

Sticker Stain in One-inch Red Alder Lumber

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B. G. Anderson ✓

R. G. Frashour



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OREGON FOREST PRODUCTS LABORATORY

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INTRODUCTION

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The Oregon Forest Products Laboratory was asked in July 1953 by the Oregon Alder and Maple Company, Willamina, to work on the problem of dark stain which developed at sticker crossings in air-drying red alder (Alnus rubra, Bong.) during the summer months.

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Previous experience at the Oregon Alder and Maple Company had demonstrated that the uniform light-brown shade preferred by furniture manufacturers could be obtained by kiln-drying the lumber immediately after sawing, using a high initial humidity and an initial dry-bulb temperature from 130 to 150 degrees F.

It was observed that the color of the lumber when kiln-dried green could be varied from nearly white to chocolate brown by manipulation of the relative humidity and dry-bulb temperature during the first hours (approximately 48) in the kiln. Lumber handled in this manner did not develop sticker stain.

This suggested the possibility of fixing the color of the lumber by a steaming treatment before air-drying. With the elimination of sticker stain and poor color, favorable air-drying weather could be used to full advantage, with the possibility of saving from 2 to 4 days kiln time.

Four charges of freshly sawed one-inch alder lumber were first steamed under various conditions, then air-dried. A fifth charge was air-dried without previous steaming, as a control.

DRYING PROCEDURE

Five charges of approximately 200 fbm each of random-width, rough, one-inch red alder lumber were dried, surfaced, and inspected to determine the effects of the experimental treatment on the occurrence of sticker stain in the finished lumber. The type of treatment given to each of the five charges is indicated in the following table:

Chg	Steaming treatment				Dates	Air-drying		Kiln-drying			
	DB ¹	WB ²	Time	Final avg MC		Type of sticker	Final avg MC	DB	WB	Time	Final avg MC
	Deg F	Deg F	Hr	%		%	Deg F	Deg F	Hr	%	
1	140	136	18	65	7/16-8/3	Solid	15	180	145	31	8.7
2	180	177	18	77	7/16-8/3	"	14	180	145	31	8.0
3	Not steamed			89	7/15-8/3	Hollow-back	15	180	145	31	8.9
4	130	130	24	94	8/7-10/12	Solid	16	180	145	120	4.7
5	120	120	24	86	8/7-10/12	"	18	180	145	120	5.0

- 1 Dry bulb.
- 2 Wet bulb.

After kiln drying, charges 1, 2 and 3 were taken to the Oregon Alder and Maple Company for planing and inspection. All 3 charges were surfaced to a thickness of 15/16 inches. All boards in these three charges were found to be free from sticker stain.

The color characteristics of the five charges after final kiln-drying are summarized as follows:

Charge	Color	Pattern	Sticker stain	Remarks
1	Light-brown	Uniform	None	Desirable color
2	Flat light-brown	Uniform	None	Lusterless; undesirable
3	White to pink	Mottled	None	Undesirable color
4	Similar to charge 3	Somewhat mottled	None	" " "
5	Lighter than charge 4	Slightly mottled	In 18% of boards	" " "

Boards in charge 1 were colored to a uniform light-brown color with no mottling. The shade of color in charge 1 was said to conform with the desires of California furniture manufacturers.

Boards in charge 2 were colored to a uniform light-brown color of lighter shade than that in charge 1. The shade of color in charge 2 was said to fit the term "lifeless" or "without luster", as described by Floyd Edmiston, of the Oregon Alder and Maple Company. Boards with a shade of color found in charge 2 are said to be undesirable from the furniture manufacturers' standpoint. The difference in color shade or luster between charges 1 and 2 was attributed to the difference in steaming temperature.

Boards in charge 3 were free from sticker stain, but contained irregular areas stained in a mottled pattern. The background color in these boards was from white to pink. Color in charge 3 was unsatisfactory for exposed parts in furniture manufacture.

Charges 4 and 5 were surfaced at the Laboratory after kiln-drying, and inspected for sticker stain.

Charge 4 was free from sticker stain, but contained slight mottling of color. Color in this charge was similar to that of charge 3.

Charge 5 contained sticker stain in 18 per cent of the boards. Color was lighter than that of charge 4, and also had less mottling.

During the inspection of surfaced boards in charges 1 and 2, an improvement was noted in appearance of tight knots. Tight knots in these charges appeared to have suffered less checking during seasoning and machining than was observed in the commercial lumber currently being run. This difference was tentatively attributed to the steaming treatment given the experimental lumber before air drying. Subsequent adjustment in initial kiln-schedule conditions resulted in confirmation of this observation in commercial runs. The schedule adjustment made was a change in initial wet-bulb depression from 10 deg F to 5 deg F.

Figures 1 through 5 show the progress of air-drying in the various charges of lumber. All charges air-dried to an average of about 20 per cent moisture content in ten days. Charges 1 through 3 air-dried to an average of about 15 per cent moisture content in 18 days. All charges were put out for air-drying in July or August.

After air-drying, charges 1 through 3 were kiln-dried to an average of 8-9 per cent moisture content in about 30 hours (Figures 6, 7, 8). Charges 4 and 5 were kiln-dried to an average of 8-9 per cent moisture content in about 40 hours, although these two charges were left in the kiln for a total of 120 hours (Figures 9, 10).

Charges 1, 2, and 3 were kiln-dried together, as also were charges 4 and 5. As can be seen from the drying rates of the kiln samples for the separate charges (Figures 6, 7, 8, 9, 10), the charges in each group dried in much the same manner, regardless of differences in treatment before kiln-drying.

Figure 11 shows average shrinkage in width during drying for kiln samples in all charges. Average shrinkage was 4.5 per cent to an average moisture content of 10 per cent. Average shrinkage was 5.1 per cent to an average moisture content of 7 per cent.

