W*H^2)$
Example: determine required post spacing for 20 psf wind load and 4'-0" screen height:
$S = 3{,}180'\#/(20*4^2) = 9'\text{-}11.25"$

Solving for H
$H = [3{,}180'\#/(W*S)]^{1/2}$
Example: determine maximum screen height for 20 psf wind load and 6'-0" post spacing:
$H = [3{,}180'\#/(20*6)]^{1/2} = 5' - 1\text{-}3/4"$

Allowable wind load:
$W = 3{,}180'\#/(S*H^2)$
Example: determine maximum wind load for 4' screen height and 6'-0" post spacing:
$W = 3{,}180'\#/(6*4^2) = 33.1$ psf

Table 2:	Post strength (ft-#)=		1750			
Wind load ASD	Post Spacing					
Screen Height	3	4	4.5	5	5.5	6
3	117.8	88.4	78.6	70.7	64.3	58.9
3.5	86.6	64.9	57.7	51.9	47.2	43.3
4	66.3	49.7	44.2	39.8	36.2	33.1
4.5	52.4	39.3	34.9	31.4	28.6	26.2
5	42.4	31.8	28.3	25.5	23.1	21.2
5.5	35.1	26.3	23.4	21.0	19.1	17.5
6	29.5	22.1	19.6	17.7	16.1	14.7

Based on post strength, assumes anchorage method will develop the full post strength.

Maximum spacing when fall protection is required:
$S = M_a/2{,}100"\#/ft$
$S = 21{,}000"\#/2{,}100"\#/ft = 10'$

Post Deflections at maximum allowable wind load (ASD):
$\Delta = UH^4/(8EI) = M*H^2/(0.55*8EI) = (1{,}750'\#*12)*H^2/(0.55*8*10{,}100{,}000*0.933)$
$\Delta = 0.0005065*H^2$

Ht (in)	36	42	48	54	60	66	72
Defl'n	0.6564	0.8935	1.1670	1.4770	1.8234	2.2063	2.6257

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LIVE LOADS

When post is installed so that the base is lower than the finished floor height determine allowable post height - measured from base of post or bottom of cantilevered portion to point of live load application typically 42” above finish floor.

2" post (SP)	Post strength (ft-#)=		1750			
	Post Spacing					
	3	4	4.5	5	5.5	6
LL Post HT (in)	105.0	105.0	93.3	84.0	76.4	70.0

Linear interpolation is allowable between values shown.
When post spacing is under 4’ the 200# concentrated load governs. For IRC compliant installations the post height may be determined based on the 4’ spacing column regardless of actual spacing.
For IBC compliant installations the 50 plf distributed load governs for post spacing over 4’.

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GLASS STRENGTH

All glass is fully tempered glass conforming to the specifications of ANSI Z97.1, ASTM C 1048-97b and CPSC 16 CFR 1201. The minimum Modulus of Rupture for the glass F_r is 24,000 psi. Safety Factor of 4.0 is applicable to the glass when subject to human impact. For wind loads ASTM E1300-12a allows edge stress of 10,600 psi for wind loads but recommend limiting to 9,600 psi because of unsupported edge and relatively high deflections.

Allowable glass bending stress: 24,000/4 = 6,000 psi. – Tension stress calculated.

Monolithic glass thickness options:
1/4" nominal - 0.219" minimum
3/8" nominal - 0.355" minimum
1/2" nominal - 0.469" minimum

Laminated glass thickness options:
5/16" laminated - 0.219" effective for deflection - 0.235" effective for stress
7/16" laminated - 0.270" effective for deflection - 0.284" effective for stress
9/16" laminated - 0.368" effective for deflection - 0.403" effective for stress

The effective laminated glass thicknesses with respect to deflection and stress are calculated according to the appendix of ASTM E1300. Calculations are shown on the following page. Calculations assume a 0.06" thick PVB interlayer at high exterior temperatures.

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5/16” laminated glass

Laminated Glass Effective Thickness				
h1	h2	hv	E	g
0.115	0.115	0.03	10400000	140
hs	hs;1	hs;2	Is	
0.145	0.0725	0.0725	0.001208938	
a	Γ	hef;w	h1;ef;σ	h2;ef;σ
36	0.513029316	0.21886742	0.235284878	0.235284878

Variable	Description
H1 & H2	Glass pane thicknesses
Hv	Interlayer thickness
E	Young's Modulus
g	Shear Modulus
Hs	.5(h1+h2)+hv
Hs;1	hsh1/(h1+h2)
Hs;1	hsh2/(h1+h2)
Is	$h1(hs;2)^2+h2(hs;1)^2$
a	Minimum Pane Width
Γ	$1/(1+9.6(Eishv/(G(ahs)^2))$
hef;w	$\sqrt[3]{((h1)^3+(h2)^3+12\Gamma Is)}$
h1;ef;σ	$\sqrt{((hef;w)^3/(h1+2\Gamma hs;2))}$
h2;ef;σ	$\sqrt{((hef;w)^3/(h2+2\Gamma hs;1))}$

7/16” laminated glass

Laminated Glass Effective Thickness				
h1	h2	hv	E	g
0.18	0.115	0.03	10400000	140
hs	hs;1	hs;2	Is	
0.1775	0.108305085	0.069194915	0.002210778	
a	Γ	hef;w	h1;ef;σ	h2;ef;σ
36	0.463316132	0.269823121	0.283673407	0.30202107

9/16” laminated glass

Laminated Glass Effective Thickness				
h1	h2	hv	E	g
0.219	0.219	0.03	10400000	140
hs	hs;1	hs;2	Is	
0.249	0.1245	0.1245	0.00678911	
a	Γ	hef;w	h1;ef;σ	h2;ef;σ
36	0.356173677	0.368462436	0.403213517	0.403213517

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Wind loading on glass:

Post deflection is relatively high and cannot be assumed to rigidly support the edges of the glass. Therefore, SCIA models of two posts and a glass panel are used to estimate the glass stress and system deflection. Posts are assumed to have half the stiffness which simulates an intermediate post that is loaded from both sides. Tables of results are provided at the end of this report. Diagrams of the results are over 500 pages long and can be provided on request. Posts can run full height of the wind screen or can terminate early resulting in a glass cantilever at the top. The four cases considered in this report are no cantilever, 1/2 height cantilever, 1/3 height cantilever and 1/4 height cantilever. For example, a 60" tall wind screen with a 1/3 cantilever has 40" tall posts and a 20" glass cantilever. The model assumes a uniform load of 10psf. Then the observed stress is compared to the allowable stress to find the allowable wind load.

Wind loading as limited by glass stress:

Allowable glass stress = 10,600psi (wind load)

For monolithic glass:
Allowable wind load = 10,600psi/(Observed Stress)*10psf

For laminated glass:
In order to model the behavior of the glass-post interaction, the effective thickness with respect to deflection is used in the model. This has the result of overestimating the stress since the effective thickness with respect to stress is greater. Therefore, an adjustment accounting for this effective thickness is required. Allowable wind load is calculated according to the following equation:
Allowable wind load = 10,600psi/(Observed Stress)*10psf*($h_{ef;w}^2/h_{ef;\sigma}$)

Allowable wind load tables as limited by glass stress are shown on the following pages:

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Table 3: Allowable Wind Load, No cantilever
Nominal glass thickness = 1/4”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	73.6	73.6	73.1	73.6	73.6	73.6
42	54.1	53.8	53.8	53.8	53.8	54.1
48		40.9	40.9	40.9	40.9	
54			32.4	32.4	32.4	
60				26.4	26.4	

Table 4: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 1/4”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	30.5	26.0	20.2	16.7	13.6	9.9
42	23.4	21.5	17.2	14.4	11.9	8.8
48		17.7	14.6	12.5	10.4	
54			12.2	10.8	9.1	
60				9.2	8.0	

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Table 5: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 1/4”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	56.1	47.1	42.6	32.8	29.4	21.2
42	30.2	31.5	33.4	27.6	24.9	18.4
48		20.0	25.0	22.5	21.2	
54			16.8	16.9	17.5	
60				12.5	14.1	

Table 6: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 1/4”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	67.1	51.0	62.4	59.2	48.4	16.9
42	39.1	32.7	40.0	48.0	39.1	14.8
48		23.0	25.9	32.3	30.8	
54			18.9	21.2	20.5	
60				16.3	14.4	

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Table 7: Model stresses (psi), No cantilever
Nominal glass thickness = 3/8”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	197.0	188.3	147.0	116.9	96.4	67.9
42	143.8	145.0	124.0	98.1	80.9	56.7
48		109.6	109.7	87.6	71.6	
54			86.9	76.8	63.1	
60				70.7	57.6	

Table 8: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 3/8”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	97.2	77.4	59.2	49.5	39.7	28.2
42	83.5	67.1	51.7	43.3	35.1	25.2
48		59.6	46.3	38.8	31.7	
54			41.2	34.9	28.6	
60				31.7	26.2	

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Table 9: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 3/8”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	215.0	161.1	133.3	96.4	87.6	61.6
42	158.7	136.8	115.8	90.6	77.4	55.2
48		116.2	102.9	80.9	70.2	
54			89.8	72.1	62.8	
60				64.6	57.6	

Table 10: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 3/8”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	209.1	186.9	147.6	94.6	96.4	49.1
42	153.8	152.7	124.6	99.1	80.9	43.8
48		116.2	111.5	88.3	72.1	
54			91.4	77.4	63.1	
60				71.1	57.6	

