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To Make Long Character-Marked Cuttings From Low-Grade Yellow-Poplar Lumber –Rip First

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ABSTRACT

Long, character-marked furniture cuttings are easily obtained when low-grade (2A and 2B Common) yellow-poplar lumber is first ripped into strips and then crosscut to remove objectionable defects. Overall yields of character-marked material using this procedure were 78 % from 1 Common and 2A Common and 70% from 2B Common yellow-poplar lumber. Furthermore, 82% of the 1 Common cuttings, 61% of the 2A Common cuttings, and 35% of the 2B Common cuttings were longer than 50 inches.

INTRODUCTION

Tradition has called for clear grade cuttings in fine hardwood products. But as high-quality lumber continues to become more expensive, furniture, kitchen cabinet, and other manufacturers must examine the potentials of lower grade lumber. There may be opportunities to include more of the natural' 'character marks" in wood (presently called defects) in exposed cuttings. Recent surveys by the American Walnut-Fine Hardwoods Association have shown that consumers prefer character-marked furniture over clear grade furniture. Acceptance of character-marked quality products is important because it opens the door to use of the less expensive and more abundant lower grades of lumber.

We define character-marked cuttings as cuttings that may contain, on the exposed face, minor defects such as stain, small bird pecks, small burls, pin knots, and pinworm holes. The reverse or nonexposed face may contain defects of a sound grade that do not impair the strength of the piece for the use intended. Character-marked cuttings are currently used in exposed surfaces in painted furniture and cabinets, as core material, and as panel edge banding material.

Hardwood products require medium- and long-length cuttings (30 to 90" long) as well as abundance of short-length cuttings. To determine how well these cutting size requirements could be satisfied with lower grade lumber, several samples of yellow-poplar lumber were processed into character-marked cuttings with a gang rip operation as the first processing step. In the second processing step, gang-ripped strips were defected, producing random-length character-marked quality cuttings. These cutting lengths were then compared with those needed for furniture and kitchen cabinet exposed parts.

Gang ripping was done first, instead of the traditional crosscutting first, because it yields similar quantities of parts more easily, produces longer length cuttings more readily, and can be highly automated (Lucas and Araman, 1975; Araman, 1978). However, to use the rip-first system effectively, a manufacturer must (1) produce standard width parts and/or (2) glue cuttings into panels and then rip parts from the panels.

THE STUDY

Character-marked cuttings were made from 1 Common (lC), 2A Common (2AC), and 2B Common (2BC) 4/4 yellow-poplar lumber. Two 500-board-foot samples of each grade were ripped into strips of specific widths. One sample of each grade was ripped into 2.25" strips, and the other sample was ripped into 3" strips. Wide edgings generated during ripping were saved for processing into cuttings. The 2.25" and 3" widths were selected because earlier work showed high overall yields in strips and wide edgings when ripping of widths from 1 to 3" was simulated (Araman, 1978). Also, we wished to confirm our earlier finding that the narrower width resulted in longer cuttings.

An important objective of most gang ripping processes is to produce glue line quality surfaces on the sides of the cuttings. To assure a glue-line edge from gang ripping, relatively straight boards are required. Therefore, all boards with crook in excess of 5/16 inch over the total length were crosscut in half before ripping. Some crook was so pronounced that the boards were crosscut in half again. The lumber was then gang ripped, using a 7/16-inch hogging head cut on the leading edge. Saw blade width was 3/16 inch.

After gang ripping, the objectionable defects (i.e., those too large or not classified as character marks) were identified and the lengths of cuttings between these defects were measured (Fig. 1). Wide edging material that contained at least a 1-inch wide cutting (after the rough edge was removed by ripping) was similarly measured. Yield of cuttings and length distributions for the cuttings based on their surface areas (length x width) were then calculated.