Figure 12 gives a cumulative distribution of final moisture-meter readings in charges 1, 2 and 3. All the boards gave moisture-meter readings between 7.0 and 11.5 per cent. Ninety-five per cent of the boards gave readings below 10 per cent, and 80 per cent of the boards gave readings below 9.0 per cent. The average moisture-meter reading was 8.8 per cent. The average final moisture content after conditioning of the kiln samples used in the three charges was 8.5 per cent by the oven-test method.

Figure 13 gives a cumulative distribution of shrinkage in width of 18 kiln samples dried to an average of 7.7 per cent moisture content (before conditioning). The average shrinkage value was 4.9 per cent. Ninety per cent of the shrinkage values were 5.5 per cent or lower. Eighty per cent of the shrinkage values were 5.2 per cent or lower.

CONCLUSIONS

The occurrence of sticker stain during air-drying of one-inch red alder lumber could be eliminated by a steaming treatment of the stickered lumber prior to air-drying. A desirable and uniform shade of color in the final dried lumber can be obtained by the use of this preliminary steaming treatment. The optimum conditions for this treatment appear to be about 140 deg F dry-bulb temperature, 4 deg F wet-bulb depression, and minimum steaming time about 18 hours. No doubt, adjustments in the shade of color could be obtained by using different dry-bulb temperatures and wet-bulb depressions during steaming. The immediate objective of this short-term project was to determine the effects of certain preliminary treatments on the development of sticker stain during air-drying. The limited data obtained in this study do not permit exact observations on the color shades resulting from various steaming conditions. The preceding conclusions are based on the assumption that the lumber will be freshly sawed when subjected to the steaming treatment.

Following the method outlined will allow the operator to take full advantage of air-drying during the summer months, with no losses from sticker staining or undesirable color, and with reduction of 2-4 days in total kiln time needed.

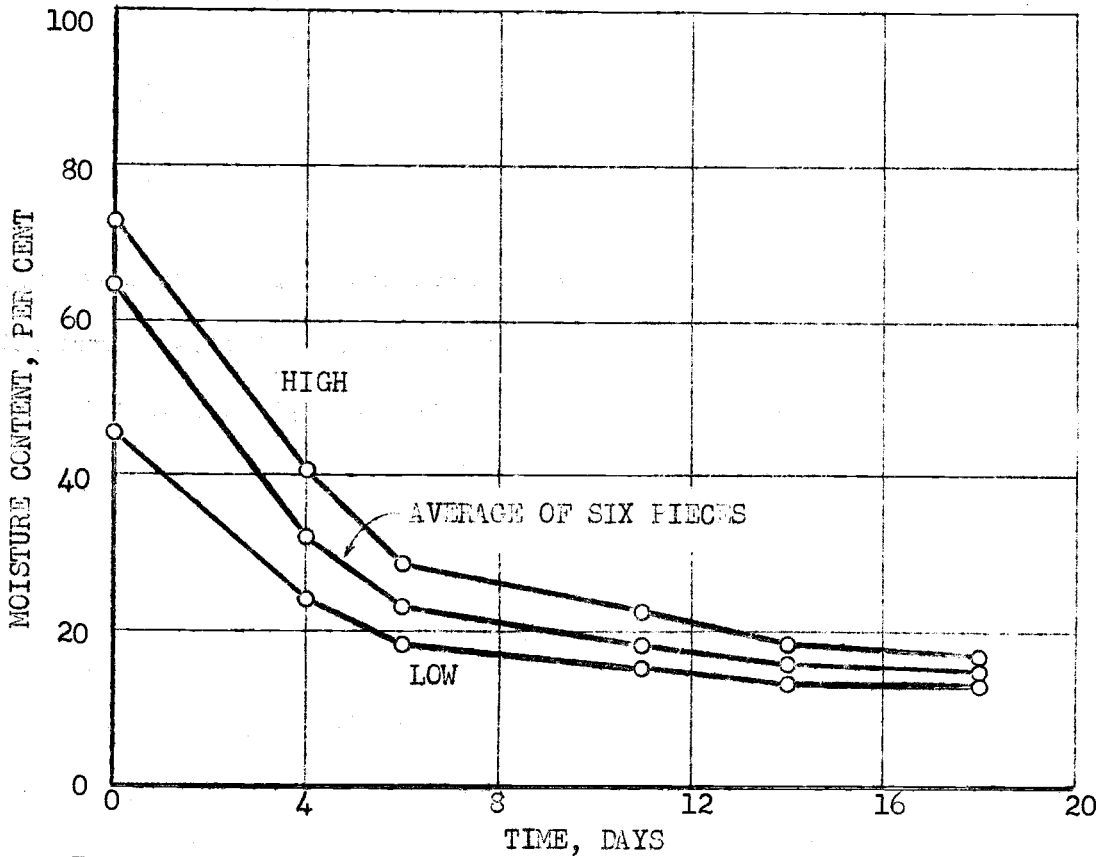


Figure 1. Moisture content during air-drying of one-inch red alder lumber after steaming at 140-136 degrees F for 18 hours; July 6 to August 3, 1953. (charge 1)

