WASTE STUDY IN A DOUGLAS FIR PLANING MILL

by

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A Thesis

Presented to the Faculty

of the

School of Forestry

Oregon State College

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Forestry

May 1942

Approved:

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Professor of Forestry

ACKNOWLEDGEMENTS

The writer desires to acknowledge his indebtness to his parents, Mr. and Mrs. W. A. Bengtila, who have made it possible for him to attend college. Special thanks is also due to Mr. George Young of the Corvallis Lumber Company for permission to make the study at his mill and for the data he supplied in connection with the study.

Donald M. W. Bengtila

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INTRODUCTION

Our lumber industry has been long highly criticized for its wasteful practices in the manufacture of its products. After the present war is over closer utilization will again be practiced, which will bring more criticism of the wasteful operator, and he may even be forced out of business by governmental control. Also, the operator who is wasteful will not be able to compete with other operators when the lumber prices go down; unless he gets closer utilization from his log he may be running at a loss which will force him out of business.

A complete waste study of the lumber industry would involve all the mills in the industry along with all of the processes that go on in the mill. The result from such a study would give only average figures for the whole industry and would not give the individual mill operator figures which he could use as management decisions to cut down wasteful practices in his own mill.

This paper is written as a guide for the operators in the Douglas-fir region who operate planing mills and want to get greater recovery with a corresponding increase in value from their products. It would also be applicable to other species found in this region that are manufactured with little regard for waste.

This study does not take in shaving or sawdust waste, but its object was to find out the quantity, quality, and sizes of lumber that are available in the wood-bin of this

particular Douglas-fir planing mill, and from this study other similar studies may be made in other mills which may help the management make new decisions in production that will cut down waste.

Very little work has been done along this line, largely because there has been an abundant supply of raw resources and the prices of lumber have been so low that it has not been a paying proposition to handle or save small pieces of wood. Yet this is a very wasteful practice for this product is well along its way in process, having had milling, kiln-drying, surfacing, and handling costs allocated to it after which it is sold as fire wood which is a very small yield in proportion to the costs put into it. If any work has been done along this line, it was not found, so all work was done by trial and error until a working plan for making the study was arrived at with all data being taken from this one planing mill, and all calculation done in the office.

DESCRIPTION OF THE PLANING MILL

The planing mill has three planers with a combined average eight hour capacity of 105,000 board feet, and in addition a timber sizer which was not used in this study.

All dimension and shop lumber is run through the Berling No. 91. Finish and pattern stock is run through the American No. 77 which has pattern attachments. The sticker machine is a Woods No. 702B and is also used at times for 1x6 and smaller boards on special orders.

The lumber from both the Berling No. 91 and the American No. 77 (Fig. 1) fall on the dry chain which carries it to the grader. He grades it and the man standing next to him either lets it go on to be sorted or pulls it onto the trim saw chain. There are two 14 inch circular hand trim saws which trim out all of the defect from the lumber coming from these two machines. As the lumber comes from the trim saws it falls back onto the dry chain where it goes past the grader and is sorted ready to be tied in bundles or taken out without bundling to the dry sheds ready for shipment.

The lumber going through the sticker or Woods No. 702B (Fig. 1) is sorted directly into that which is ready for the dry shed or is tabled where a man operates another 14 inch circular trim saw, taking out the defect, after which it joins the pieces not needing trimming.

