

ESTIMATING THE SPECIFIC GRAVITY OF PLYWOOD

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ESTIMATING THE SPECIFIC GRAVITY OF PLYWOOD¹

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When veneer is manufactured into plywood the resulting product has a greater specific gravity than the veneer because of the cumulative influence of a number of factors. These factors include the pressing conditions, the weight of bonding medium applied to a unit area of veneer before pressing into plywood, the number of plies in a given thickness of plywood, the difference in the volumetric shrinkage of plywood and veneer, and the average specific gravity, weighted as to thickness, of the material comprising the plies.

It is possible to estimate what the increase in specific gravity will be, as follows:

1. Using the specific gravity of the veneer plies obtained from the method described in Forest Products Laboratory Mimeograph No. 1397, determine the average specific gravity of the plies weighted according to thickness. This is done by multiplying the thickness by the specific gravity for each veneer, and dividing the sum of the products by the sum of the thicknesses.

Example; What is the weighted average specific gravity of three veneer sheets 0.035 inch, 0.060 inch, and 0.037 inch in thickness having specific gravity values of 0.62, 0.40, and 0.58 respectively?

$$\begin{aligned} \text{Weighted average specific gravity} &= \\ \frac{(0.035 \times 0.62) + (0.060 \times 0.40) + (0.037 \times 0.58)}{0.035 + 0.060 + 0.037} &= 0.51 \end{aligned}$$

2. From the sum of the oven-dry thicknesses of the veneer plies subtract the average oven-dry thickness of the finished plywood to obtain the compression resulting from manufacture.

¹This mimeograph is one of a series of progress reports prepared by the Forest Products Laboratory to further the Nation's war effort, Results here reported are preliminary and may be revised as additional data become available,

3. The increase in specific gravity may be computed from the following formula:

$$G_i = \frac{G_{av} (T_v - T_p) + 0.002 (N-1)}{T_p} - 0.01$$

Where:

G_i = Increase in specific gravity of plywood over the average weighted specific gravity of the plies.

G_{av} = Average specific gravity of plies weighted as to thickness (from step 1).

T_v = Sum of thicknesses of oven-dry veneer plies,

T_p = Thickness of oven-dry plywood. ($T_v - T_p$ comes from step 2.)

N = Number of plies.

0.002 = Constant for phenolic resin film glue (0.035 gram per sq. in.).

0.01 = Constant to correct for difference in shrinkage of plywood and veneer.

The value obtained from the formula is added to the average weighted specific gravity of the veneer plies to give the estimated specific gravity of the plywood.

Since slight variations in specific gravity and the other variables included in the formula do not greatly affect the value representing the increase in specific gravity, a value determined for a given pressing schedule and plywood thickness due to plywood manufacture may be added to the average weighted specific gravity of the veneer plies without repeating the computation for each panel. The actual specific gravity of the veneer used is of more importance in determining the specific gravity of plywood than the other factors. For future reference, values obtained for standard thicknesses and methods may be assembled in tabular form.

Use of Chart for Estimating Increase
in Specific Gravity

By use of the attached chart (fig. 1) the increase in specific gravity of plywood over that of the average of its constituent veneer plies may be found graphically. The use of the chart is substituted only for the use of the formula, thus to obtain the estimated specific gravity of the plywood, the value from the chart must be added to the weighted average specific gravity of the veneer sheets as obtained according to step 1.

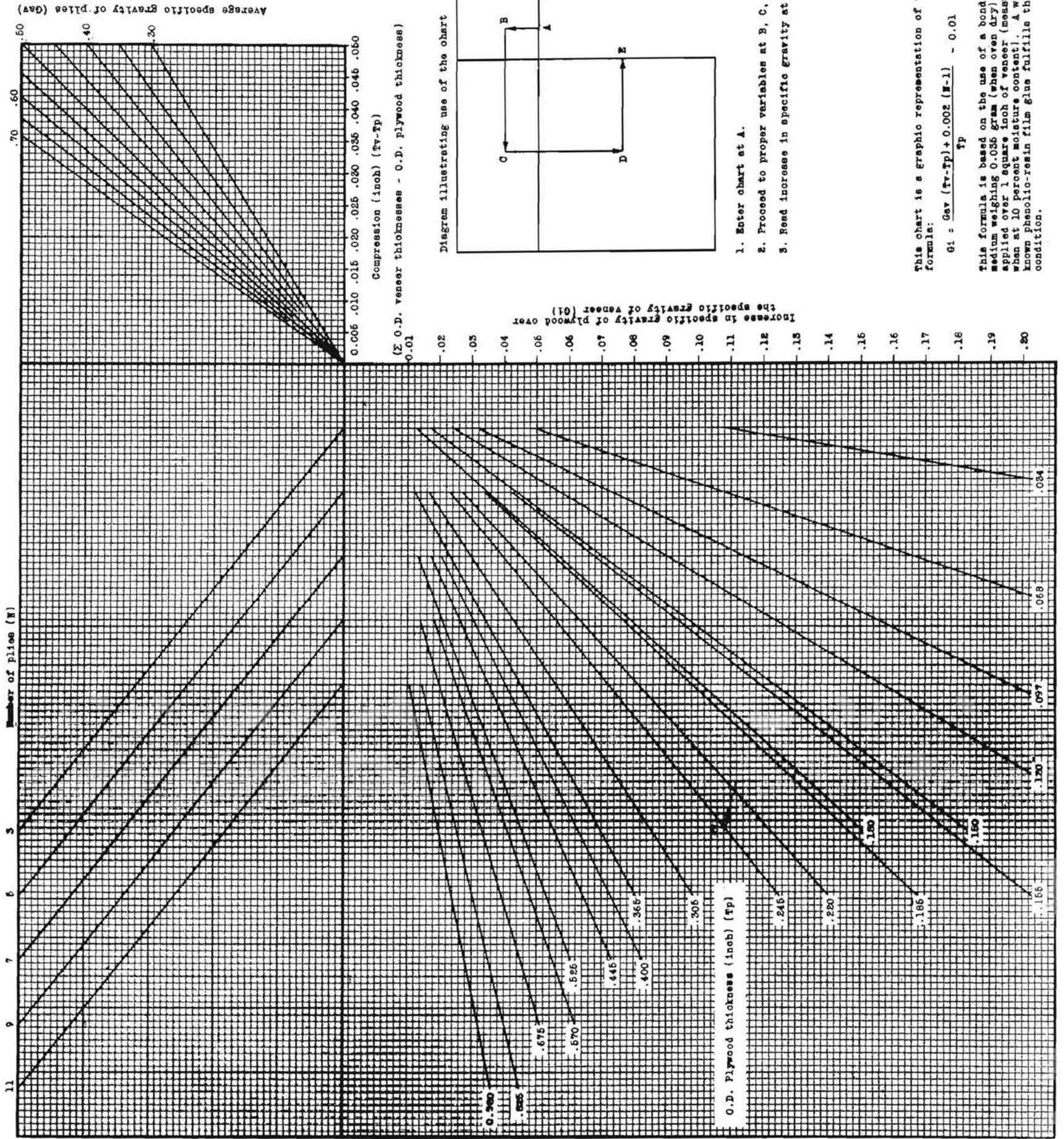


Figure 1.—Plywood specific gravity chart