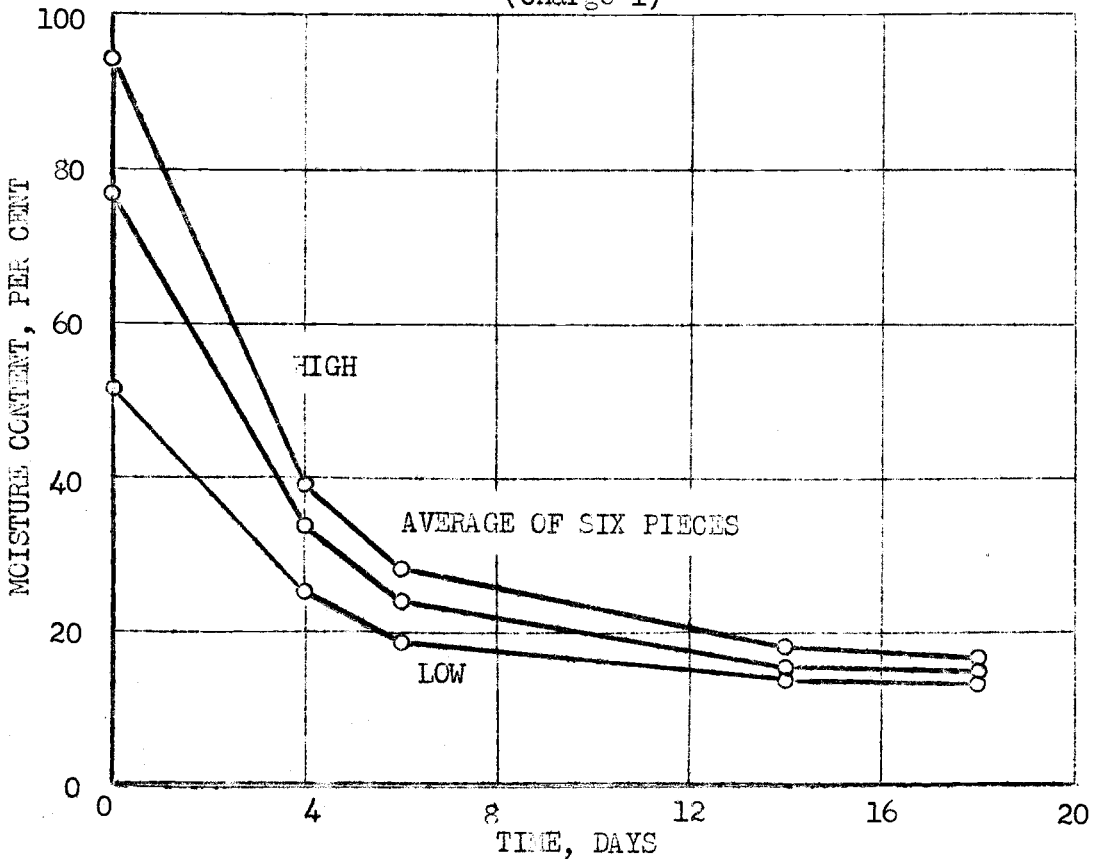


Figure 2. Moisture content during air-drying of one-inch red alder lumber after steaming at 180-177 degrees F for 18 hours; July 16 to August 3, 1953. (charge 2)

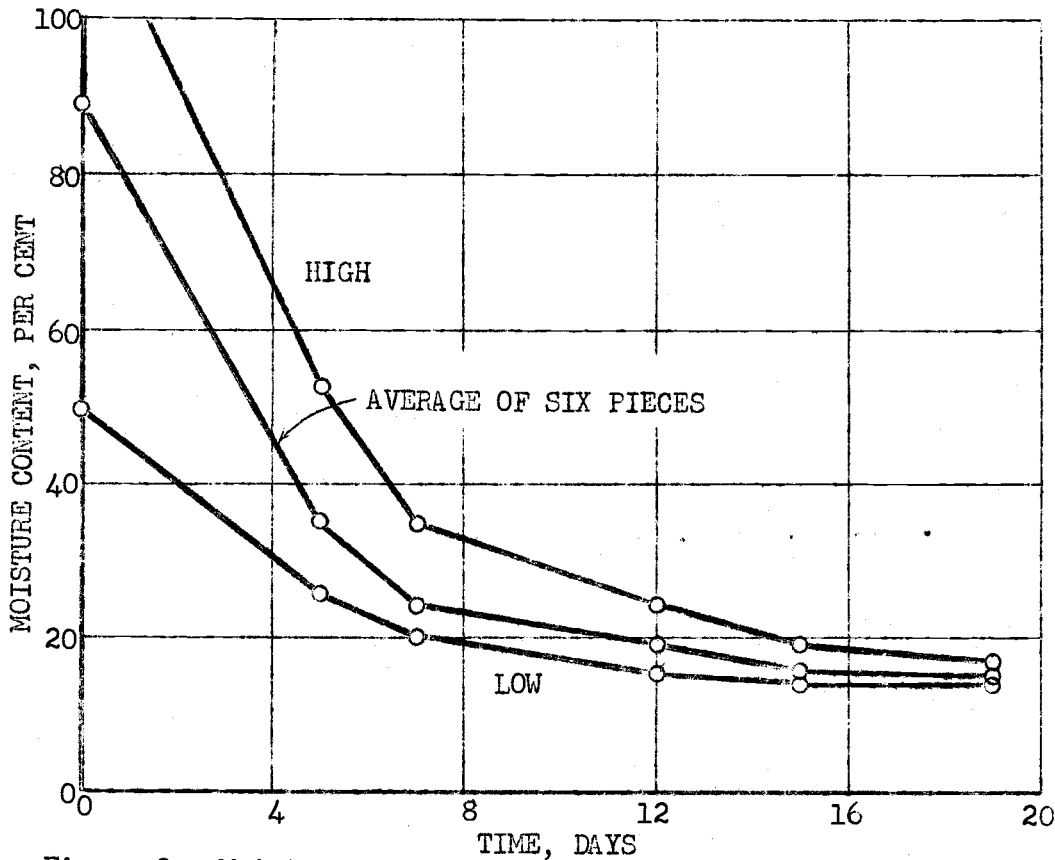


Figure 3. Moisture content during air-drying of one-inch red alder lumber not steamed, but stacked on hollow-back stickers from July 15 to August 3, 1953.
(charge 3)

