

# Allowable Southern Pine Design Values Used to Calculate Maximum Spans<sup>1</sup>

Based on 1991 SPIB Grading Rules • Values in pounds per square inch (psi)

Property	Size	Dense Select Structural	Select Structural	NonDense Select Structural	No. 1 Dense	No. 1 NonDense	No. 2 Dense	No. 2 NonDense	No. 3	Standard		
<b>Floor and Ceiling Joists Tables 1 to 9 and 42 to 47</b>												
$F_b^2$	2 x 4	3510	3280	3050	2300	2130	1950	1960	1720	1550	980	720
	2 x 6	3100	2930	2700	2010	1900	1720	1670	1440	1320	865	
	2 x 8	2820	2650	2420	1900	1730	1550	1610	1380	1260	805	
	2 x 10	2470	2360	2130	1670	1500	1380	1380	1210	1090	690	
	2 x 12	2360	2190	2010	1550	1440	1320	1320	1120	1040	660	
E	All	1,900,000	1,800,000	1,700,000	1,800,000	1,700,000	1,600,000	1,700,000	1,600,000	1,400,000	1,400,000	1,300,000
$F_{c\perp}$	All	660	565	480	660	565	480	660	565	480	565	565
$F_v$	All	90	90	90	90	90	90	90	90	90	90	90
	(except 2 x 4)	100	100	100	100	100	100	90	90	90	90	90
<b>Rafters: Snow Load (<math>C_D = 1.15</math>) Tables 10 to 33</b>												
$F_b^3$	2 x 4	4030	3770	3500	2650	2450	2250	2250	1980	1790	1120	825
	2 x 6	3570	3370	3110	2310	2180	1980	1920	1650	1520	990	
	2 x 8	3240	3040	2780	2180	1980	1790	1850	1590	1450	925	
	2 x 10	2840	2710	2450	1920	1720	1590	1590	1390	1260	795	
	2 x 12	2710	2510	2310	1790	1650	1520	1520	1290	1190	760	
E	All	1,900,000	1,800,000	1,700,000	1,800,000	1,700,000	1,600,000	1,700,000	1,600,000	1,400,000	1,400,000	1,300,000
$F_{c\perp}$	All	660	565	480	660	565	480	660	565	480	565	565
<b>Rafters: Construction Load (<math>C_D = 1.25</math>) Tables 34 to 39</b>												
$F_b^4$	2 x 4	4380	4100	3810	2880	2660	2440	2440	2160	1940	1220	900
	2 x 6	3880	3670	3380	2520	2370	2160	2080	1800	1650	1080	
	2 x 8	3520	3310	3020	2370	2160	1940	2010	1720	1580	1010	
	2 x 10	3090	2950	2660	2080	1870	1730	1730	1510	1370	865	
	2 x 12	2950	2730	2520	1940	1800	1650	1650	1400	1290	825	
E	All	1,900,000	1,800,000	1,700,000	1,800,000	1,700,000	1,600,000	1,700,000	1,600,000	1,400,000	1,400,000	1,300,000
$F_{c\perp}$	All	660	565	480	660	565	480	660	565	480	565	565
<b>Wet-Service Floor Joists (<math>MC &gt; 19\%</math>) Tables 40 &amp; 41</b>												
$F_b^5$	2 x 6	2640	2490	2300	1710	1610	1470	1420	1220	1320	865	
	2 x 8	2390	2250	2050	1610	1470	1320	1370	1170	1270	805	
	2 x 10	2100	2000	1810	1420	1270	1170	1170	1090	1090	690	
	2 x 12	2000	1860	1710	1320	1220	1320	1320	1120	1040	660	
E <sup>6</sup>	All	1,710,000	1,620,000	1,530,000	1,620,000	1,530,000	1,440,000	1,530,000	1,440,000	1,260,000	1,260,000	
$F_{c\perp}^7$	All	440	380	320	440	380	320	440	380	320	380	

1 Listed allowable bending,  $F_b$ , and modulus of elasticity, E, design values are from AFPA's Span Tables for Joists and Rafters supplement on design values. The allowable shear parallel-to-grain,  $F_v$ , and compression perpendicular-to-grain,  $F_{c\perp}$ , design values are from AFPA's National Design Specification supplement on design values. The general procedure followed was to multiply tabulated design values by appropriate adjustment factors (i.e. repetitive members, load duration, and/or wet service uses), and then round to the nearest 5 or 10 psi.

2 Bending values were multiplied by the repetitive member use factor,  $C_r = 1.15$ , and by the seven-day load duration factor for construction,  $C_D = 1.25$ . ( $F_b \times 1.15 \times 1.25$ ). The repetitive member use factor assumes installation of at least three members spaced not more than 24" on center, and joined by sheathing adequate to support the design load.

3 Bending values were multiplied by the repetitive member use factor,  $C_r = 1.15$ , and by the two-month load duration factor for snow,  $C_D = 1.15$ . ( $F_b \times 1.15 \times 1.15$ ). The load duration factor recognizes wood's ability to carry substantially greater maximum loads for short durations than for long durations.

