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CLIENT DANVID WINDOWS  
JOB NAME ANCHOR CALCULATIONS  
SUBJECT \_\_\_\_\_  
\_\_\_\_\_

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JOB 02-290  
DATE 9-26-2002  
BY YL

**ANCHOR CALCULATIONS**

**FOR**

**DANVID WINDOWS**

**JOB #02-290**

**SUBMITTED 9-26-2002**

**PREPARED FOR:**

**DANVID WINDOWS  
1813 KELLY BOULEVARD  
CARROLLTON, TX 75006**

ITEM

1. Calculations
2. References

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**CALCULATIONS FOR WINDOW PRODUCTS**  
**ANCHORED INTO SPRUCE PINE FIR (SPF) SUBSTRATE FRAMING**  
**THROUGH NAILING FIN:**

*Manufacturer:* DANVID WINDOWS  
1813 KELLY BOULEVARD  
Carrollton, TX 75006

*Property Type:* Single hung window  
*Frame Size:* 4'-5" wide × 6'-0" high

**CONNECTION DATA:**

*Material:* Spruce Pine Fir (SPF)  
*Specific Gravity:* G = 0.42  
*Anchor Type:* # 8 Wood Screw  
*Screw Diameter:* 0.164"  
*Minimum Embedment:* 1.25"

*Tabulated Withdrawal Design Value:* 82 lb/inch

*Application Adjustment Factors:* Load Duration ( $C_D$ ) = 1.6  
Penetration ( $C_d$ ) = 1.0

*Allowable Working Load:*  $82 * (1.6) * (1.0) = 131 \text{ lb/Screw}$

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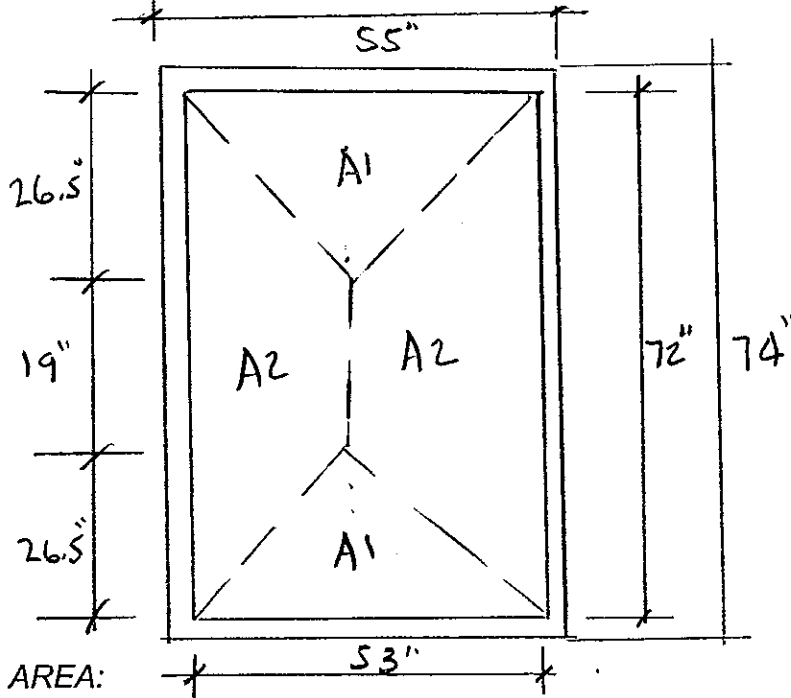
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**LOAD DISTRIBUTION:**

Check largest size to determine required spacing.



$$A_1 = (26.5 * 53) / (2 * 144) = 4.88 \text{ ft}^2$$

$$A_2 = (19 + 72) (26.5 / 2) / 144 = 8.37 \text{ ft}^2$$

**DESIGN PRESSURE:**

$$D_p = \pm 40.0 \text{ psf}$$

**TOTAL LOAD:**

$$W_1 = A_1 \cdot D_p = (4.88 \text{ ft}^2) * (40 \text{ psf}) = 196 \text{ lb}$$

$$W_2 = A_2 \cdot D_p = (8.37 \text{ ft}^2) * (40 \text{ psf}) = 335 \text{ lb}$$

**QUANTITY OF NAILS REQUIRED:**

$$@ A_1 = 196 / 131 = 1.5 \Rightarrow \text{Use 2 Screws}$$

$$@ A_2 = 335 / 131 = 2.5 \Rightarrow \text{Use 3 Screws}$$

**MAXIMUM O.C. SPACING:**

$$@ A_1 = (53.0 + 2.0 - 12.0) / 2 = 21.5$$

$$@ A_2 = (72.0 + 2.0 - 12.0) / 3 = 20.7$$

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**CONCLUSION:**

Maximum allowable on center spacing when attaching window to spruce pine fir is 6" from each corner and 12" on center.