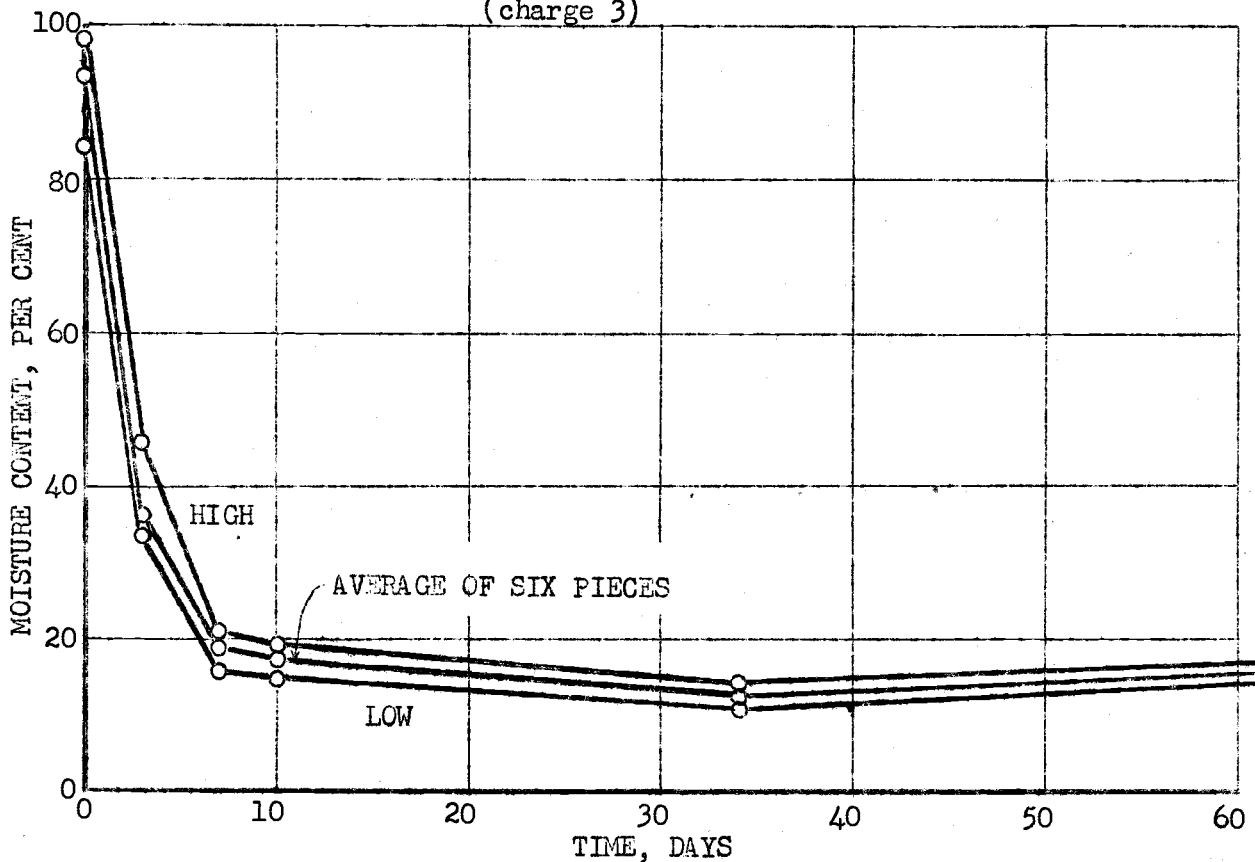


Figure 4. Moisture content during air-drying of one-inch red alder lumber after steaming at 130-130 degrees F for 24 hours; August 7 to October 12, 1953.
(charge 4)

