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# MOISTURE CONTENT OF AIRCRAFT LUMBER

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## MOISTURE CONTENT OF AIRCRAFT LUMBER<sup>1</sup>

Stock being worked up into finished parts should have a moisture content which is in equilibrium, or nearly so, with the atmospheric conditions to which it will be subjected during manufacture and in use.

Moisture content might be considered relatively unimportant were it not for the effect of moisture on strength and changes in moisture on shrinkage.<sup>2</sup> The effect of changes in moisture content on the dimensions of Sitka spruce lumber is shown in figure 1. This chart emphasizes the importance of minimizing moisture changes, thus preventing, as far as possible, shrinkage or swelling with the resulting loosening or warping of airplane parts.

The moisture-content values of wood when properly kiln dried are intended to be within the range best suited for the conditions to which the parts will be subjected during manufacture and use. They are such that any changes in moisture content during manufacture and use will not be large enough to cause troublesome shrinkage or swelling. The final average moisture allowed for propeller stock is lower than for other airplane parts. Propeller stock must be very uniform in moisture content both as to moisture distribution within each piece and between the various pieces which make up the propeller. This condition is most likely to be obtained when stock is dried to the moisture content specified.

### Dependence on Humidity and Temperature

When wood is subjected to a constant temperature and relative humidity it will in time come to a definite moisture content, which is called the equilibrium moisture content. The relationship between the moisture in wood and the surrounding atmospheric conditions is shown in figure 2. From the chart it will be seen that as the humidity increases the moisture content increases, but decreases with an increase in temperature. Since outdoor temperatures are lower and relative humidities are higher in winter than in summer, wood stored outside reaches a higher moisture content in winter than in summer.

In addition to variations due to season there is also a variation in different parts of the country as affected by altitude or proximity to the ocean. The table following shows the relative humidities for a number of widely separated cities in the United States at different seasons of the year.

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<sup>1</sup>This mimeograph is one of a series of reports issued by the Forest Products Laboratory to aid the Nation's defense.

<sup>2</sup>See Forest Products Laboratory Mimeograph No. 1313, "Moisture Content-Strength Relations for Wood."

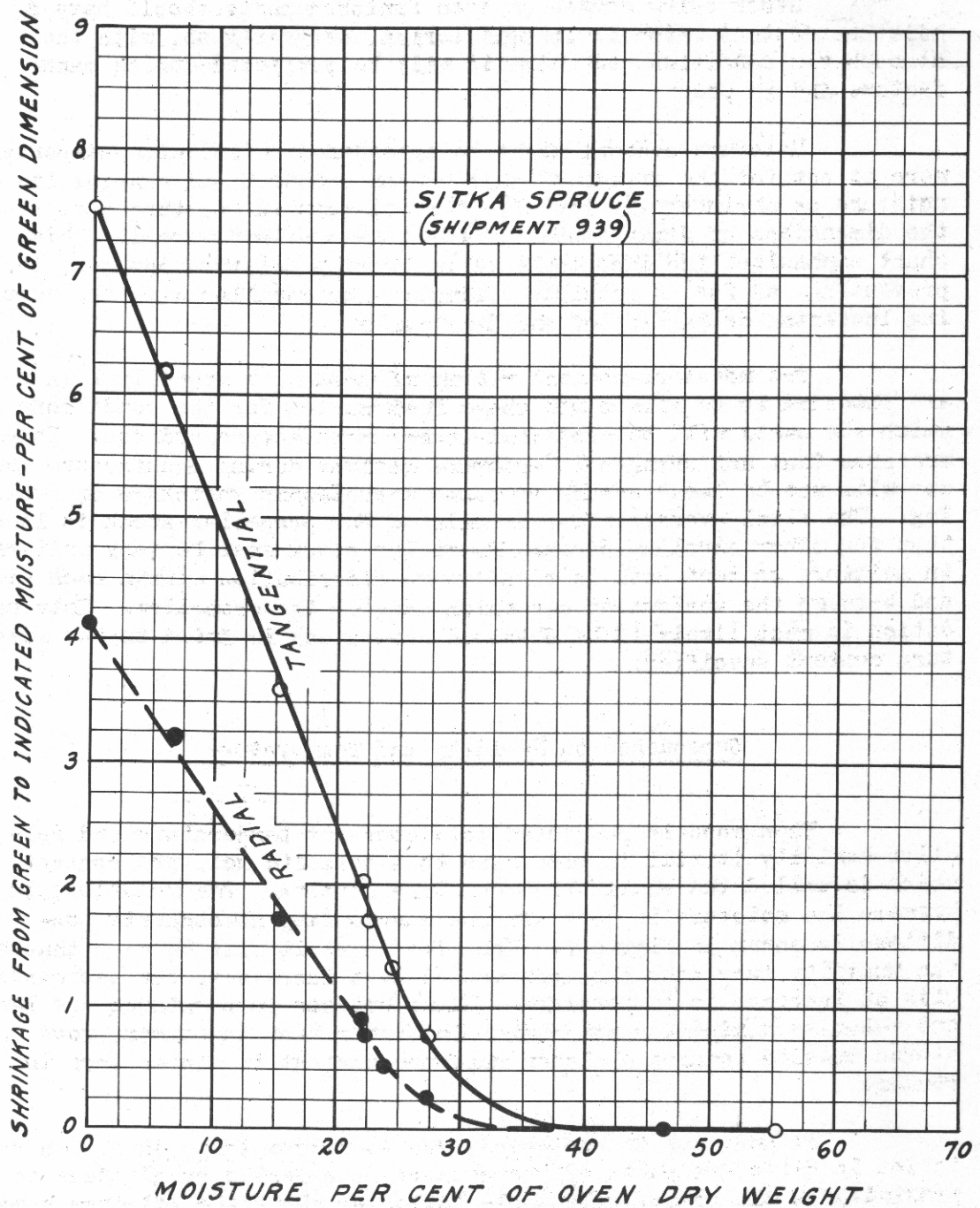


Fig. 1. Chart showing relation between shrinkage and moisture content of Sitka spruce.

