FOREST PRODUCTS LABORATORY † FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

VENEER CUTTING AND DRYING PROPERTIES

COTTONWOOD

The term cottonwood is applied to certain species of the genus Populus, the most common of which are eastern cottonwood, P. deltoides, growing widely throughout the eastern United States, swamp cottonwood, P. heterophylla, an eastern lowland tree, and black cottonwood, P. trichocarpa, growing in the western United States.[1] These species are known for their rapid growth and may attain a good size in 30 to 50 years.

The wood of cottonwood is light in color and weight and uniform in texture. It is not strong nor durable under conditions favorable to decay. It is used extensively for lumber and veneer, particularly for shipping containers. For some years it has been used to a limited extent for the manufacture of plywood, some of which is used for purposes other than containers.

Description of Logs Studied

Veneer cutting and drying studies at the Forest Products Laboratory were made on material received from Montana and Idaho. Three 4-1/2-foot black cottonwood (P. trichocarpa) bolts came from the vicinity of Missoula, Mont., and were 15 to 18 inches in diameter. The trees from which they had been cut were 68 to 93 years of age. Three black cottonwood (P. trichocarpa) bolts that were 17 to 21 inches in diameter came from near St. Maries, Idaho, from trees that were 50 to 90 years old. Three bolts of narrowleaf cottonwood (P. angustifolia) were received from the neighborhood of Livingston, Mont. They were 16 to 24 inches in diameter and 60 to 80 years old. There were no external defects on any of the bolts, except that one of the black cottonwood bolts had a slight ringshake near the center where it did not affect the cutting on a rotary lathe.

All bolts came from bottomland-grown trees of the dominant and codominant classes. The black cottonwood trees ranged from 100 to 115 feet in height, and the narrowleaf cottonwood from 60 to 70 feet.

Preparation of Logs for Cutting

One bolt was heated in water at 140° F. for 24 hours before cutting; four bolts were cut after they had been cooled for some days in a refrigerated room at 40° F. The remaining bolts were cut at room temperature which was approximately 70° F.

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[1] Betts, H. S. Cottonwood. American Wood Series. Forest Service, U. S. Dept. of Agric., 1945.

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The bolt that had been heated at 140° F. showed a definite increase in fuzziness during cutting, that could not be eliminated by adjustment of lathe parts. Some fuzziness also occurred in the bolts that were cut at room temperature; this fuzziness was only very slightly reduced by cooling the bolts to 40° F. For most purposes cutting at room temperature would probably be satisfactory.

Recommended Lathe Settings

A thorough Laboratory study of various lathe settings[2] was not possible because of the limited amount of material cut. The settings given in table 1 were the most satisfactory of those tried.

Table 1.--Lathe settings used to cut cottonwood veneer

Veneer thickness	Knife angle	Horizontal nosebar opening	Vertical nosebar opening
Inch	Degrees-Minutes	Inch	Inch
1/32	90-30	0.025	0.010
1/24	90-15	.033	.012
1/16	90-05	.052	.014
1/8	89-40	.120	.026

Attempts to cut veneer thinner than 1/32 inch from these logs were unsuccessful because of a pronounced tendency of the wood to "fuzz up," split, and tear during cutting. This tendency was often pronounced on one side of the log but not on the other. The fuzzy zone sometimes was very narrow, while in some cases it amounted to two-thirds of the circumference of the log. It varied in severity within the bolt and from bolt to bolt. Usually the veneer also buckled in these areas immediately after coming from the lathe. No amount of adjustment of the lathe settings eliminated it.

Examination of some of this fuzzy wood under a microscope showed that it contained numerous gelatinous fibers.[3,4] Such wood, sometimes also known as "tension wood," shrinks abnormally during drying, particularly along the grain. The causes of its occurrence are not known, nor is there any known treatment that will alleviate its effects.

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[2]Fleischer, H. O. Experiments in Rotary Veneer Cutting. Proceedings, Forest Products Research Society, 1949.

[3]Akins, Virginia and Maxon Y. Pillow. Occurrence of Gelatinous Fibers and Their Effects on Properties of Hardwood Species. Proceedings, Forest Products Research Society, 1950.

[4]Pillow, Maxon Y. Presence of Tension Wood in Mahogany in Relation to Longitudinal Shrinkage. Forest Products Laboratory Report No. D1763. May 1950.

Veneer Drying

The green cottonwood veneer cut at the Laboratory varied in moisture content from 100 percent to 220 percent. There was considerable variation within each bolt and even within each sheet of veneer, but the average moisture contents for the various bolts lay between 150 and 180 percent.

At the Laboratory cottonwood veneer was dried in a mechanical veneer drier according to the schedules shown in table 2.

Table 2.--Average drying schedules for cottonwood veneer

Veneer thickness	Temperature in drier	Time in drier*	Final average moisture content
Inch	°F.	Minutes	Percent
1/32	200	6	10
1/32	225	4	Less than 5
1/24	250	5-1/2	5
1/16	250	10	10
1/16	250	14	Less than 5
1/8	325	18	10

*Figures given are for heartwood. If sapwood is segregated the drying time for it can be shorter by 10 percent or more.

In a commercial plant it was observed that 1/12 inch cottonwood veneer was dried in a mechanical drier operating at a temperature of 350° F. to a final moisture content of less than 5 percent in 13 minutes.

The major defect that occurred during drying was pronounced buckling in areas that had cut fuzzily. When the defect was severe, especially on the thinner veneer, some splitting and occasional cross breaks also occurred. These defects are related to the excessive shrinkage along the grain that is associated with abnormal fibers of gelatinous type.

Occasional wet spots in the veneer did not dry to a low moisture content within the times given in table 2.

Other Factors

In commercial operations utilizing cottonwood it has been observed that the logs are often of a larger diameter than those included in this study.

Fuzziness on the sawed end sections of cottonwood logs may be used as an indicator of the presence of gelatinous fibers. However, smoothly cut end sections may occur on logs containing these fibers to an objectionable extent.

In commercial operations it has been observed that fuzzy, buckled cottonwood veneer is sometimes used in the manufacture of plywood. It is difficult to spread glue properly in mechanical spreaders on such buckled veneer. Because of the increased height of an assembly of buckled veneer sheets it is also difficult to get the panel lay-ups into the plywood press. Based on commercial experience the material apparently presents no difficulties in the way of adhesion and sanding. It is thought that plywood panels containing gelatinous fibers may be subject to excessive warping but information on this point is lacking.

Some western plywood manufacturers using cottonwood have reported plywood yields as high as 2.4 to 2.5 M sq. ft. of 3/8-inch plywood per M bd. ft. log scale. One manufacturer reports an average yield of 3.75 M sq. ft. of 1/4-inch plywood per M bd. ft. of logs.