THE RESULTS

Length of cuttings. The distributions of cutting lengths

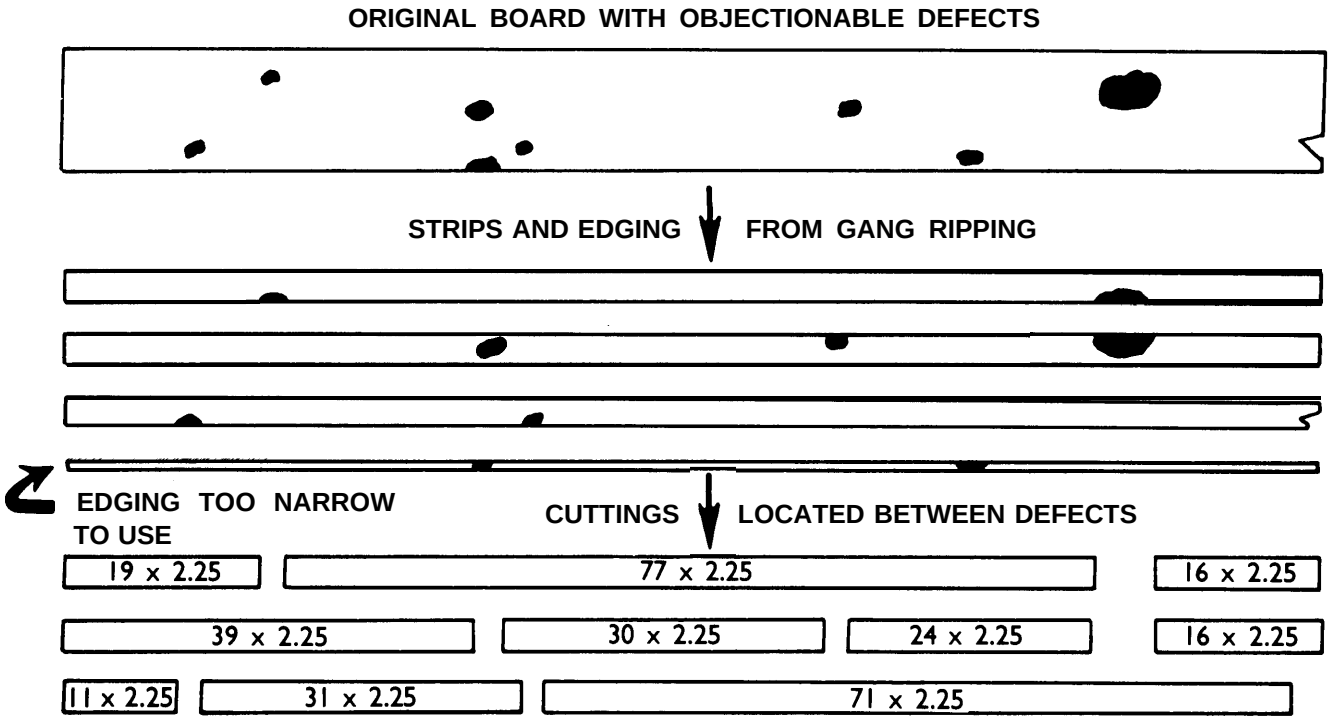

Fig. 1. Gang ripping an 8.5-inch by 10-foot 2C board to 2.25-inch wide strips and removing objectionable defects to produce random length cuttings. (For illustration purposes, acceptable defects are not shown.)

from the six samples after gang ripping 2.25- and 3-inch strips are shown in Figures 2 and 3, respectively. Character-marked cuttings from 10 to 194 inches long were obtained. The cuttings from the 2.25-inch test using 2AC lumber were found to be uniformly distributed between normal (10 to 49 inches), long (50 to 89 inches), and extra long (90 to 194 inches) cutting length groups. The 2AC cuttings from the 3-inch test had more normal length cuttings. About 50% of the lC cuttings were in the extra long group; in contrast about 65% of the 2BC cuttings were in the normal cutting length group. Even though most of the 2BC cuttings were normal length, there was still an abundance of long and extra long cuttings over 50 inches long.

Boards halved due to crook. Additional long length cuttings could have been obtained if the lumber had been straighter. Sixteen percent of the lC boards, 15% of the 2AC boards, and 29% of the 2BC boards had to be crosscut in half to remove excessive crook (over 5/16 inch deflection) so that a glue-line edge could be cut on the leading edge of each board. Furthermore, 5% of the lC halved boards, 19% of the 2AC halved boards, and 1% of the 2BC halved boards had to be crosscut in half again.

Ripping width comparisons. Yields, when 3" strips were ripped, were similar to those for 2.25" strips (Table 1). However, the average length of character-marked cuttings was about 11" longer when the narrower strip was used. Ripping the narrower strip also generated fewer edgings, thus fewer narrow edging cuttings. With the 2.25" strips, about 1 out of 10 cuttings came from edg ings, but almost twice that amount came from edgings with the 3" strips.

Lumber grade comparisons. Yields from lC and 2AC lumber were similar, but the 2BC lumber yielded about 7% less material (Table 1). Average cutting lengths decreased markedly as grade went down, but the average cutting length from 2BC (around 40 inches) is still significantly long. The percentages of cuttings that came