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Table 11: Model stresses (psi), No cantilever
Nominal glass thickness = 1/2”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	199.2	147.4	115.2	91.4	75.2	52.5
42	167.5	123.5	96.4	76.3	62.7	43.8
48		110.6	86.2	67.9	55.8	
54			75.2	59.6	48.6	
60				54.4	44.4	

Table 12: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 1/2”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	192.7	146.8	115.0	94.6	74.6	52.7
42	161.6	122.5	95.5	75.2	62.0	43.8
48		109.5	85.5	67.1	54.9	
54			74.6	58.2	48.0	
60				53.3	43.8	

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Table 13: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 1/2”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	200.0	149.1	115.6	98.1	75.2	52.7
42	168.0	125.0	96.4	76.8	62.7	44.0
48		111.8	86.2	68.4	55.8	
54			75.7	59.9	48.6	
60				54.9	44.5	

Table 14: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 1/2”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	195.6	146.0	115.5	96.4	74.6	52.5
42	164.1	122.3	96.4	76.8	62.4	43.8
48		109.6	86.2	68.4	55.5	
54			75.7	59.9	48.6	
60				54.6	44.4	

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Table 15: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 5/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	84.8	84.8	84.2	84.8	84.8	84.8
42	62.3	62.0	62.0	62.0	62.0	62.3
48		47.1	47.1	47.1	47.1	
54			37.3	37.3	37.3	
60				30.4	30.4	

Table 16: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 5/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	35.1	29.9	23.2	19.3	15.7	11.4
42	26.9	24.8	19.7	16.6	13.7	10.1
48		20.3	16.8	14.4	12.0	
54			14.1	12.4	10.5	
60				10.6	9.2	

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Table 17: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 5/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	64.6	54.2	49.0	37.8	33.9	24.4
42	34.8	36.2	38.5	31.8	28.7	21.2
48		23.1	28.8	25.9	24.5	
54			19.3	19.5	20.2	
60				14.3	16.3	

Table 18: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 5/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	77.2	58.7	71.8	68.2	55.7	19.5
42	45.0	37.7	46.1	55.2	45.0	17.0
48		26.5	29.8	37.2	35.5	
54			21.8	24.4	23.6	
60				18.8	16.6	

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Table 19: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 7/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	122.9	124.5	124.6	125.0	124.9	97.7
42	90.9	90.9	91.6	91.6	91.6	82.0
48		69.4	69.4	69.4	69.8	
54			54.8	55.1	55.1	
60				44.8	44.8	

Table 20: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 7/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	56.7	46.2	35.5	29.6	23.8	17.1
42	46.5	39.5	30.7	25.7	20.9	15.2
48		34.0	26.9	22.7	18.6	
54			23.5	20.1	16.6	
60				17.9	15.0	

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Table 21: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 7/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	112.8	90.9	77.7	58.9	51.7	36.9
42	85.6	72.8	65.5	51.4	44.9	32.4
48		57.8	55.3	44.6	39.6	
54			45.3	38.1	34.7	
60				32.3	30.5	

Table 22: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 7/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	133.0	119.1	127.2	85.0	86.9	29.4
42	102.0	78.2	96.1	95.3	74.2	25.9
48		74.7	71.1	74.2	63.4	
54			49.9	58.9	53.1	
60				48.5	44.1	

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Table 23: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 9/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	254.8	218.0	170.6	135.7	111.5	78.5
42	185.9	184.0	143.6	113.5	93.5	65.5
48		141.6	128.4	101.7	83.1	
54			112.5	89.5	73.1	
60				81.5	66.6	

Table 24: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 9/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	127.5	100.9	77.0	64.5	51.7	36.7
42	108.7	87.7	67.6	56.5	45.9	32.9
48		77.5	60.5	50.8	41.5	
54			53.9	45.7	37.5	
60				41.5	34.4	

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Table 25: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 9/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	274.6	211.5	171.3	116.6	111.5	79.0
42	203.7	180.3	144.0	114.5	93.5	65.9
48		152.4	128.7	102.5	83.6	
54			113.5	89.5	73.1	
60				82.0	66.6	

Table 26: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 9/16”

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	269.3	216.6	171.3	115.6	111.5	64.2
42	197.7	182.6	144.3	114.5	93.5	57.5
48		149.6	129.1	102.5	83.1	
54			113.5	90.2	73.1	
60				82.0	66.6	

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Wind loading as limited by deflection:

There is no well defined deflection limit in the code. ASTM E2358 limits railing to H/12. However, experience has shown that occupants will be uncomfortable with defections much lower than H/12. Deflections at a 10psf load as calculated by the SCIA model are provided in the appendix. While not required by code, it is recommended that wind screens be designed for approximately 1" max deflection. For informational purposes, wind loads that cause 1" peak deflection are provided in the tables below.

Table 27: Wind load at 1" Peak Deflection, No cantilever
Nominal glass thickness = 1/4", Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	106.4	71.9	48.1	32.6	22.5	11.5
42	73.0	52.9	37.2	26.0	18.4	9.6
48		38.6	28.6	20.8	15.1	
54			22.0	16.6	12.4	
60				13.3	10.3	

Table 28: Wind load at 1" Peak Deflection, 1/2 height cantilever
Nominal glass thickness = 1/4", Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	28.0	18.2	12.0	8.1	5.7	3.0
42	21.1	14.5	9.9	6.9	4.9	2.6
48		11.3	8.1	5.8	4.2	
54			6.5	4.9	3.6	
60				4.0	3.1	

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Table 29: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	46.3	32.8	23.3	16.1	11.8	6.4
42	30.8	23.1	17.3	12.7	9.5	5.3
48		16.4	12.8	9.8	7.5	
54			9.5	7.5	6.0	
60				5.8	4.7	

Table 30: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	53.2	39.2	28.5	20.2	14.9	5.4
42	33.7	26.4	20.3	15.4	11.5	4.6
48		17.9	14.4	11.4	8.9	
54			10.4	8.5	6.8	
60				6.4	5.3	

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Table 31: Wind load at 1” Peak Deflection, No cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	106.4	71.9	48.1	32.6	22.5	11.5
42	73.0	52.9	37.2	26.0	18.4	9.6
48		38.6	28.6	20.8	15.1	
54			22.0	16.6	12.4	
60				13.3	10.3	

Table 32: Wind load at 1” Peak Deflection, 1/2 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	76.3	48.3	31.3	20.8	14.3	7.3
42	57.8	38.6	25.8	17.7	12.3	6.4
48		30.6	21.3	14.9	10.6	
54			17.4	12.6	9.2	
60				10.6	7.9	

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Table 33: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	101.0	65.4	43.1	28.8	19.9	10.2
42	71.9	49.8	34.1	23.6	16.6	8.7
48		37.6	27.0	19.2	13.8	
54			21.3	15.7	11.6	
60				12.9	9.7	

Table 34: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	107.5	70.4	46.5	31.3	21.6	9.6
42	75.8	52.9	36.5	25.3	17.7	8.2
48		39.5	28.5	20.4	14.7	
54			22.3	16.6	12.2	
60				13.4	10.2	

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Table 35: Wind load at 1” Peak Deflection, No cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	147.1	90.9	57.8	38.0	25.8	13.0
42	109.9	71.9	47.2	31.5	21.7	11.1
48		56.5	38.5	26.5	18.5	
54			31.4	22.2	15.8	
60				18.7	13.6	

Table 36: Wind load at 1” Peak Deflection, 1/2 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	120.5	74.1	46.7	30.8	20.9	10.5
42	94.3	60.2	39.2	26.2	18.1	9.3
48		49.0	32.9	22.5	15.7	
54			27.5	19.3	13.7	
60				16.6	12.0	

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Table 37: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	140.8	87.0	54.9	36.1	24.5	12.3
42	107.5	69.4	45.2	30.2	20.8	10.6
48		54.9	37.3	25.5	17.8	
54			30.8	21.6	15.3	
60				18.3	13.3	

Table 38: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	147.1	90.1	57.1	37.5	25.3	12.0
42	109.9	71.4	46.5	31.2	21.4	10.4
48		56.5	38.2	26.2	18.2	
54			31.4	22.1	15.7	
60				18.7	13.5	

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Table 39: Wind load at 1” Peak Deflection, No cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	44.2	36.5	28.8	22.1	16.7	9.5
42	26.2	22.9	19.1	15.5	12.2	7.4
48		14.7	12.8	10.8	8.9	
54			8.8	7.7	6.6	
60				5.6	4.9	

Table 40: Wind load at 1” Peak Deflection, 1/2 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	28.0	18.2	12.0	8.1	5.7	3.0
42	21.1	14.5	9.9	6.9	4.9	2.6
48		11.3	8.1	5.8	4.2	
54			6.5	4.9	3.6	
60				4.0	3.1	

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Table 41: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	46.3	32.8	23.3	16.1	11.8	6.4
42	30.8	23.1	17.3	12.7	9.5	5.3
48		16.4	12.8	9.8	7.5	
54			9.5	7.5	6.0	
60				5.8	4.7	

Table 42: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	53.2	39.2	28.5	20.2	14.9	5.4
42	33.7	26.4	20.3	15.4	11.5	4.6
48		17.9	14.4	11.4	8.9	
54			10.4	8.5	6.8	
60				6.4	5.3	

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Table 43: Wind load at 1” Peak Deflection, No cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	68.5	51.8	37.7	27.2	19.5	10.4
42	42.9	34.7	26.9	20.3	15.2	8.5
48		23.5	19.2	15.1	11.7	
54			13.8	11.4	9.1	
60				8.6	7.1	

