ALLOWABLE AXIAL LOADS - SIMPLE COLUMNS - 2x & 4x - ②

California Building Code 2007 Edition (CBC), NDS 2005

Lumber: Douglas Fir-Larch Surfaced Dry (19% Moisture Content). Stresses are size adjusted.

Size, Area & d	Grade & Stresses	l_e ①	Buckling Value, F_{cE} psi	Allowable F_c` PSI	Allowable Load Lbs	Size, Area & d	Grade & Stresses	l_e ①	Buckling Value, F_{cE} psi	Allowable F_c` PSI	Allowable Load Lbs
2x4	**#1+**	**7'-0"**	942	808	**4,241**	**2x6**	**#1+**	**7'-0"**	2326	1340	**11,058**
		8'-0"	721	647	**3,398**			**8'-0"**	1781	1203	**9,928**
Area =	F_c^* = 1782	**9'-0"**	570	526	**2,760**	Area =	F_c^* = 1705	**9'-0"**	1407	1059	**8,740**
5.25in²	E'_{min}= 660,000	**10'-0"**	462	434	**2,277**	8.25 in²	E'_{min}= 660,000	**10'-0"**	1140	922	**7,609**
	c'=0.8	**11'-0"**	381	363	**1,905**		c'=0.8	**11'-0"**	942	800	**6,602**
③		**12'-0"**	320	308	**1,615**	③		**12'-0"**	791	696	**5,738**
d=3.5	#1	**7'-0"**	885	764	**4,009**	d = 5.5"	#1	**7'-0"**	2185	1284	**10,593**
		8'-0"	677	611	**3,205**			**8'-0"**	1673	1148	**9,470**
	F_c^* = 1725	**9'-0"**	535	495	**2,601**		F_c^* = 1650	**9'-0"**	1322	1007	**8,305**
	E'_{min}= 620,000	**10'-0"**	434	408	**2,143**		E'_{min}= 620,000	**10'-0"**	1071	874	**7,209**
	c'=0.8	**11'-0"**	358	341	**1,793**		c'=0.8	**11'-0"**	885	757	**6,242**
		12'-0"	301	289	**1,519**			**12'-0"**	743	657	**5,417**
	#2	**7'-0"**	828	709	**3,720**		**#2**	**7'-0"**	2044	1171	**9,660**
		8'-0"	634	568	**2,983**			**8'-0"**	1565	1053	**8,683**
	F_c^* = 1552	**9'-0"**	501	462	**2,424**		F_c^* = 1485	**9'-0"**	1236	928	**7,653**
	E'_{min}= 580,000	**10'-0"**	406	381	**1,999**		E'_{min}= 580,000	**10'-0"**	1002	808	**6,669**
	c'=0.8	**11'-0"**	335	319	**1,673**		c'=0.8	**11'-0"**	828	702	**5,791**
		12'-0"	282	270	**1,419**			**12'-0"**	696	610	**5,035**
4x4	**#1+**	**7'-0"**	942	808	**9,896**	**4x6**	**#1+**	**7'-0"**	942	800	**15,406**
		8'-0"	721	647	**7,929**			**8'-0"**	721	643	**12,382**
Area =	F_c^* = 1782	**9'-0"**	570	526	**6,441**	Area =	F_c^* = 1705	**9'-0"**	570	523	**10,076**
12.25 in²	E'_{min}= 660,000	**10'-0"**	462	434	**5,312**	19.25 in²	E'_{min}= 660,000	**10'-0"**	462	432	**8,319**
	c'=0.8	**11'-0"**	381	363	**4,445**		c'=0.8	**11'-0"**	381	362	**6,967**
		12'-0"	320	308	**3,769**	③		**12'-0"**	320	307	**5,910**
d = 3.5"	#1	**7'-0"**	885	764	**9,353**	d = 3.5"	#1	**7'-0"**	885	757	**14,565**
		8'-0"	677	611	**7,479**			**8'-0"**	677	607	**11,681**
	F_c^* = 1725	**9'-0"**	535	495	**6,068**		F_c^* = 1650	**9'-0"**	535	493	**9,494**
	E'_{min}= 620,000	**10'-0"**	434	408	**5,001**		E'_{min}= 620,000	**10'-0"**	434	407	**7,833**
	c'=0.8	**11'-0"**	358	341	**4,183**		c'=0.8	**11'-0"**	358	341	**6,556**
		12'-0"	301	289	**3,545**			**12'-0"**	301	289	**5,560**
	#2	**7'-0"**	828	709	**8,681**		**#2**	**7'-0"**	828	702	**13,511**
		8'-0"	634	568	**6,959**			**8'-0"**	634	564	**10,866**
	F_c^* = 1552	**9'-0"**	501	462	**5,655**		F_c^* = 1485	**9'-0"**	501	460	**8,846**
	E'_{min}= 580,000	**10'-0"**	406	381	**4,665**		E'_{min}= 580,000	**10'-0"**	406	380	**7,306**
	c'=0.8	**11'-0"**	335	319	**3,904**		c'=0.8	**11'-0"**	335	318	**6,119**
		12'-0"	282	270	**3,311**			**12'-0"**	282	270	**5,191**

