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FOREST PRODUCTS LABORATORY UNITED STATES FOREST SERVICE

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MOISTURE CONTENT FOR AIRCRAFT WOOD

Moisture changes in aircraft wood during and after manufacture should be minimized. Changes in moisture content of wood bring on swelling and shrinking, with detriment to shape and strength of members and fitting of parts. An essential provision against such damage is close control of moisture in the material by careful kiln drying and conditioning before manufacture.

Forest Products Laboratory recommendations in this regard are the following:

1. The average moisture content of any lot of aircraft lumber, except propeller stock, should be from 8 to 12 per cent at the end of the kiln run. The allowable range of moisture content for individual pieces is from 3 per cent below to 4 per cent above the average for the kiln charge as a whole.

2. The average moisture content should approach the upper limit (12 per cent) in summer and the lower limit (8 per cent) in winter, as atmospheric conditions in the factory in summer and in winter would naturally bring the wood to approximately these moisture values.

3. Propeller stock should be dried in the kiln to an average moisture content between 5 and 7 per cent, the allowable range for individual pieces being from 2 per cent below to 3 per cent above the average for the charge. When ready for gluing, a moisture content of 8 to 10 per cent is satisfactory for this class of stock. The reason for drying to the lower moisture content in the kiln is to obtain greater uniformity as between the various pieces.

4. For veneer and thin laminations (less than ½ inch thick) 5 to 10 per cent moisture is satisfactory at the time of gluing. This is lower than for thicker stock, on account of the larger relative amount of moisture which thin pieces absorb from the glue.

5. Before manufacture, stock should be bulk piled in the shop (or room having approximately same temperature and humidity as the shop) to obtain as uniform moisture distribution as possible throughout the pile and in each piece. The conditioning period should be at least two weeks for 3-inch material, and for other sizes in proportion; but *propeller stock* should in no case be held in storage less than two weeks.

A fuller discussion of moisture content for aircraft wood in manufacture and in service is given in the "Manual for the Inspection of Aircraft Wood and Glue for the United States Navy," obtainable from the Government Printing Office, Washington, D. C. at a price of $1.25. This manual contains much other information relating to the use of wood in aircraft. Directions for determining the moisture content of wood will be found in the manual and also in Technical Note B-11.

In the present Technical Note, recommendations as to moisture content are based on atmospheric conditions within the aircraft factory rather than conditions that the airplane will meet in service. Fortunately, no violent change for the wood is involved in passing from a moisture content of 8 to 12 per cent in the factory to the 11 to 13 per cent moisture content which it reaches later under average service conditions; furthermore, such change as would ordinarily occur is in the direction of tighter joints and closer fitting of parts.

NOTE: While 11 to 13 per cent average moisture content for wood in service is the general rule, the average in very humid regions is somewhat higher; hence the *Forest Products Laboratory's recommended design stresses* for aircraft wood are conservatively based on the strength of the wood at 15 per cent moisture content. See Manual for Inspection of Aircraft Wood and Glue for U. S. Navy, page 140.