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**Table 11A Dowel Bearing Strength for Wood Screw Connections**

Species Combination	Specific Gravity G	Dowel bearing strength in pounds per square inch (psi) <sup>2</sup> F <sub>e</sub>
Aspen	0.39	2950
Balsam Fir	0.36	2550
Beech-Birch-Hickory	0.71	8850
Coast Sitka Spruce	0.39	2950
Cottonwood	0.41	3200
Douglas Fir-Larch	0.50	4650
Douglas Fir-Larch (North)	0.49	4450
Douglas Fir-South	0.46	4000
Eastern Hemlock	0.41	3200
Eastern Hemlock-Balsam Fir	0.36	2550
Eastern Hemlock-Tamarack	0.41	3200
Eastern Hemlock-Tamarack (North)	0.47	4150
Eastern Softwoods	0.36	2550
Eastern Spruce	0.41	3200
Eastern White Pine	0.36	2550
Engelmann Spruce-Lodgepole Pine	0.38	2800
Engelmann Spruce-Lodgepole Pine (MSR 1650f and higher grades)	0.46	4000
Engelmann Spruce-Lodgepole Pine (MSR 1500f and lower grades)	0.38	2800
Hem-Fir	0.43	3500
Hem-Fir (North)	0.46	4000
Mixed Maple	0.55	5550
Mixed Oak	0.68	8150
Mixed Southern Pine	0.51	4800
Mountain Hemlock	0.47	4150
Northern Pine	0.42	3350
Northern Red Oak	0.68	8150
Northern Species	0.35	2400
Northern White Cedar	0.31	1900
Ponderosa Pine	0.43	3500
Red Maple	0.58	6100
Red Oak	0.67	7950
Red Pine	0.44	3650
Redwood, close grain	0.44	3650
Redwood, open grain	0.37	2650
Sitka Spruce	0.43	3500
Southern Pine	0.55	5550
Spruce-Pine-Fir	0.42	3350
Spruce-Pine-Fir (E of 2,000,000 psi and higher grades of MSR and MEL)	0.50	4650
Spruce-Pine-Fir (South)	0.36	2550
Western Cedars	0.36	2550
Western Cedars (North)	0.35	2400
Western Hemlock	0.47	4150
Western Hemlock (North)	0.46	4000
Western White Pine	0.40	3100
Western Woods	0.36	2550
White Oak	0.73	9300
Yellow Poplar	0.43	3500

1. Specific gravity based on weight and volume when oven-dry.  
 2. F<sub>e</sub> = 16600G<sup>1.84</sup>; Tabulated values are rounded to the nearest 50 psi.

WOOD SCREWS



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$$Z = \frac{D^2}{K_D} \sqrt{\frac{1.75 F_{em} F_{yb}}{3(1+R_e)}} \quad \text{MODE IV} \quad (11.3-3)$$

where

$$k = -1 + \sqrt{\frac{2(1+R_e)}{R_e} + \frac{F_{yb}(2+R_e)D^2}{2F_{em}t_s^2}}$$

$$R_e = F_{em}/F_{es}$$

$t_s$  = thickness of side member, in.

$F_{em}$  = dowel bearing strength of main member (member holding point), psi (see Table 11A)

$F_{es}$  = dowel bearing strength of side member, psi (see Table 11A)

$$F_e = 16600 G^{1.84}$$

$F_{yb}$  = bending yield strength of wood screw, psi

$D$  = unthreaded shank diameter of wood screw, in or

= root diameter of the threaded portion of the wood screw when the thread length is such that the threads will extend into the shear plane of the connection, in.

$$K_D = 2.2 \quad \text{for } D \leq 0.17''$$

$$K_D = 10D + 0.5 \quad \text{for } 0.17'' < D < 0.25''$$

$$K_D = 3.0 \quad \text{for } D \geq 0.25''$$

Table 11.3A provides nominal lateral design values for various cut thread wood screw connections with wood side members assuming the unthreaded shank diameter of the wood screw is in the shear plane. Nominal wood screw design values,  $Z$ , shall be multiplied by all applicable adjustment factors (see Table 7.3.1) to obtain allowable wood screw design values,  $Z'$ . Design values

**Table 11.2A Cut Thread or Rolled Thread Wood Screw Withdrawal Design Values (W)<sup>1</sup>**

Tabulated withdrawal design values (W) are in pounds per inch of thread penetration into side grain of main member. Thread length is approximately 2/3 the total wood screw length (see Reference 7).

Specific Gravity G	Wood Screw Gage										
	6g	7g	8g	9g	10g	12g	14g	16g	18g	20g	2
0.73	209	229	249	268	288	327	367	406	446	485	5
0.71	198	216	235	254	272	310	347	384	421	459	5
0.68	181	199	216	233	250	284	318	352	387	421	4
0.67	176	193	209	226	243	276	309	342	375	409	4
0.58	132	144	157	169	182	207	232	256	281	306	3
0.55	119	130	141	152	163	186	208	231	253	275	3
0.51	102	112	121	131	141	160	179	198	217	237	2
0.50	98	107	117	126	135	154	172	191	209	228	2
0.49	94	103	112	121	130	147	165	183	201	219	2
0.47	87	95	103	111	119	136	152	168	185	201	2
0.46	83	91	99	107	114	130	146	161	177	193	2
0.44	76	83	90	97	105	119	133	148	162	176	2
0.43	73	79	86	93	100	114	127	141	155	168	1
0.42	69	76	82	89	95	108	121	134	147	161	1
0.41	66	72	78	85	91	103	116	128	141	153	1
0.40	63	69	75	81	86	98	110	122	134	146	1
0.39	60	65	71	77	82	93	105	116	127	138	1
0.38	57	62	67	73	78	89	99	110	121	131	1
0.37	54	59	64	69	74	84	94	104	114	125	1
0.36	51	56	60	65	70	80	89	99	108	118	1
0.35	48	53	57	62	66	75	84	93	102	111	1
0.31	38	41	45	48	52	59	66	73	80	87	1

1. Tabulated withdrawal design values (W) for wood screw connections shall be multiplied by all applicable adjustment factors (see Table 7.3.1).