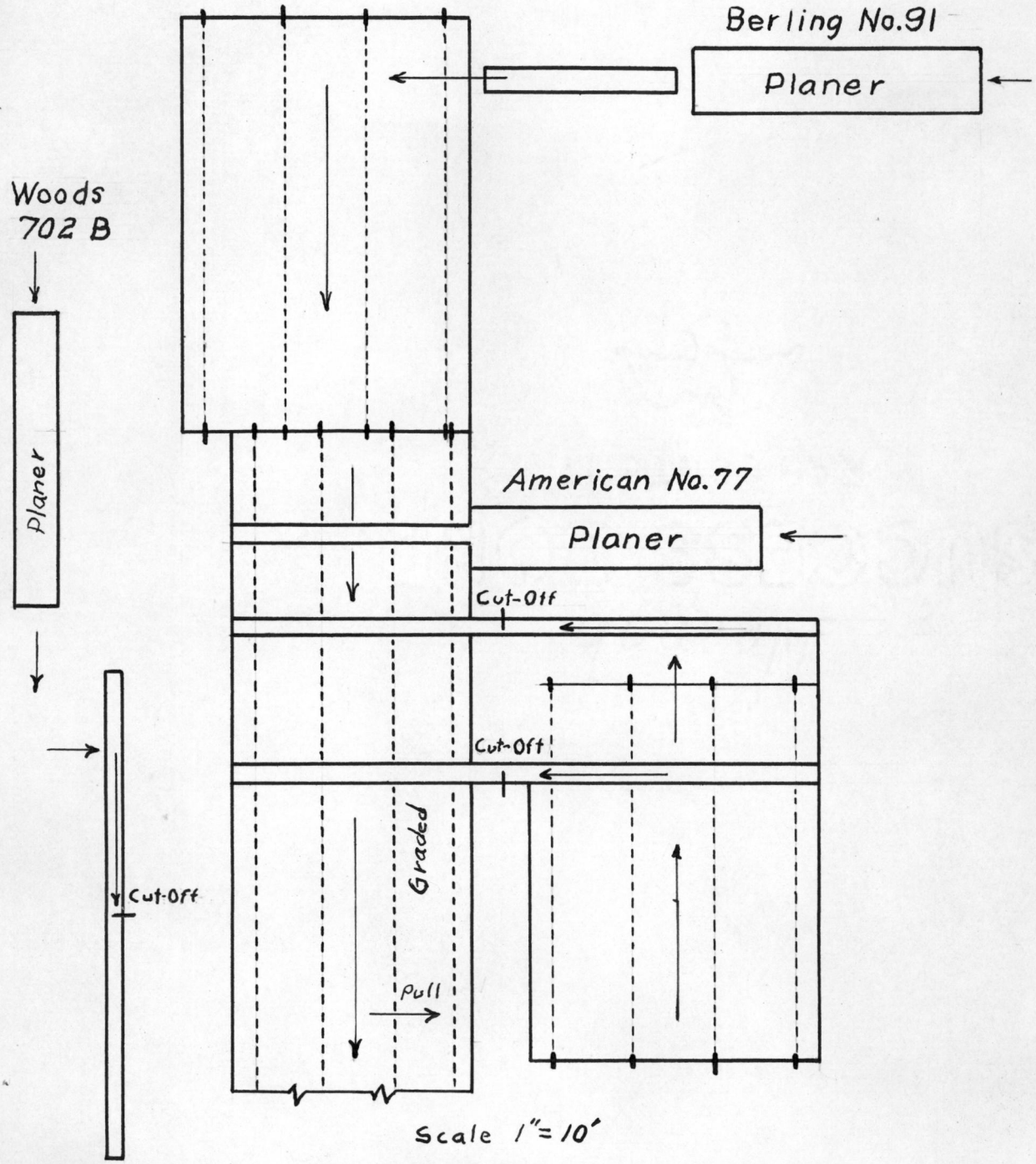

Figure 1.
Diagram Showing Placement
of
Machinery and Lumber Flow

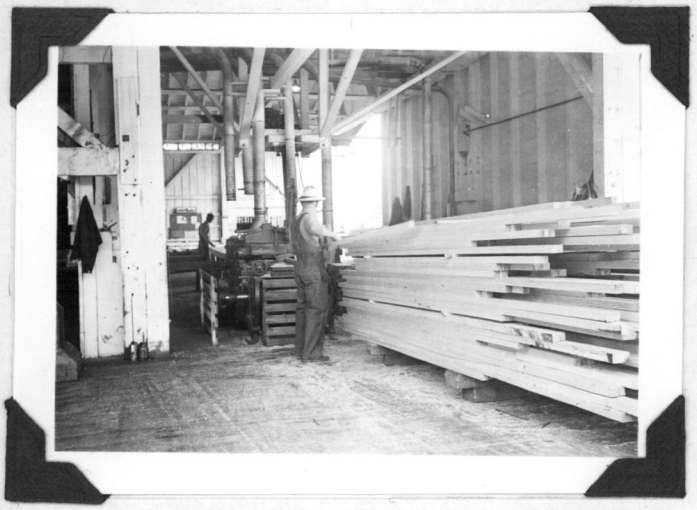

Figure 2a.

Woods Planer No. 702B.

