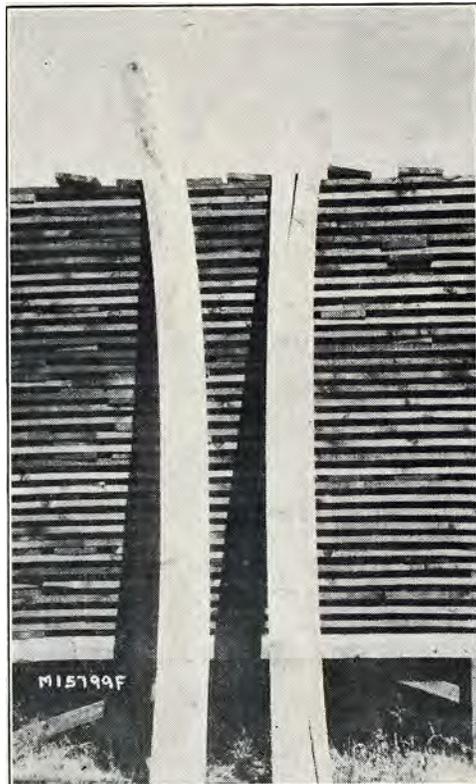


# Bowing and Twisting of Softwood Lumber Due to Compression Wood

**T**HERE IS a peculiar type of wood that occurs to a greater or less degree in all coniferous tree species. This wood has been called "compression wood" because it is commonly found in the lower, or compression, side of branches and leaning trees. Other names for wood of this type are "rotholz," "hard grain," and "timber bind." The most outstanding characteristic of compression wood is its



Both boards are bowed and one is badly split because the compression wood, which was on only one side of each board, had greater longitudinal shrinkage than the normal wood.

by **M. Y. PILLOW**

*Assistant Wood Technologist, Forest Products Laboratory, Forest Service, U. S. Department of Agriculture*



This split is the result of excessive longitudinal shrinkage of the compression wood in the center of the board.

tendency to shrink along the grain to a much greater extent than normal wood does, thereby often resulting in considerable bowing, splitting, twisting, and occasionally in checking across the grain.

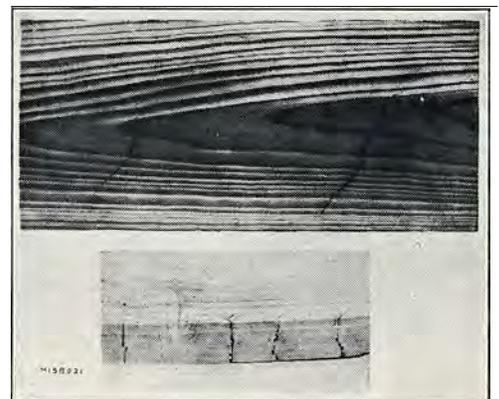
### How Compression Wood Behaves as the Moisture Content Changes

Normal wood in seasoning from a green to an air-dry condition of 12 per cent moisture content shrinks only a very small amount along the grain—usually less than one-tenth of 1 per cent. A shrinkage of one-tenth of 1 per cent in a board 16 feet long would cause a shortening in length of about 3/16 inch. Compression wood, on the other hand, often shrinks as much as one-half of 1 per cent under the foregoing conditions or more than five times as much as normal wood. A shrinkage of one-half of 1 per cent in a board 16 feet long would mean a shortening of nearly an inch in length as the board dried to an air-dry

condition. Frequently, however, the shrinkage of compression wood is even greater

If a board is composed of both compression wood and normal wood, the shrinkage of the compression wood will be more or less retarded by the lower shrinkage of the normal wood attached to it, but the shrinkage will still be sufficient to cause the lumber to bow or twist considerably. Figure 1 shows two pieces of lumber that bowed and split because they contained compression wood on one side only. Another piece, which contained compression wood through the center portion and consequently split wide open, is shown in Figure 2. A board with a streak of compression wood bounded on each side with normal wood often develops cross breaks in the compression wood because of the difference in the longitudinal shrinkages of normal and compression wood. Small pieces of two such boards are shown in Figure 3, both of which had a band of compression wood through the center.

Boards containing compression wood and



The breaks across the grain developed as a result of the excessive longitudinal shrinkage of compression wood adjacent to normal wood.

that are fastened in place before they are thoroughly dry often cause butt joints of flooring and siding to open up with subsequent drying. Figure 4 shows siding in which such a condition occurred. A few instances have also been known where floors and roofs either bowed up or sagged because one or more of the horizontal supports on which they rested contained compression wood on one side and curved with subsequent change of moisture.

