U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
R. W. COWLIN, DIRECTOR

Research Note

Number 205 Portland, Oregon April 1961

SEASONING AND SURFACING DEGRADE IN KILN-DRYING PONDEROSA PINE IN EASTERN WASHINGTON

by

A. C. Knauss and E. H. Clarke

This report presents results of a study to determine the degrade (loss in volume and value) of ponderosa pine lumber when cut, kiln-dried, and surfaced in accordance with commercial practice. The study measured (1) loss in volume due to culling and trimming surfaced dry lumber because of sawing, seasoning, and surfacing defects; (2) reduction in grade due to seasoning and surfacing defects; and (3) reduction in grade due to incomplete manufacture or the development of manufacturing defects. Degrade is expressed as a percentage of the rough green lumber volume and also as a loss in value per thousand board feet of lumber.

The study was made at the Ardenvoir, Wash., sawmill of C. A. Harris and Sons, Inc., in June and July 1957. The lumber considered was the total cut from approximately 131,000 board feet of ponderosa pine logs representative of timber in the area. However, only lumber items containing at least 700 board feet were included in the degrade analysis since items produced in smaller quantity might not give representative results.

STUDY PROCEDURE

In making the degrade study, the lumber was first graded, marked, and tallied in the rough green condition at the sawmill to establish its potential grade[1/] and value. It was then kiln-dried according to industry practice. Finally, it was planed, regraded, and tallied for shipment. At the time of regrading, the original grade designation was corrected to reflect defects that were present but not discernible in the rough green condition. The difference between the potential grade and volume (as indicated by the corrected tally of unseasoned lumber) and the final grade and volume of surfaced dry lumber is represented as degrade.

Initial Grading

The rough green lumber was graded according to 1956 Western Pine Association Standard Grading Rules by an association grade supervisor. The grade was marked on each piece of lumber, and pieces which had not been trimmed adequately in the sawmill were pencil-trimmed by the grader. The lumber was then sorted into the following groups for kiln-drying: (1) random-width 1-inch Selects, (2) random-width 5/4-inch Selects, and (3) 1-inch Commons, 4 to 12 inches wide.

Kiln-Drying

The unseasoned lumber was stacked immediately following sawing and loaded into the kilns where it was dried according to schedules in table 1.

Drying was done in a battery of side-loading, steam-heated, internal-fan, cross-circulation kilns equipped with automatic temperature and humidity controls. The lumber was flat-piled, using 3/4-inch-thick stickers, into unit packages 4 feet wide. The packages were then loaded into the kiln by use of forklift trucks. Most of the lumber was 16 feet long, but sometimes two lengths were piled together in the same package.

[1/] Potential grade is the surfaced dry grade of lumber one could obtain if no defects resulted from missawing, seasoning, or surfacing.

Table 1.--Kiln-drying schedules for ponderosa pine;

C. A. Harris and Son, Inc., 1957

Thickness and grade	Time from start of drying	Temperature	
		Dry bulb	Wet bulb
	Hours	------- Degrees F. -------	
1-inch Selects and Shop	0	140	134
	24	146	135
	42	150	135
	60	155	140
	74	160	140
	86	172	164
	93	Out	--
5/4-inch Shop	0	140	125
	18	145	125
	48	150	125
	72	160	130
	90	170	135
	112	178	164
	132	Out	--
1-inch Common	0	140	130
	24	150	135
	47	156	153
	51	Out	--

In these kilns circulating air passed transversely through 12 feet of piled lumber (three unit packages of lumber), through reheating coils, and then through another 12 feet of piled lumber before returning to main coils and fans overhead. The kilns were operated as compartment units and circulation was reversed at 3-hour intervals. The dry kilns operated satisfactorily throughout this study.

The 1-inch Selects and Shop were kiln-dried to a moisture content of 7 to 10 percent, the 5/4-inch Shop to 7 to 12 percent, and the 1-inch Commons to 8 to 15 percent, which is representative of commercial practice at this plant. All items were given a relatively

short, high-humidity conditioning treatment at the end of the drying process to relieve casehardening stresses.

Planing

The dry lumber was allowed to stand for a day or more before it was unstacked, retrimmed (in accordance with the pencil-trim indicated at the time of original grading) and sorted into planing units. Each planing unit consisted of a single thickness and green grade and, in the case of Commons, a single width. The lumber was then surfaced with conventional planing equipment using feed rates of 250 feet a minute for 1-inch Selects and Commons and 150 feet a minute for 5/4-inch Shop.