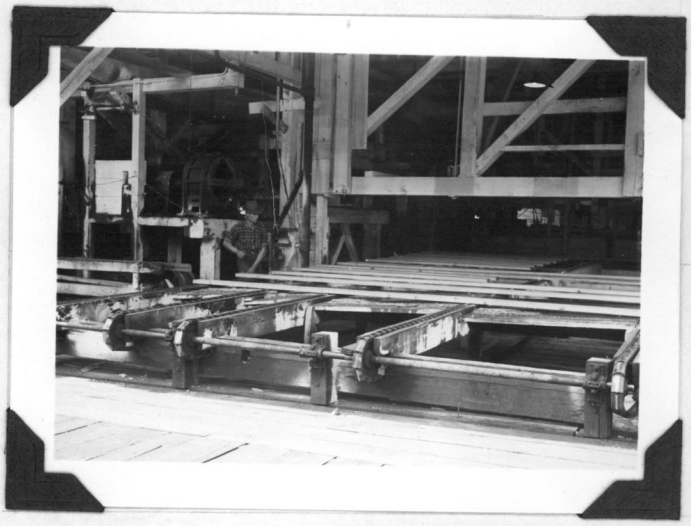

Figure 2b.

Dry Chain with Planer Berling No. Left Foreground (Not Shown)

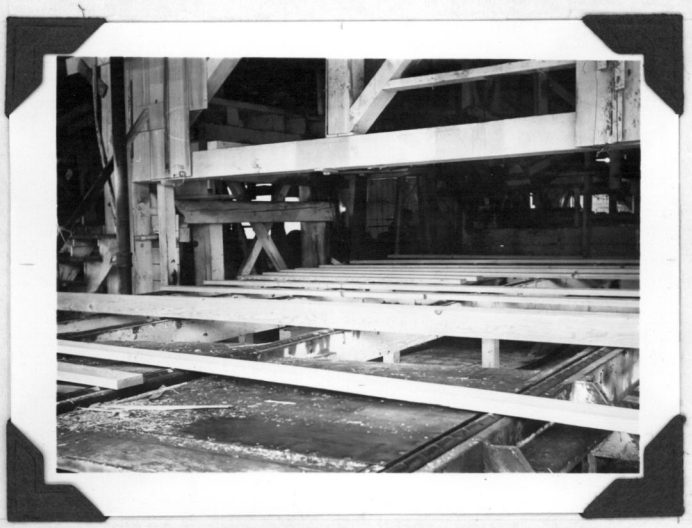

Figure 2c.

Dry Chain with Planer American No. 77 in Left Background

The planers are fed with lumber coming directly from the dry kiln with no preceding rough dry grading being done.

COLLECTING OF DATA

The average amount of waste material from trimming was the data wanted. The easiest way to have gotten this would have been to keep a daily record of the number of loads taken out of the wood-bin by the wood truck and then take an average of this number. This would have been a very unsatisfactory method because it would have only given the total average amount of waste and nothing about the trimmings as to size, defect, or the average amount that came from each kind of stock.

First, a study was made at the conveyor leading to the wood-bin (Fig. 3) to find out the average length of the piece.

Second, every fifth piece was taken from the wood conveyor until a sampling of ten to twenty-five pieces was accumulated so a study could later be made to determine the reason the piece ended up in the wood-bin.

Third, the sizes of the waste before trimming was gotten by recording the number of cuts made on each piece of stock by the man on the circular trim saw (Fig. 4) as he cut the waste into wood.

This data was accumulated over a period of sixty days.