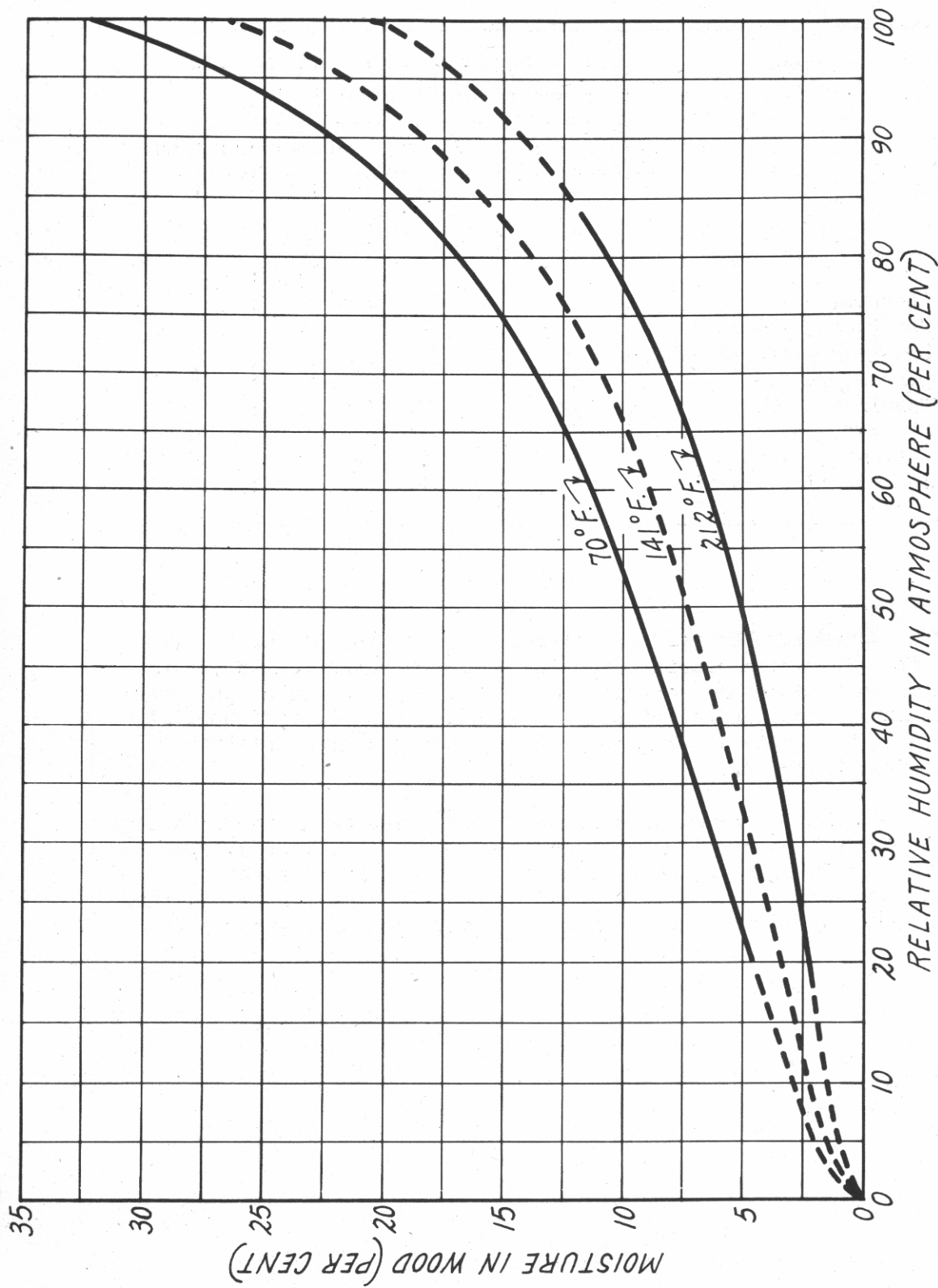


Fig. 2. Relation of the equilibrium moisture content of wood to the relative humidity of the surrounding atmosphere, at three temperatures.

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City	: Mean relative humidity in percent : based on daytime readings			
	: Winter	: Spring	: Summer	: Autumn
New York, N.Y.	: 73	: 70	: 74	: 75
Cleveland, Ohio	: 77	: 72	: 70	: 74
Spokane, Wash.	: 82	: 61	: 47	: 67
Seattle, Wash.	: 83	: 73	: 69	: 81
Phoenix, Ariz.	: 47	: 32	: 32	: 41
San Diego, Calif.	: 74	: 78	: 81	: 78
San Francisco, Calif.	: 79	: 79	: 84	: 80
Denver, Colo.	: 54	: 51	: 49	: 46
Washington, D. C.	: 72	: 69	: 75	: 76
El Paso, Tex.	: 45	: 27	: 41	: 46
Galveston, Tex.	: 84	: 82	: 79	: 78
Jacksonville, Fla.	: 80	: 74	: 80	: 83

Obviously the moisture content of wood for different parts of the country varies considerably for the same season of the year. The approximate moisture content of wood for any section of the country and any season can be determined by noting the relative humidity as given in the table and reading off the corresponding moisture content from figure 2.

Humidities given in this table are based on daytime readings by the Weather Bureau and do not necessarily give the mean average humidity for 24-hour periods. The humidity during the night is usually much higher than during the day, and the equilibrium moisture content will follow the mean average humidity for the 24-hour period.