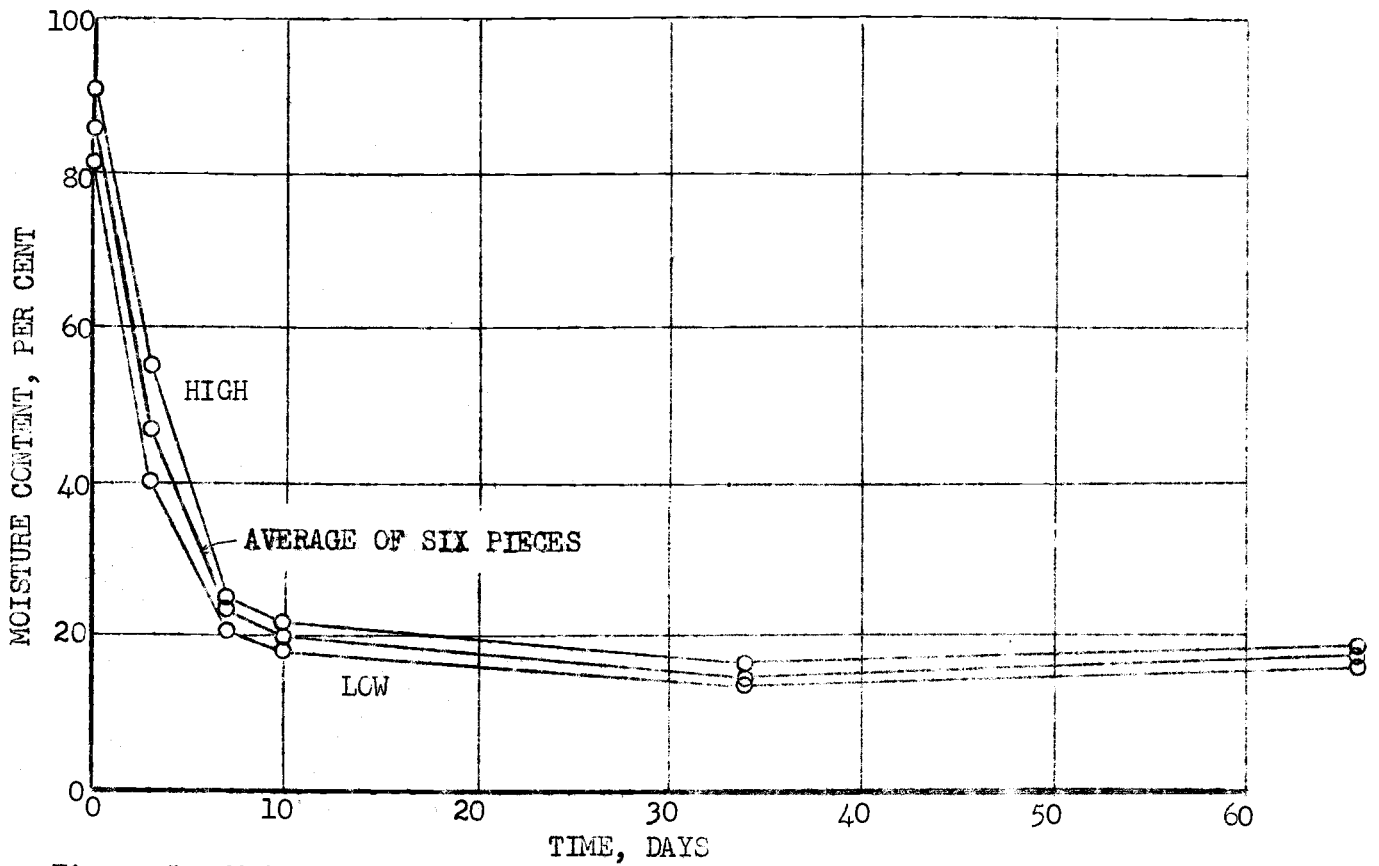


Figure 5. Moisture content during air-drying of one-inch red alder lumber after steaming at 120-120 degrees F for 24 hours; August 7 to October 12, 1953. (charge 5)

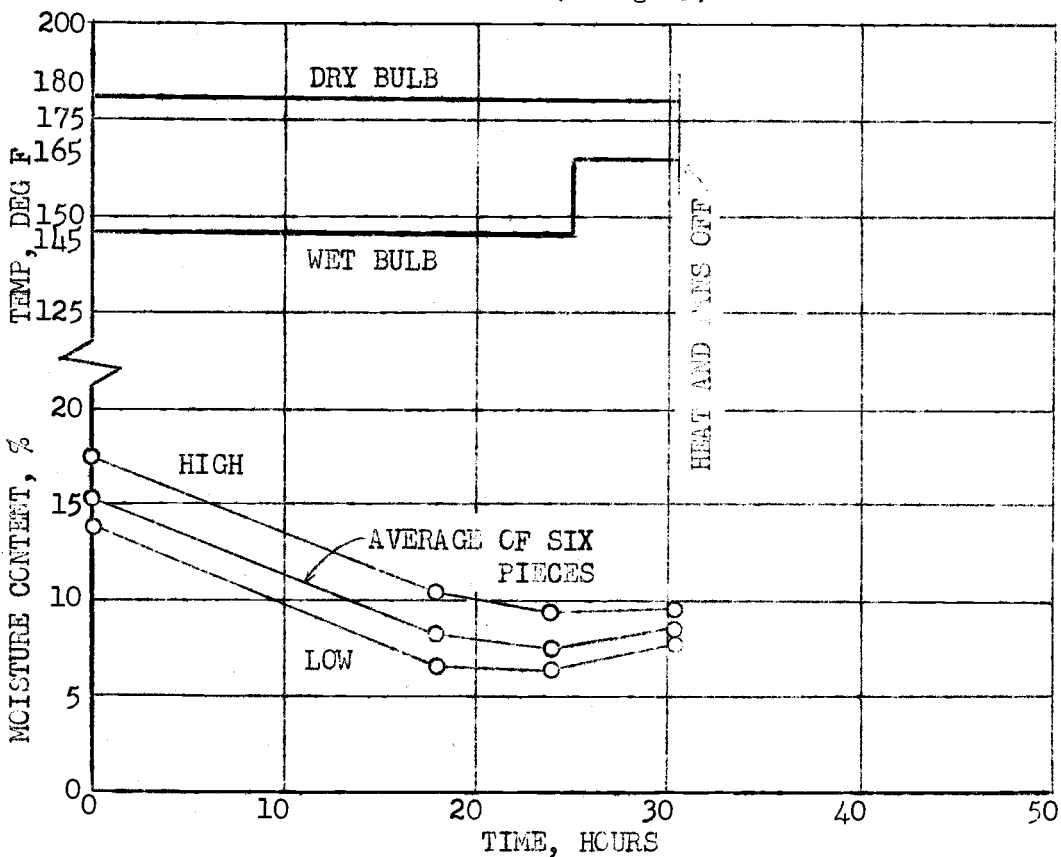


Figure 6. Kiln schedule-drying rate for one-inch air-dried red alder lumber; charge 1.

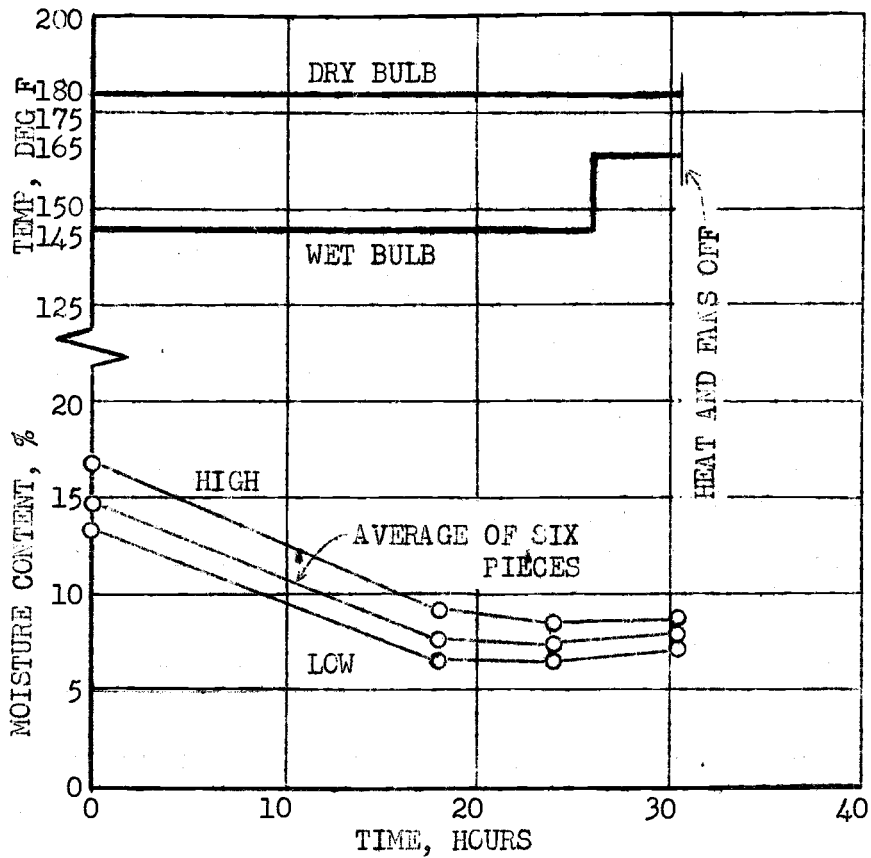


Figure 7. Kiln schedule-drying rate for one-inch air-dried red alder lumber; charge 2.