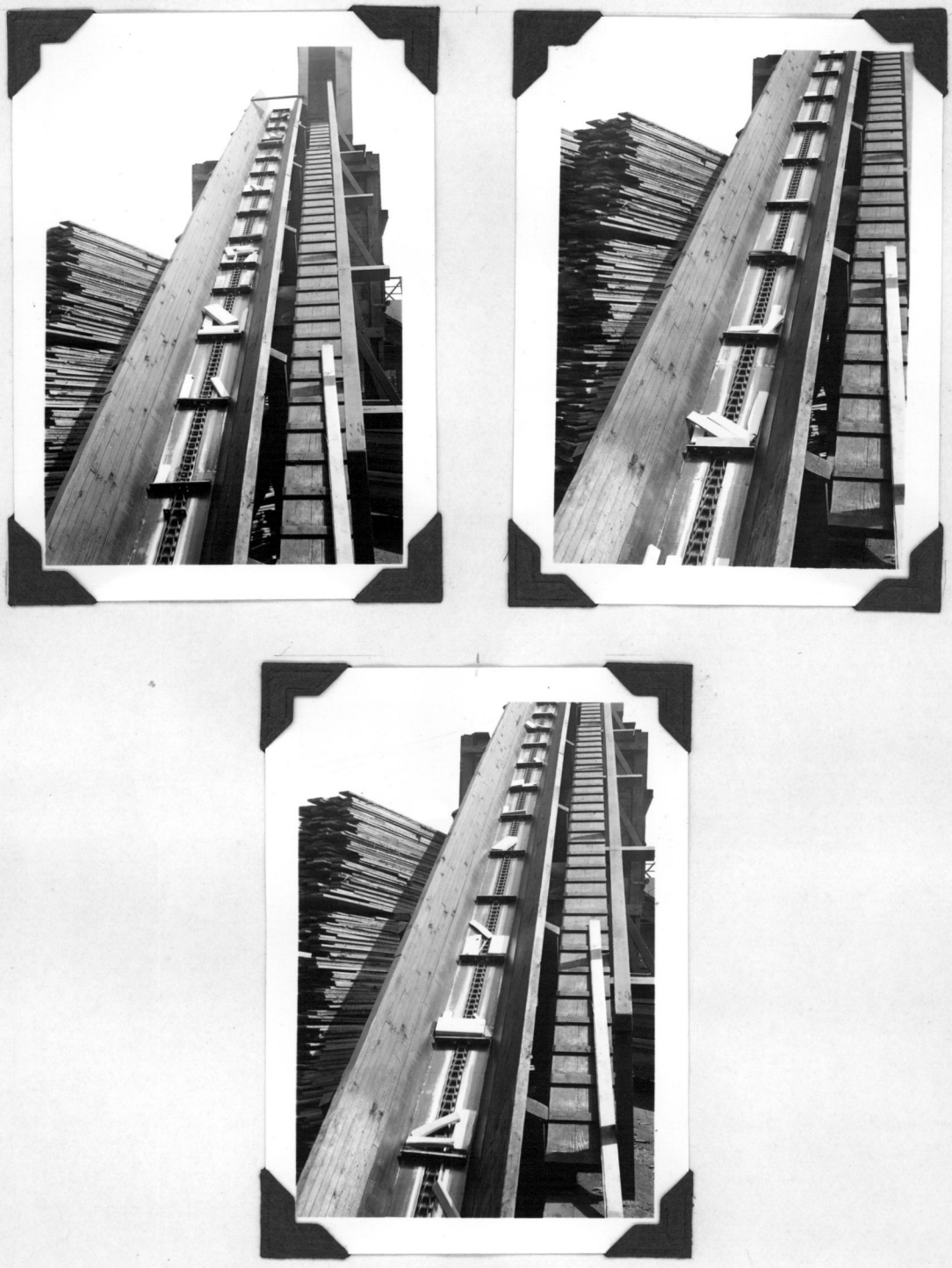

Figure 3

Pictures Showing the Wood Conveyor Where Samples Were Taken and Average Length of Piece Was Gotten

Figure 4a

Picture Showing Dry Chain, Trim Chain, and Trim-saws

Figure 4b

Picture Shows Stock Collecting on Trim Chain

Figure 4c

Trim-saw Where Number of Cuts
of Waste Was Taken

Date: 4-24-42 Time: 4:46

Discription: 1x4 flooring 4:26

Total mins: 20

No. of Cuts:	
1	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸
2	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 IIII
3	𝍸 𝍸 𝍸 II
4	𝍸 𝍸 𝍸
5	II
6	I

Figure 5

Sample Data Sheet for
Recording Trimming Cuts

CALCULATION OF RESULTS

To get the average length of cut a total of 1,890 pieces were measured to the full inch at the wood conveyor. These lengths varied from six to fifteen inches with a combined total length of 20,310 inches or an average length of 10.7 inches. This figure was taken to the nearest inch which is eleven, and is used to convert the number of cuts at the trim-saw into board feet of lumber.

Data was taken on the following seven different patterns, 2x4's, 1x8 shiplap, 1 5/8 x 5 shop, 1x6 siding, 1x3 flooring, 1x4 flooring, and 1x4 ceiling. The period of time over which data was taken at any one time ranged from ten minutes to one hour with the shortest total length of time being one and a half hours.

The data was calculated in the following manner: (1) the percentage of cuts there were of each length; (2) the total board feet of trimmings based on rough measurement; (3) the percentage the trimmings were to the average daily capacity of that particular stock; (4) the types of defect and the percentage of each kind; (5) the possible recovery of clear lumber from the trimmings as a percentage of rough lumber in trimmings. The actual thickness and width of clear cuts is given and the length is figured on the same basis as the percentage of the different length cuts as in number one above.