Table 44: Wind load at 1” Peak Deflection, 1/2 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	44.4	28.7	18.8	12.7	8.8	4.6
42	33.3	22.7	15.5	10.8	7.6	4.1
48		17.8	12.6	9.1	6.6	
54			10.2	7.6	5.6	
60				6.3	4.8	

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Table 45: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	66.7	45.7	31.4	21.6	15.4	8.1
42	45.5	33.1	24.0	17.2	12.5	6.8
48		24.0	18.2	13.6	10.1	
54			13.8	10.7	8.2	
60				8.4	6.7	

Table 46: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	74.1	52.1	36.4	25.2	18.0	7.2
42	48.8	36.6	26.9	19.6	14.3	6.1
48		25.8	19.9	15.1	11.4	
54			14.8	11.7	9.1	
60				9.1	7.2	

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Table 47: Wind load at 1” Peak Deflection, No cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	112.4	74.6	49.5	33.3	22.9	11.7
42	77.5	55.2	38.5	26.7	18.8	9.8
48		40.8	29.9	21.5	15.5	
54			23.2	17.3	12.9	
60				14.0	10.7	

Table 48: Wind load at 1” Peak Deflection, 1/2 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	81.3	51.3	33.1	22.1	15.1	7.7
42	61.7	41.2	27.4	18.7	13.0	6.8
48		32.7	22.6	15.8	11.2	
54			18.6	13.4	9.7	
60				11.3	8.4	

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Table 49: Wind load at 1” Peak Deflection, 1/3 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	105.3	68.0	44.6	29.8	20.5	10.4
42	76.3	52.1	35.5	24.4	17.1	8.9
48		39.7	28.2	20.0	14.3	
54			22.5	16.4	12.0	
60				13.5	10.1	

Table 50: Wind load at 1” Peak Deflection, 1/4 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	112.4	73.0	47.8	32.1	22.0	9.9
42	80.0	55.2	37.7	26.0	18.2	8.5
48		41.5	29.7	21.1	15.1	
54			23.4	17.2	12.6	
60				14.1	10.6	

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Live Loading on Glass

When the tech wall acts as a guard rail it is subject to live loading. If a grab rail is not attached to the wall then the loads are applied to the glass. In all guard rail applications the glass must be checked for a 200# concentrate load. In commercial applications the glass must also be checked for a 50plf live load. If the glass is used for fall protection it must be laminated glass so that a panel will remain in place if it is shattered. Each post height, cantilever height, glass thickness and post spacing combination will behave slightly differently so general rules on stress caused by live loads are very difficult to formulate. Following the rules below will help designers meet live loading criteria, however, most specific installations will require individual analysis to ensure the glass will meet live loading criteria.

General rules when designing for live loading:

1) If a hand rail can be provided at 42", this is the best solution since the live loading will be taken by the rail instead of the infill glass.
2) Otherwise 9/16" laminated glass will likely be required due to glass stress.
3) Posts should be at least 40" tall, shorter posts will cause large stress concentrations at the top of the posts.

Provided below are examples of systems that meet and don't meet live loading criteria. The result diagrams below illustrate how it is difficult to estimate the live load stress without a specific FEA model of the proposed system.

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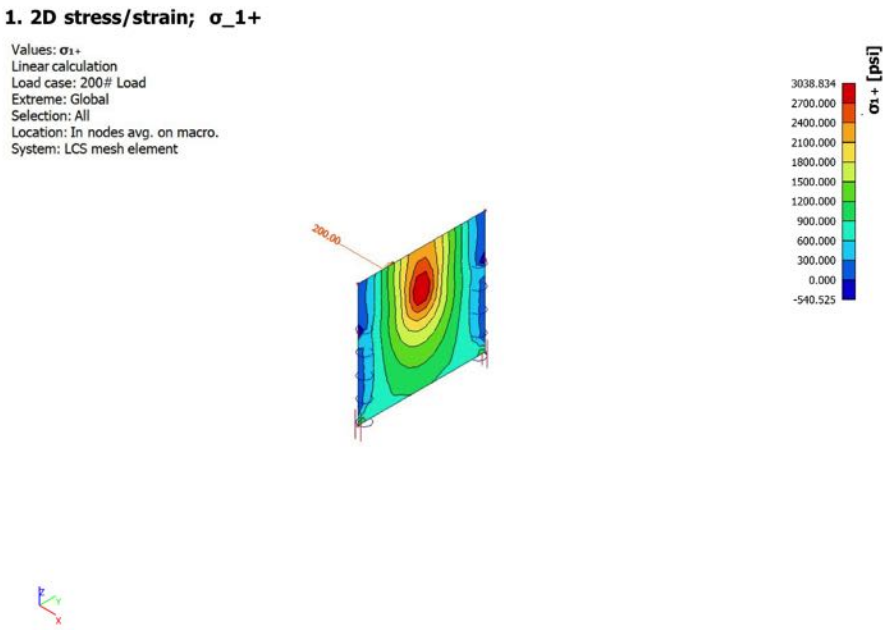
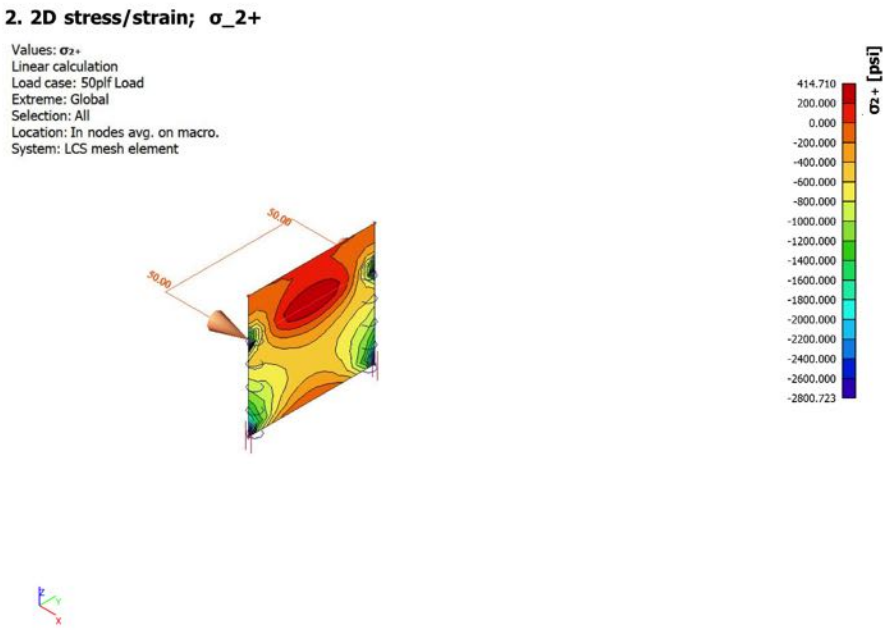
Example 1)
60” tall system, 40” tall posts, 60” post spacing, 9/16” glass





Peak glass stress is 3,040psi < 6,000psi. System will meet live loading criteria.

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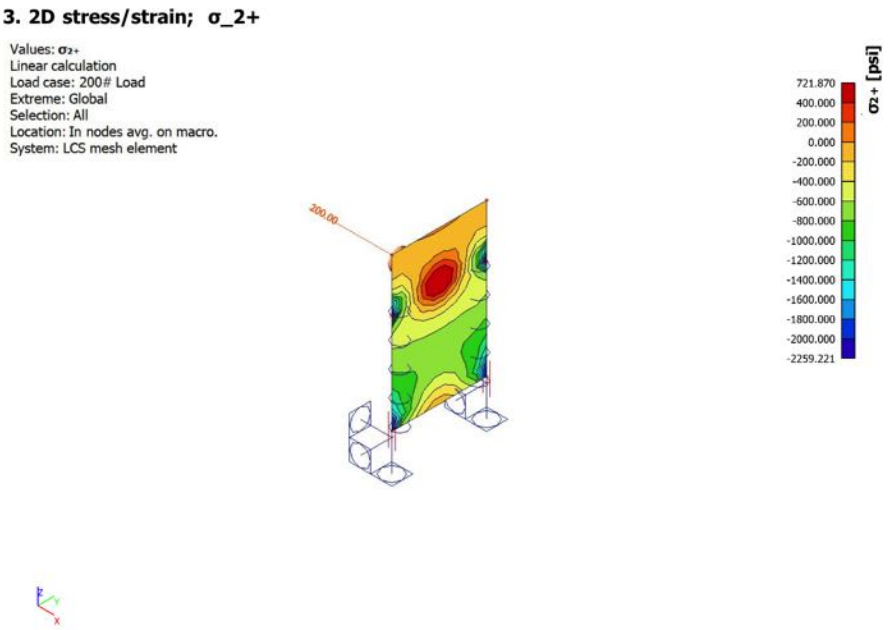
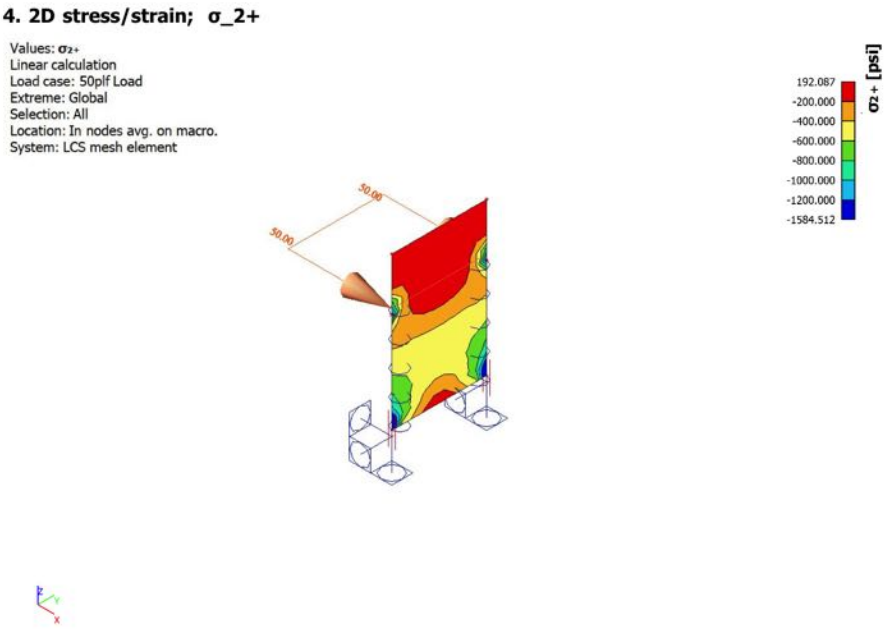
Example 2)
60” tall system, 40” tall posts, 36” post spacing, 9/16” glass