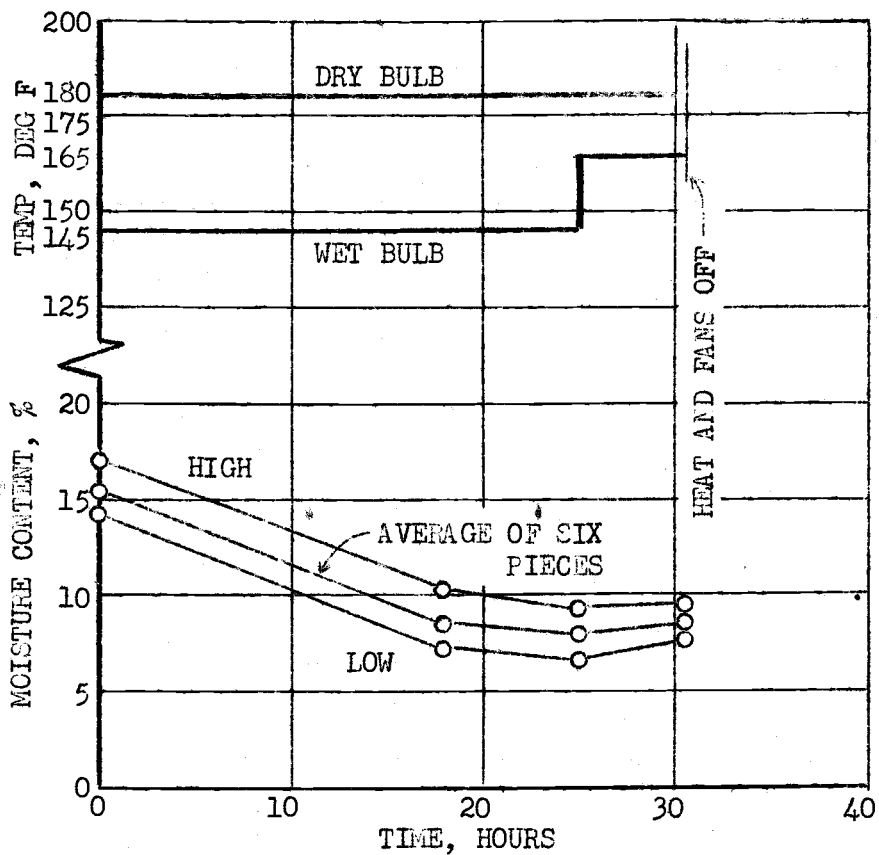


Figure 8. Kiln schedule-drying rate for one-inch air-dried red alder lumber; charge 3.

