

REVISED EDITION AVAILABLE

TECHNICAL NOTE NUMBER B-14

FOREST PRODUCTS LABORATORY - U. S. FOREST SERVICE - MADISON, WISCONSIN

METHOD OF DETERMINING THE SPECIFIC GRAVITY OF WOOD

Next to actual strength tests, the specific gravity of wood affords the best indication of its strength properties. The specific gravity of any piece of wood may easily be determined by the method described below, and, with the aid of an equation table published by the U. S. Forest Products Laboratory, the strength of the piece as a beam or as a column, its shock-resisting ability, its ability to withstand wear, its toughness, its shearing strength, and its value in several other respects may be closely estimated.

The specific gravity of a substance is its weight divided by the weight of an equal volume of water. As both the weight and volume of wood vary with the amount of moisture in it, specific gravity as applied to wood is an indefinite quantity unless the circumstances under which it is determined are specified. The specific gravity of wood is based on the weight, oven dry, but the volume may be that in the oven-dry, air dry, or green condition. The true specific gravity of wood is, of course, that based on volume oven-dry, but for greater convenience in making determinations, the Forest Products Laboratory bases specific gravity on the volume of the specimen when tested, either green or air-dry, and has determined the relation of strength to specific gravity separately for green and air-dry wood.

In using the laboratory table for estimating the properties of a particular timber, therefore, it is necessary to determine specific gravity on the volume of the sample in a green condition, or at a moisture content of about 12 per cent (air-dry condition), or the volume oven-dry may be obtained and converted into volume green by means of shrinkage figures.

Specific gravity determinations may be made upon solid specimens or, in the case of timbers from which solid blocks can not readily be cut, upon borings from a hole about 1 inch in diameter and 2 inches in depth. The sample should contain not more than 25 cubic inches. Larger pieces require considerably more time for drying.

After selecting a representative specimen or collecting the chips from a boring, proceed as follows:

To find specific gravity of wood based upon volume in a green or air-dry condition

1. Find volume of specimen by measurements or by immersion method (measurements preferred) or measure depth and diameter of bored hole and compute volume of hole

2. Put specimen in oven at 212° Fahrenheit (100° centigrade) and dry until constant weight is attained or put boring chips in small paper bag, and dry in the same manner.

3. Weigh specimen or weigh chips without bag.

4. Compute specific gravity, using formula

$$\text{Sp.Gr.} = \frac{D}{V},$$

where D = wt. in grams and V = vol. in c. c.

To find specific gravity of wood based upon volume when oven-dry

1. Put specimen in oven at 212° Fahrenheit (100° centigrade) and dry until constant weight is attained.

2. Weigh specimen.

3. Find volume of specimen by measurements or by immersion method.

When weights or measurements are not taken in metric units, use the following reduction factors.

Inches x 2.54 = centimeters

Ounces x 28.4 = grams

Cu. inches x 16.4 = cu. cm.

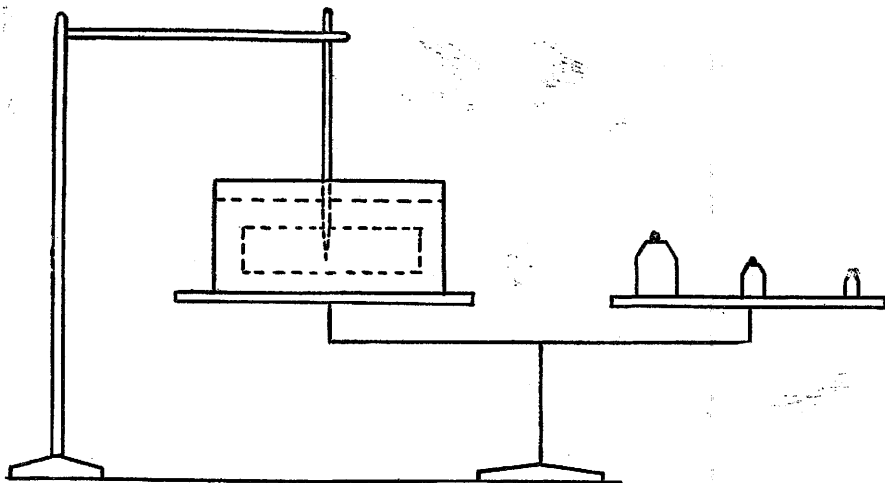
Pounds x 454 = grams

Both the oven-dry weight and the volume should be correct to within at least one-half of one per cent.

Determining Volume of Specimen by Immersion

The volume of the specimen may be found by determining the weight of water it displaces when immersed. This weight in grams is numerically equal to the volume of the specimen in cubic centimeters.

A container holding water enough for complete submergence of the specimen is placed on one pan of a balance scale. (See sketch.) The combined weight of the container and water is then balanced with weights added to the other scale pan. By means of a sharp rod the specimen is held completely submerged without touching the container while the scales are again balanced. The weight which is added to restore balance is the weight of water displaced by the specimen, and if in grams is numerically equal to the volume of the specimen in cubic centimeters.



Green specimens may usually be immersed for volume determinations in the condition in which they are selected.

Oven-dry specimens should be dipped in hot paraffine before immersion, preferably while still warm. Any surplus paraffine adhering to the sample should be scraped off. The weight of the sample should, of course, be taken before the paraffine is applied.

It is important that the determination of the volume by the immersion method be made as quickly as possible after the immersion of specimen, because any absorption of water by the sample directly affects the accuracy of the result. If the volume of the sample is estimated and approximately the required weights are placed on the pan before the specimen is immersed, the time necessary for balancing may be reduced to a minimum.

The method of finding the volume by immersion is not recommended for air dry material.

Determination of Moisture Content at the Same Time

If the specimen or boring chips are weighed immediately when obtained as well as after oven-drying the moisture content may be computed, thus affording both moisture and specific gravity determinations on the same piece.