

DEGRADE IN PRODUCTION OF LUMBER FROM DOUGLAS-FIR,
WESTERN LARCH, AND WHITE FIR IN EASTERN OREGON*

By
H. D. Stillwell, Technologist
Oregon Forest Products Laboratory

Study of degrade during seasoning and machining of lumber from Douglas-fir, western larch, and white fir was made at Halfway, Oregon, in 1955. The study was a joint effort of several agencies--Oregon Forest Products Laboratory, U.S. Forest Service, Bureau of Indian Affairs, Bureau of Land Management, and Western Pine Association. Analysis of lumber degrade was subsidiary to accumulation of data on lumber recovery by species, log grade, and log diameter. Work at Halfway was one of a series of studies planned for the pine region of California, Oregon and Washington in an effort to establish log grades for the region.

PROCEDURE

Lumber studied was sawed by the Stillwell-Pengilly Lumber Company at Halfway, then trucked to Robinette for drying and planing. The rough-green lumber was graded and separated according to species, log-diameter class (under 18, 18-23, and over 23 inches), thickness, grade and width. Selects, however, were random width.

The test lumber air-dried about a week in hot, dry weather. Some checking occurred during the week.

The lumber was dried in a Moore two-track, cross-circulation kiln, 60 feet long, with a separate heating system for each half-length of the kiln. Overhead fans were 72 inches in diameter. A booster coil was located between tracks to minimize temperature drop across the width of the kiln. Steam was applied at 15 pounds by a low-pressure boiler. Since none of the lumber items developed in the study were of sufficient volume to make up a kiln charge, it was necessary to dry them together, using a compromise schedule and removing each item when dried. Dry-bulb temperature began at 133° F. and was increased gradually to 160° F. with humidity controlled to

*A detailed report of the lumber-recovery study will be published when complete.

lumber requirements. Final moisture content ranged between 10 and 12 percent for most items. Dry lumber from the kiln was held in a covered cooling shed until it could be surfaced. Such exposure to hot, dry weather resulted in planing some items of common lumber at lower moisture contents than desired.

After the lumber items were surfaced, they were regraded by a Western Pine Association grader. Causes for degrade were recorded under seasoning and other manufacturing defects. Planer split and knot damage were classified arbitrarily as seasoning defects for the study. Trim and cull were not tallied, but were calculated later from lumber recovery. Some characteristics, such as shake and knot clusters, could not be estimated accurately in the rough-green lumber, but could be seen plainly in the surfaced-dry lumber. The rough-green lumber tally was corrected on the basis of the more accurate grading of surfaced-dry lumber.

RESULTS

The surfaced-dry lumber recovery by grades as percentages of rough-green grade tally is shown in Table 1. The calculated values for trim and cull were constant for each thickness. For each species, the value losses by causes in dollars per M board feet for each green grade are listed in Tables 2, 3 and 4. Lumber values used were taken from the 1956 Western Pine Association price list. Since the bulk of the volume occurred in 4/4 commons and 8/4 No. 1 and No. 2 grades, factors degrading these items are quite important.

Log diameter had some influence on degrade. As diameter increased, 4/4 selects showed increase in planer split and thin lumber; losses from checking, mechanical blemish and narrow boards, however, decreased. One-inch commons showed a decrease in planer split and broken knots but an increase in knotholes with increased log diameter.

Lumber width had some influence on degrade and final moisture content. One-inch-thick items showed degrade from broken knots and knotholes in widths over 6 inches, and planer split and checks in widths over 8 inches. Two-inch-thick

items showed degrade from twist, crook or bow and broken knots in 4- to 8-inch widths, and degrade from knotholes and planer split in widths over 6 inches. Final moisture content was higher in the wider widths.

There was some correlation with results of a previous degrade study at La Grande, Oregon. Knotholes, broken knots, and planer split were important defects in 4/4 common grades in the earlier work. Planer split and check caused degrade in select grades.

SUMMARY

Among the three species, Douglas-fir lumber lost most value per M fbm in all grades except No. 1.

