FORESTRY FACTS

Department of Forest and Wildlife Ecology

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:

$$MC_s = [(\text{wet weight} \div \text{oven dry weight}) - 1] \times 100 \qquad (1)$$

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:

$$\begin{aligned} CF = &(\text{actual thickness in inches} \div \text{nominal thickness in inches}) \\ &\times (\text{actual width in inches} \div \text{nominal width in inches}) \\ &\times (\text{actual length in feet} \div \text{nominal length in feet}) \end{aligned} \qquad (2)$$

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,

$$\begin{aligned} CF &= (1.125 \div 1) \times (\text{actual width} \div \text{scaled width}) \times (8.17 \div 8) \\ &= 1.125 \times 1 \times 1.021 \\ &= 1.149 \end{aligned}$$

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,

$$\begin{aligned} CF &= (2.156 \div 2) \times (\text{actual width} \div \text{scaled width}) \times (14 \div 14) \\ &= 1.078 \times 1 \times 1 \\ &= 1.078 \end{aligned}$$

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,

$$\begin{aligned} CF &= (1.5 \div 2) \times (5.5 \div 6) \times (12 \div 12) \\ &= 0.75 \times 0.917 \times 1 \\ &= 0.688 \end{aligned}$$

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

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

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

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:

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

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

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

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

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

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

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				
Slippery	11.5	25.0	3251	Baldcypress	13.2	21.9	2844
Hackberry	11.8	25.5	3319	Cedar, Alaska	14.4	21.9	2844
Hickory, Bitternut (Pecan)	14.7	31.2	4062	Atlantic white	10.9	16.1	2100
Hickory (True)				Eastern red-	16.4	22.9	2981
Mockernut	9.1	33.3	4332	Incense	13.1	18.2	2371
Pignut	9.3	34.3	4332	Northern white	11.1	15.1	1964
Shagbark	10.9	33.3	4333	Port-Orford	12.6	20.2	2641
Shellbark	6.6	32.2	4195	Western red-	12.2	16.1	2100
Holly, American	8.3	26.0	3387	Douglas-fir, Coast type	12.3	23.4	3049
Hophornbeam, Eastern	7.9	32.8	4266	Interior west	13.2	23.9	3116
Laurel, California	15.1	26.5	3456	Interior north	14.0	23.4	3048
Locust, Black	21.2	34.3	4470	Fir, Balsam	9.9	17.2	2236
Madrone, Pacific	7.8	30.2	3925	California red	10.6	18.7	2437
Maple (Soft)				Grand	10.7	18.2	2371
Bigleaf	12.8	22.9	2980	Noble	10.1	19.2	2507
Red	13.1	25.5	3318	Pacific silver	10.4	20.8	2711
Silver	12.4	22.9	2981	Subalpine	10.5	16.1	2101
Maple (Hard)				White	12.2	19.2	2506
Black	12.3	27.0	3523	Hemlock, Eastern	12.6	19.8	2573
Sugar	12.3	29.1	3793	Western	11.5	21.8	2847
Oak (Red)				Larch, Western	11.3	25.0	3251
Black	11.7	29.1	3792	Pine, Eastern white	12.3	17.7	2303
California black	16.4	26.5	3455	Lodgepole	11.5	19.8	2576
Laurel	6.3	29.1	3791	Ponderosa	12.6	19.8	2573
Northern red	13.6	29.1	3793	Red	12.2	21.3	2777
Pin	13.0	30.2	3928	Southern yellow group			
Scarlet	13.2	31.2	4065	Loblolly	12.9	24.4	3183
Southern red	9.6	27.0	3520	Longleaf	15.0	28.1	3658
Water	10.4	29.1	3793	Shortleaf	12.9	24.4	3183
Willow	6.4	29.1	3790	Sugar	12.6	17.7	2302
Oak (White)				Western white	10.0	18.2	2370
Bur	15.4	30.2	3928	Redwood, Old growth	14.9	19.8	2573
Chestnut	10.1	29.6	3858	Second growth	13.2	17.7	2302
Live	17.5	41.6	5417	Spruce, Black	11.3	19.8	2575
Overcup	10.7	29.6	3860	Engelmann	10.0	17.2	2234
Post	11.0	31.2	4063	Red	10.6	19.2	2506
Swamp chestnut	10.7	31.2	4063	Sitka	10.8	19.2	2505
White	10.8	31.2	4062	Tamarack	12.0	25.5	3318