Ceiling. Rough size 1x4, surfaced size 9/16 by 3 1/4 inches.

No. of Pieces	Percent of Pieces	Length in Inches
137	30	11
144	32	22
56	13	33
41	9	44
24	5	55
50	11	66
Totals 452	100	Time: 1 hr. 30 min.

1,904 board feet of lumber per eight hours was used up in trimmings. The average capacity of ceiling is 28,000 board feet per eight hours or 7 per cent of the rough lumber found its way into the wood-bin.

Twenty samples were taken and they had a rough board footage of 6 feet. Of the twenty samples eight pieces or 40 per cent had no defect, two pieces or 10 per cent had knots, three pieces or 15 per cent had pitch seams, one piece or 5 per cent were scant on tongue, groove, or face, three pieces or 15 per cent had bark, and three pieces or 15 per cent had handling defect or dog marks.

The recovery of clear lumber from 1x4 ceiling would come from ripping two strips 5/16x1 1/4 inches by the length as found in the percentages of cuts of the different lengths with a total board footage of three and four hundredth feet, or 56 per cent of the total amount of trimmings could be recovered in clear lumber.

Flooring. Rough szie 1x4, surfaced size 25/32x3 1/4 inches.

No. of Pieces	Percent of Pieces	Length in Inches
194	33	11
201	35	22
66	13	33
31	7	44
35	8	55
22	4	66
Totals 549	100	Time: 1 hr, 40 min.

1,795 board feet of lumber per eight hours was used up in trimmings. The average capacity of flooring is 32,000 board feet per eight hours or 6 per cent of the rough lumber found its way into the wood-bin.

Twenty samples were taken and they had a rough board footage of 6 feet. Of the twenty samples ten pieces or 50 per cent were scant on tongue, groove, or face, four pieces or 20 per cent had bark, two pieces or 10 per cent had pitch seams, one piece or 5 per cent had handling defect or dog marks, one piece or 5 per cent had knots, and one piece or 5 per cent was clear.

The recovery of clear lumber from 1x4 flooring would come from ripping one strip 25/32x 2 3/4 inches by the lengths as found in the percentages of cuts of the different lengths with a total board footage of four feet, or 66 per cent of the total amount of trimmings could be recovered in clear lumber.

Flooring. Rough size 1x3, surfaced size 25/32x2 3/8 inches.

No. of Pieces	Percent of Pieces	Length in Inches
45	20	11
64	28	22
32	14	33
40	18	44
25	12	55
19	8	66
225	100	Time: 25 minutes

2,688 board feet of lumber per eight hours was used up in trimmings. The average capacity of ceiling is 24,000 board feet per eight hours or 11 per cent of the rough lumber found its way into the wood-bin.

Twenty-five samples were taken and they had a rough board footage of 5.5 feet. Of the twenty-five samples eleven pieces or 44 per cent had no defect, nine pieces or 36 per cent had bark, two pieces or 8 per cent were scant on tongue, groove or face, one piece or 4 per cent had knots, one piece or 4 per cent had dog marks, and one piece or 4 per cent had pitch seams.

The recovery of clear lumber from 1x3 flooring would come from ripping one strip 25/32x2 inches by the lengths as found in the percentages of cuts of the different lengths with a total board footage of three feet, or 55 per cent of the total amount of trimmings could be recovered in clear lumber.

Siding. Rough size 1x6, surfaced size 3/4x5 7/16 inches.

No. of Pieces	Percent of Pieces	Length in Inches
91	33	11
102	37	22
27	9	33
30	11	44
10	4	55
18	6	66
Totals 278	100	Time: 55 minutes

2,616 board feet of lumber per eight hours was used up in trimmings. The average capacity of siding is 38,000 board feet per eight hours or 7 per cent of the rough lumber found its way into the wood-bin.

Ten samples were taken and they had a rough board footage of 4.9 feet. Of the ten samples six pieces or 60 per cent had no defect, two pieces or 20 per cent were scant on tongue, groove, or face, one piece or 10 per cent had knots, and one piece or 10 per cent had shake.

The recovery of clear lumber from 1x6 siding would come from ripping one strip 3/4x3 1/5 inches by the lengths as found in the percentages of cuts of the different lengths with a total board footage of 2.4 feet, or 49 per cent of the total amount of trimmings could be recovered in clear lumber.

