

FORESTRY FACTS



UW
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COLLEGE OF
**AGRICULTURAL
& LIFE SCIENCES**
UNIVERSITY OF WISCONSIN-MADISON

Department of Forest Ecology and Management • School of Natural Resources

No. 69

November, 1993

Calculating The Weight Of Lumber

Gene Wengert

The average weight of 1000 board feet (BF) of lumber can be calculated for a particular species, by following the procedures below. Be aware though, there is considerable variation from load to load of the same species.

STEP 1: Determine the moisture content (MC) at which the lumber was scaled (that is, at which the board foot volume was measured). In the weight calculation equations, this value is called MC_s . Remember that moisture content is calculated with the following equation:

$$MC_s = [(wet\ weight \div oven\ dry\ weight) - 1] \times 100 \quad (1)$$

STEP 2: Determine the correction factor (CF) that must be applied to the scaled volume to determine the actual volume of wood. Use the following formula:

$$CF = (actual\ thickness\ in\ inches \div nominal\ thickness\ in\ inches) \\ \times (actual\ width\ in\ inches \div nominal\ width\ in\ inches) \\ \times (actual\ length\ in\ feet \div nominal\ length\ in\ feet) \quad (2)$$

CF Example 1:

A load of green (freshly sawn) hardwood lumber is 1- 1/8 inches thick, but is counted as 1 inch thick when scaled for board footage. The lumber is in random widths, for which the actual and scaled widths are equal. All lumber is 98 inches long (or 8.17 feet), and is scaled as 8 foot. So,

$$CF = (1.125 \div 1) \times (actual\ width \div scaled\ width) \times (8.17 \div 8) \\ = 1.125 \times 1 \times 1.021 \\ = 1.149$$

CF Example 2:

The same scenario as in Example 1, except the lumber is 2-5/32 inches thick (scaled as 2 inches thick) and exactly 14 feet in length. The lumber is again in random widths. So,

$$CF = (2.156 \div 2) \times (actual\ width \div scaled\ width) \times (14 \div 14) \\ = 1.078 \times 1 \times 1 \\ = 1.078$$

CF Example 3:

Planed softwood lumber is scaled as two-by-sixes, although the actual thickness is 1.5 inches and the actual width is 5.5 inches. The two-by-sixes are exactly 12 feet long. Therefore,

$$CF = (1.5 \div 2) \times (5.5 \div 6) \times (12 \div 12) \\ = 0.75 \times 0.917 \times 1 \\ = 0.688$$

STEP 3: Determine the basic weight for MC, of the desired species (BW_{MC_s}), using Table 1 and one of the following formulas:

$$BW_{MC_s} = C + [B \times (MC_s - 30)], \text{ if } MC_s \text{ is above } 30\%; \text{ or}$$

$$BW_{MC_s} = C - [A \times (30 - MC_s)], \text{ if } MC_s \text{ is equal to or below } 30\%. \quad (3)$$

STEP 4: Apply the board foot correction factor, CF, from equation 2, to arrive at the weight, in pounds, per 1000 BF of lumber, corrected for scaling errors and moisture content:

$$\text{Corrected weight at } MC_s = BW_{MC_s} \times CF \quad (4)$$

STEP 5: If the weight of the same lumber at a different moisture content (MC_x) is desired, use the following formula:

$$\text{At } MC_x, \text{ weight (pounds)} = \text{Weight at } MC_s \times (100 + MC_x) \div (100 + MC_s) \quad (5)$$

Weight Calculation Examples

Example 1: What is the weight of 1000 BF of 75% MC, 4/4 northern red oak (scaled thickness = 1 inch), 1-1/8 inches thick and 12 feet long?

Answer:

$$\begin{aligned} MC_s &= 75\% \\ CF &= (1.125 \div 1) \times 1 \times 1 = 1.125 \\ BW_{75\%} &= 3793 + [29.1 \times (75-30)] = 5103 \text{ pounds} \\ \text{Corrected weight} &= 5103 \times 1.125 = 5741 \text{ pounds} \end{aligned}$$

Example 2: The lumber in Example 1 is subsequently dried to 6% MC. What is the new weight?

Answer:

$$\text{Weight at } MC_{6\%} = 5740 \times (100 + 6) \div (100 + 75) = 3477 \text{ pounds}$$

Note: This lumber has shrunk about 6% in going from 75% MC to 6% MC, so it is no longer 1000 BF at 6% MC, but about 940 BF. Yet, because it was 1000BF when measured green, we base the calculations on the green size and weight. If it were rescaled at 6% MC, the calculations would be redone.

Example 3: What is the weight of 1000BF of northern red oak that was cut to 1-5/8 inches (1.625") when green, but, when scaled as 6/4 lumber (1-1/2 inches thick) at 6% MC, had actually shrunk to 1-9/16 inches thick (1.5625")?

Answer:

$$\begin{aligned} MC_s &= 6\% \\ CF &= (1.5625 \div 1.5) \times 1 \times 1 = 1.042 \\ BW_{6\%} &= 3793 - [13.6 \times (30-6)] = 3467 \text{ pounds} \\ \text{Corrected weight} &= 3467 \times 1.042 = 3613 \text{ pounds} \end{aligned}$$

Example 4: What is the weight of 1000 BF of loblolly pine 2" x 10" x 16' lumber (actual size: 1.5" x 9.25" x 16') at 15% MC? The footage is measured at 15% MC.