Peak glass stress is 2,260psi < 6,000psi. System will meet live loading criteria. Note the closer posts lowered the peak stress. Generally smaller post spacings will result in less stress.

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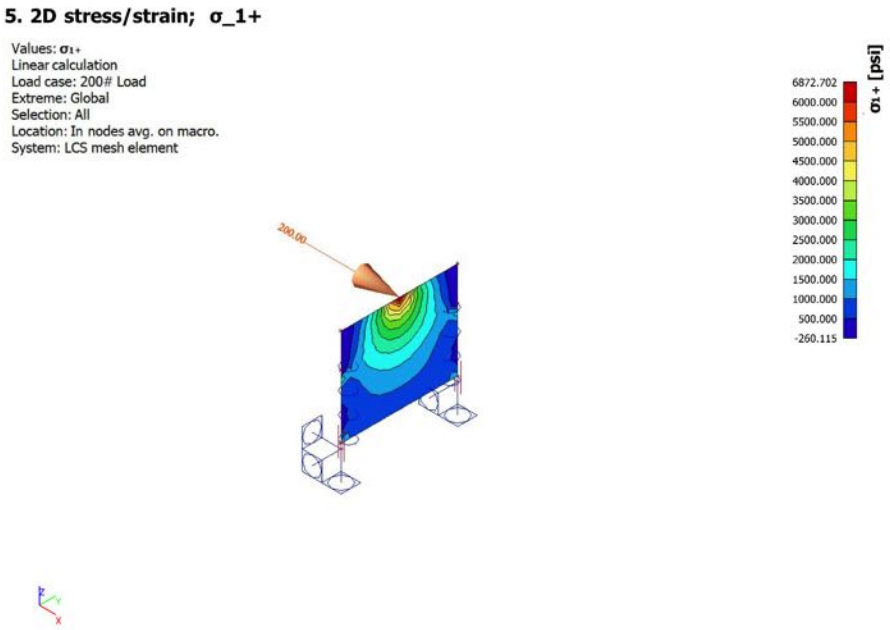
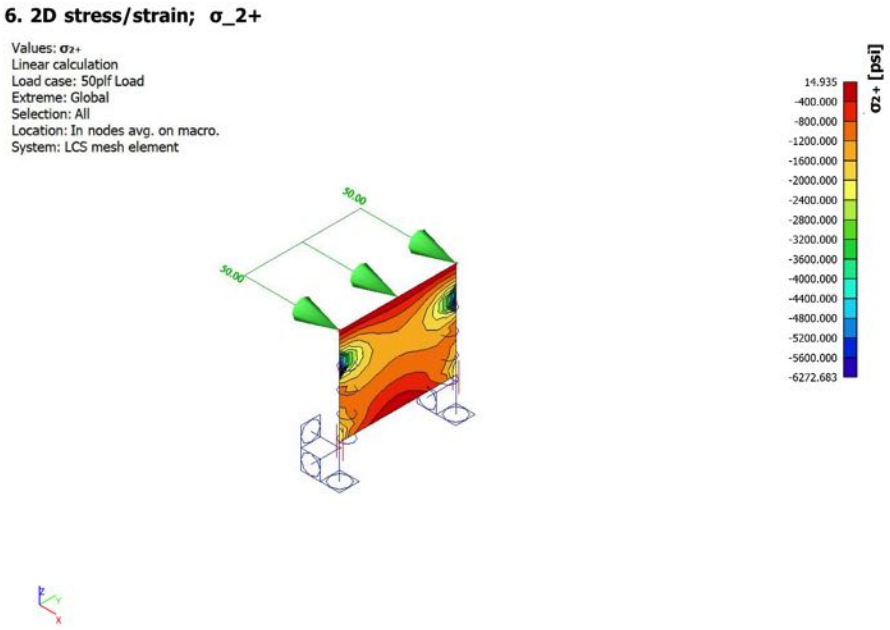
Example 3)
42” tall system, 28” tall posts, 48” post spacing, 9/16” glass





Peak glass stress is 6,870psi > 6,000psi. Glass stress exceeds 6,000psi! Note that a shorter system has higher stress because the loading occurs on the edge of glass and the posts are shorter.

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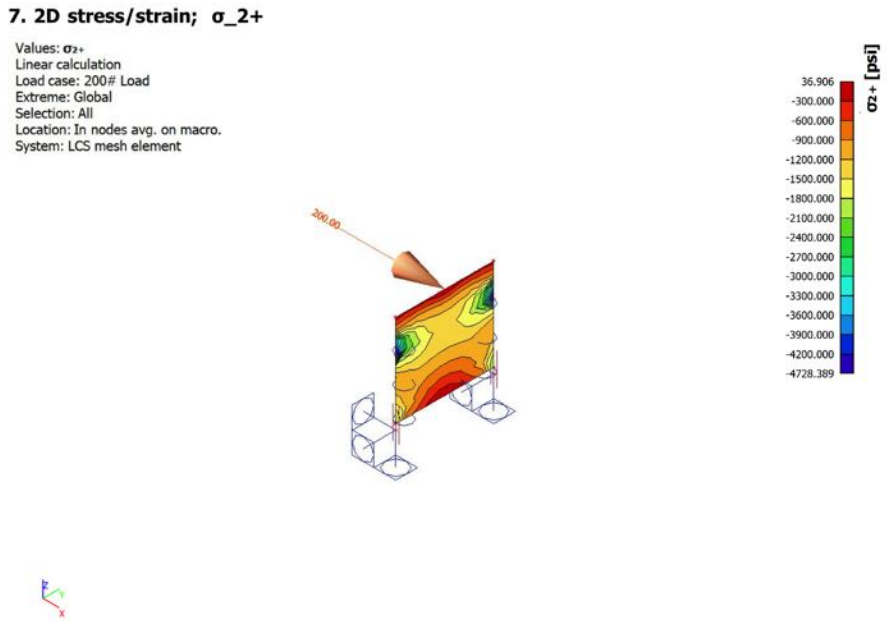
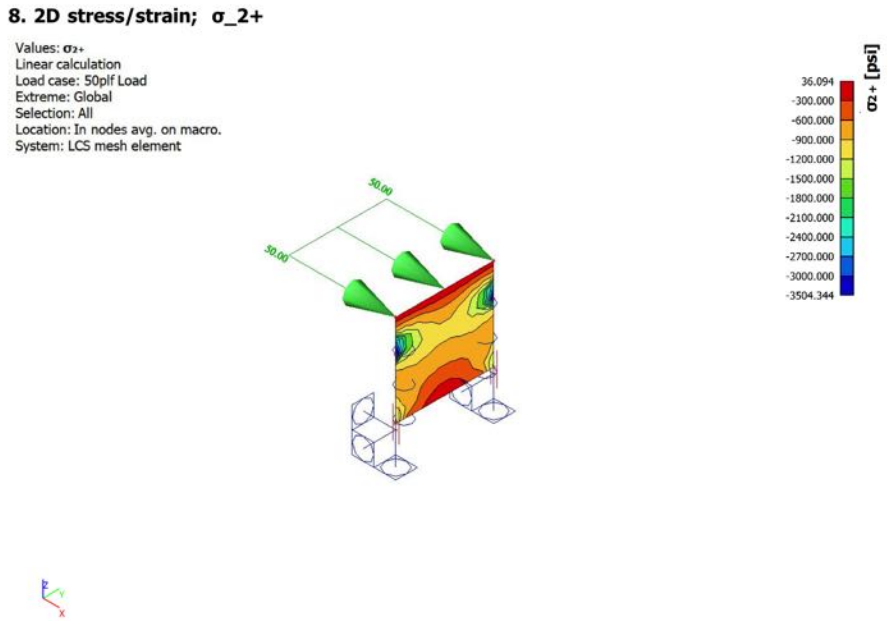
Example 4)
36” tall system, 24” tall posts, 36” post spacing, 9/16” glass





Peak glass stress is 4,730psi < 6,000psi. System will meet live loading criteria.

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CONCRETE CORE MOUNTS

Core mount depth and edge distance requirements will vary by the loading and strength of concrete. The wind load tables below may be used to find an acceptable combination of depth and edge distance for a desired loading.

