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FOREST PRODUCTS LABORATORY
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DETERMINING PENETRATION OF WOOD PRESERVATIVES

The effectiveness of any wood preservative treatment is measured very largely by the depth to which the preservative penetrates. This can be determined by the following tests, which are used by the Forest Products Laboratory.

The presence of creosote, creosote mixtures, or other dark-colored oils is indicated by the dark discoloration, and the degree of penetration may readily be determined by taking a sample at a point free from checks and other imperfections and at a considerable distance from the end of the stick. This may be done either with an ordinary 1/2-inch bit, and measuring the penetration on the wall of the hole, or with an increment borer, which brings out a core of wood that shows in cross section the depth of penetration and is easily examined. The observation should be made at once, because the oil spreads rapidly over the cut surface, particularly over the end-grain of the wood. With low-viscosity oils it is often desirable to examine a tangential or radial section of the treated wood rather than an end-grain section. In order to prevent infection, the hole in the treated piece should be tightly closed with a thoroughly treated plug.

No reliable method has been found for determining the depth of penetration of pentachlorophenol when used in colorless or light-colored oil solvents. In boring cores from wood recently treated, however, it is often possible to distinguish the "wet" treated portion from the untreated portion of the boring.

As zinc chloride is colorless, the depth of penetration of this preservative must be ascertained by chemical means. The most common method of determining penetration on a cut face or boring consists in spraying over the freshly cut surface a mixture of equal parts of a 1 percent potassium ferricyanide solution, a 1 percent potassium iodide solution, and a 5 percent solution of soluble starch. This colors the

treated portion a very dark blue, but does not affect the untreated wood. Although the color fades in time, it may be brought back by spraying again. This method may also be used on chromated zinc chloride.

Sodium fluoride is colorless, but its presence in wood can be determined by the following method. Make one solution (1) in the ratio of 5 grams of zirconium oxychloride in 500 cc. of water. Make another solution (2) in the ratio of 2 grams of sodium alizarine sulfonate, 40 cc. of concentrated hydrochloric acid, and 460 cc. of water. The two solutions are kept separated until ready for use, when a quantity of solution 2 is added to an equal quantity of solution 1. It is essential that 2 be added to 1 rather than vice versa. The cut surfaces or borings are sprayed or dipped in the solution. The treated wood will turn yellow while the untreated wood will remain dark red. This method is also recommended by the proprietors of some patented fluoride-phenol-dichromate preservatives to measure the penetration of the sodium fluoride.

Mercuric chloride is also colorless, but dipping the wood in a solution of hydrogen sulfide turns the treated area black.

The penetration of preservatives containing copper salts, such as Greensalt (Erdalith or Ascu), Celcure, and Chemonite, can usually be observed without the aid of a special stain. The following stain has been found useful, however, for determining the penetration of these preservatives: Dissolve 0.5 gram 5-diphenyl carbazide in 50 ml. of isopropyl alcohol and 50 ml. of water. When a boring or cross section of treated wood is sprayed or dipped in this solution, the presence of the copper compound is indicated by a purple color while the untreated wood shows little change.

As individual pieces may show an abnormally high or low degree of penetration, a sufficient number of tests should be made to obtain a fair average. Samples should be taken at a considerable distance from the ends of the stick, in order that they will not be affected by the heavy longitudinal penetration from the ends.