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THE MOISTURE CONTENT OF SOFTWOOD LUMBER SHIPPED FROM WESTERN MILLS IN THE SUMMER

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During the months of July and August of the past summer (1928) the U. S. Forest Products Laboratory conducted a survey to obtain information on the moisture content of softwood lumber at the time of shipment from western mills. The mills visited are located in Montana, Idaho, Oregon, Washington, and California. This survey was for the purpose of obtaining more adequate information than that which had been procured in the previous moisture-content surveys¹, which were limited to winter conditions for this western region.

The specimens for the moisture-content determinations were collected at 28 mills and included 9 species: Western yellow pine, western white pine, sugar pine, Douglas fir, western hemlock, redwood, white fir, western larch, and Sitka spruce. Four hundred and thirty-six lots of lumber were tested; each one consisted of approximately 40 moisture-content determinations on individual boards of the same species, size, and grade, seasoned and stored in the same manner. All of the lots were selected from stock that was actually being shipped or was in shipping condition. The individual moisture-content determinations amounted to 17,000.

The variety in the lumber tested and the records kept are illustrated by the representative shipment described in Table 1.

¹E. C. Peck. "The Moisture Content of Softwood Lumber at the time of Shipment from the Mill." American Lumberman No. 2763, 36-38 (Apr. 21, 1928); Southern Lumberman 131, No. 1699, 40, 42-43, 47 (Apr. 21, 1928); Timberman 29, No. 7, 38-40, 44 (May, 1928); Sash-Door-Finish 10, No. 1, 30-34 (May, 1928).

Table 1.---A representative mill shipment

Lot let- ter :	Species of wood :	Grade of lumber :	Size of lumber :	How seasoned :	Time of air drying :	Time in storage :	Number of samples
Inches							
A	Western yellow pine	Shop	6/4	Kiln dried		1 mo.	39
B	"	C. Sel. & Btr.	4/4	"		6 wks.	40
C	"	C. Sel. & Btr.	6/4	"		6 wks.	39
D	"	No. 3 Common	4/4	"		None	42
E	"	Shop	8/4	"		8 mo.	42
F	"	Shop	5/4	"		1 mo.	37
G	"	No. 3 Common	4/4	Air dried	6 wks.	None	44
H	"	Box	6/4	"	6-1/2 mo.	None	39
I	Sugar pine	No. 3 Common	4/4	"	2 mo.	1 wk.	41
J	"	No. 2 Shop	10/4	"	9 mo.	None	41
K	"	No. 3 Shop	5/4	"	3 mo.	40 days	39
L	White fir	No. 3 Common	8/4	Kiln dried		4 mo.	41
M	"	No. 3 Common	4/4	"		10 mo.	40
N	"	No. 3 Dimension	8/4	Air dried	6 wks.	None	45

The object of the investigation was not to compare the moisture-content values of lumber shipped from individual mills or from the different regions, but to obtain information regarding the moisture content of the different grades of lumber as shipped during the summer from the western lumber-producing regions as a whole.

The results are presented in two ways, in a series of bar charts and in two charts showing the relation of average moisture content and uniformity of dryness. On the bar charts (figs. 1 to 8, inclusive) the height of each bar indicates in percentage the number of pieces that had moisture-content values falling within the group that it represents. Figure 1, for instance, shows that 40 per cent of the pieces it records had a moisture content of 8 per cent or more and below 12 per cent. The points plotted on the two summary charts (figs. 9 and 10) show for the individual lots both the average moisture content and the moisture content below which 90 per cent of the pieces in the lot fell. The average is plotted vertically and the "90 per cent" point horizontally. The upper 10 per cent of the pieces in each lot, that is, those having the highest moisture-content values, were discarded in order to be certain of eliminating all extremely irregular values. The range in moisture content in the remaining 90 per cent of the pieces gives a fair basis for comparison among different lots of lumber and among various kinds and grades.

Figure 1.--Kiln-dried Selects. This chart includes moisture-content tests on nine species: Sugar pine, western yellow pine, western white pine, Douglas fir, western hemlock, redwood, white fir, western larch, and Sitka spruce. The average moisture content of the samples in this grade is 8.8 per cent, with large representations in the 4 to 8 and the 8 to 12 per cent groups.