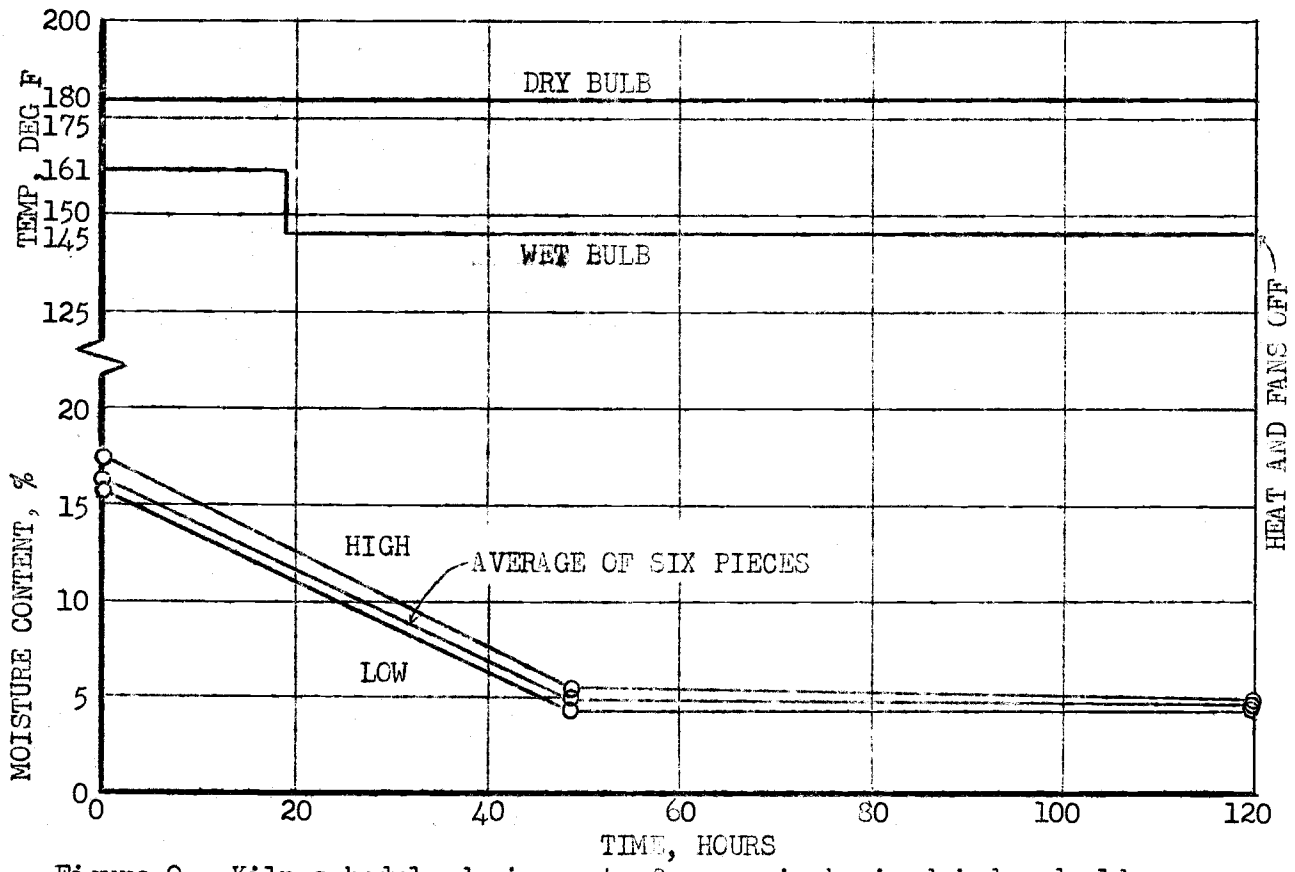


Figure 9. Kiln schedule-drying rate for one-inch air-dried red alder lumber; charge 4.

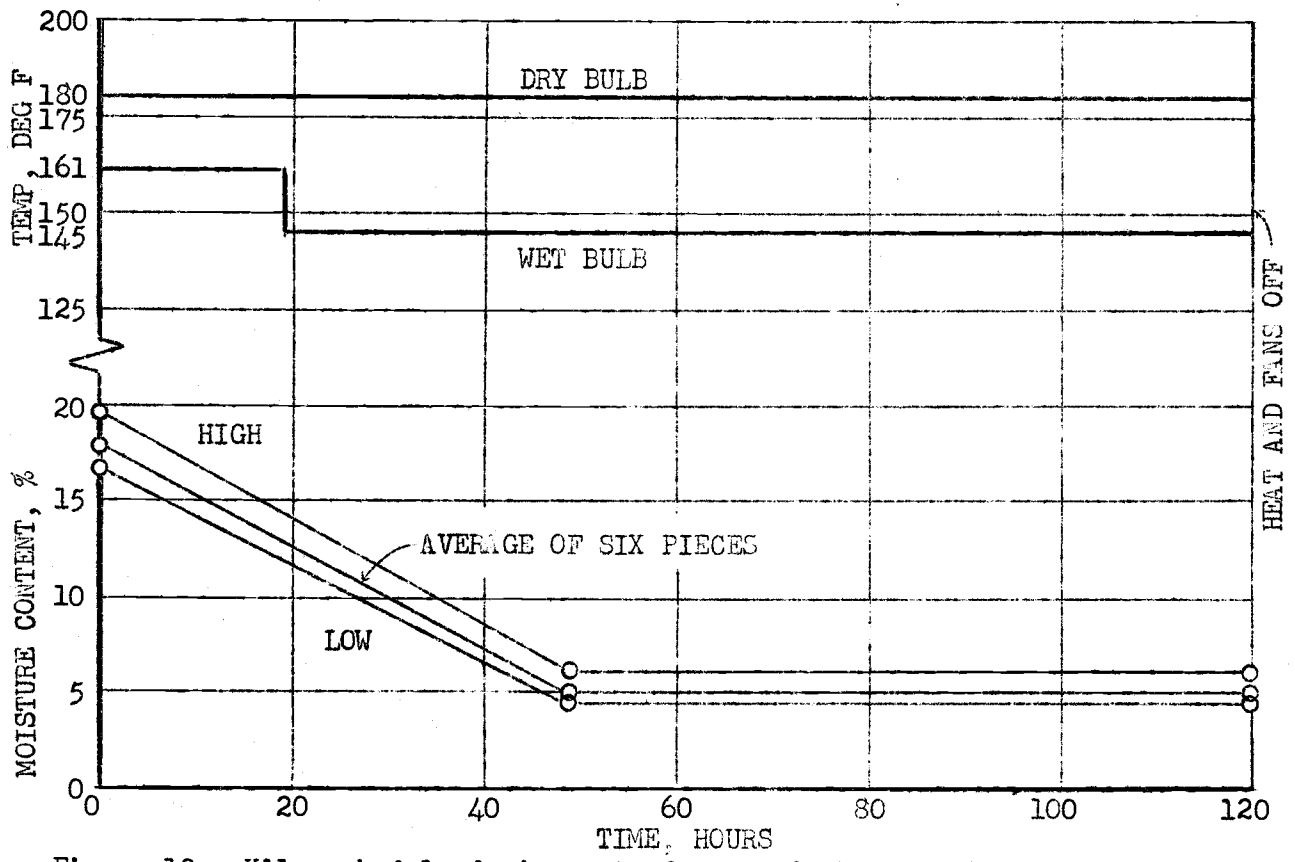


Figure 10. Kiln schedule-drying rate for one-inch air-dried red alder lumber; charge 5.