Shiplap. Rough szie 1x8, surfaced size 25/32x 6 13/16 inches.

	No. of Pieces	Percent of Pieces	Length in Inches
	12	28	11
	22	51	22
	5	12	33
	2	5	44
	1	2	55
	1	2	66
Totals	43	100	Time: 15 minutes

1,760 board feet of lumber per eight hours was used up in trimmings. The average capacity of shiplap is 65,000 board feet per eight hours, or 3 per cent of the rough lumber found its way into the wood-bin.

Ten samples were taken and they had a rough board footage of 6 feet. Of the ten samples four pieces or 40 per cent had no defect, three pieces or 30 per cent had knots, two pieces or 20 per cent were rotten, and one piece or 10 per cent was scant on tongue, groove, or face.

The recovery of clear lumber from 1x8 shiplap would come from ripping one strip 13/16x6 1/2 inches by the lengths as found in the percentages of cuts of the different lengths with a total board footage of 4 feet, or 67 per cent of the total amount of trimmings could be recovered in clear lumber.

Shop. Rough size 1 13/16x5, surfaced size 1 5/8x 4 7/8. inches.

	No. of Pieces	Percent of Pieces	Length in Inches
	29	36	11
	19	23	22
	3	5	33
	10	12	44
	6	7	55
	14	17	66
Totals	81	100	Time: 40 minutes

2,112 board feet of lumber per eight hours was used up in trimmings. The average capacity of shop is 50,000 board feet per eight hours or 4 per cent of the rough lumber found its way into the wood-bin.

Ten samples were taken and they had a rough board footage of 7.5 feet. Of the ten samples seven pieces or 70 per cent had no defect and three pieces or 30 per cent had knots.

The recovery of clear lumber from 1 5/8x4 7/8 inches shop would come from using the full piece where it was free of defect with the lengths as found in the percentages of cuts of the different lengths with a total board footage of 5.1 feet, or 68 per cent of the total amount of trimmings could be recovered in clear lumber.

Dimension. Rough size 2x4, surfaced size 1 5/8x3 5/8 inches.

	No. of Pieces	Percent of Pieces	Length in Inches
	14	22	11
	37	55	22
	4	6	33
	6	9	44
	3	4	55
	3	4	66
Totals	67	100	Time: 30 minutes

1,526 board feet of lumber per eight hours was used up in trimmings. The average capacity of 2x4 dimension is 65,000 board feet per eight hours or 2 per cent of the rough lumber found its way into the wood-bin.

Ten samples were taken and they had a rough board footage of 6 feet. Of the ten samples two pieces or 20 per cent had no defect, two pieces or 20 per cent was scant on one or more faces, two pieces or 20 per cent had wane, two pieces or 20 per cent had knots, and two pieces or 20 per cent were badly checked.

The recovery of clear lumber from 1 5/8x 3 7/8 dimension or 2x4's would come from using the full piece where it was free of defect with the lengths as found in the percentages of cuts of the different lengths with a total board footage of 3 feet, or 50 per cent of the total amount of trimmings could be recovered in clear lumber.