For all species, the select grades lost most value per M fbm.

One-inch-thick boards of Douglas-fir and white fir lost more value per M fbm than did two-inch-thick boards of the same species.

Important degrade factors were:

Planer splits and checks in select grades.

Knotholes in 4/4 common grades.

Mechanical blemishes in larch and Douglas-fir select grades.

Table 1.--Surfaced-dry lumber recovery by grades as percentages of the rough-green grade tally in mill study at Halfway, Oregon, September 1955.

: Rough-green :		Surfaced-dry lumber grade recovery										
Thickness:	Grade	Volume:	B	C	D	Mldg.	1	2	3	4	5	Trim, cull
(Inches)		(Fbm)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
<u>Douglas-fir</u>												
4/4	B	47	66.0	6.4						23.2		4.4
	C	1,247		58.9	15.9				14.9		0.6	4.4
	D	1,170			60.9			3.4	18.8	11.6	0.9	4.4
	2	1,687					48.2	36.2	8.8		2.4	4.4
	3	4,215						62.5	30.9		2.2	4.4
	4	3,628							86.3		9.3	4.4
	5	1,196									95.6	4.4
8/4	1	29,230					77.1	17.7	3.1	0.6		1.5
	2	10,852						88.4	8.6	1.5		1.5
	3	4,774							92.0	6.5		1.5
	4	1,886								98.5		1.5
Total:		59,932										
<u>Larch</u>												
4/4	B	1,407	49.7	15.1	18.4	14.6		0.3				1.9
	C	1,888		59.2	23.0	14.9		0.2	0.4	0.4		1.9
	D	1,636			70.4	19.7		2.1	4.2	1.7		1.9
	Mldg.	556				97.1			0.9			
	2	1,080					70.0	23.7	4.4			1.9
	3	1,267						71.2	26.9			1.9
	4	1,185							96.2		1.9	1.9
	5	344									98.3	1.9
8/4	1	16,541					72.6	18.0	6.8	0.3		2.3
	2	3,965						91.1	5.8	0.8		2.3
	3	1,780							96.0	1.7		2.3
	4	231								97.7		2.3
Total:		31,880										
<u>White fir</u>												
4/4	C	141		70.9	12.0				3.5	9.2		4.4
	D	458			79.7				7.2	8.7		4.4
	2	786					70.6	20.0	5.0			4.4
	3	4,186						75.9	18.3		1.4	4.4
	4	4,724							92.2		3.4	4.4
	5	2,429									95.6	
8/4	1	7,792					81.8	12.7	3.2	0.6		1.6
	2	6,589						94.8	3.1	0.5		1.6
	3	3,202							96.0	2.4		1.6
	4	1,054								98.4		1.6
Total:		31,361										

Table 2.--Douglas-fir value loss by causes in dollars per M board feet for each rough-green grade in mill study at Halfway, Oregon, September 1955.

Thickness:	4/4						::	8/4		
Grade:	B	C	D	2	3	4	:	1	2	3
Volume, Fbm:	47	1,247	1,170	1,687	4,215	3,628	:	29,230	10,852	4,774
<u>Seasoning defects</u>										
Checks		0.99	0.14	0.12	0.10			0.08		
Twist		0.62	0.70	0.03	0.05			0.40	0.09	
Crook or bow		0.43	0.37		0.06			0.45	0.60	0.58
Broken knot			0.23	2.48	0.17	0.25			0.03	
Knothole		0.30		2.50	2.69	1.22		0.04		0.30
Planer split	21.06	14.23	15.41	3.02	1.25	0.25		0.77	0.47	
Wet				0.07						
Subtotal:	21.06	16.57	16.85	8.22	4.32	1.72		1.74	1.19	0.88
<u>Other mismanufacture</u>										
Thin		0.55	1.13	0.14				0.08		
Narrow or wane		0.47	0.99	0.56	0.25	0.41		0.79	1.36	0.97
Mechanical blemish (torn grain, dog and chip marks)		2.72	1.04	0.48	0.10	0.12		0.11	0.12	0.09
Subtotal:		3.74	3.16	1.18	0.35	0.53		0.98	1.48	1.06
<u>Trim and cull</u>	<u>6.17</u>	<u>6.62</u>	<u>5.42</u>	<u>3.67</u>	<u>0.31</u>	<u>2.58</u>		<u>1.36</u>	<u>1.24</u>	<u>0.90</u>
Total, All Defects:	27.23	26.93	25.43	13.07	4.98	4.83		4.08	3.91	2.84