Following surfacing, the lumber was graded by the same Western Pine Association supervisor who had previously graded it in the rough green condition. The authors tallied the surfaced lumber by grade and recorded the volume culled or trimmed. In tallying, notation was made of the specific cause of degrade and trim. This information was used to compile degrade values shown in tables 2, 3, and 4.

RESULTS AND DISCUSSION

General

The volume of random-width Selects and Shop items in this study was determined by lumber rule measurement on a surfaced dry basis. These measurements were used to establish the input volumes shown in the degrade tables. Common grade items were cut to specified widths and they were tallied in terms of nominal thickness, width, and length. Thus all rough green and surfaced dry tallies shown are on the same basis.

It is not always possible to accurately judge the extent of wane, shake, pitch, wormholes, decay, felling defects, or the size of knots in rough green lumber. It was obvious after surfacing that some study lumber had been misgraded in the unseasoned condition. Therefore, a corrected tally was made to transfer such misgraded lumber to its proper category. The resulting green lumber tally provided the input or base from which all degrade was calculated.

Table 2.--Grade recovery of ponderosa pine Select and Shop lumber following kiln-drying and surfacing; 1957 study at C. A. Harris & Son, Inc.

Thickness and grade	Rough green lumber input: Corrected volume tested	Grade recovery of surfaced dry lumber as percent of input: B & Btr.	C Select	D Select	Molding	No. 3 Clear	No. 1 Shop	No. 2 Shop	No. 3 Shop	No. 3 Common	No. 4 Common	No. 5 Common	Cull and trim loss	Total degrade
	Board feet	Percent												
1-inch:														
C Select	1,528	--	71.6	14.4	12.1	0.2	0	0	0	0	0	0	1.7	28.4
D Select	3,629	--	--	85.9	10.2	0	0	0	0	.1	.4	.3	3.1	14.1
Molding	2,342	--	--	--	98.9	0	.4	0	0	.1	0	.4	.2	1.1
No. 3 Clear	5,525	--	--	--	--	96.7	2.6	.4	0	0	.1	0	.2	3.3
No. 1 Shop	6,909	--	--	--	--	--	98.4	.8	0	0	.2	.4	.2	1.6
No. 2 Shop	1,606	--	--	--	--	--	--	98.2	0	0	1.7	0	.1	1.8
5/4-inch:														
B & Btr. Select	1,489	72.5	16.6	5.8	3.4	0	0	0	0	0	0	0	1.7	27.5
C Select	6,640	--	83.2	8.2	7.7	0	0	0	0	0	0	.1	.8	16.8
D Select	8,880	--	--	87.9	10.1	.5	0	.7	0.5	0	0	0	.3	12.1
Molding	6,880	--	--	--	97.4	.4	0	.9	1.2	0	0	0	.1	2.6
No. 1 Shop	5,658	--	--	--	--	--	82.1	14.4	1.0	.2	1.9	0	.4	17.9
No. 2 Shop	9,783	--	--	--	--	--	--	95.3	4.1	0	.5	0	.1	4.7
No. 3 Shop	4,552	--	--	--	--	--	--	--	99.5	.2	0	.2	.1	.5

Table 3.--Grade recovery of ponderosa pine Common lumber following kiln-drying and surfacing; 1957 study at C. A. Harris & Son, Inc.

Rough green lumber input			Grade recovery of surfaced dry lumber as percent of input					
Thickness and grade	Width	Corrected volume tested	No. 2 Common	No. 3 Common	No. 4 Common	No. 5 Common	Cull and trim loss	Total degrade
	Inches	Board feet	Percent					
1-inch:								
No. 2 Common	4 & 6	826	78.2	18.9	1.8	0	1.1	21.8
	8	2,537	76.7	19.2	2.8	0	1.3	23.3
	10	1,927	79.1	17.2	.7	.6	2.4	20.9
	12	18,256	85.8	10.9	1.7	.2	1.4	14.2
No. 3 Common	4 & 6	947	--	80.4	16.5	2.1	.9	19.6
	8	1,548	--	95.3	3.4	.3	1.0	4.7
	10	1,651	--	86.5	10.1	1.9	1.5	13.5
	12	18,730	--	84.4	14.5	.4	.7	15.6
No. 4 Common	4 & 6	1,000	--	--	93.2	5.7	1.1	6.8
	8 & 10	1,419	--	--	90.9	7.1	2.0	9.1
	12	8,563	--	--	95.1	4.5	.4	4.9
No. 5 Common	4 & 6	726	--	--	--	99.5	.5	.5
	8 & 10	724	--	--	--	99.4	.6	.6
	12	2,574	--	--	--	99.8	.2	.2

Table 4.--Seasoning, surfacing, and manufacturing degrade in kiln-dried ponderosa pine lumber; 1957 study at C. A. Harris & Son, Inc.