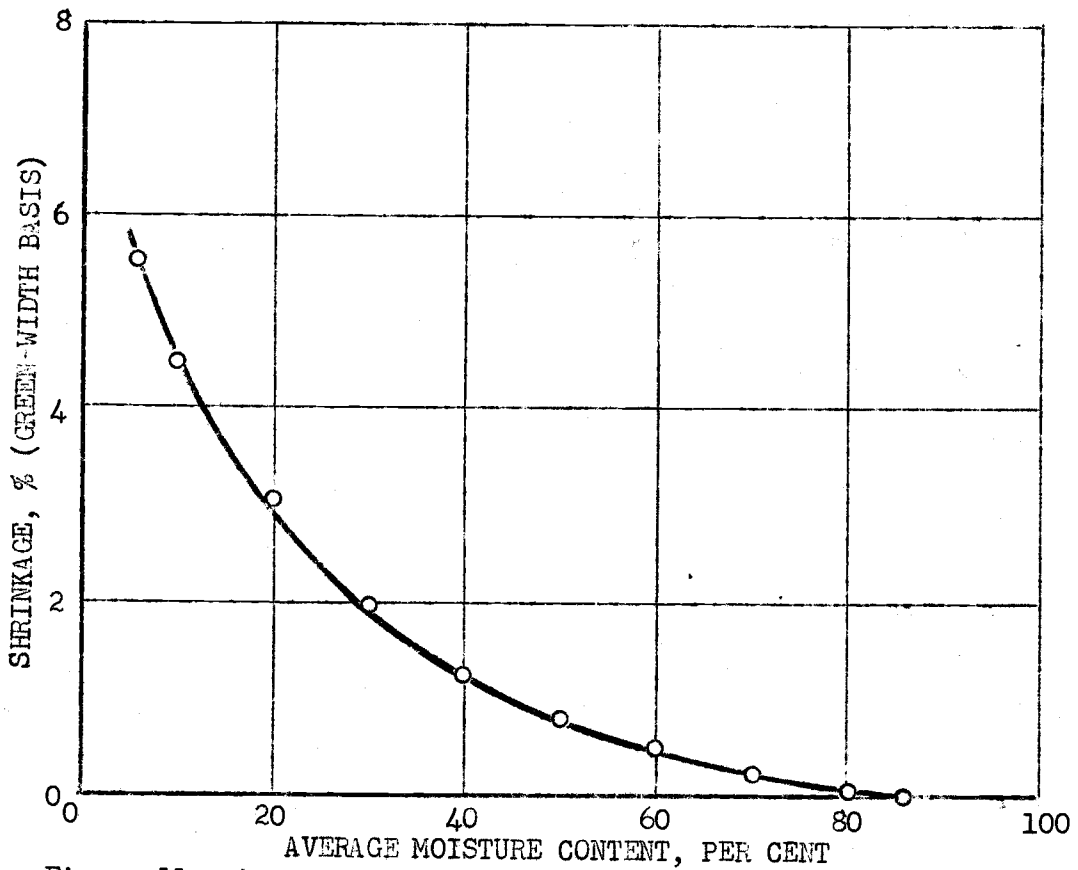


Figure 11. Average shrinkage in width during drying of one-inch red alder lumber.

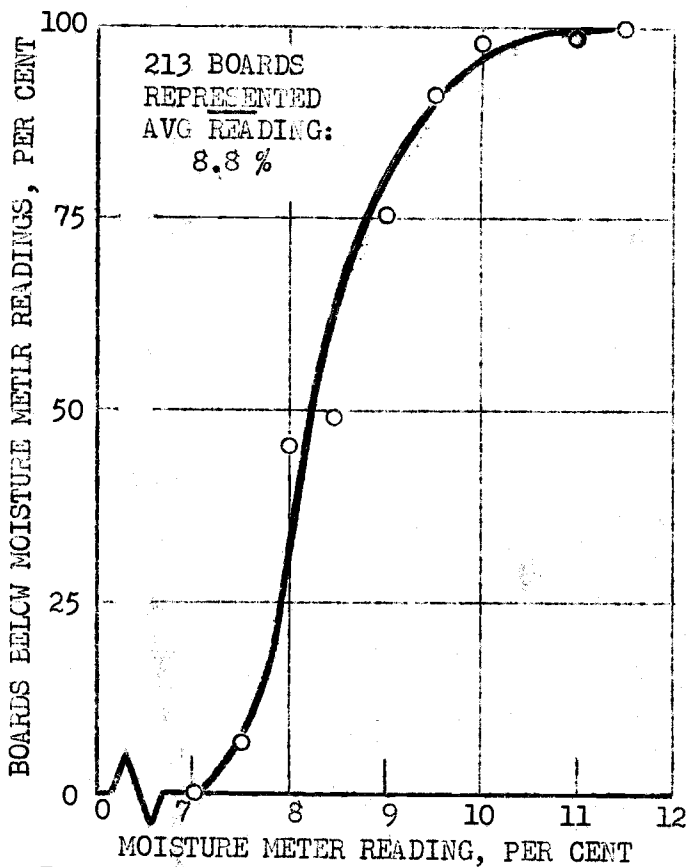


Figure 12. Cumulative distribution of final moisture meter readings of one-inch red alder; charges 1, 2, 3.

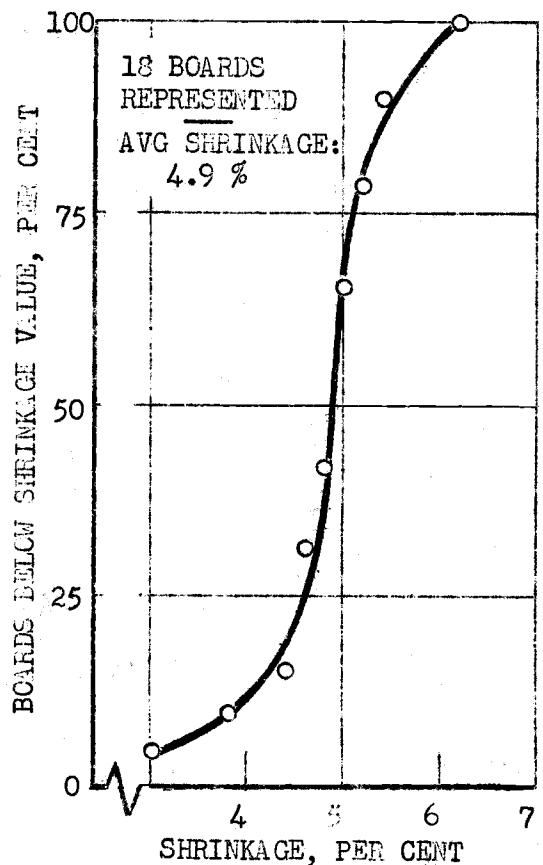


Figure 13. Cumulative distribution of shrinkage values in one-inch red alder lumber dried to 7.7% avg mc; green-weight basis.