4 Bending values were multiplied by the repetitive member use factor,  $C_r = 1.15$ , and by the seven-day load duration factor for construction,  $C_D = 1.25$ . ( $F_b \times 1.15 \times 1.25$ ).

5 Bending values were multiplied by the repetitive member use factor,  $C_r = 1.15$ , and by the wet service factor,  $C_M = 0.85$ , except if  $F_b \leq 1150$  psi, then  $C_M = 1.0$ . ( $F_b \times 1.15 \times 0.85$  or 1.0). The wet service factor assumes lumber is used where the moisture content will exceed 19% for an extended period of time.

6 Modulus of elasticity values were multiplied by the wet service factor,  $C_M = 0.90$ . ( $E \times 0.90$ ).

7 Compression perpendicular-to-grain values were multiplied by the wet service factor,  $C_M = 0.67$ . ( $F_{c\perp} \times 0.67$ ).

# SOUTHERN PINE SPAN TABLES

Maximum Spans given in feet and inches

**Table 1 Floor Joists – 30 psf live load, 10 psf dead load,  $L/360$**

*Sleeping rooms and attic floors*

Size	Spacing	Grade									
		Dense Select Structural	Select Structural	NonDense Select Structural	No. 1 Dense	No. 1 NonDense	No. 2 Dense	No. 2 NonDense	No. 3		
2 x 6	12	12-6	12-3	12-0	12-3	12-0	11-10	12-0	11-10	11-3	10-5
	16	11-4	11-2	10-11	11-2	10-11	10-9	10-11	10-9	10-3	9-1
	24	9-11	9-9	9-7	9-9	9-7	9-4	9-7	9-4	8-11	7-5
2 x 8	12	16-6	16-2	15-10	16-2	15-10	15-7	15-10	15-7	14-11	13-3
	16	15-0	14-8	14-5	14-8	14-5	14-2	14-5	14-2	13-6	11-6
	24	13-1	12-10	12-7	12-10	12-7	12-4	12-7	12-4	11-9	9-5
2 x 10	12	21-0	20-8	20-3	20-8	20-3	19-10	20-3	19-10	19-0	15-8
	16	19-1	18-9	18-5	18-9	18-5	18-0	18-5	18-0	17-1	13-7
	24	16-8	16-5	16-1	16-5	16-1	15-8	15-8	14-8	13-11	11-1
2 x 12	12	25-7	25-1	24-8	25-1	24-8	24-2	24-8	24-2	23-1	18-8
	16	23-3	22-10	22-5	22-10	22-5	21-11	22-5	21-1	20-3	16-2
	24	20-3	19-11	19-7	19-11	19-6	18-8	18-8	17-2	16-7	13-2

**Table 2 Floor Joists – 40 psf live load, 10 psf dead load,  $L/360$**

*All rooms except sleeping rooms and attic floors*

Size	Spacing	Grade									
		Dense Select Structural	Select Structural	NonDense Select Structural	No. 1 Dense	No. 1 NonDense	No. 2 Dense	No. 2 NonDense	No. 3		
2 x 6	12	11-4	11-2	10-11	11-2	10-11	10-9	10-11	10-9	10-3	9-4
	16	10-4	10-2	9-11	10-2	9-11	9-9	9-11	9-9	9-4	8-1
	24	9-0	8-10	8-8	8-10	8-8	8-6	8-8	8-6	8-2	6-7
2 x 8	12	15-0	14-8	14-5	14-8	14-5	14-2	14-5	14-2	13-6	11-11
	16	13-7	13-4	13-1	13-4	13-1	12-10	13-1	12-10	12-3	10-3
	24	11-11	11-8	11-5	11-8	11-5	11-3	11-5	11-0	10-6	8-5
2 x 10	12	19-1	18-9	18-5	18-9	18-5	18-0	18-5	18-0	17-3	14-0
	16	17-4	17-0	16-9	17-0	16-9	16-5	16-9	16-1	15-3	12-2
	24	15-2	14-11	14-7	14-11	14-7	14-0	14-0	13-2	12-6	9-11
2 x 12	12	23-3	22-10	22-5	22-10	22-5	21-11	22-5	21-9	20-11	16-8
	16	21-1	20-9	20-4	20-9	20-4	19-11	20-4	18-10	18-2	14-5
	24	18-5	18-1	17-9	18-1	17-5	16-8	16-8	15-4	14-10	11-10

These spans are based on the 1993 AFPA (formerly NFPA) Span Tables for Joists and Rafters and the 1991 SPIB Grading Rules. They are intended for use in covered structures or where the moisture content in use does not exceed 19 percent for an extended period of time. Loading conditions are expressed in psf (pounds per square foot). Deflection is limited to span in inches divided by 360 and is based on live load only. Check sources of supply for availability of lumber in lengths greater than 20'-0".

These grades are the most commonly available.