Rough green lumber input			Proportion of input degraded during processing, by cause																		
			Seasoning and surfacing defects												Manufacturing defects					Total degrade
Thickness and grade	Width	Corrected volume tested	Wet	Surface check	End split	Warp	Planer split	Torn grain	Brown stain	Loose knot	Broken knot	Knot-hole	Broken grain	Cull and trim loss	Total	Thin	Narrow	Mechanical damage	Cull and trim loss	Total	
	Inches	Bd. ft.	Percent													Percent					Percent
1-inch Shop & Btr.:																					
C Select		1,528	0	4.1	0	12.6	0	0	0	0	0	1.9	0.7	1.3	20.6	5.1	0	2.3	0.4	7.8	28.4
D Select		3,629	0	.3	.1	6.8	0	0	0	0	0	.2	.8	2.8	11.0	2.0	.1	.7	.3	3.1	14.1
Molding		2,342	0	.4	0	.1	0	0	0	0	0	0	.1	.2	.8	0	0	.3	0	.3	1.1
No. 3 Clear		5,525	0	.9	0	0	0	0	0	0	0	0	0	.1	1.0	2.2	0	0	.1	2.3	3.3
No. 1 Shop		6,909	0	0	0	0	0	0	0	0	0	0	.1	.1	.2	1.2	0	.1	.1	1.4	1.6
No. 2 Shop		1,606	0	0	0	.9	0	0	0	0	0	0	0	.1	1.0	.8	0	0	0	.8	1.8
5/4-inch Shop & Btr.:																					
B & Btr.		1,489	0	1.0	0	17.0	2.7	0	1.6	0	0	0	0	1.4	23.7	2.1	0	1.4	.3	3.8	27.5
C Select		6,640	0	1.9	0	10.0	1.1	0	0	0	0	0	0	.6	13.6	2.7	0	.3	.2	3.2	16.6
D Select		8,880	0	1.7	0	4.7	1.9	0	0	0	0	0	0	.1	8.4	3.4	0	.1	.2	3.7	12.1
Molding		6,880	0	0	0	.2	.2	0	.2	0	0	0	0	0	.6	1.4	0	.5	.1	2.0	2.6
No. 1 Shop		5,658	.2	2.4	0	3.6	1.4	0	3.8	0	0	0	0	.1	11.5	6.1	0	0	.3	6.4	17.9
No. 2 Shop		9,783	.3	.8	0	.3	.4	0	.4	0	0	0	0	.1	2.3	2.4	0	0	0	2.4	4.7
No. 3 Shop		4,552	0	0	0	0	0	0	0	0	0	0	0	0	0	.4	0	0	.1	.5	.5
1-inch Commons:																					
No. 2 Common	4 & 6	826	0	0	0	7.1	0	0	0	3.5	.7	3.2	2.3	.9	17.7	2.7	1.2	0	.2	4.1	21.8
	8	2,537	0	0	0	7.0	1.9	0	0	4.2	0	.8	2.7	1.3	17.9	3.7	.6	1.1	0	5.4	23.3
	10	1,927	0	0	0	.8	4.2	0	0	1.4	1.8	1.4	3.1	2.2	14.9	1.9	3.2	.7	.2	6.0	20.9
	12	18,256	0	.2	.3	.1	.7	0	0	4.3	1.2	1.5	2.4	1.3	12.0	1.1	.5	.5	.1	2.3	14.2
No. 3 Common	4 & 6	947	0	0	0	1.3	0	0	0	5.2	0	7.0	2.1	.9	16.5	.4	1.5	1.2	0	3.1	19.6
	8	1,548	0	0	0	0	1.2	0	0	0	0	1.9	0	.9	4.0	0	.6	0	.1	.7	4.7
	10	1,651	0	0	0	0	0	0	0	2.3	0	4.9	2.8	1.3	11.3	.7	1.3	0	.2	2.2	13.5
	12	18,730	0	0	0	.1	.7	.2	0	2.7	.4	7.5	2.3	.7	14.6	.4	.5	.1	0	1.0	15.6
No. 4 Common	4 & 6	1,000	0	0	.4	.6	0	.6	0	.2	1.4	1.5	.9	.7	6.3	0	0	0	.5	.5	6.8
	8 & 10	1,419	0	0	0	0	0	0	0	0	.4	0	3.4	1.8	5.6	.6	2.7	0	.2	3.5	9.1
	12	8,563	0	0	0	0	.3	0	0	0	0	1.7	1.4	.4	3.8	.2	.9	0	0	1.1	4.9
No. 5 Common	4 & 6	726	0	0	0	0	0	0	0	0	0	0	0	.5	.5	0	0	0	0	0	.5
	8 & 10	724	0	0	0	0	0	0	0	0	0	0	0	.6	.6	0	0	0	0	0	.6
	12	2,574	0	0	0	0	0	0	0	0	0	0	0	.1	.1	0	0	0	.1	.1	.2