Table 3.--Western larch value loss by causes in dollars per M board feet for each rough-green grade in Mill study at Halfway, Oregon, September 1955.

Thickness:	4/4							:	8/4		
Grade:	B	C	D	Mldg	2	3	4	:	1	2	3
Volume, Fbm:	1,407	1,888	1,636	556	1,080	1,267	1,185	:	16,541	3,965	1,780
<u>Seasoning</u>											
<u>Defects</u>											
Checks	6.32	5.77	1.63		0.84				0.79		
Twist		0.24	.		0.10	.			0.36	0.45	
Crook or bow		0.04							0.04	0.20	0.19
Broken knot					0.59						
Knothole					1.91	1.72	0.08				
Planer split	<u>1.44</u>	<u>1.29</u>	<u>1.87</u>	<u>0.31</u>	<u>1.05</u>	<u>0.27</u>			<u>1.59</u>	<u>0.70</u>	
Subtotal:	7.76	7.34	3.50	0.31	4.49	1.99	0.08		2.78	1.35	0.19
<u>Other</u>											
<u>Mismanufacture</u>											
Thin	0.62	2.08	0.69		0.08	0.05			0.07		
Narrow or wane		1.01	2.08		0.22	0.17	0.20		0.83	0.37	0.32
Mechanical											
blemish	2.20	1.04	1.82		0.69	0.16	0.16		0.15		
(torn grain, dog and chip marks)											
Subtotal:	2.82	4.13	4.59		0.99	0.38	0.36		1.05	0.37	0.32
<u>Trim and Cull</u>	<u>2.83</u>	<u>2.81</u>	<u>2.43</u>	<u>2.09</u>	<u>1.68</u>	<u>1.33</u>	<u>1.12</u>		<u>1.99</u>	<u>1.80</u>	<u>1.29</u>
Total, all defects:	13.41	14.28	10.52	2.40	7.16	3.70	1.56		5.82	3.52	1.80

Table 4.--White fir value loss by causes in dollars per M board feet for each rough-green grade in mill study at Halfway, Oregon, September 1955.

Thickness:	4/4					:	8/4		
Grade:	C	D	2	3	4	:	1	2	3
Volume, Fbm:	141	458	785	4,186	4,724	:	7,792	6,589	3,202
<u>Seasoning defects</u>									
Checks		1.70					0.01		
Twist							0.42	0.01	
Crook or bow	1.49		0.08				0.30	0.11	
Broken knot			0.43	0.10			0.03		
Knothole			1.35	0.89	0.59		0.14		
Planer split	<u>12.56</u>	<u>5.31</u>	<u>0.10</u>	<u>0.02</u>			<u>0.75</u>	<u>0.22</u>	<u>0.29</u>
Subtotal:	14.05	7.01	1.96	1.01	0.59		1.65	0.34	0.29
<u>Other mismanufacture</u>									
Thin							0.06	0.04	
Narrow or wane	2.20	2.75	0.20	0.10	0.09		0.21	0.08	0.40
Mechanical blemish (torn grain, dog and chip marks)			0.15	0.11	0.11		0.07		
Subtotal:	2.20	2.75	0.35	0.21	0.20		0.34	0.12	0.40
<u>Trim and cull</u>	<u>7.02</u>	<u>6.14</u>	<u>3.44</u>	<u>3.23</u>	<u>2.74</u>		<u>1.33</u>	<u>1.20</u>	<u>1.00</u>
Total, All Defects:	23.27	15.90	5.75	4.45	3.53		3.32	1.66	1.69