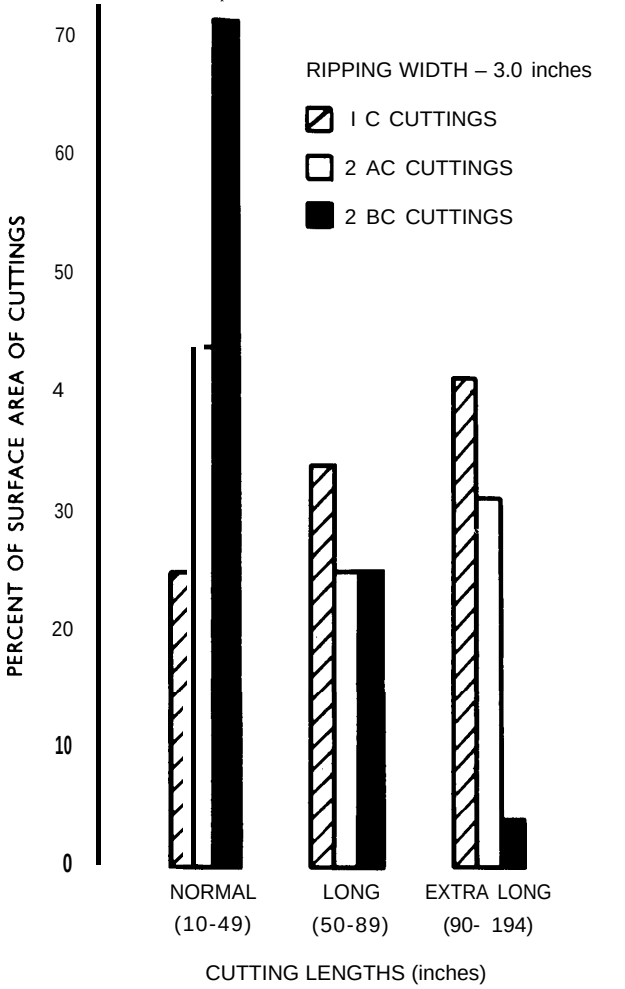

Fig. 2. Distribution of lengths of character-marked cuttings from gang-ripped 2.25-inch strips with defects removed to produce random-length cuttings.

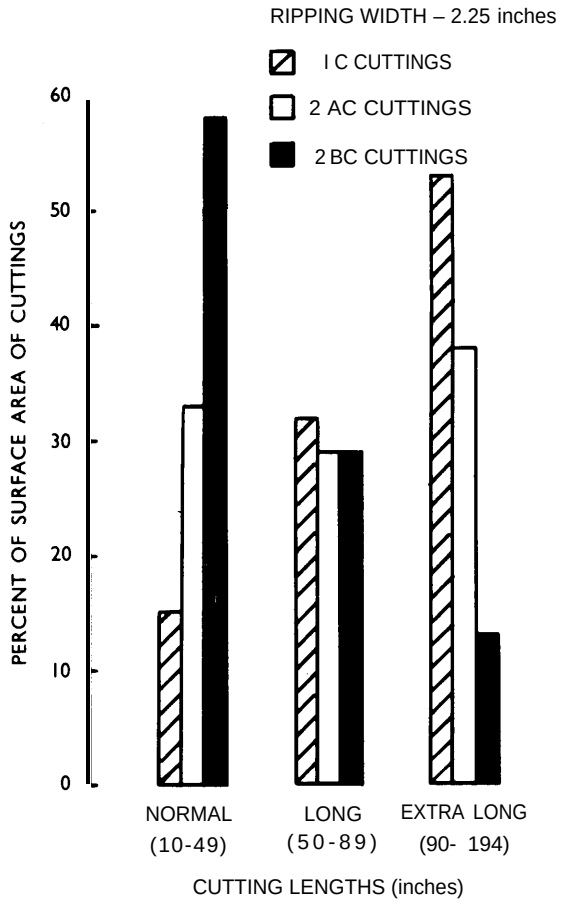

Fig. 3. Distribution of lengths of character-marked cuttings from gang-ripped 3-inch strips with defects removed to produce random-length cuttings.

from strips and edgings were similar for each grade for the same strip widths.

DISCUSSION

This study shows that character-marked cuttings over 50" long are easily obtained from low-grade (2AC and 2BC) yellow-poplar lumber if it is ripped first. For instance, 82% of the cuttings from lC lumber, 61% of the cuttings from 2AC lumber, and 35% of the cuttings from 2BC lumber were longer than 50". In a current study on

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Lumber grade	Strip width	Yield in cuttings[a/]	Ave. cutting lengths[a/]	Percentage of cuttings[b/]	
				from strips	from edgings
	inches	%	inches		
1C	2.25	77	93	92	8
	3.00	78	79	78	22
2AC	2.25	79	71	87	13
	3.00	77	59	83	17
2BC	2.25	69	44	89	11
	3.00	70	37	79	21

[a/]Includes edging cuttings: 1 inch width minimum

[b/]Based on surface area of cuttings

Table 1. Yields, average cutting lengths, and origin of character-marked cuttings from 1C, 2AC, and 2BC yellow-poplar lumber gang ripped into 2.25 and 3" strips and crosscut to remove defects and produce random-length cuttings.

the cutting requirements for veneered furniture, we have found that about 22% of the cuttings from 4/4, 5/4, 6/4, and 8/4 lumber need to be longer than 50".
Likewise for solid furniture, 18% of the 4/4 cuttings, 20% of the 5/4 cuttings, 19% of the 6/4 cuttings, and only 5% of the 8/4 cuttings need to be longer than 50". For exposed kitchen cabinet cuttings, 2% of the 3/4 cuttings, 7% of the 4/4 cuttings, and 24% of the 5/4 cuttings need to be longer than 50". The gang-ripped 1C, 2AC, or 2BC lumber could easily satisfy these cutting requirements if character-marked cuttings were allowed.