Grade Recovery

The volume of rough green lumber tested and the grade recovery after kiln-drying and surfacing are shown in tables 2 and 3 for each lumber item considered in the study. The amount of lumber that remained in the corrected grade of green lumber, the amount dropping to lower grades, and the amount of cull and trim are shown for each grade-thickness item.

As would be expected, the higher grades suffered more degrade than did the lower grades. For example, 5/4-inch B and Better had a degrade of 27.5 percent; No. 3 Shop, 0.5 percent; and No. 5 Common, 0.4 percent. Cull and trim loss was small in all items, with a maximum of 3.1 percent in 1-inch D Select.

Seasoning and Surfacing Degrade

Types of seasoning and surfacing defects and the amount of degrade caused by each are shown in table 4.

Surface checking caused some degrade in a few Shop and Better items, with a maximum of 4.1 percent in 1-inch C Select. Surface checking usually develops during the early stages of drying and can be minimized by using higher relative humidities during the early part of the drying. However, in kiln-drying ponderosa pine, low humidities are desirable during the early stages of drying in order to minimize brown stain. Since, in this study, both brown stain and surface checking developed in limited amounts, it appears that a satisfactory humidity balance was reached in trying to minimize both defects.

End-splitting was a minor cause of degrade, but contributed to the trim loss. It, too, can be minimized by use of high humidities during the early stages of drying.

Warping--including bow, crook, cup, and twist--was a major defect in kiln-drying the study lumber. Bow, crook, and twist generally result from the unequal longitudinal shrinkage which occurs in drying lumber containing cross and irregular grain, such as is found around large live knots, in crooked logs, or logs containing spiral grain, compression wood, or juvenile wood. These defects can be minimized by following good piling practice to hold the lumber straight and flat during kiln-drying, although warping cannot be eliminated entirely. Warp is especially difficult to control when the lumber is dried to moisture contents of 10 percent or less, as is required for Selects

and Shop. Of the 27 lumber items analyzed in this study, 9 showed a degrade loss of more than 1.0 percent due to warp. A maximum of 17.0-percent degrade due to warp was found for 5/4-inch B and Better Select. Use of more stickers, to hold the lumber flat and straight during kiln-drying, and improved final conditioning treatment for the relief of stresses appeared to offer some promise of reducing the amount of warping in this lumber.

Cupping results when flat-grain lumber is kiln-dried to low moisture contents. When the cupped lumber is flattened on the bed of the planer as it is surfaced, it is subject to splitting--called planer split or roller check--along the midwidth of the board, and the board is degraded. Final moisture contents as high as permitted for the grade of lumber lessen cupping and leave boards more flexible when passing through the planer, thereby reducing loss due to planer splits. Also, cupping can be minimized by providing adequate stickers to hold the boards flat during drying, and by a final conditioning treatment to reduce casehardening stresses. In this study, although the high-humidity conditioning treatment at the end of drying--to raise the moisture content of the outer shell of lumber and thereby improve its flexibility--was relatively short, good drying practice is indicated by the fact that planer splitting degraded only a moderate amount of 5/4-inch Select and no 1-inch Select lumber.

Broken grain accounted for some degrade in most 1-inch Common lumber items. This defect usually occurs when the cross and irregular grain structure around large knots shrinks and develops localized warping. Flattening of the warped portion by the planer often breaks the grain of the wood, and the board is degraded.

