A SIMPLE DEVICE FOR DETECTING COMPRESSION WOOD

Revised June 1953

Reprinted December 1962

No. 1390
A SIMPLE DEVICE FOR DETECTING COMPRESSION WOOD¹

Forest Products Laboratory, ² Forest Service
U. S. Department of Agriculture

---

A simple device that facilitates the detection of compression wood in lumber from Sitka spruce and other coniferous species has recently been developed by the Forest Products Laboratory. Consisting of a simple box containing an electric light arranged to cast its rays through an aperture, the apparatus discloses the presence of compression wood, which is relatively opaque compared with translucent normal wood. When a thin specimen containing compression wood is placed in the aperture, the compression wood blocks the passage of light much more than does normal wood (fig. 1).

Compression wood is responsible for much crook and bow in lumber and has mechanical properties inferior to those of normal wood.³ For these reasons it is particularly objectionable in lumber to be used for aircraft.

The new apparatus (fig. 2) reveals the presence of gradational forms of compression wood which hitherto have been discernible only under microscopical examination. It permits rapid examination of thin cross sections from lumber.⁴ The extreme forms of compression wood, which are particularly objectionable, ordinarily can be detected on large transverse surfaces by the comparatively wide and eccentric annual rings containing a high percentage of summerwood not so hard as normal summerwood nor, when dry, so dark. Compression wood consequently lacks the customary marked

¹—This report was one of a series of progress reports originally issued by the Forest Products Laboratory to aid the Nation's war program.

²—Maintained at Madison, Wis., in cooperation with the University of Wisconsin.


Report No. 1390 (Revised)
contrast between normal summerwood and springwood, and thus has a "lifeless" appearance. It is in revealing the borderline and intermediate forms of compression wood, difficult to detect without a microscope, that the new apparatus is particularly helpful.

The summerwood of compression wood evidently is more opaque than normal summerwood because the microscopically discontinuous structure of the secondary cell wall of the summerwood tracheids dissipates the light. Normal summerwood does not have the microscopic checks and striations in the secondary cell wall which characterize compression wood.

Variations in moisture content of wood appear to have little effect on this method of detecting compression wood. Pitch-soaked wood, on the other hand, is highly translucent regardless of whether it contains compression wood. It is therefore not well adapted for this test. Some pitch is found in Douglas-fir, but Sitka spruce is little affected by it.

Surfaces of samples cut with a circular cut-off saw or ordinary hand saw, provided it is reasonably sharp, are suitable for this test provided the end grain surfaces are parallel. Sanded surfaces are unsatisfactory because in sanding the cell cavities become filled with particles of wood and sand which destroy the translucence of normal wood, and, hence, its contrast to compression wood when examined. Thin specimens should be cut, before fabrication, from each piece of lumber suspected of containing compression wood and examined in the light box. Cross sections 5/32 inch thick provided the most satisfactory specimens in Laboratory tests.

Making the Apparatus

While direct sunlight or a powerful flashlight sometimes gives useful results for thin specimens, for accurate inspections the Laboratory apparatus is needed. Working drawings show its construction features (fig. 3). A 75-watt electric light is strong enough to give good penetration.

This box should be used in a dimly lighted area or at least not in bright light. Its exterior and the grooves for the specimen slides are painted black to reduce reflection of extraneous light. If it is necessary to use the light box in ordinary room light, a simple fiberboard viewing device can be made as indicated in figure 4, and held together with gummed paper.

A wood viewing device, fitted with specimen slides at one end and used with an ordinary flashlight, electric light bulb, or direct sunlight, has also been designed. Working drawings for it are shown in figure 5. The Laboratory model takes only specimens up to 2 inches wide, but dimensions of the slide can be varied for larger specimens.
Fig. 1. Cross sections of wood which were photographed by transmitted light. Above, normal wood showing translucence, and below, compression wood interspersed with normal wood showing location of compression wood by its opaque summerwood.
Fig. 2. Forest Products Laboratory apparatus for detecting compression wood by transmitted light.
Fig. 3. Working drawings of a wood box to be used to detect compression wood by transmitted light.

ZM-39767-F
Figure 4. -- Diagrams for cutting and folding corrugated fiberboard for a viewing device to reduce extraneous light during detection of compression wood by transmitted light.
Fig. 5. Working drawings of a wood box for holding and examining cross sections of wood to detect compression wood by transmitted light.
The following are obtainable free on request from the Director, Forest Products Laboratory, Madison 5, Wisconsin.

<table>
<thead>
<tr>
<th>Subject List</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of publications on Box and Crate Construction and Packaging Data</td>
<td></td>
</tr>
<tr>
<td>List of publications on Chemistry of Wood and Derived Products</td>
<td></td>
</tr>
<tr>
<td>List of publications on Fungus Defects in Forest Products and Decay in Trees</td>
<td></td>
</tr>
<tr>
<td>List of publications on Glue, Glued Products, and Veneer</td>
<td></td>
</tr>
<tr>
<td>List of publications on Growth, Structure, and Identification of Wood</td>
<td></td>
</tr>
<tr>
<td>List of publications on Mechanical Properties and Structural Uses of Wood and Wood Products</td>
<td></td>
</tr>
<tr>
<td>List of publications on Fire Protection</td>
<td></td>
</tr>
<tr>
<td>List of publications on Logging, Milling, and Utilization of Timber Products</td>
<td></td>
</tr>
<tr>
<td>List of publications on Pulp and Paper</td>
<td></td>
</tr>
<tr>
<td>List of publications on Seasoning of Wood</td>
<td></td>
</tr>
<tr>
<td>List of publications on Structural Sandwich, Plastic Laminates, and Wood-Base Aircraft Components</td>
<td></td>
</tr>
<tr>
<td>List of publications on Wood Finishing</td>
<td></td>
</tr>
<tr>
<td>List of publications on Wood Preservation</td>
<td></td>
</tr>
<tr>
<td>Partial list of publications for Architects, Builders, Engineers, and Retail Lumbermen</td>
<td></td>
</tr>
<tr>
<td>Partial list of publications for Furniture Manufacturers, Woodworkers and Teachers of Woodshop Practice</td>
<td></td>
</tr>
</tbody>
</table>

Note: Since Forest Products Laboratory publications are so varied in subject, no single list is issued. Instead a list is made up for each Laboratory division. Twice a year, December 31 and June 30, a list is made up showing new reports for the previous 6 months. This is the only item sent regularly to the Laboratory's mailing list. Anyone who has asked for and received the proper subject lists and who has had his name placed on the mailing list can keep up to date on Forest Products Laboratory publications. Each subject list carries descriptions of all other subject lists.
<table>
<thead>
<tr>
<th>U.S. Forest Products Laboratory</th>
<th>U.S. Forest Products Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describes the construction and use of a simple apparatus for detecting compression wood in lumber from coniferous species. The device is particularly helpful in revealing borderline and intermediate forms of compression wood that are difficult to detect without a microscope.</td>
<td>Describes the construction and use of a simple apparatus for detecting compression wood in lumber from coniferous species. The device is particularly helpful in revealing borderline and intermediate forms of compression wood that are difficult to detect without a microscope.</td>
</tr>
</tbody>
</table>