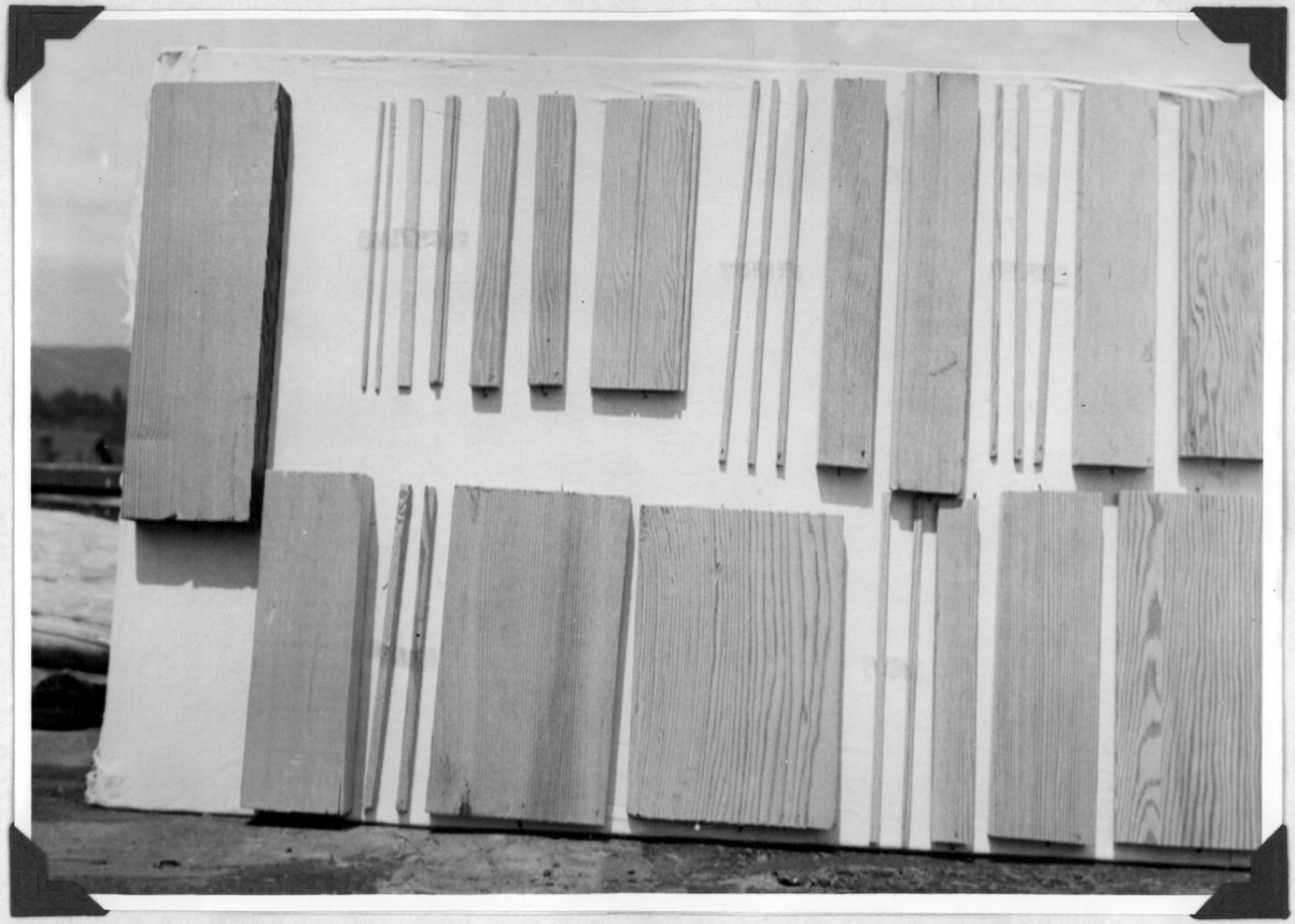

Figure 6

Samples Showing Possible Trim Recovery
Bottom row left to right 2x4, 1x8 shiplap, 1x6 siding.
Top row shop, 1x4 ceiling, 1x3 flooring, and 1x4 flooring.

AVAILABLE TRIMMINGS

The percentage of rough lumber that found its way into the wood bin according to stock, the heaviest amount being in the clear lumber with a lesser amount in common boards and dimension lumber. Clear lumber such as flooring, ceiling, siding, etc., has a trimming waste average of 8 per cent at this particular mill, while dimension and common had a waste in trimming average of 3 per cent.

The reason for this is self-evident. Ceiling, flooring, siding, etc., are graded much more closely and allow very little if any defect; therefore they have a larger amount of trimming, while dimension and common allow considerable defect with little need for trimming.

30 per cent of the total trimmings were 11 inches long, 36 per cent were 22 inches long, 11 per cent were 33 inches long, 9 per cent were 44 inches long, 6 per cent were 55 inches long, and 8 per cent were 66 inches long. For a better picture of the amount of trimmings that reach the wood-bin every day (Figs. 7 and 8) an average of four loads are taken out each day, each of these loads has a cord of wood in it, or 200 cu. ft. of loose wood. This amount of trimmings is equal to about six thousand board feet of lumber (Fig. 9).

In ceiling, flooring, siding, etc., the amount of clear lumber (Fig. 6) that can be recovered from the

Figure 7

Load of Planer
Trimmings

Figure 8

Load of Planer
Trimmings

Figure 9

Load of 1x6
2,300 bd. ft.

amount of trimmings based on the rough size of the trimmings averaged 59 per cent. The amount of recovery in boards and dimension was also 59 per cent, but a use variable comes in which may raise the recovery because dimension and boards may not have to be clear to be used, while the higher grade lumber will probably be used in places where it will have to be free of defect and therefore will give a lower percentage of recovery.