Taken separately, loose or broken knots and knotholes only moderately degraded several grades of Common boards, but collectively they accounted for more than half of the degrade in No. 2 and No. 3 Common boards. Damage to knots results primarily from greater shrinkage of wood in the knot than in the surrounding wood. If knots become loose in drying, or check, they are easily damaged as the lumber is surfaced to final pattern. Dry, loose knots often drop out, leaving knotholes. The moisture content of the knot and board at the time of surfacing largely influences the amount of damage at the planer. Common boards in this study were dried to a moisture-content level of 8 to 15 percent and those knots in the range of 8- to 12-percent moisture content were both loosened and embrittled, thereby contributing to degrade. Degrade due to knotholes in 1-inch C and D Select was relatively slight in this study.

Cull and trim resulted primarily from end split and to some extent from warped ends. Losses chargeable to seasoning, surfacing, or manufacturing do not include trim due to shattered grain at the ends of the logs, to shake, or to other defects (such as wane, wormholes, or decay) obviously present in the board as sawed but not recognized in the original grading. These trim losses were deducted from the original tally.

Some of the degrading defects discussed here--such as planer split, broken grain, broken knots, and often knotholes--develop at the planer in the surfacing operation. Although it has not been possible to prevent development of these defects by modifying the design or operation of planing equipment, the resulting degrade can be reduced considerably by controlling temperatures and relative humidities during drying, as well as by controlling final dryness of the lumber. Therefore, these are classified as seasoning defects rather than surfacing defects.

Manufacturing Degrade

Other factors that reduce the potential grade include inadequate manufacture in the sawmill and breakage due to rough handling. Typical examples of the former are pieces cut too thin or too narrow to surface to the required final size. Since such pieces are not degraded by seasoning or surfacing, the resulting losses are treated as manufacturing defects. Elimination of such loss requires examination and improvement of the sawing operation. Mechanical damage (such as dogholes, damaged faces, and broken edges caused by log turners or forks on lift trucks) can be minimized by modifications in equipment and care in handling. Cull and trim losses due to thin or narrow ends are included under manufacturing defects.

Wane not removed in planing was treated as a natural characteristic of the study lumber. The original grading assumed that any wane which exceeded permissible limits of the grade would be removed in planing. When the surfacing did not remove the excess wane or when it was necessary to trim such lumber to retain the original grade, the original grade or footage of the study lumber was corrected to reflect these changes. Thus, degrade or footage loss due to wane was not charged as a seasoning, surfacing, or manufacturing defect.

Loss in Value

Reductions in lumber sale value due to the degrade developed in seasoning and surfacing, as well as the losses due to manufacturing defects, are summarized by cause in table 5. The volume of lumber degraded or lost because of such defects was shown in table 4, but table 5 more adequately reflects the severity of degrade by expressing the loss in potential sale value. A major portion of the degraded lumber dropped only one grade, but some dropped two or more grades. Lumber lost in cull or trim was considered to have no sale value.

In this study, the Select grades of B and Better and C suffered the greatest losses in potential value, ranging from $12.75 to $30.90 per thousand board feet. Major causes of loss in these grades were surface checking, warp, and thin sawing. Value losses in Common boards varied from a few cents per thousand in No. 5 to several dollars per thousand in No. 2. Major causes for loss in Common boards were those defects associated with knots, including holes, loose knots, and broken grain.

This study was made to evaluate the effect of seasoning and surfacing defects on grade yield and sale value of lumber kiln-dried and surfaced in accordance with commercial practice. Kiln runs made in the course of the study were not intended to demonstrate how well lumber can be dried. Neither were they intended to demonstrate the most profitable balance between the cost of kiln-drying and the sale value of the dry lumber. Total cost of kiln-drying lumber, however, must include degrade losses as well as kiln investment and processing costs. This degrade analysis was made to point out the major seasoning and surfacing defects now developing in commercial kiln-drying practice and to suggest where improvements in equipment and practice might be profitable.

Table 5.--Loss in value of kiln-dried ponderosa pine lumber due to seasoning, surfacing, and manufacturing degrade; 1957 study at C. A. Harris & Son, Inc.[1/]