Figure 2.--Kiln-dried Flooring. Two species are included here: Douglas fir and western hemlock. The average moisture content of all the flooring samples is 8.7 per cent. The concentrations of moisture-content values are in the 4 to 8 and the 8 to 12 per cent groups. The drying of flooring was more uniform than that of any other kind of lumber, fewer wet boards being present.

Figure 3.--Kiln-dried Shop. The species represented here are sugar pine, western yellow pine, Douglas fir, and Sitka spruce. The average moisture content is 7.7 per cent, with a very heavy concentration in the 4 to 8 per cent group and with almost all of the boards dried below 20 per cent moisture content. The shop lumber was kiln dried to a lower average moisture content than any other kind.

Figure 4.--Kiln-dried Common. The species represented in this chart are sugar pine, western yellow pine, white fir, Douglas fir, western hemlock, western white pine, western larch, and Sitka spruce. The average moisture content of this grade of lumber is 12.1 per cent. The distribution of the moisture-content values of the individual samples shows a concentration in the 8 to 12 per cent group, with a large number of high values of moisture content. The large number of wet boards is due to the practice, in many instances, of drying common lumber only to a relatively high moisture content.

Figure 5.--Kiln-dried Dimension. Three species are included in this chart; Douglas fir, white fir, and western larch. The average moisture content for the lumber represented is 14.8 per cent. The irregularity of the groups in the figure is due to the relatively small number of lots obtained. The very great concentration in the 8 to 12 per cent group is caused by several lots dried to moisture-content values unusually low for dimension stock.

Figure 6.--Air-dried Selects. Nine species are represented on this chart: Sugar pine, western yellow pine, western white pine, Douglas fir, western hemlock, white fir, western larch, redwood, and Sitka spruce. The average moisture content is 13.7 per cent with large numbers of individual samples falling in the 12 to 16 and the 8 to 12 per cent groups. There is also a heavy representation in the 16 to 20 per cent group. The inclusion in this grade of a considerable amount of lumber from a slow-drying species caused the average moisture content to be higher than that of the common grade.

Figure 7.--Air-dried Common. In this grade of lumber there are seven species: Sugar pine, western yellow pine, western white pine, white fir, Douglas fir, western hemlock, and western larch. The average moisture content is 12.6 per cent. The individual moisture-content values are heavily concentrated in the 8 to 12 per cent group with another concentration in the 12 to 16 per cent group.

Figure 8.--Air-dried Dimension. Four species are represented in this chart: White fir, Douglas fir, western hemlock, and western larch. The average moisture content of the samples is 15.4 per cent. The moisture-content values of the individual pieces are concentrated in the 12 to 16 and 16 to 20 per cent groups.

Figure 9.--Kiln-dried Lumber. All the species of wood and all the kinds and grades of kiln-dried lumber are included in this chart. Each point represents one lot (approximately 40 individual moisture-content determinations); the position of the point indicates the average moisture content and the moisture content below which 90 per cent of the pieces in the lot fell. The points for the lots of summer kiln-dried lumber group themselves about the diagonal line (from lower left to upper right) that was located from the points plotted for the moisture-content studies made on lumber dried in the winter. This grouping means that the relationship of average moisture content and range of moisture content (within the lots) remains nearly constant throughout the year. In other words, whether the lumber is dried in the winter or in the summer, with a given average moisture content, 90 per cent of the boards may be expected to have moisture-content values below a certain point.

Figure 10.--Air-dried Lumber. This chart is similar to Figure 9 except that it represents the air-dried lumber, all species, kinds, and grades. There is also a reasonably definite relationship between the average and the "90 per cent" point in the air-dried lumber, which is approximately the same for winter and for summer air seasoning.

