

BOARD FOOT

It is a unit of volume measurement commonly used in North America to estimate the actual volume of wood utilized in form of sawn timber from the stem or portion of it. The unit is applied to planks produced from Saw mills and also to estimate the utilizable quantity of timber from a standing tree.

The definition of Board Foot is a unit of 12 inches long, 12 inches wide and 1 inch thick. The generalized formula for the volume of a sawn board is $L_i WT$

$$\begin{aligned} \text{Where } L_i &= \text{Length in inches} \\ W &= \text{Width in inches} \\ T &= \text{Thickness in inches} \end{aligned}$$

MILL TALLY VOLUME

Mill Tally Volume is the Board foot volume determined directly by observing and felling the actual quantity of timber as it is sawn in a mill.

HOPPUS FOOT

In Great Britain, cubic volume of logs have until recently being commonly measured using Quarter Girth or Hoppus rule, in which girth is measured in middle inches and the length is measured in feet; volume in cubic fit.

$$\begin{aligned} V &= G^2 L \\ (-) &- (G^2/4) L/144 \\ 4 &144 \end{aligned}$$

The hoppus rule gives 78.4% of the cubic volume of the cylinder. Thus allowing a waste of 21.6%.

CONCEPT OF TREE VOLUME

Most tree are naturally irregular. The problem is whether to include such irregular portion in volume estimation to obtain a biological volume which is unreal in term of utilization. To what extent should irregularities be omitted in volume estimation considering basic taper and cross section alone is another problem. Some cases produce quite a misleading estimation.

VOLUME ESTIMATION OF TREES IN CONVERTED FORM

Cord Volume Estimation

Materials involved are billets of wood for pulp, particle board firewood, split or unsplit size materials such as pit prop, posts and less regular materials in quantity hillet forms for charcoal. These materials are traditionally aggregated in cords.

A standard cord is 8ft by 4ft i.e. 128 cubic feet. Length of each piece of wood being 4ft. The solid wood content of a cord is always much less than 128cu. Ft and presence and thickness of bark and the method of palling. There are more air space in a cord of crooked and knotty pieces of wood than in one of straight pieces of wood with well straight boles. Cords of split wood contain less solid volume than round wood. The relative amount of space in a cord will also increase as the diameter of pieces of wood decreases.

Other measures of stacked materials are:

- (i) CUNIT – Which is used in Australia. It represents 100 cubic feet solid wood volume occupying about 145 cubic fee of space.

- (ii) STERE or RAUM – Metre – Which is used in Western Europe and is the cord equivalent to 1 cu. m. 1 cord = 3.6 steres approximately.

Conversion factors by which stacked cubic feet (Cord) may be converted into solid volume are:

- (a) Pitwood and pole = 0.75
- (b) Split fuel-wood = 0.75
- (c) Small branch hard wood = 0.35
- (d) Roots and stumps = 0.5

$$\text{The Conversion factor} = \frac{\text{Solid volume}}{\text{Stacked volume}}$$

The scaling of cords is done by measuring the 3 dimensions of length, width and height in feet. The overall volume in cubic feet is divided by 128 to obtain the number of cords.

Some precautions are necessary in measuring and preparing cords:

- (i) Height measurements are taken at regular intervals of 1 or 2 feet – average and allowance of 3 – 4 inches being made for shrinkage and settling.
- (ii) Length of the cord should be measured on both sides. The length of pieces of wood should be checked for uniformity. It is very important especially on sloping ground to measure the cord height and length at right angle to each number.

The scallion of pulpwood in cord units, deduction are normally for defective wood and loose piling. Defective wood include burnt or rotten; wood not meeting height requirement and partially the debarked wood.

Each stick in a cord is examined and the total volume of all rejected pieces subtracted from the gross volume of the cord. To deduct for loose piling, the total volume of number of sticks that can be added to the cord is subtracted from the gross cord volume.

OTHER METHODS OF OBTAINING SOLID VOLUME OF CORD:

1. Direct measurement through displacement method.
2. Summing cubic volume of individual pieces derived by formula method – Smalian’s or Huber’s.
3. Scaling from photographs, ratio of air space to piled wood in percentage may be used to estimate solid volume by the dot-grid method.
4. With finer conversion at stump (particularly blown slurried fibre) volume is best ascertained by using containers –bins of known dimension.

TREE FORM AND VOLUME ESTIMATION

Form and taper vary with age, diameter and height class.

EXPRESSION OF TAPER:

Taper is the deviation by narrowing of stem from radial symmetry along the vertical axis of a tree that has been expressed in mathematic functions. The following are examples:

(a) Hojer’s Formula --
$$\frac{d}{b} = C \log \frac{C + L}{c}$$

Total height – ht of “d” above ground 100

Where $L = \frac{\text{Total height} - \text{breast ht}}{\text{Total height} - \text{ht of "d" above ground}} \times \frac{d}{D}$

$d =$ diameter at a distance L from tip of the tree

$D =$ diameter at breast height

C & $c =$ Constants depending on absolute form quotient

(b) Tor Johnson's Formula
$$-- = \frac{d}{D} \log \left(\frac{C + L - 2.5}{C} \right)$$

This is a modification of Hojer's formula; value 2.5 is a biological constant which corrects for error in upper tree diameters.

(c) Behre's Hypoperbolic Formula:

$$Y = \frac{x}{a + bx} \quad \text{or} \quad -- = \frac{d}{D} = \frac{L}{a + bL}$$

$$Y = --$$

$$X = L$$

a and $b =$ constants which vary with form quotient but in all trees $a + b = 1$.