

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

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

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.

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Jim MacDonald

DATE: 01/01/08

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	Size, Area & d	Grade & Stresses	l_e ①	Buckling Value, F_{cE} psi	Allowable F_c PSI	Allowable Load Lbs
6x6 Area = 30.25 in ² d = 5.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	2044	871	26,340	6x8 Area = 41.25 in ² d = 5.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	2044	871	35,918
		8'-0"	1565	820	24,795			8'-0"	1565	820	33,812
		9'-0"	1236	759	22,955			9'-0"	1236	759	31,303
		10'-0"	1002	692	20,918			10'-0"	1002	692	28,525
		11'-0"	828	622	18,829			11'-0"	828	622	25,676
		12'-0"	696	556	16,823			12'-0"	696	556	22,941
	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	1656	624	18,889	③	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	1656	624	25,758
		8'-0"	1268	595	17,995			8'-0"	1268	595	24,538
		9'-0"	1002	559	16,908			9'-0"	1002	559	23,057
		10'-0"	812	518	15,659			10'-0"	812	518	21,353
		11'-0"	671	473	14,315			11'-0"	671	473	19,521
		12'-0"	564	428	12,960			12'-0"	564	428	17,673
8x8 Area = 56.25 in ² d = 7.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	3801	938	52,788	8x10 Area = 71.25 in ² d = 7.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	3801	938	66,865
		8'-0"	2910	916	51,518			8'-0"	2910	916	65,256
		9'-0"	2299	888	49,960			9'-0"	2299	888	63,283
		10'-0"	1862	855	48,088			10'-0"	1862	855	60,912
		11'-0"	1539	816	45,895			11'-0"	1539	816	58,133
		12'-0"	1293	772	43,407			12'-0"	1293	772	54,982
	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	3080	664	37,325	③	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	3080	664	47,278
		8'-0"	2358	650	36,588			8'-0"	2358	650	46,344
		9'-0"	1863	634	35,689			9'-0"	1863	634	45,206
		10'-0"	1509	615	34,610			10'-0"	1509	615	43,840
		11'-0"	1247	593	33,338			11'-0"	1247	593	42,228
		12'-0"	1048	567	31,872			12'-0"	1048	567	40,371
10x10 Area = 90.25 in ² d = 9.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	6098	964	86,984	10x12 Area = 71.25 in ² d = 7.5"	#1 $F_c^* = 1000$ $E'_{min} = 580,000$ c'=0.8	7'-0"	6098	964	105,297
		8'-0"	4669	951	85,856			8'-0"	4669	951	103,931
		9'-0"	3689	936	84,501			9'-0"	3689	936	102,291
		10'-0"	2988	918	82,892			10'-0"	2988	918	100,343
		11'-0"	2469	898	81,000			11'-0"	2469	898	98,053
		12'-0"	2075	873	78,801			12'-0"	2075	873	95,390
	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	4941	678	61,226	③	#2 $F_c^* = 700$ $E'_{min} = 470,000$ c'=0.8	7'-0"	4941	678	74,116
		8'-0"	3783	671	60,563			8'-0"	3783	671	73,313
		9'-0"	2989	662	59,773			9'-0"	2989	662	72,356
		10'-0"	2421	652	58,839			10'-0"	2421	652	71,226
		11'-0"	2001	640	57,746			11'-0"	2001	640	69,903
		12'-0"	1681	626	56,479			12'-0"	1681	626	68,369

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

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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:

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

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.

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Jim MacDonald

DATE: 01/01/08