Rough green lumber input				Cause of loss																
				Seasoning and surfacing defects												Manufacturing defects				
Thickness and grade	Width	Corrected volume tested	1959 mill price	Wet	Surface check	End split	Warp	Planer split	Torn grain	Brown stain	Loose knot	Broken knot	Knot-hole	Broken grain	Cull and trim	Total	Thin	Narrow	Mechanical damage	Cull and trim	Total	Total loss in value
	Inches	Bd. ft.	Dollars per M bd. ft.	Dollars per M bd. ft.													Dollars per M bd. ft.					Dollars per M bd. ft.
1-inch Shop & Btr.:																						
C Select		1,528	256.00	0	3.87	0	12.60	0	0	0	0	0	1.70	0.73	3.33	22.23	5.60	0	2.05	1.02	8.67	30.90
D Select		3,629	167.00	0	.06	.02	1.56	0	0	0	0	0	.04	.50	4.69	6.87	.66	.13	.15	.50	1.44	8.31
Molding		2,342	145.00	0	.25	0	.07	0	0	0	0	0	0	.11	.30	.73	0	0	.33	0	.33	1.06
No. 3 Clear		5,525	117.00	0	.31	0	0	0	0	0	0	0	0	0	.12	.43	.84	0	0	.12	.96	1.39
No. 1 Shop		6,909	83.00	0	0	0	0	0	0	0	0	0	0	.05	.08	.13	.28	0	.05	.08	.41	.54
No. 2 Shop		1,906	64.00	0	0	0	0	0	0	0	0	0	0	0	.06	.06	0	0	0	0	0	.06
5/4-inch Shop & Btr.:																						
B & Btr.		1,489	266.00	0	.83	0	5.15	1.16	0	.10	0	0	0	0	3.72	10.96	.13	0	.86	.80	1.79	12.75
C Select		6,640	260.00	0	1.42	0	7.23	.85	0	0	0	0	0	0	1.56	11.06	2.17	0	.22	.52	2.91	13.97
D Select		8,880	190.00	0	.27	0	.33	.35	0	0	0	0	0	0	.19	1.14	.92	0	.01	.38	1.31	2.45
Molding		6,880	183.00	0	0	0	.21	.15	0	.21	0	0	0	0	0	.57	.99	0	.37	.19	1.55	2.12
No. 1 Shop		5,658	141.00	.06	.77	0	1.27	.45	0	1.22	0	0	0	0	.10	3.87	3.05	0	0	.42	3.47	7.34
No. 2 Shop		9,783	109.00	.09	.24	0	.09	.12	0	.12	0	0	0	0	.11	.77	.80	0	0	0	.80	1.57
No. 3 Shop		4,552	79.00	0	0	0	0	0	0	0	0	0	0	0	0	0	.10	0	0	.08	.18	.18
1-inch Commons:																						
No. 2 Common	4 & 6	826	106.31	0	0	0	3.22	0	0	0	1.49	.33	1.19	1.06	.96	8.25	1.15	.43	0	.24	1.82	10.07
	8	2,537	98.00	0	0	0	1.80	.44	0	0	.97	0	.18	.67	1.28	5.34	.90	.16	.25	0	1.31	6.65
	10	1,927	99.00	0	0	0	.21	1.09	0	0	.36	.47	.36	.88	2.19	5.56	.49	1.06	.18	.20	1.93	7.49
	12	18,256	109.00	0	.06	.09	.03	.24	0	0	1.35	.37	.49	.93	1.97	5.53	.39	.22	.15	.11	.87	6.40
No. 3 Common	4 & 6	947	65.44	0	0	0	.14	0	0	0	.57	0	1.01	.44	.59	2.75	.05	.27	.13	0	.45	3.20
	8	1,548	75.00	0	0	0	0	.13	0	0	0	0	.21	0	.68	1.02	0	.15	0	.08	.23	1.25
	10	1,651	73.00	0	0	0	0	0	0	0	.25	0	.54	.46	.94	2.19	.08	.48	0	.15	.71	2.90
	12	18,730	78.00	0	0	0	.02	.11	.03	0	.41	.41	1.15	.37	.55	3.05	.06	.13	.02	0	.21	3.26
No. 4 Common	4 & 6	1,000	52.48	0	0	.08	.09	0	.11	0	.05	.19	.24	.14	.33	1.23	0	0	0	.28	.28	1.51
	8 & 10	1,419	62.75	0	0	0	0	0	0	0	0	.11	0	.91	1.12	2.14	.16	.72	0	.12	1.00	3.14
	12	8,563	63.00	0	0	0	0	.08	0	0	0	0	.46	.38	.25	1.17	.05	.24	0	0	.29	1.46
No. 5 Common	4 & 6	726	36.00	0	0	0	0	0	0	0	0	0	0	0	.28	.28	0	0	0	0	0	.28
	8 & 10	724	36.00	0	0	0	0	0	0	0	0	0	0	0	.23	.23	0	0	0	0	0	.23
	12	2,574	36.00	0	0	0	0	0	0	0	0	0	0	0	.04	.04	0	0	0	.04	.04	.08

[1/] Based on average sale value of surfaced dry items f.o.b. mill, 1959 WPA yearly Price Summary.