Check concrete failure modes:
Stanchions loaded with moment will resist moment by creating couple moment bearing reactions on the concrete. Assume stanchions experience plastic deformation and the bearing reactions are uniform.
Distance between centroids of bearing reactions = d/2 (d = embedment depth)
Bearing reaction depth = d/2
Allowable bearing stress = $0.65*0.85f'_c/1.6 = 0.3453f'_c$
Post width = 2.375”
Allowable bearing load , $P_a = 2.375”*d/2*0.3453f'_c = 0.4100df'_c$
Allowable moment, $M_a = (0.4100df'_c)*d/2 = 0.2050*d^2*f'_c$
Bearing stress check limits moment strength with respect to embedment depth and concrete strength.

Check edge breakout:
Edge breakout is calculated as the concrete two way shear strength.
v_c is calculated according to ACI318-14 Table 22.6.5.2
Note that the perimeter of the breakout is offset $0.5c_1$ from the stanchion edges where c_1 is the edge distance to the face of the stanchion.
The width of the breakout section, $w = 2.375”+c_1$
The height of the breakout section, $h = d/2+0.5C_1$
The total perimeter of the breakout, $b_0= w+2h$

Once v_c is determined the allowable bearing load is calculated as,$P_a= 0.75*v_c*c_1*b_0/1.6$
And $M_a = P_a*d/2$

Sample calculations are shown below for several different embedment depth, edge distance and concrete strength combinations. The calculations first calculate the allowable load against shear breakout failure then the allowable load against compression failure. Lastly, the lesser of the two failure modes is multiplied by d/2 to find the allowable moment.

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Inputs								
Post Width (in)	Concrete Strength		Edge Distance (in)	Embedment	Edge breakout calcs			
b (in)	f'_c (psi)	λ	C_1 (in)	d (in)	w (in)	h (in)	β	b_0 (in)
2.375	3000	1	3	4	5.375	3.5	1.535714286	12.375
2.375	3000	1	3	5	5.375	4	1.34375	13.375
2.375	3000	1	3	6	5.375	4.5	1.194444444	14.375
2.375	3000	1	5	4	7.375	4.5	1.638888889	16.375
2.375	3000	1	5	5	7.375	5	1.475	17.375
2.375	3000	1	5	6	7.375	5.5	1.340909091	18.375
2.375	5000	1	3	4	5.375	3.5	1.535714286	12.375
2.375	5000	1	3	5	5.375	4	1.34375	13.375
2.375	5000	1	3	6	5.375	4.5	1.194444444	14.375
2.375	5000	1	5	4	7.375	4.5	1.638888889	16.375
2.375	5000	1	5	5	7.375	5	1.475	17.375
2.375	5000	1	5	6	7.375	5.5	1.340909091	18.375

						Bearing Calcs	Strength	
						0.65*0.85f'_c/1.6	$f_a$bd/2	Min(P_a)*d/2
α_s	4λ√f'_c (psi)	(2+4/β)λ√f'_c (psi)	(2+$\alpha_s C_1/b_0$)λ√f'_c (psi)	$V_c C_1 b_0$	P_a (lbs)	f_a (psi)	P_a (lbs)	M_a (in-lbs)
30	219.089023	252.2071311	507.8881897	8133.67998	3812.66249	1035.9375	4920.70313	7625.32498
30	219.089023	272.5875054	478.1054848	8790.94705	4120.75643	1035.9375	6150.87891	10301.89107
30	219.089023	292.9678796	452.4664605	9448.21412	4428.85037	1035.9375	7381.05469	13286.5511
30	219.089023	243.2259493	611.2750985	17937.9138	8408.39707	1035.9375	4920.70313	9841.40625
30	219.089023	258.0794423	582.398518	19033.3589	8921.88697	1035.9375	6150.87891	15377.19727
30	219.089023	272.9329354	556.6649666	20128.804	9435.37687	1035.9375	7381.05469	22143.16406
30	282.842712	325.5980062	655.6808335	10500.5357	4922.12611	1726.5625	8201.17188	9844.252219
30	282.842712	351.9089562	617.2315268	11349.0638	5319.87367	1726.5625	10251.4648	13299.68419
30	282.842712	378.2199062	584.1316888	12197.592	5717.62124	1726.5625	12301.7578	17152.86372
30	282.842712	314.0033503	789.1527589	23157.7471	10855.1939	1726.5625	8201.17188	16402.34375
30	282.842712	333.1791274	751.8732537	24571.9606	11518.1066	1726.5625	10251.4648	25628.66211
30	282.842712	352.3549045	718.6513817	25986.1742	12181.0192	1726.5625	12301.7578	36543.05748

The results of the calculations above are summarized in the table below. A concrete strength, embedment depth and edge distance combination should be selected that develops the strength of the stanchion already selected for the required wind loading.

Table 51 Concrete Failure Allowable Moments

Concrete Strength (psi)	Edge Distance (in)	Embedment Depth (in)	Allowable Moment (in-lbs)
3,000.00	3.00	4.00	7,630.00
3,000.00	3.00	5.00	10,300.00
3,000.00	3.00	6.00	13,300.00
3,000.00	5.00	4.00	9,840.00
3,000.00	5.00	5.00	15,400.00
3,000.00	5.00	6.00	22,100.00
5,000.00	3.00	4.00	9,840.00
5,000.00	3.00	5.00	13,300.00
5,000.00	3.00	6.00	17,200.00
5,000.00	5.00	4.00	16,400.00
5,000.00	5.00	5.00	25,600.00
5,000.00	5.00	6.00	36,500.00

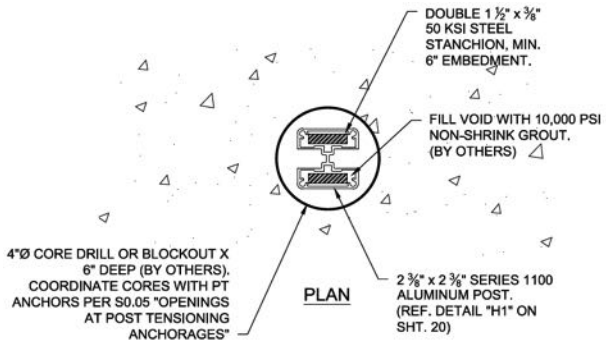
For typical 4” embedment, 3” edge distance and 3,000psi concrete, allowable wind load is according to the table below:

Table 52:	Connection strength (ft-#)=		636			
Wind load ASD	Post Spacing					
Screen Height	3	4	4.5	5	5.5	6
3	42.8	32.1	28.6	25.7	23.4	21.4
3.5	31.5	23.6	21.0	18.9	17.2	15.7
4	24.1	18.1	16.1	14.5	13.1	12.0
4.5	19.0	14.3	12.7	11.4	10.4	9.5
5	15.4	11.6	10.3	9.3	8.4	7.7
5.5	12.7	9.6	8.5	7.6	7.0	6.4
6	10.7	8.0	7.1	6.4	5.8	5.4

EMBEDDED STANCHIONS

1-7/8”x3/8” Stanchions

Each post has two flat bar stanchions that are grouted in place so the post and stanchions will bend as single composite shape.



F_y = 50ksi

F_u = 65ksi

n = 29,000ksi/10,100ksi = 2.871

Center of bars are 0.6875” from center of post.

Use parallel axis theorem to find stanchion contribution to I,

I_{stanch} = 2.871*2[1.875”*0.375”^{3}/12+1.875”*0.375”*0.6875”^{2}] = 1.955in^4

I_{net} = 1.955in^4+ 0.933in^4 = 2.888in^4 (Equivalent aluminum shape)

S_{al} = 2.888in^4/1.200in = 2.407in^3

S_{st} = 2.888in^4/(0.875in*2.871) = 1.149in^3

M_{al} = 20.9ksi*2.407in^3 = 50,300”#

M_{st} = 50ksi/1.67*1.149in^3 = 34,400”# (controls) > 20,390”# OK

Check rupture of stanchions below bottom of post:

Z = 2*0.375”*1.875”*0.6875”^{2} = 0.6647in^3

M_a = 65ksi/2*0.6647in^3 = 21,600”# > 20,390”# OK

Find moment at top of stanchion:

V = 28.43psf*5’*3.286’ = 467.1#

M = 467.1#*3.286’/2*12 = 9,209”# < 16,344”# OK

EMBEDDED POST REINFORCED WITH DOUBLE BAR STANCHION

Where the Series 1100 post is reinforced with the double bar stanchion and embedded in the core hole with the stanchions then the strength of the post and stanchion are additive.