FOOTNOTES: ① Effective column length, $l_e = k_e l$ and $k_e = 1$.

For column lengths in between tabulated values, use values for next higher length.

② Sill plates, connectors and footings need to be designed as required per CBC.

③. Buckling is assumed in stronger axis.

CBC SECTION 2306.1 (NDS 2005 3.7.1) - COLUMN DESIGN

For a column length not shown in table, allowable axial load can be calculated by the formula:

Allowable axial load in pounds = AREA x F_c'

Where:

$$F_c' = F_c^* \left[\frac{1 + \left(F_{cE} / F_c^*\right)}{2c} - \sqrt{\left(\frac{1 + \left(F_{cE} / F_c^*\right)}{2c}\right)^2 - \frac{\left(F_{cE} / F_c^*\right)}{c}} \right]$$

F^*_c is from the table above. $l_e = k_e l$ and $k_e = 1$

c = 0.8

F_{cE} = 0.822 $E'_{Min} / (l_e / d)^2$ E'_{Min} is from the table above.

DIVISION OF BUILDING AND SAFETY
COUNTY OF VENTURA

B & S STD **B-3**

SHEET 1 OF 2

BUILDING OFFICIAL ________________ Jim MacDonald

DATE: 01/01/08

Effective date Jan 1, 2008

ALLOWABLE AXIAL LOADS - SIMPLE COLUMNS - 6x, 8x & 10x - ②

California Building Code 2007 Edition (CBC), NDS 2005

Lumber: Douglas Fir-Larch Surfaced Dry (19% Moisture Content). Stresses are size adjusted.

Size, Area & d	Grade & Stresses	l_e ①	Buckling Value, F_{cE} psi	Allowable F_c` PSI	Allowable Load Lbs
6x6	**#1**	**7'-0"**	2044	871	**26,340**
		8'-0"	1565	820	**24,795**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	1236	759	**22,955**
30.25 in^2	E'_{min} = 580,000	**10'-0"**	1002	692	**20,918**
	c'=0.8	**11'-0"**	828	622	**18,829**
d = 5.5"		**12'-0"**	696	556	**16,823**
	#2	**7'-0"**	1656	624	**18,889**
		8'-0"	1268	595	**17,995**
	$F_c^{\star}$ = 700	**9'-0"**	1002	559	**16,908**
	E'_{min} = 470,000	**10'-0"**	812	518	**15,659**
	c'=0.8	**11'-0"**	671	473	**14,315**
		12'-0"	564	428	**12,960**
8x8	**#1**	**7'-0"**	3801	938	**52,788**
		8'-0"	2910	916	**51,518**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	2299	888	**49,960**
56.25 in^2	E'_{min} = 580,000	**10'-0"**	1862	855	**48,088**
	c'=0.8	**11'-0"**	1539	816	**45,895**
d = 7.5"		**12'-0"**	1293	772	**43,407**
	#2	**7'-0"**	3080	664	**37,325**
		8'-0"	2358	650	**36,588**
	$F_c^{\star}$ = 700	**9'-0"**	1863	634	**35,689**
	E'_{min} = 470,000	**10'-0"**	1509	615	**34,610**
	c'=0.8	**11'-0"**	1247	593	**33,338**
		12'-0"	1048	567	**31,872**
10x10	**#1**	**7'-0"**	6098	964	**86,984**
		8'-0"	4669	951	**85,856**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	3689	936	**84,501**
90.25 in^2	E'_{min} = 580,000	**10'-0"**	2988	918	**82,892**
	c'=0.8	**11'-0"**	2469	898	**81,000**
d = 9.5"		**12'-0"**	2075	873	**78,801**
	#2	**7'-0"**	4941	678	**61,226**
		8'-0"	3783	671	**60,563**
	$F_c^{\star}$ = 700	**9'-0"**	2989	662	**59,773**
	E'_{min} = 470,000	**10'-0"**	2421	652	**58,839**
	c'=0.8	**11'-0"**	2001	640	**57,746**
		12'-0"	1681	626	**56,479**

