

BASE VALUE EQUATIONS*

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Apply to Dimension Lumber Base Values						
Base Value	x	Size Adjustment Factor	x	Routine Adjustment Factors	x	Special Use Factors = Design Value
F_b	x	C_F	x	$C_D \times C_r$	x	$C_M \times C_R \times C_1 \times C_{fu}$ = F'_b
F_t	x	C_F	x	C_D	x	$C_M \times C_R \times C_1$ = F'_t
F_v			x	$C_D \times C_v$	x	$C_M \times C_R \times C_1$ = F'_v
$F_{c\perp}$					x	$C_M \times C_R \times C_1$ = $F'_{c\perp}$
$F_{c//}$	x	C_F	x	C_D	x	$C_M \times C_R \times C_1$ = $F'_{c//}$
E					x	$C_M \times C_R \times C_1$ = E'

For $F_{c\perp}$ value of 0.02* deformation basis, see Table F.

Note: C_F = Size Factor C_M = Wet Use Factor
 C_r = Repetitive Member Factor C_R = Fire Retardant Factor, refer to the National Design Specification
 C_v = Horizontal Shear C_t = Temperature Factor, refer to the National Design Specification
 C_D = Duration of Load C_{fu} = Flat Use Factor

* These equations are for the use of the Adjustment Factors A through G. Adjustment Factor Tables A through G are for use with the Base Values in Tables 1 and 2.

DIMENSION LUMBER ADJUSTMENT FACTORS

SIZE FACTORS (C_F)				TABLE A		
Apply to Dimension Lumber Base Values						
Grades	Nominal Width (depth)	Fb		Ft	Fc//	Other Properties
		2" & 3" thick nominal	4" thick nominal			
Select Structural, No. 1, No. 2 & No. 3	4" & less	1.5	1.5	1.5	1.15	1.0
	5"	1.4	1.4	1.4	1.1	1.0
	6"	1.3	1.3	1.3	1.1	1.0
	8"	1.2	1.3	1.2	1.05	1.0
	10"	1.1	1.2	1.1	1.0	1.0
	12"	1.0	1.1	1.0	1.0	1.0
	14" & wider	0.9	1.0	0.9	0.9	1.0
Construction & Standard	4" & less	1.0	1.0	1.0	1.0	1.0
Utility	2" & 3"	0.4	—	0.4	0.6	1.0
	4"	1.0	1.0	1.0	1.0	1.0
Stud	4" & less	1.1	1.1	1.1	1.05	1.0
	5" & 6"	1.0	1.0	1.0	1.0	1.0
	8" & wider	use No. 3 grade Base Values and Size Factors				



REPETITIVE MEMBER FACTOR (C_r)		TABLE B
Apply to Size-adjusted F_b		
Where 2" to 4" thick lumber is used repetitively, such as for joists, studs, rafters and decking, the pieces side by side share the load and the strength of the entire assembly is enhanced. Therefore, where three or more members are adjacent or are not more than 24" apart and are joined by floor, roof or other load distributing elements, the F_b value can be increased 1.15 for repetitive member use.	REPETITIVE MEMBER USE	
	$F_b \times 1.15$	

DURATION OF LOAD ADJUSTMENT (C_D)		TABLE C
Apply to Size-adjusted Values		
Wood has the property of carrying substantially greater maximum loads for short durations than for long durations of loading. Tabulated design values apply to normal load duration. (Factors do not apply to MOE or $F_{c\perp}$).		
LOAD DURATION	FACTOR	
Permanent	0.9	
Ten Years (Normal Load)	1.0	
Two Months (Snow Load)	1.15	
Seven Day	1.25	
One Day	1.33	
Ten Minutes (Wind and Earthquake Loads)	1.6	
Impact	2.0	
Conform load requirements with local codes. Refer to Model Building Codes or the National Design Specification for high-temperature or fire-retardant treated adjustment factors.		



**HORIZONTAL SHEAR
ADJUSTMENT (C_v)**

TABLE D

Apply to F_v Values

Horizontal shear values published in Table 1 and 2 are based upon the maximum degree of shake, check or split that might develop in a piece. When the actual size of these characteristics is known, the following adjustments may be taken.

2" THICK LUMBER		3" and THICKER LUMBER	
For convenience, the tables below may be used to determine horizontal shear values for any grade of 2" thick lumber in any species when the length of split or check is known:		Horizontal shear values for 3" and thicker lumber also are established as if a piece were split full length. When specific lengths of splits are known and any increase in them is not anticipated, the following adjustments may be applied:	
When length of split on wide face is:	Multiply Tabulated F_v value by:	When length of split on wide face is:	Multiply Tabulated F_v value by:
No split	2.00	No split	2.00
1/2 x wide face	1.67	1/2 x narrow face	1.67
3/4 x wide face	1.50	1 x narrow face	1.33
1 x wide face or more	1.00	1 1/2 x narrow or more	1.00

FLAT USE FACTORS (C_{fu})

TABLE E

Apply to Size-adjusted F_b

NOMINAL WIDTH	NOMINAL THICKNESS	
	2" & 3"	4"
2" & 3"	1.00	—
4"	1.10	1.00
5"	1.10	1.05
6"	1.15	1.05
8"	1.15	1.05
10" & wider	1.20	1.10

ADJUSTMENTS FOR COMPRESSION PERPENDICULAR TO GRAIN ($C_{c\perp}$) **TABLE F**

for Deformation Basis of 0.02”
Apply to $F_{c\perp}$ Values

Design values for compression perpendicular to grain ($F_{c\perp}$) are established in accordance with the procedures set forth in ASTM Standards D2555 and D245. ASTM procedures consider deformation under bearing loads as a serviceability limit state comparable to bending deflection because bearing loads rarely cause structural failures. Therefore, ASTM procedures for determining compression perpendicular to grain values are based on a deformation of 0.04” and are considered adequate for most classes of structures. Where most stringent measures need to be taken in design, the following formula permits the designer to adjust design values to a more conservative deformation basis of 0.02”.

$$Y_{02} = 0.73 Y_{04} + 5.60$$

EXAMPLE: SPF's $Y_{04} = 335$
 $Y_{02} = 0.73 (335) + 5.60 = 250$ Psi

WET USE FACTORS (C_M) **TABLE G**

Apply to Size-adjusted Values

The recommended design values shown in the accompanying tables are for applications where the moisture content of the wood does not exceed 19%. For use conditions where the moisture content of dimension lumber will exceed 19%, the Wet Use Adjustment Factors below are recommended:

PROPERTY	ADJUSTMENT FACTOR
Fb Extreme Fiber Stress in Bending	0.85*
Ft Tension Parallel to Grain	1.0*
Fc// Compression Parallel to Grain	0.8**
Fv Horizontal Shear	0.97
Fc⊥ Compression Perpendicular to Grain	0.67
E Modulus of Elasticity	0.9

* Fiber Stress in Bending Wet Use Factor 1.0 for size-adjusted Fb not exceeding 1150 psi.

** Compression Parallel to Grain in Wet Use Factor 1.0 for size-adjusted Fc not exceeding 750 psi.