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CONCRETE MASONRY UNIT CONSTRUCTION (CMU)

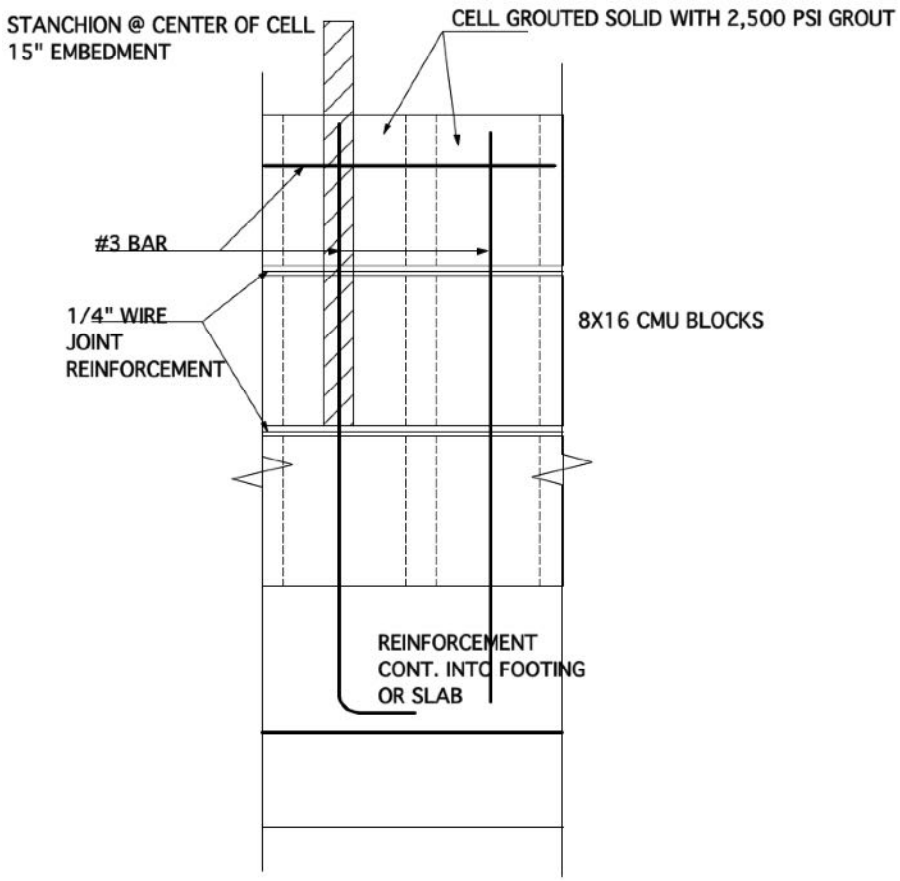
When stanchions or posts are embedded into the grouted cells of CMU:
The CMU wall shall be designed for the imposed moments from the posts.
The stanchion (previous page) shall be embedded a minimum of 15” into the CMU unless engineered for less.
The minimum wall thickness shall be 8” nominal unless engineered for less.
A bond beam with (2) #3 bars or larger shall be constructed along the top course or as other engineering requires to accommodate the post loading. The reinforcement bar shall pass between the stanchion/post and each face of the wall.

Additional reinforcement may be required depending on project requirements and specific configuration. Maximum allowable moment for this detail is 9,600”# per post.

Other CMU wall configurations shall be engineered to support the imposed loads from the posts.

Surface mounted base plate installation shall be engineered for the specific application.

Face mounted post installations shall be engineered for the specific application.



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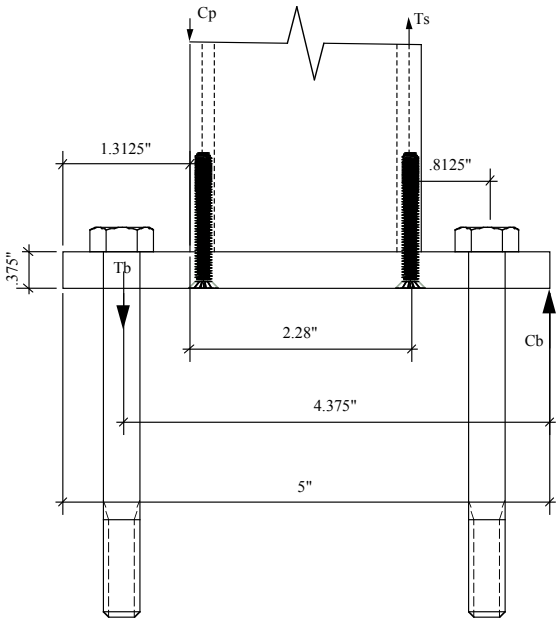
BASEPLATE MOUNTED POSTS



Failure modes → screw tension
→ screw shear
→ screw withdrawal

For screw withdrawal
See ADM 5.4
From testing screw engagement in slot is adequate so that failure is consistently screw rupture without withdrawal from the slot.

Base plate to post screws are AISI 4037 steel alloy fabricated in accordance with SAE J429 Grade 8 and coated with Magni 550 corrosion protection.
Refer to base plate attachment strength test report for determination of allowable screw tension strength and allowable moment on the connection.
Average failure moment = 22,226"#
Safety factor calculated in accordance with ADM 9.3.2 = 2.07

Allowable Moment on the base plate to post connection:
$M_{allowable}$ = 22,226"#/2.07 = 10,895"#

Allowable screw tension load:
T_{all} = 10,895"#/(2*2.28") = 2,389# From testing

Calculated strength:
Screw tension → F_{tU} = 0.0376 • 150 ksi = 5,640# Screw rupture on net tension area
For fracture SF = 1.6/(0.9*0.75) = 2.37 → 5,640/2.37 =2,380#

Using the calculated screw strength
M_{all} = 2 • 2,380# • 2.28" = 10,852"# < 21,000"# (Does not develop full post strength)

Table 53:	Connection strength (ft-#)=		900			
Wind load ASD	Post Spacing					
Screen Height	3	4	4.5	5	5.5	6
3	60.6	45.5	40.4	36.4	33.1	30.3
3.5	44.5	33.4	29.7	26.7	24.3	22.3
4	34.1	25.6	22.7	20.5	18.6	17.0
4.5	26.9	20.2	18.0	16.2	14.7	13.5
5	21.8	16.4	14.5	13.1	11.9	10.9
5.5	18.0	13.5	12.0	10.8	9.8	9.0
6	15.2	11.4	10.1	9.1	8.3	7.6

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BASE PLATE ANCHORAGE TO STEEL

3/8" A307 or ASTM F593 Group 1 or 2 Condition CW stainless steel bolts into 1/4" tapped steel or with nuts.

Tensile area of 3/8" threaded rod (UNC) = 0.0775 in^2

Rod strength ϕP_n= (0.75*60ksi) * 0.0775 in^2 = 3,488# (controls)

Check thread strength into standoff – minimum thread embed = 1/4"

Internal thread stripping area = 0.828 in^2 for 3/8 – 16 threads

Strength of threads $\phi P_n = 0.65*0.58*A_{sn}*t*F_{tu}$ = 0.65*0.58*0.828*(1/4)*75ksi = 4,541#

Shear strength ϕV_n= 0.65*0.5*60 ksi*0.0775 in^2 = 1,511#

T_a = 3,488#/1.6 = 2,180#

M_a = 2*2,180#*4.25" = 18,500"# > 10,852"# (Develops screw to baseplate strength)

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BASE PLATE MOUNTED TO CONCRETE - Expansion Bolt Alternative:
Base plate mounted to concrete with Hilti Kwikbolt 3/8"x3.75" concrete anchors with 2.75" effective embedment. Anchor strength based on ESR-1917
Minimum conditions used for the calculations:
$f'_c \geq 3{,}000$ psi uncracked concrete
edge distance = 2.75" spacing = 3.5" (Assume 4-1/2" from center of post to edge of concrete)
h = 2.75": effective embed depth (3.0625"" nominal)
For concrete breakout strength:
$N_{cb} = [A_{Ncg}/A_{Nco}]\varphi_{ed,N}\varphi_{c,N}\varphi_{cp,N}N_b$
A_{Ncg}= (1.5*2.75*2+3.5)*(1.5*2.75+2.25) = 74.91 in^2 2 anchors
A_{Nco}= 9*2.75"^{2} = 68.06 in^2
$C_{a,cmin}$ = 2.5" (ESR-1917 Table 3)
C_{ac} = 4.125" (ESR-1917 Table 3)
$\varphi_{ed,N}$ = 0.7+0.3*2.75"/(1.5*2.75") = 0.9
$\varphi_{c,N}$ = (use 1.0 in calculations with k = 24)
$\varphi_{cp,N}$= max (2.75"/4.125 or 1.5*2.75"/4.125) = 1
$N_b = 24*1.0*\sqrt{3000}*2.75^{1.5}$ = 5,995#
N_{cb} = 74.91/68.06*0.9*1.0*1.0*5,995 = 5,940#

Concrete pullout strength per ESR 1917 Table 3, $N_{p,uncr}$=4,110# each
$N_{p,uncr}$=2*4,110# = 8,220# > 5,940# (Pullout strength does not control for tension strength of anchor pair)

Determine allowable tension load on anchor pair
T_s = 0.65*5,940#/1.6 = 2,410#

Check shear strength - Concrete breakout strength in shear:
$V_{cb} = A_{vc}/A_{vco}(\varphi_{ed,V}\varphi_{c,V}\varphi_{h,V}V_b$
A_{vc} = (1.5*2.75"*2+3.5")*(2.75"*1.5) = 48.47in^2
A_{vco}= 4.5$(c_{a1})^2$ = 4.5(2.75")^2 = 34.03in^2
$\varphi_{ed,V}$= 1.0 (affected by only one edge)
$\varphi_{c,V}$= 1.4 uncracked concrete
$\varphi_{h,V} > 1$ (Depends on slab thickness, assume minimum value of 1)
$V_b = [7(l_e/d_a)^{0.2}\sqrt{d_a}]\lambda\sqrt{f'_c}(c_{a1})^{1.5}$ = [7(2.75/0.375)$^{0.2}\sqrt{0.375}$]1.0$\sqrt{3000}$(2.75)$^{1.5}$ =1,590#
V_{cb} = 48.47/34.03*1.0*1.4*1.0*1,590# = 3,170#
ϕV_{cb}/LF = 0.7*3,170#/1.6 = 1,380#
Steel shear strength = 0.65*3,595#*2/1.6 = 2,920#
Concrete breakout controls shear strength, V_a = 1,380# (will not control anchor design)

M_a = 2,410#*(4.25"-0.5*2,410/(0.85*3000*4.75")) = 10,000"# < 10,852"# (Does not develop screw to baseplate strength) See reduced allowable wind loads next page.