#### How Compression Wood May Be Recognized

Compression wood is readily recognized by its appearance. The annual growth rings in compression wood are usually relatively wide and they appear to have an unusually large amount of summerwood, which is the darker-colored portion of the ring. The summerwood, however, occurring in compression wood is not so hard nor so flinty in appearance as is normal summerwood. The usual clear line of demarcation between springwood and summerwood of the same annual ring in the southern yellow pines, Douglas fir, and some other conifers is lacking in compression wood. In the soft pines, spruces, and true firs, where there is normally a more gradual transition of springwood to summerwood, the compression wood can be distinguished by its larger percentage of summerwood. There is a "dead" or "lifeless" appearance in boards containing compression wood because of the lack of contrast between the springwood and summerwood. This is especially noticeable when it is compared directly with normal wood.

Because compression wood commonly forms on the lower side of leaning trees,

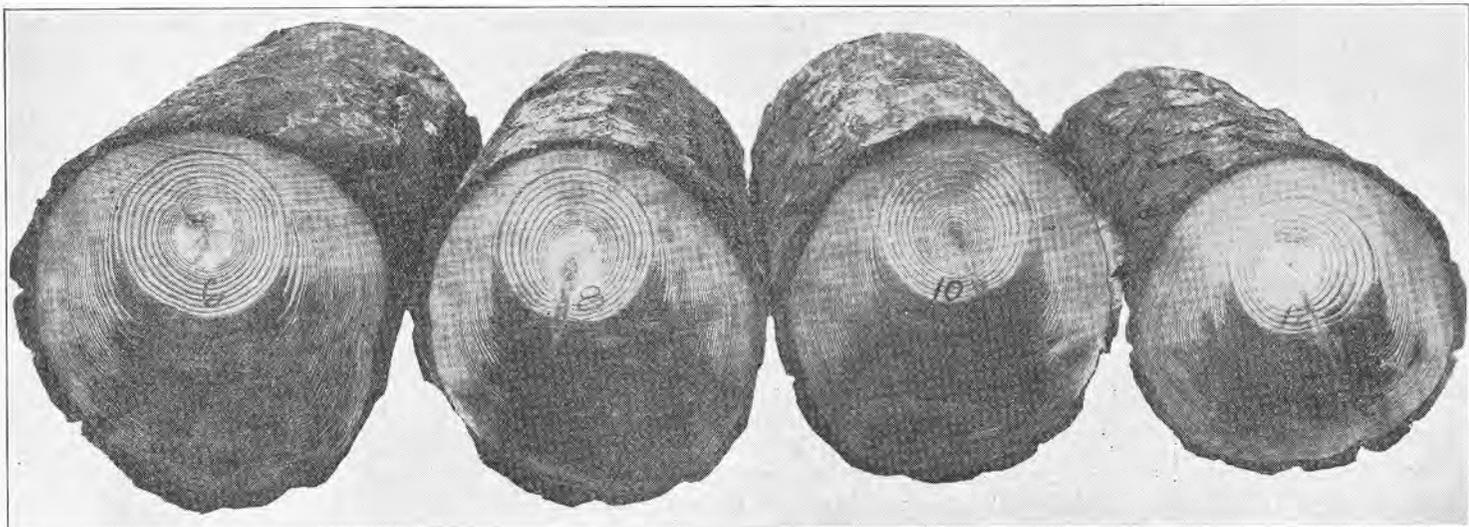


*The compression wood in one of the abutting pieces in this siding shrunk so much that the butt joints opened up because the boards were nailed in place before they were thoroughly dry.*

it is found on only one side of an annual ring. A few instances have been known where the compression wood grew first on one side of the tree and then on another, but in each case the compression wood was in only one part of any one annual ring. Most commonly, however, compression wood is found on one side of a single log at a given height and, since the annual

rings are wider on the compression wood side, the growth center of the log is not in the approximate geometrical center of the log. This eccentricity of annual growth layers together with the darker color of the wood makes compression wood identifiable even before it is cut into lumber. Figure 5 shows four sections of a log that contained very pronounced compression wood. In addition logs containing compression wood are usually crooked or have long sweeping curves.

While in the aggregate the amount of softwood lumber containing compression wood amounts to a considerable percentage of the total amount sawed, that which would cause serious trouble in the utilization of the lumber can be readily recognized. This is especially true if the moisture content of the lumber is reduced to that of an air-dry condition or lower, since the pieces are then often twisted out of shape in addition to having an appearance different from normal wood. For many uses slightly bowed or twisted pieces can be utilized satisfactorily. In pieces containing the more pronounced compression wood the longitudinal shrinkage is much greater. If, however, the use requirements are exacting, the pieces containing compression wood can be eliminated by careful selection. In many instances trouble caused by the excessive longitudinal shrinkage of compression wood can be avoided by having the lumber at the proper moisture content at the time it is fastened in place. Lumber containing compression wood will stay in place satisfactorily if the moisture content remains unchanged.



Four pieces of a log that contained compression wood in the lower half. Note the eccentricity of the growth rings and the difference in appearance of normal wood and compression wood.