As mentioned elsewhere, the diagonal lines appearing in Figures 9 and 10 are taken from the similar figures for the report on the corresponding survey of moisture-content conditions in winter¹; the lines show the moisture-content relationship usual during the winter in the territory investigated. The close proximity of the summer points to these lines means that the same general relationship of average moisture content to maximum moisture content (within the 90 per cent limit) holds all through the year. On the other hand, comparison of the results previously reported with the present results makes evident the low averages and the small ranges of moisture content in the summer-shipped lumber. It is impossible to say whether this is due solely to the climatic factors or to improvement in seasoning practice since the original survey. Nevertheless, for the western regions examined, the moisture-content values of the present summer-seasoned lumber, both air-dried and kiln-dried, beyond question are considerably lower than the values of the winter-seasoned lumber.²

²Although the results obtained for the summer survey of the southern pine region are included in the charts of the previous report, the effect on the winter values, as shown by the unpublished detail data, is sufficiently small to be neglected here.

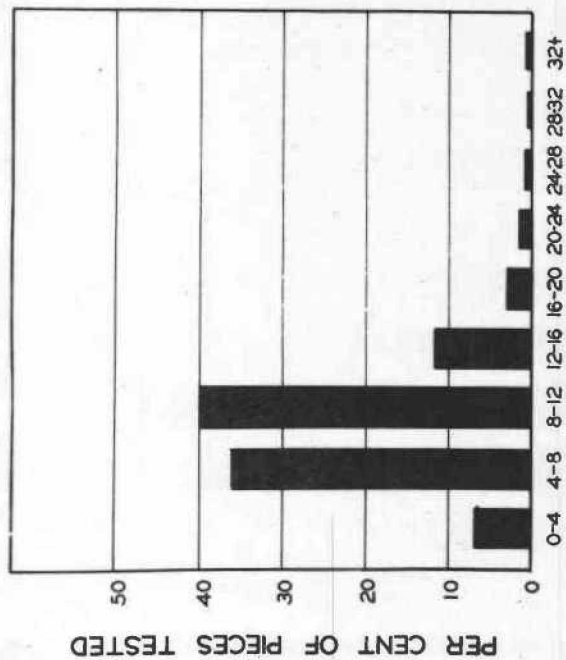


Fig. 1

