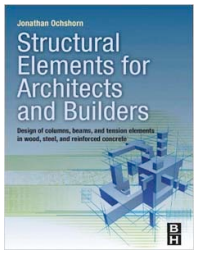

Capacity of wood column calculator

Jonathan Ochshorn

contact | academic homepage | Structural Elements text | calculator homepage

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Directions: Select wood species and grade (or enter values for modulus of elasticity, *E,* and allowable stress, F_c, after setting "Species" for "Other"), wet service conditions, duration of load factor (C_D), and effective column height for both axes (unless braced at different points, both heights should be the same -- see Fig. 1). Select either the 2005 or 2012 *National Design Specification* (NDS) values for lumber sizes, and choose either nails or bolts for built-up columns (see the NDS for nail and bolt requirements). Revised values for Southern Pine (effective June 1, 2013) are included only when the 2012 NDS is selected. ***Press "update" button***.

See additional explanations and examples in my text. The duration of load factor, C_D, for common proportions of dead and live loads is 1.0. For other combined loads (e.g., snow and dead load), see text for further details.

Note that the size factor adjustment (C_F) should *not* be included in the allowable stress value entered, as it is already included in the calculations for each column size. The combined values of allowable stress and size factor for Southern Pine have been accounted for.

The x-axis refers to the "strong" axis of bending, except in the case of 3-2x4's bolted together, where the y-axis is stronger (see Fig. 2a). Fig. 2b shows an example where different unbraced lengths apply to the two axes: sheathing nailed to the stud prevents buckling about the y-axis, but not the x-axis. In this case, one might model the column with an unbraced height of 8 feet about the x-axis, and 0 feet about the y-axis.

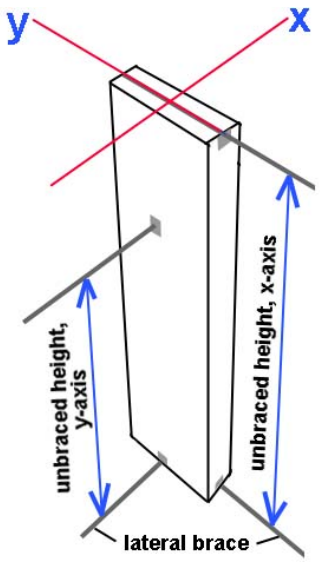

Fig. 1. *Wood compression element showing different unbraced lengths for x- and y-axes*

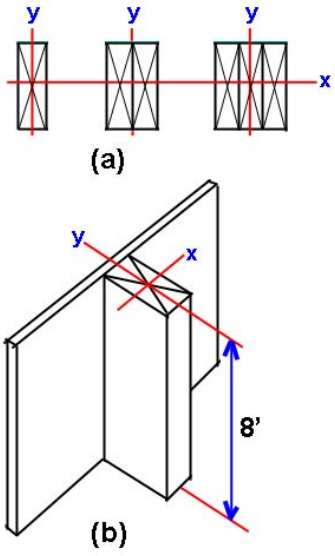

Fig. 2. *a) definition of x- and y-axes for wood cross-sections; b) example of continuous bracing for y-axis*

These values not used except for 'other' species

Dimension lumber

Species	Emin (psi)	Fc (psi)	Fc (psi) =varies	Column size	Emin (psi) =660,000	Capacity (lb)

Southern Pine | 580,000 | 1100

Note that Fc for Southern Pine dimension lumber includes a size factor and therefore varies with different sizes.

Grade

Select Structural

Lumber dimensions:

based on 2012 NDS

Duration of load factor, Cd

1.15

Outdoors (wet service conditions)?

No

Unbraced height, KL (ft), x-axis

1.00

Southern Pine 'timber' values only available for wet service conditions

Unbraced height, KL (ft), y-axis

12.00

For built-up columns:

Use nails with Kf = 0.6

2x4	**307**
2-2x4	**1,449**
3-2x4	**4,726**
2x6	**483**
2-2x6	**2,274**
3-2x6	**7,399**
2x8	**636**
2-2x8	**2,993**
3-2x8	**9,711**
2x10	**812**
2-2x10	**3,816**
3-2x10	**12,360**
2x12	**987**
2-2x12	**4,641**
3-2x12	**15,032**
4x4	**3,800**
4x6	**5,960**
4x8	**7,838**
4x10	**9,988**
4x12	**12,148**

Beams and stringers

Fc (psi) =n/a Emin (psi) =n/a

Column size	Capacity (lb)
6x10	
6x12	
8x12	

Posts and timbers

Fc (psi) =n/a Emin (psi) =n/a

Column size	Capacity (lb)
6x6	
6x8	
8x8	
8x10	
10x10	
10x12	
12x12	

Capacity calculation values for: 2x6

x-axis dimension = 5.5 in.

y-axis dimension = 1.5 in.

Cf included in allowable stress value for Southern Pine

Cm or wet service factor = 1

Cd or load duration factor = 1.15

Fc = 1800 and F*c = Fc x Cm x Cd = 2070

Values for x-axis buckling:

See values of E'min above. FcE = 0.822 x E'min / (le/d)^2 = 113966.88 psi.

Kf = 1 for solid columns.

Cp or stability factor includes Kf and equals: 0.996

Values for y-axis buckling:

See values of E'min above. FcE = 0.822 x E'min / (le/d)^2 = 58.87 psi.

Kf = 1 for solid columns.

Cp or stability factor includes Kf and equals: 0.028

Capacity of 2x6 = F*c x minimum Cp x area = 2070 x 0.028 x 5.5 x 1.5 = 483 lb.

First posted July 1, 2008 | Last updated March 28, 2014