Not only are long character-marked cuttings available, but high yields are also possible. Yields in random length cuttings averaged 78% from 1C and 2AC and 70% from 2BC. Furthermore, the simple rip-first cutup system requires only a few easy operator decisions. This decreases the possibility of yield-reducing errors. In con-

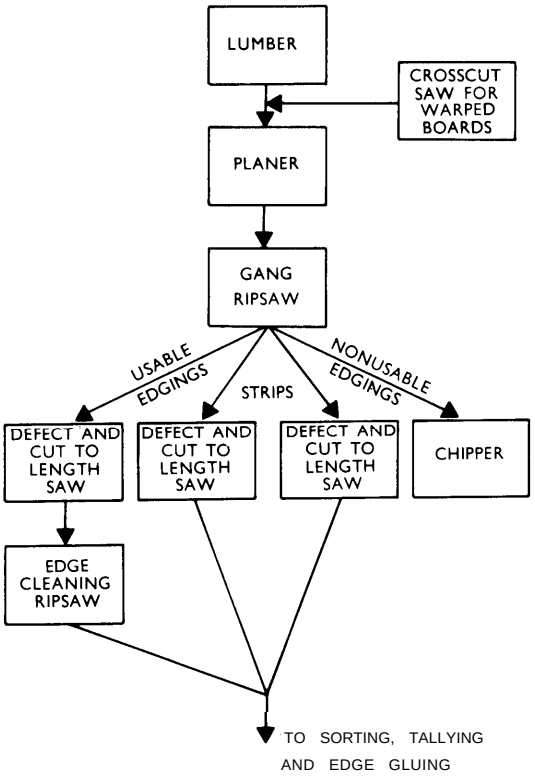

Fig. 4. The basic flow of operations in an automated gang-rip-first rough mill.

trast, difficult operator decisions are required in crosscut-first rough mills, and this discourages the use of low-grade lumber.

Which width should be ripped? The 2.25-inch ripping width might be preferred over the 3-inch width for several reasons:

- Longer average cutting lengths can be obtained from each grade tested.
- Fewer edgings will require processing.
- Similar overall yields can be obtained.

Which grade would produce the lowest cost cutting? The lumber and processing costs, per 1000 square feet of character-marked cuttings can be calculated by simply dividing the sum of the costs by the yield in cuttings. Estimated processing costs used in these calculations are slightly higher for the lower grades, as more crosscutting is required to remove defects. Using the yields from the 2.25-inch ripping width, we find that the 2AC cuttings are the least expensive and the 1C cuttings are the most expensive (Table 3).

Table 3. Costs per 1000 square feet of character-marked cuttings from 1C, 2AC, and 2BC yellow-poplar lumber gang ripped into 2.25-inch strips and then crosscut to remove defects and produce random-length cuttings.

Grade of lumber	Lumber cost per Mbf[a/]	Estimated processing costs/Mbf of rough lumber	Cost per 1000 Ft² of cuttings	Average yield in character marked cuttings
	dollars			percent
1C	270	180	584	77
2AC	205	200	513	79
2BC	165	220	558	69

[a/] Lumber costs/Mbf (thousand board feet) for 4/4 Appalachian yellow-poplar from the February 1978 Hardwood Market Report.

PRACTICAL ROUGH MILL PROCESSING

A ripfirst system can be automated and highly efficient (Fig. 4). Before being planed and ripped, lumber should be checked for straightness and crosscut to remove excessive crook. As mentioned previously, relatively straight rough lumber is needed to assure that a glue-line edge will be cut on the leading edge of the board. Almost 30% of the 2BC boards in this study had to be crosscut before ripping.

SUMMARY

Character-marked cuttings over 50 inches long can be made from low-grade yellow-poplar lumber by a rip-first processing system, and high yields can be obtained. Cuttings from 2AC are the least expensive (13% less than 1C). A 2.25-inch ripping width provides longer cuttings, fewer edgings to process, and yields similar to those of a 3-inch width. Adoption of this rough mill technique and use of character-marked cuttings could alleviate the shortage of long cuttings by using abundant less expensive low-grade lumber□

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