Size, Area & d	Grade & Stresses	l_e ①	Buckling Value, F_{cE} psi	Allowable F_c` PSI	Allowable Load Lbs
6x8	**#1**	**7'-0"**	2044	871	**35,918**
		8'-0"	1565	820	**33,812**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	1236	759	**31,303**
41.25 in^2	E'_{min} = 580,000	**10'-0"**	1002	692	**28,525**
	c'=0.8	**11'-0"**	828	622	**25,676**
③		**12'-0"**	696	556	**22,941**
d = 5.5"	**#2**	**7'-0"**	1656	624	**25,758**
		8'-0"	1268	595	**24,538**
	$F_c^{\star}$ = 700	**9'-0"**	1002	559	**23,057**
	E'_{min} = 470,000	**10'-0"**	812	518	**21,353**
	c'=0.8	**11'-0"**	671	473	**19,521**
		12'-0"	564	428	**17,673**
8x10	**#1**	**7'-0"**	3801	938	**66,865**
		8'-0"	2910	916	**65,256**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	2299	888	**63,283**
71.25 in^2	E'_{min} = 580,000	**10'-0"**	1862	855	**60,912**
③	c'=0.8	**11'-0"**	1539	816	**58,133**
d = 7.5"		**12'-0"**	1293	772	**54,982**
	#2	**7'-0"**	3080	664	**47,278**
		8'-0"	2358	650	**46,344**
	$F_c^{\star}$ = 700	**9'-0"**	1863	634	**45,206**
	E'_{min} = 470,000	**10'-0"**	1509	615	**43,840**
	c'=0.8	**11'-0"**	1247	593	**42,228**
		12'-0"	1048	567	**40,371**
10x12	**#1**	**7'-0"**	6098	964	**105,297**
		8'-0"	4669	951	**103,931**
Area =	$F_c^{\star}$ = 1000	**9'-0"**	3689	936	**102,291**
71.25 in^2	E'_{min} = 580,000	**10'-0"**	2988	918	**100,343**
③	c'=0.8	**11'-0"**	2469	898	**98,053**
d = 7.5"		**12'-0"**	2075	873	**95,390**
	#2	**7'-0"**	4941	678	**74,116**
		8'-0"	3783	671	**73,313**
	$F_c^{\star}$ = 700	**9'-0"**	2989	662	**72,356**
	E'_{min} = 470,000	**10'-0"**	2421	652	**71,226**
	c'=0.8	**11'-0"**	2001	640	**69,903**
		12'-0"	1681	626	**68,369**

FOOTNOTES: ① Effective column length, $l_e = k_e l$ and $k_e = 1$.
For column lengths in between tabulated values, use values for next higher length.
② Sill plates, connectors and footings need to be designed as required per CBC.
③ Buckling is assumed in stronger axis.

CBC SECTION 2306.1 (NDS 2005 3.7.1) - COLUMN DESIGN

For a column length not shown in table, allowable axial load can be calculated by the formula:

Allowable axial load in pounds = AREA x F_c'

Where:

$$F_c' = F_c^* \left[\frac{1 + \left(F_{cE} / F_c^*\right)}{2c} - \sqrt{\left(\frac{1 + \left(F_{cE} / F_c^*\right)}{2c}\right)^2 - \frac{\left(F_{cE} / F_c^*\right)}{c}} \right]$$

F^*_c is from the table above. **$l_e = k_e l$ and $k_e = 1$**

c = 0.8

F_{cE} = 0.822 $E'_{Min} / (l_e / d)^2$ **E'_{Min} is from the table above.**

DIVISION OF BUILDING AND SAFETY
COUNTY OF VENTURA

B & S STD **B-3**

SHEET 2 OF 2

BUILDING OFFICIAL ____________________ Jim MacDonald

DATE: 01/01/08

Effective date Jan 1, 2008