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FACTORS INFLUENCING DECAY OF UNTREATED WOOD[1]

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Abstract

Discusses the various conditions that have been shown by study and experience to influence the decay of wood. These particularly touch on the fungi's need for moisture, air, and suitable temperatures, and how control measures usually hinge on restricting at least one of these.

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A large proportion of untreated wood lasts indefinitely under the ordinary conditions of its use. This long durability is characteristic of most wood in houses and other buildings and in such articles as furniture and musical instruments. Under certain other conditions, however, wood will be attacked by decay fungi.

To live, all decay fungi require four things--favorable temperatures, moisture, air, and suitable food material. If the other conditions are right, they get their food from the wood. Control of fungal activity usually results from depriving fungi of one of these essentials.

Moisture, Air, and Warmth

Lack of sufficient air or moisture prevents decay. Wood kept constantly dry, continuously submerged in the water or mud, or buried deep underground does not decay. Dry wood, such as that in household furniture, contains too little moisture to permit the growth of fungi.[2] Submerged or deeply buried wood, such as submerged piling that supports the masonry foundations of bridges or large buildings, contains too little air. The air supply in the soil becomes deficient a few feet below the surface of the ground; at depths of more than 5 or 6 feet, the rate of decay is usually very slow, especially in dense, compact soils. Decay usually extends deepest in light sandy or gravelly soils.

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[1] Revised from U.S. Forest Products Laboratory Report No. 68, "Factors That Influence the Decay of Untreated Wood in Service and Comparative Decay resistance of Different Species," or originally issued in 1928 and revised in 1958.

[2] A few types of fungi under some conditions can conduct water to dry wood from a distant source of supply and thus make it damp enough to decay. They are sometimes found in building, particularly in sustructure areas.

A likely condition for decay exists when untreated wood is alternately wet and dry, or in contact with the ground or in any like situation in which it can collect moisture and remain damp for a long time. The rate at which decay takes place depends upon the kind of fungus, the character of the wood, and the degree of exposure to moisture and warmth. Decay may progress so rapidly as to destroy the usefulness of a piece of wood in a few months or so slowly as to be scarcely noticed.

Climatic conditions have an important hearing on the life of untreated wood. Warm humid climates are more favorable to decay in wood used outdoors than dry or cold climates. In areas of low rainfall, decay in posts, poles, and similar timbers is usually near the groundline. Elsewhere, decay is not confined to the groundline area, but is frequently found also in the untreated tops or sides of poles many feet above the ground. The influence of locality and climate probably is greater in connection with above-ground service than it is with wood in contact with the ground.

Heartwood and Sapwood

Under conditions that favor decay, the sapwood (the light-colored outer portion of the wood of the tree) of all species will usually rot quickly. The natural decay resistance of all common native species of wood rests in the heartwood only. When long life is desired of untreated wood under conditions favoring decay, all sapwood should be excluded regardless of species.[3] The natural preservatives usually stored in the heartwood may be present in larger amounts in some trees than in others of the same species. Thus, marked differences in decay resistance may occur in heartwood of the same species and even of the same tree.

Time of Cutting

The season of the year in which wood is cut is not known to have any effect on its inherent power to resist decay, but wood cut and peeled in late fall or winter is usually safer from immediate damage than that cut in warm weather. In cold weather freshly cut timber is exposed at a time when fungi are not active, so that it may be moved to a safe place or become dry enough to avoid their attack before warm weather begins. Even with the best of outdoor piling conditions, however, poles, railway ties, and similar timbers in warm, humid parts of the United States may start to decay before they become sufficiently dry to prevent infection. Regardless of the time it is cut, timber on the ground, in improperly constructed piles, or with the bark on, may become infected with decay during the warm weather before it is put to use.[4]

Drying

Drying wood that is later to be used untreated in contact with the ground does not increase its natural resistance to decay. Drying may, however, have a very important influence upon the life of wood to be used in certain confined parts of buildings or in other unexposed places. Poles, posts, and railway ties to be used without treatment will have about the same service life whether or not they are seasoned. If dry, the wood will take up moisture from the soil; and if green, it may give off moisture to the soil. In either event the wood will reach a moisture content determined by the surrounding

[3] Sapwood usually takes the preservatives readily, so that when wood is to be impregnated with a good wood preservative, the presence of sapwood is often an advantage. If thoroughly treated, the sapwood will usually be at least as decay resistant as the treated heartwood, if not more so.

[4] Insects are also most active in warm weather and may cause damage under conditions that favor decay. Rapid drying encourages checking; hence, checking also may be greater in summer-cut timber. Checking, furthermore, aids infection by stain and decay fungi.

soil. In buildings and other structures, however, the moisture conditions may be very different. Partially dry wood built into spaces in which it cannot dry out rapidly may retain moisture so long that decay may destroy the wood before it becomes seasoned. Dry wood in the same spaces would not contain enough moisture to permit decay and would therefore, serve satisfactorily so long as it remained dry.

Service Conditions

Outdoor Uses

The importance of decay resistance is obvious in railway ties, poles. posts. and other wood in contact with the ground. Decay is important enough in such timbers that consumers are turning more and more to the use of wood preservatives. Ties, poles, and posts of low natural decay resistance that are thoroughly treated with a suitable preservative generally have longer life at lower cost per year than the naturally decay-resistant woods without treatment. In some localities, however, where treated wood is expensive and decay-resistant wood is relatively low in cost, the use of untreated wood may be the more economical. Records of the length of service given in specific cases by posts, poles, or railway ties may be obtained from the Forest Products Laboratory. As a general rule. the serviceability of posts, ties, and other products when used untreated is dependent upon the decay resistance of the heartwood or the species used, the proportion of heartwood present, and the climatic and soil conditions at the point of installation. In areas where termites are active, deterioration by these insects may cause the posts and other untreated products to become unserviceable before serious loss through decay occurs.

Buildings

The furniture, framing. sheathing, flooring, and interior woodwork of houses, under proper design and construction practice, are kept so dry that the wood does not decay regardless of sapwood or species. Decay resistance is unimportant, therefore, in the selection of wood for these and simllar uses. Leaks or drips from water pipes, or other abnormal conditions induced by improper design or construction or by lack of repair in houses, sometimes cause decay; the remedy is usually to improve the conditions rather than to select wood of high decay resistance.

Where not too close to the ground, siding of houses kept in reasonably good repair has long life regardless of species. Although siding is exposed to rain, the water usually runs off quickly and, unless defective gutter, downspouts, and the like let the water seep in and collect in crevices or pockets. the wood does not stay wet long enough for fungi to produce much decay. Decay resistance in house siding cannot be said to be of major importance, although the use of decay–resistant wood such as cedar or redwood for this purpose is safe and conservative.

Decay resistance is of variable importance depending upon the region and local conditions of exposure in substructure parts and such exterior items as cornices, trim, window frames, and sash. Steps, porches, and railings exposed to the weather and the bases of porch columns and posts often are especially subject to decay. Decay resistance, therefore, may be important in such structures.

In factories and mills in which much moisture is present or in which high humidity is maintained, as is often the case in paper mills, weaving mills, and dye houses, moisture is likely to collect in the wood in such quantities as to promote rapid decay. Roofed planking in such buildings during cold weather is especially likely to collect moisture by condensation. Experience has shown that decay resistance is very important in lumber for such area.

Wood of high natural decay resistance will provide adequate protection for the above uses. However, such factors as species availability and the need for appropriate combinations of resistance along with working and strength properties have led to the increasing use of preservative-treated wood where protection against decay is needed.