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Table 54:	Connection strength (ft-#)=		833			
Wind load ASD	Post Spacing					
Screen Height	3	4	4.5	5	5.5	6
3	56.1	42.1	37.4	33.7	30.6	28.0
3.5	41.2	30.9	27.5	24.7	22.5	20.6
4	31.6	23.7	21.0	18.9	17.2	15.8
4.5	24.9	18.7	16.6	15.0	13.6	12.5
5	20.2	15.1	13.5	12.1	11.0	10.1
5.5	16.7	12.5	11.1	10.0	9.1	8.3
6	14.0	10.5	9.3	8.4	7.6	7.0

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ATTACHMENT TO WOOD:
Check required embedment for 3/8" lag screws:
From National Design Specification for Wood Construction Table 11.2A
For full post to base plate mounting strength = 10,895"#:
T = 10,895"#/3.75" = 2,905#
adjusted for wood bearing pressure:
a = 2,905/(1.25*625psi*5) = 0.744"
T' = 10,895"#/(4.25-0.744/2) = 2,809# (1,405# per lag)
G ≥ 0.49 (pressure treated Doug-Fir, Southern Pine, LVL, or denser wood)
W = 296#/" (MC ≤ 19%)
C_D = 1.6 for wind loads and guard loads (NDS Table 2.3.2)
C_M = 0.7 (NDS Table 10.3.3) where moisture content of wood may exceed 19%.
W' = 296#/"*1.6 = 477#/" (MC ≤ 19%)
W' = 296#/"*1.6*0.7 = 332#/" (MC ≥ 19%)
Allowable tension load on 3/8" lag screw stainless steel
$T_a = AF_{yt}$ = 0.0775in²*75 ksi/3 = 1,938# ≥ 2,809/2 = 1,405#

Required embedment depth e:
e = 1,405/332#/" = 4.232"
Req. lag screw length = 4.232" + 0.5 + 7/32" = 4.95" Use 6" lag screws for weather exposed installation.
e = 1,405/477#/" = 2.945"
Req. lag screw length = 2.945" + 0.5 + 7/32" = 3.664" Use 5" lag screws for protected installation.

When there is decking between the base plate and the solid lumber backing the lag screw length shall be increased to assure the minimum embedment is achieved.
Recommend using 3/8" x (4.95"+t_d) stainless steel lag screws, (4) per base plate (weather exposed).
Where t_d = material thickness between the base plate and the solid lumber backing.
Minimum blocking under base plate is 6x8 nominal.
Attachment of blocking to joists:
Required number of screws for 1/4" x 3" screws:
Z' = 159#*1.6*0.7 = 178#
From ∑M about center of block:
solving for N:
N = 2,810/(178) = 16 screws each end

Typical installation will use 3/8"x5" SS lag screws:
A typical installation is a 3/4" decking above solid blocking or beam that is protected from moisture,
p = 5"-3/4"-7/32" = 4.03"
W'p = 477pli*4.03" = 1,922# > 1,405# greater than assumed minimum steel strength

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Allowable bearing stress on panel product is 360psi
M_a = 2*1,922#*(4.375”-2*1,922#/(5”*360psi)/2) = 12,713”# for typical installation > 10,895”#
(Develops screw to baseplate strength)

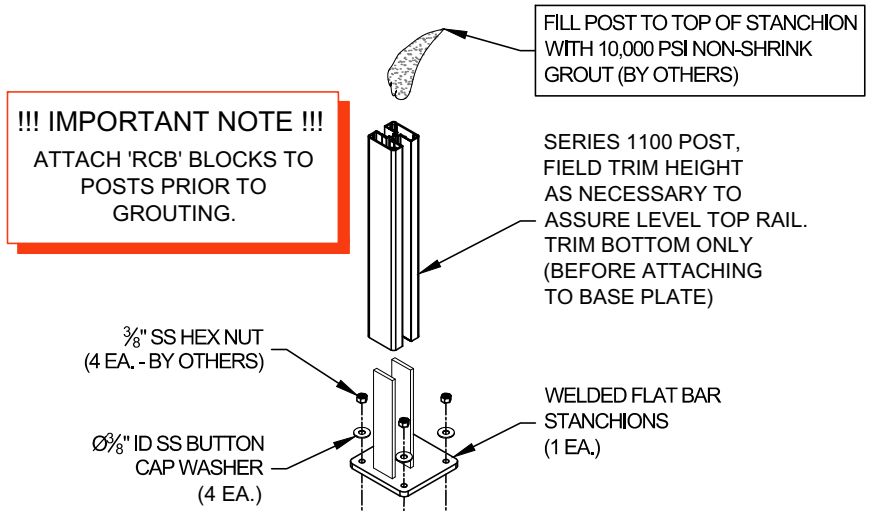
For through bolts:
Use 3/8” bolts to minimum 4x solid blocking with 2” square plate washers on the backside under the nut. Blocking shall be adequately secured.

Wood framing shall have adequate strength to carry the imposed loads from the posts.

STEEL BASEPLATE WITH STEEL BAR STANCHIONS:
Stanchion strength same as previously checked.

Check rupture of welds to baseplate:
Flat bar max tension = 20,390”#/1.375” = 14,830#
Perimeter = 2*1.875”+2*.375” = 4.5”
5/16” fillet weld strength per Steel Construction Manual
R_n/Ω = 928*5*4.5” = 20,880# > 14,830# OK

The base plate size and location of the stanchions may be customized for specific project requirements.



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FASCIA MOUNTED POSTS
Posts may be fascia mounted to steel, concrete, CMU or wood using a minimum of two 3/8" anchors designed for the imposed loads and moments as calculated.

ALTERNATIVES
Alternative anchors may be designed based on the post moments as calculated.

DESIGN STEPS:
1) Determine wind load using ASCE SEI 7-05, 7-10, 7-15 or other accepted standard for project conditions as illustrated in table 1. Wind loads are to be ASD level wind loads, adjust strength level by $W_{strength}*0.6 = W_{ASD}$
2) Select correct allowable wind load table according to glass thickness and glass cantilever height.
3) Verify allowable wind load is greater than design wind load.
4) Select anchors based on substrate.

LIMITATIONS
The specifier shall verify the suitability of the system for any specific installation to include but not limited to the wind load conditions, fall protection requirements, substrate support and any local codes or other requirements. This report may be used by a qualified professional as a guide in preparing a project specific design. THIS REPORT IS NOT INTENDED TO CERTIFY THE SERIES 1100 POSTS FOR A SPECIFIC INSTALLATION.

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APPENDIX

SCIA model result tables:

Table A3: Model stresses (psi), No cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1440	1440	1450	1440	1440	1440
42	1960	1970	1970	1970	1970	1960
48		2590	2590	2590	2590	
54			3270	3270	3270	
60				4020	4020	

Table A4: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	3480	4080	5250	6330	7780	10700
42	4530	4930	6180	7340	8940	12100
48		6000	7260	8470	10200	
54			8660	9840	11600	
60				11500	13200	

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Table A5: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1890	2250	2490	3230	3600	5000
42	3510	3370	3170	3840	4250	5750
48		5290	4240	4710	4990	
54			6320	6270	6050	
60				8510	7510	

Table A6: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1580	2080	1700	1790	2190	6270
42	2710	3240	2650	2210	2710	7180
48		4610	4100	3280	3440	
54			5600	5010	5170	
60				6500	7360	

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Table A7: Model stresses (psi), No cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	538	563	721	907	1100	1560
42	737	731	855	1080	1310	1870
48		967	966	1210	1480	
54			1220	1380	1680	
60				1500	1840	

Table A8: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1090	1370	1790	2140	2670	3760
42	1270	1580	2050	2450	3020	4200
48		1780	2290	2730	3340	
54			2570	3040	3700	
60				3340	4050	

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Table A9: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	493	658	795	1100	1210	1720
42	668	775	915	1170	1370	1920
48		912	1030	1310	1510	
54			1180	1470	1688	
60				1640	1840	

Table A10: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	507	567	718	1120	1100	2160
42	689	694	851	1070	1310	2420
48		912	951	1200	1470	
54			1160	1370	1680	
60				1490	1840	

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Table A11: Model stresses (psi), No cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	532	719	920	1160	1410	2020
42	633	858	1100	1390	1690	2420
48		958	1230	1560	1900	
54			1410	1780	2180	
60				1950	2390	

Table A12: Model stresses (psi), 1/2 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	550	722	922	1120	1420	2010
42	656	865	1110	1410	1710	2420
48		968	1240	1580	1930	
54			1420	1820	2210	
60				1990	2420	

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Table A13: Model stresses (psi), 1/3 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	530	711	917	1080	1410	2010
42	631	848	1100	1380	1690	2410
48		948	1230	1550	1900	
54			1400	1770	2180	
60				1930	2380	

Table A14: Model stresses (psi), 1/4 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	542	726	918	1100	1420	2020
42	646	867	1100	1380	1700	2420
48		967	1230	1550	1910	
54			1400	1770	2180	
60				1940	2390	

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Table A15: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1440	1440	1450	1440	1440	1440
42	1960	1970	1970	1970	1970	1960
48		2590	2590	2590	2590	
54			3270	3270	3270	
60				4020	4020	