CONCLUSION

This paper is written so that it may be of some help to a planing mill operator to get less waste from his lumber, or, in other words, to get more over-run from the logs. Costs are left out and not considered at all and some of the conclusions may be more costly than the amount of recovery will carry, and also some of the practices may not fit into the lumber uses which would take research to find out if odd lengths are used or not. A market study has not been made to find out where the short pieces could be utilized, but if one will notice about him or remember that in many places such as in window sash the pieces may only be one inch by nine inches, or in cabinet work many odds and ends are also used, it will not be hard to imagine a market for these pieces if they are once saved.

The practice now in the manufacture of the better grades of Douglas-fir is to sell 4,5,6,7,8,9, and 10

foot pieces and from 10 feet to go on in multiples of two feet. A large number of pieces aren't free from defect for 4 feet and then again many pieces won't quite make the multiple of two from ten feet on so again it is trimmed off to find its way into the wood-bin. It would be a better practice to sell in multiples of one foot all the way through and to save all pieces shorter than four feet in one piece so it could be remanufactured and used someplace else. In common and dimension lumber the practice is to save nothing shorter than four feet and from there go on in multiples of two, so the above again would hold true.

Many pieces, after being graded have a knot (Fig. 14) in them which has to be trimmed out. Before trimming these pieces are of some even foot in length and by trimming two feet are lost, even if there is only a three-inch defect. This could be avoided if on the saw-mill floor (Figures 10 and 11) the cants weren't trimmed to exact lengths, but just squared off, for it was found by measuring one-hundred logs that there is a trim of eight inches to two feet on every log which also finds its way into the wood-bin (Figs. 12 and 13). If this trim was left on until after the piece was graded a knot could be cut out of a 16 foot board with this eight inch to two foot trim leaving two eight foot or a four and a twelve foot board, depending upon the knot placement. The amount of lumber lost in wood from this practice of trimming cants to exact length can be

Figure 10

Floor of Saw-mill
Showing Location
of Trim-saw

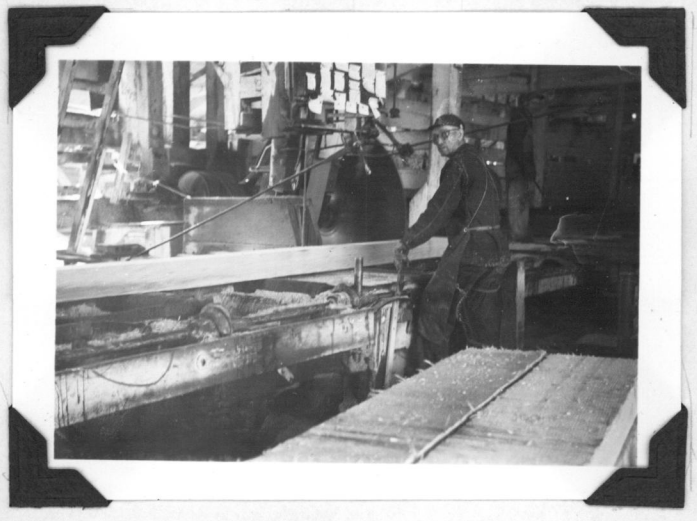

Figure 11

Large Trim-saw

Figure 12

Block Wood Conveyor
Showing Wasteful Trimming

Figure 13

Block Wood Conveyor
Showing Wasteful Trimming

Figure 14

Boards with Knots
to be Trimmed out

Figure 15

Load of Block Wood

Figure 16

Load of Block Wood

best shown by these figures, eight loads (Figs. 15 and 16) of one cord each or 200 cu. ft. of loose wood per load are taken out of the wood-bin of this mill that cuts 120,000 board feet of logs during this same period.

RECOMMENDATIONS

In making another study of this type to find out the amount of waste in trimmings for any given planing mill a few errors might be omitted by following these suggested principles:

(1) Five hundred samples as for length taken at the wood chute would be sufficient to get an average length of trimming.

(2) For each different pattern a minimum of two hours of tallying should be done at the trim-saw in periods of a half hour at a time to get a representative sampling.

(3) A hundred pieces for each different pattern should be analyzed at the wood chute for the amount of clear recovery and defect as to why the piece is on its way to the wood-bin. A better samping could be gotten here if instead of the trimmer man cutting it into wood he would allow the pieces to come out full length and be picked off the chain as a whole piece for analysis purposes.

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