WEIGHTS OF VARIOUS WOODS GROWN
IN THE UNITED STATES

Calculated values of weights are necessarily approximate values owing to variations in moisture content, density, sapwood thickness, and the like that occur in different parts of the same timber. The calculated average weights obtained by the methods given here are not 100 percent accurate but are more accurate than the weight tables commonly given in grading rules as a basis for estimating timber transportation costs or other exacting transactions. The methods are also useful in roughly determining truck capacity needed to haul a given lot of timbers or the possibility of driving or towing logs.

There is enough difference between the weights of sawed and round timbers to require separate methods for estimating their average weights.

PART I. SAWED TIMBERS

Table 1 gives for various woods grown in the United States the average weights per cubic foot of sawed timbers at moisture content values of 8 and 15 percent, and the average weight of 1,000 board-feet when air-dry (15 percent moisture content). Factors for adjusting values for each 1 percent change in moisture content are given.

Table 1 is based on the weights and volumes of 2-by-2-inch, clear specimens from the top 4 feet of 16-foot butt logs of typical trees.

In any lot of lumber of a given species in the air-dry condition at 15 percent moisture content, the weight per cubic foot will rarely vary more than 10 percent from the figure given in table 1. The greatest changes in weight are those that occur in the early stages of drying of green wood. Changes in the moisture content of air-dry wood are attended by only
relatively small changes in weight per cubic foot, owing to the counter
effect of change in volume as a result of accompanying shrinkage and
swelling.

The values given in table 1 for weight per 1,000 board-feet at 15 per-
cent moisture content were determined by multiplying the values per
cubic foot at 15 percent by 83.3. The weights per 1,000 feet given in
column 5 apply to theoretical board-foot measure (1,000 linear feet actu-
ally 1 inch thick and 12 inches wide, or equivalent) and not to a 1,000
board-feet lumber scale. Rough lumber is sometimes oversized and
dressed lumber usually undersized with respect to nominal sizes. The
values given in column 5 of table 1 will generally, therefore, need to be
adjusted for actual shipments of lumber. The adjustment for 1- by 8-
inch boards dressed to 25/32 inch in thickness and 7-1/2 inches in width
is as follows:

\[
\frac{25/32 \times 7-1/2}{1 \times 8} = 0.7324.
\]

The value given in column 5 of table 1 (actual board-feet 15 percent
moisture content) multiplied by this adjustment factor, gives the weight
of the dressed lumber. The adjustment for rough oversized lumber is
made in similar fashion, that is, actual size divided by nominal size.
In like manner constants for any dressed size may be worked out and
the weight per 1,000 board-feet computed.

Column (6) is an example of the weight per 1,000 board-feet of 1- by 8-
inch boards dressed to 25/32 inch in thickness and 7-1/2 inches in width
for various species. It has been computed by multiplying the values in
column 5 by the foregoing constant 0.7324.

PART II. ROUND TIMBERS

The weight per unit volume of green round timbers, such as logs, pulp-
wood, posts, poles, and piling, may be estimated by means of tables 2,
3, and 4. Table 2 gives the average specific gravity and moisture con-
tent of sapwood and heartwood of various species in the green condition.
Table 3 gives the percentage of sapwood in round timbers for various
thicknesses, and diameters. Table 4 gives the weight per cubic foot of
green wood at various specific gravities and moisture content values.
All three tables are necessary for estimating the weight per cubic foot of round timbers because in round timbers the proportions of sapwood and heartwood in the total volume often differ widely. Furthermore, the sapwood generally contains more water than the heartwood and both the sapwood and heartwood contain more moisture in the butt logs than in the top logs.

The following example illustrates how to determine the approximate weight per cubic foot of green round timber using tables 2, 3, and 4:

Example:

Given a species, say, black tupelo. The average specific gravity for the species is found from table 2 to be 0.46. The moisture content of the sapwood can be determined by actual measurement or estimated from table 2 as 115 percent. The moisture content of the heartwood can be determined by actual measurement or estimated from table 2 as 87 percent.

Next measure the average diameter of the timber and average width of sapwood. If the average diameter is, say, 10 inches and average sapwood thickness is 1-3/4 inches, then from table 3 the percentage of the volume of the round timber occupied by the sapwood is found to be 58 percent. The percentage of the volume occupied by the heartwood will therefore be, 100 percent minus 58 percent, or 42 percent.

Turning to table 4, and looking under a specific gravity of 0.46 for a sapwood moisture content of 115 percent, the weight per cubic foot is found to be 61.7 pounds per cubic foot. Under the same specific gravity value and a moisture content of 87 percent the weight of the heartwood is estimated to be half way between that given for moisture content values of 86 percent and 88 percent, or 53.7 pounds per cubic foot. (Moisture content values in the left column may be applied to either sapwood or heartwood.)

To find the weight in pounds per cubic foot of the round timber it is necessary to multiply the weight of sapwood by the percentage of sapwood divided by 100. Similarly for heartwood. Their sum gives the weight of the round timber in pounds per cubic foot.

Thus:  
\[ 61.7 \times \frac{58}{100} = 35.8 \text{ pounds} \]
\[ 53.7 \times \frac{42}{100} = 22.6 \text{ pounds} \]

Total weight of round timber per cubic foot = 35.8 + 22.6 = 58.4 pounds.
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3 No adjust value to any desired moisture content, add factor to value to be adjusted for each 1 percent increase in moisture content; subtract factor from value to be adjusted for each 1 percent decrease in moisture content. These factors take advantage of 1/4th moisture changes in consideration.
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1. Based on weight when oven-dried.
2. Based on weight when oven-dried and volume when green.
Table 3.—Sapwood, in percent of volume, of round timbers

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