Table A16: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	3480	4080	5250	6330	7780	10700
42	4530	4930	6180	7340	8940	12100
48		6000	7260	8470	10200	
54			8660	9840	11600	
60				11500	13200	

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Table A17: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1890	2250	2490	3230	3600	5000
42	3510	3370	3170	3840	4250	5750
48		5290	4240	4710	4990	
54			6320	6270	6050	
60				8510	7510	

Table A18: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1580	2080	1700	1790	2190	6270
42	2710	3240	2650	2210	2710	7180
48		4610	4100	3280	3440	
54			5600	5010	5170	
60				6500	7360	

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Table A19: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	954	942	941	938	939	1200
42	1290	1290	1280	1280	1280	1430
48		1690	1690	1690	1680	
54			2140	2130	2130	
60				2620	2620	

Table A20: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	2070	2540	3300	3960	4930	6870
42	2520	2970	3820	4570	5610	7740
48		3450	4360	5170	6290	
54			4990	5840	7050	
60				6570	7840	

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Table A21: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	1040	1290	1510	1990	2270	3180
42	1370	1610	1790	2280	2610	3620
48		2030	2120	2630	2960	
54			2590	3080	3380	
60				3630	3840	

Table A22: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	882	985	922	1380	1350	3990
42	1150	1500	1220	1230	1580	4530
48		1570	1650	1580	1850	
54			2350	1990	2210	
60				2420	2660	

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Table A23: Model stresses (psi), No cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	499	583	745	937	1140	1620
42	684	691	885	1120	1360	1940
48		898	990	1250	1530	
54			1130	1420	1740	
60				1560	1910	

Table A24: Model stresses (psi), 1/2 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	997	1260	1650	1970	2460	3460
42	1170	1450	1880	2250	2770	3860
48		1640	2100	2500	3060	
54			2360	2780	3390	
60				3060	3700	

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Table A25: Model stresses (psi), 1/3 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	463	601	742	1090	1140	1610
42	624	705	883	1110	1360	1930
48		834	988	1240	1520	
54			1120	1420	1740	
60				1550	1910	

Table A26: Model stresses (psi), 1/4 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	472	587	742	1100	1140	1980
42	643	696	881	1110	1360	2210
48		850	985	1240	1530	
54			1120	1410	1740	
60				1550	1910	

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Table A27: Model deflection (in), No cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.226	0.274	0.347	0.452	0.599	1.055
42	0.381	0.437	0.523	0.646	0.818	1.349
48		0.682	0.781	0.922	1.119	
54			1.137	1.297	1.519	
60				1.792	2.040	

Table A28: Model deflection (in), 1/2 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.357	0.549	0.833	1.235	1.764	3.367
42	0.475	0.692	1.009	1.444	2.032	3.779
48		0.886	1.238	1.716	2.358	
54			1.533	2.059	2.758	
60				2.479	3.240	

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Table A29: Model deflection (in), 1/3 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.216	0.305	0.430	0.620	0.847	1.573
42	0.325	0.432	0.579	0.785	1.058	1.885
48		0.611	0.783	1.019	1.330	
54			1.056	1.325	1.676	
60				1.714	2.108	

Table A30: Model deflection (in), 1/4 height cantilever
Nominal glass thickness = 1/4”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.188	0.255	0.351	0.495	0.669	1.859
42	0.297	0.379	0.493	0.650	0.866	2.188
48		0.558	0.694	0.877	1.125	
54			0.964	1.176	1.460	
60				1.561	1.884	

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Table A31: Model deflection (in), No cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.094	0.139	0.208	0.307	0.444	0.869
42	0.137	0.189	0.269	0.384	0.544	1.037
48		0.259	0.350	0.481	0.663	
54			0.454	0.601	0.805	
60				0.750	0.975	

Table A32: Model deflection (in), 1/2 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.131	0.207	0.320	0.480	0.699	1.365
42	0.173	0.259	0.387	0.566	0.811	1.552
48		0.327	0.470	0.669	0.940	
54			0.574	0.794	1.091	
60				0.943	1.268	

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Table A33: Model deflection (in), 1/3 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.099	0.153	0.232	0.347	0.502	0.983
42	0.139	0.201	0.293	0.424	0.604	1.156
48		0.266	0.371	0.520	0.723	
54			0.469	0.636	0.863	
60				0.778	1.029	

Table A34: Model deflection (in), 1/4 height cantilever
Nominal glass thickness = 3/8”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.093	0.142	0.215	0.320	0.464	1.044
42	0.132	0.189	0.274	0.396	0.564	1.219
48		0.253	0.351	0.490	0.680	
54			0.448	0.604	0.819	
60				0.745	0.983	

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Table A35: Model deflection (in), No cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.068	0.110	0.173	0.263	0.388	0.771
42	0.091	0.139	0.212	0.317	0.460	0.901
48		0.177	0.260	0.378	0.541	
54			0.318	0.450	0.632	
60				0.535	0.735	

Table A36: Model deflection (in), 1/2 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.083	0.135	0.214	0.325	0.479	0.948
42	0.106	0.166	0.255	0.381	0.554	1.080
48		0.204	0.304	0.444	0.636	
54			0.363	0.518	0.730	
60				0.603	0.835	

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Table A37: Model deflection (in), 1/3 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.071	0.115	0.182	0.277	0.408	0.811
42	0.093	0.144	0.221	0.331	0.481	0.942
48		0.182	0.268	0.392	0.562	
54			0.325	0.463	0.652	
60				0.546	0.754	

Table A38: Model deflection (in), 1/4 height cantilever
Nominal glass thickness = 1/2”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.068	0.111	0.175	0.267	0.395	0.833
42	0.091	0.140	0.215	0.321	0.467	0.963
48		0.177	0.262	0.382	0.548	
54			0.318	0.453	0.638	
60				0.536	0.739	

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Table A39: Model deflection (in), No cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.226	0.274	0.347	0.452	0.599	1.055
42	0.381	0.437	0.523	0.646	0.818	1.349
48		0.682	0.781	0.922	1.119	
54			1.137	1.297	1.519	
60				1.792	2.040	

Table A40: Model deflection (in), 1/2 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.357	0.549	0.833	1.235	1.764	3.367
42	0.475	0.692	1.009	1.444	2.032	3.779
48		0.886	1.238	1.716	2.358	
54			1.533	2.059	2.758	
60				2.479	3.240	

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Table A41: Model deflection (in), 1/3 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.216	0.305	0.430	0.620	0.847	1.573
42	0.325	0.432	0.579	0.785	1.058	1.885
48		0.611	0.783	1.019	1.330	
54			1.056	1.325	1.676	
60				1.714	2.108	

Table A42: Model deflection (in), 1/4 height cantilever
Nominal laminated glass thickness = 5/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.188	0.255	0.351	0.495	0.669	1.859
42	0.297	0.379	0.493	0.650	0.866	2.188
48		0.558	0.694	0.877	1.125	
54			0.964	1.176	1.460	
60				1.561	1.884	

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Table A43: Model deflection (in), No cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.146	0.193	0.265	0.368	0.512	0.959
42	0.233	0.288	0.372	0.493	0.660	1.181
48		0.426	0.522	0.661	0.852	
54			0.725	0.881	1.097	
60				1.166	1.406	

Table A44: Model deflection (in), 1/2 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.225	0.348	0.531	0.786	1.132	2.176
42	0.300	0.440	0.645	0.928	1.312	2.461
48		0.563	0.791	1.104	1.526	
54			0.978	1.323	1.785	
60				1.590	2.094	

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Table A45: Model deflection (in), 1/3 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.150	0.219	0.318	0.463	0.651	1.238
42	0.220	0.302	0.417	0.581	0.801	1.473
48		0.417	0.550	0.737	0.987	
54			0.725	0.936	1.217	
60				1.186	1.499	

Table A46: Model deflection (in), 1/4 height cantilever
Nominal laminated glass thickness = 7/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.135	0.192	0.275	0.397	0.557	1.387
42	0.205	0.273	0.372	0.509	0.700	1.631
48		0.388	0.502	0.661	0.879	
54			0.675	0.857	1.103	
60				1.103	1.380	

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Table A47: Model deflection (in), No cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.089	0.134	0.202	0.300	0.437	0.858
42	0.129	0.181	0.260	0.374	0.532	1.020
48		0.245	0.335	0.465	0.645	
54			0.431	0.577	0.778	
60				0.714	0.937	

Table A48: Model deflection (in), 1/2 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.123	0.195	0.302	0.453	0.662	1.295
42	0.162	0.243	0.365	0.535	0.768	1.474
48		0.306	0.442	0.631	0.889	
54			0.538	0.747	1.031	
60				0.886	1.195	

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Table A49: Model deflection (in), 1/3 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.095	0.147	0.224	0.336	0.488	0.958
42	0.131	0.192	0.282	0.410	0.585	1.125
48		0.252	0.354	0.500	0.698	
54			0.445	0.609	0.830	
60				0.740	0.986	

Table A50: Model deflection (in), 1/4 height cantilever
Nominal laminated glass thickness = 9/16”, Uniform load = 10psf

	Wind Screen Height (in)					
Post Spacing (in)	**36**	**42**	**48**	**54**	**60**	**72**
36	0.089	0.137	0.209	0.312	0.455	1.012
42	0.125	0.181	0.265	0.385	0.550	1.180
48		0.241	0.337	0.473	0.661	
54			0.427	0.580	0.791	
60				0.711	0.945	

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