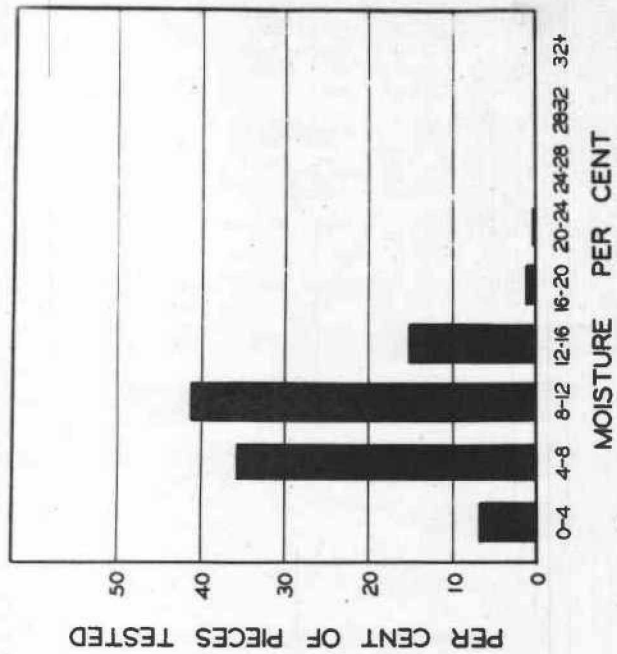


Fig. 2

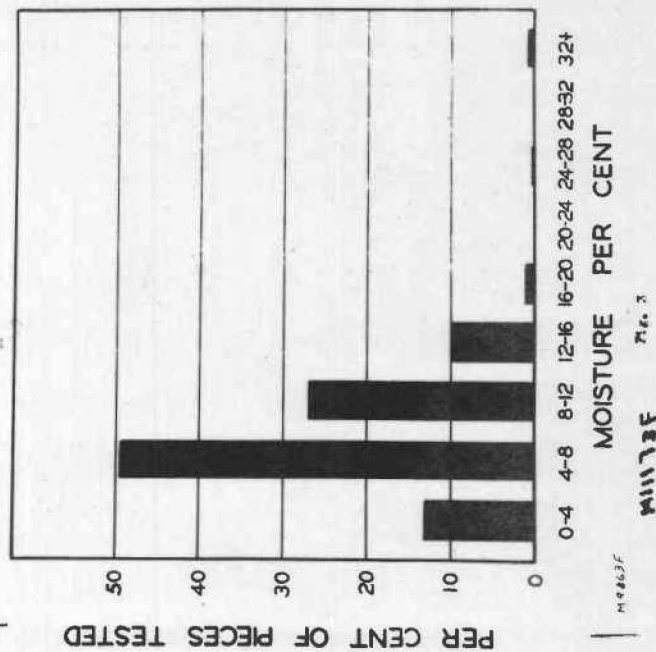


Fig. 3

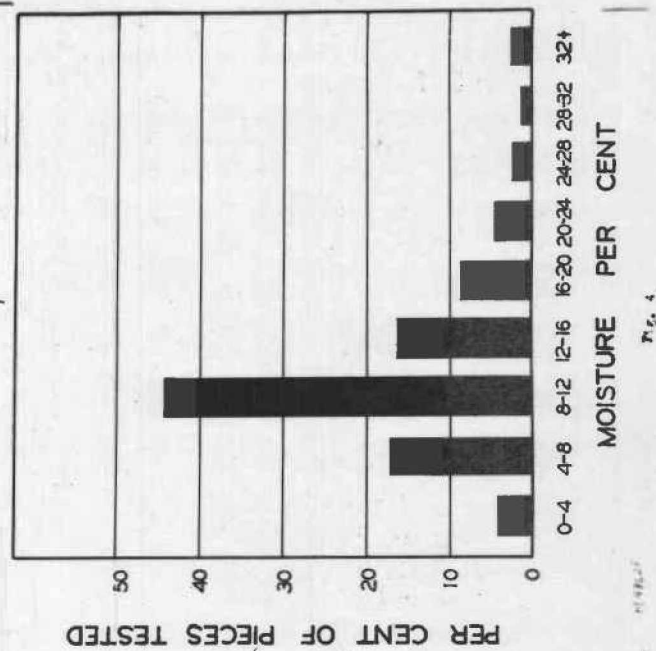


Fig. 4

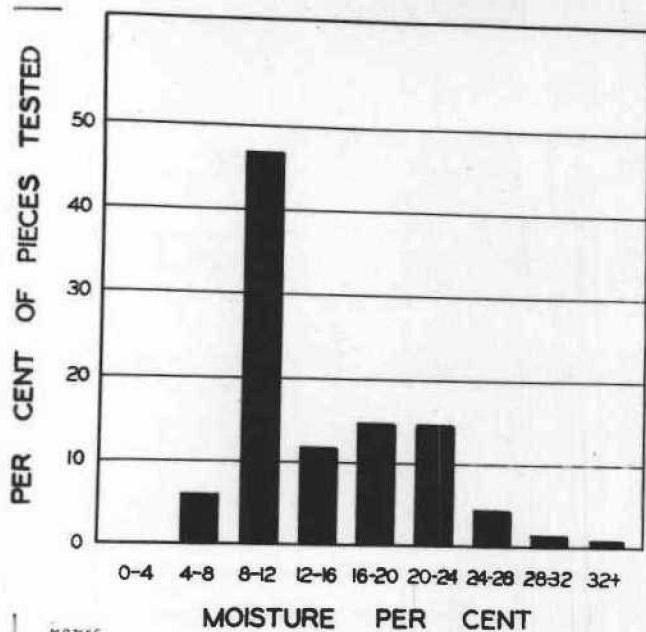


Fig. 5

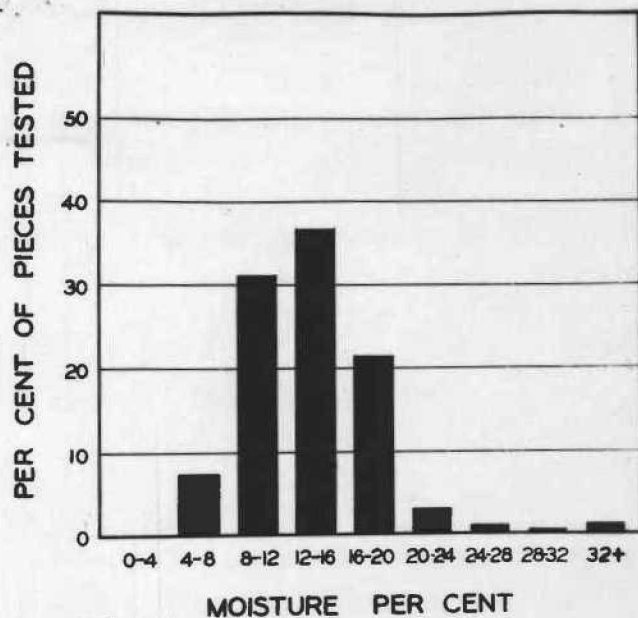


Fig. 6

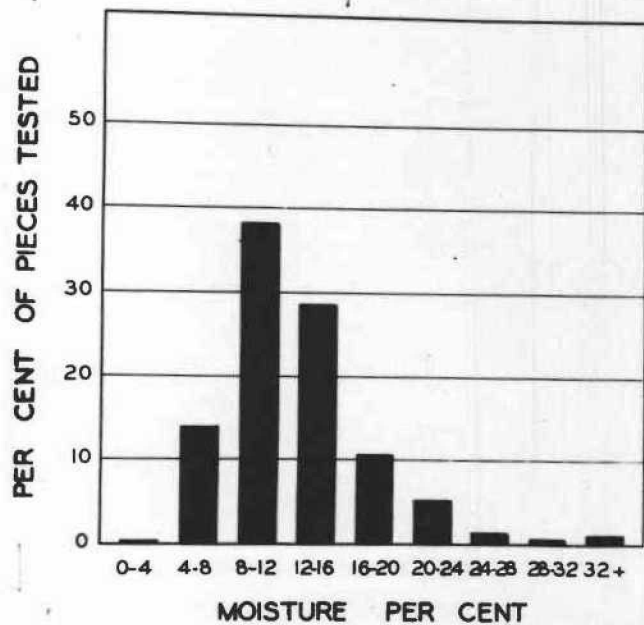


Fig. 7

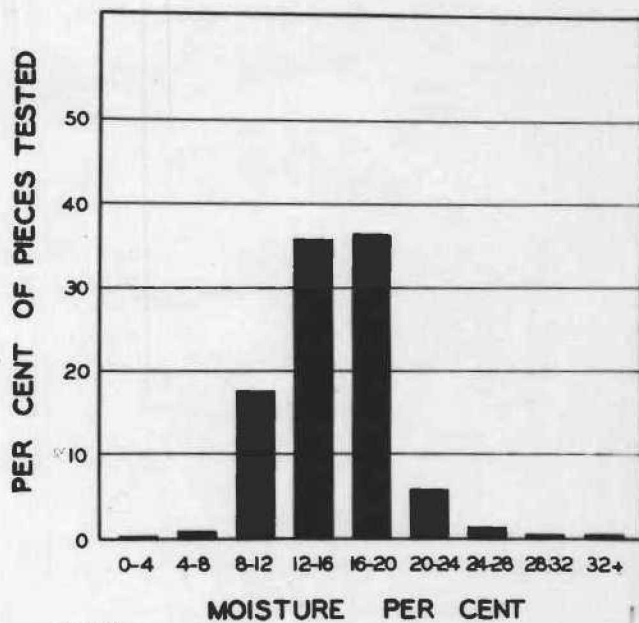


Fig. 8

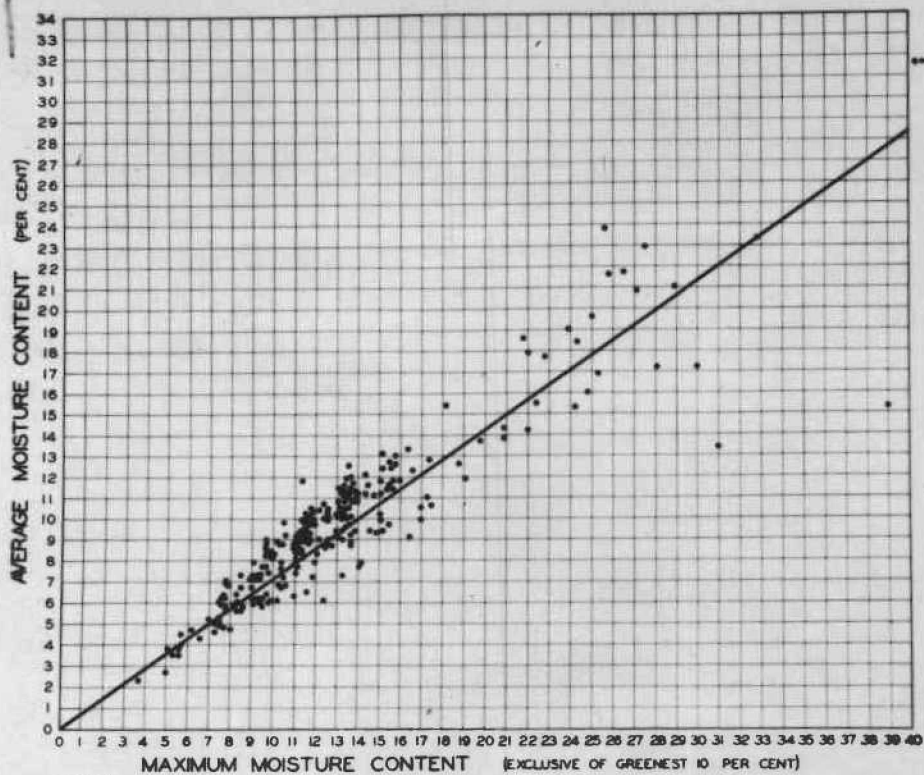


Fig. 9

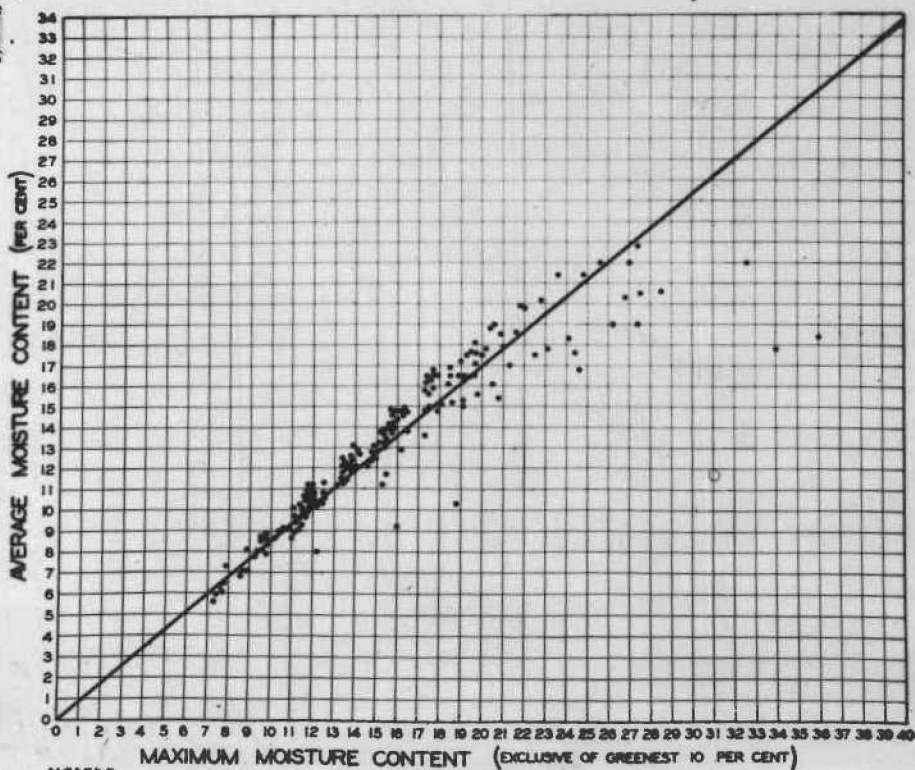


Fig. 10