Answer:

$$\begin{aligned} MC_s &= 15\% \\ CF &= (1.5 \div 2) \times (9.25 \div 10) \times (16 \div 16) = 0.694 \\ BW_{15\%} &= 3183 - [12.9 \times (30-15)] = 2990 \text{ pounds} \\ \text{Corrected weight} &= 2990 \times 0.6938 = 2074 \text{ pounds} \end{aligned}$$

Table 1. Factors for calculating the weight of wood at different moisture contents. Substitute these numbers for the variables in equation 3.

Common Lumber Name	A	B	C	Common Lumber Name	A	B	C
Hardwoods				Hardwoods (cont.)			
Alder, Red	9.9	19.2	2506	Persimmon	7.0	33.3	4332
Apple	10.9	31.7	4132	Sweetgum	8.9	23.9	3115
Ash, Black	9.3	23.4	4132	Sycamore	10.7	23.9	3115
Green	14.3	27.6	3590	Tanoak	9.0	30.2	3926
Aspen, Bigtooth	10.3	18.7	2439	Tupelo, Black	10.4	23.9	3116
Quaking	10.3	18.2	2373	Water	12.4	23.9	3115
Basswood	6.2	16.6	2174	Walnut	13.4	26.5	3454
Beech, American	8.9	29.1	3793	Willow, Black	8.6	18.7	2438
Birch, Paper	8.8	25.0	3260	Yellow Poplar	10.6	20.8	2708
Sweet	11.9	31.2	4065				
Yellow	9.2	28.6	3723				
Buckeye	8.9	17.2	2235				
Butternut	11.3	18.7	2440				
Cherry	13.8	24.4	3184	Common Lumber Name	A	B	C
Chestnut, American	11.6	20.8	2708				
Cottonwood	8.5	16.1	2102				
Dogwood	6.8	33.3	4331	Softwoods			
Elm, American	10.2	23.9	3116				
Rock	12.2	29.6	3860	Baldcypress	13.2	21.9	2844
Slippery	11.5	25.0	3251	Cedar, Alaska	14.4	21.9	2844
Hackberry	11.8	25.5	3319	Atlantic white	10.9	16.1	2100
Hickory, Bitternut (Pecan)	14.7	31.2	4062	Eastern red-	16.4	22.9	2981
Hickory (True)				Incense	13.1	18.2	2371
Mockernut	9.1	33.3	4332	Northern white	11.1	15.1	1964
Pignut	9.3	34.3	4332	Port-Orford	12.6	20.2	2641
Shagbark	10.9	33.3	4333	Western red-	12.2	16.1	2100
Shellbark	6.6	32.2	4195	Douglas-fir, Coast type	12.3	23.4	3049
Holly, American	8.3	26.0	3387	Interior west	13.2	23.9	3116
Hophornbeam, Eastern	7.9	32.8	4266	Interior north	14.0	23.4	3048
Laurel, California	15.1	26.5	3456	Fir, Balsam	9.9	17.2	2236
Locust, Black	21.2	34.3	4470	California red	10.6	18.7	2437
Madrone, Pacific	7.8	30.2	3925	Grand	10.7	18.2	2371
Maple (Soft)				Noble	10.1	19.2	2507
Bigleaf	12.8	22.9	2980	Pacific silver	10.4	20.8	2711
Red	13.1	25.5	3318	Subalpine	10.5	16.1	2101
Silver	12.4	22.9	2981	White	12.2	19.2	2506
Maple (Hard)				Hemlock, Eastern	12.6	19.8	2573
Black	12.3	27.0	3523	Western	11.5	21.8	2847
Sugar	12.3	29.1	3793	Larch, Western	11.3	25.0	3251
Oak (Red)				Pine, Eastern white	12.3	17.7	2303
Black	11.7	29.1	3792	Lodgepole	11.5	19.8	2576
California black	16.4	26.5	3455	Ponderosa	12.6	19.8	2573
Laurel	6.3	29.1	3791	Red	12.2	21.3	2777
Northern red	13.6	29.1	3793	Southern yellow group			
Pin	13.0	30.2	3928	Loblolly	12.9	24.4	3183
Scarlet	13.2	31.2	4065	Longleaf	15.0	28.1	3658
Southern red	9.6	27.0	3520	Shortleaf	12.9	24.4	3183
Water	10.4	29.1	3793	Sugar	12.6	17.7	2302
Willow	6.4	29.1	3790	Western white	10.0	18.2	2370
Oak (White)				Redwood, Old growth	14.9	19.8	2573
Bur	15.4	30.2	3928	Second growth	13.2	17.7	2302
Chestnut	10.1	29.6	3858	Spruce, Black	11.3	19.8	2575
Live	17.5	41.6	5417	Engelmann	10.0	17.2	2234
Overcup	10.7	29.6	3860	Red	10.6	19.2	2506
Post	11.0	31.2	4063	Sitka	10.8	19.2	2505
Swamp chestnut	10.7	31.2	4063	Tamarack	12.0	25.5	3318
White	10.8	31.2	4062				