Wood is not what it used to be!

Today's wood is not the same as yesteryear's wood. Wood porches, shutters, fences, windows, and doors being built or replaced today may not last as long as the originals did. Lumber cut from faster growing trees tends to rot much sooner than wood from mature trees previously available. The word preservative may sound unpleasant or unhealthy but use of preserved lumber for projects that will be subjected to dampness is more necessary than ever. There are a number of reasons for this unexpected change.

Wood decays because it supports the growth of organisms, principally fungi, insects, bacteria, and marine borers. These organisms require food, heat, air, and moisture [1]. Deny them any of these and there will be no rotting. Wood with high food value, permeability, and few toxic extractives, rots when it is subjected to dampness and temperatures between $50^{o}f$ and $95^{o}f$ [2].

What are the mechanics of decay? Essentially the trunk of a tree is composed of heartwood, sapwood and bark [3]. Wood consuming organisms are interested in the layer that has the most nutrients, the sapwood. Sapwood is rich in food because it is the layer that transports the sap and nutrients from the roots upward to the leaves [4]. It is loaded with food that organisms thrive on. Heartwood cells have fewer nutrients and may contain extractives that in some species render the wood resistant to rot, fungi and insect attacks. Redwood, cedar and cypress, woods with high levels of toxic extractives, have generally been considered slow to decay but the tendency of even these to decay increases in the faster growing trees now being harvested.

Years ago forests were dense. Trees grew slowly and needed only a thin layer of sapwood to supply sap to the crown leaving a large amount of rot resistant heartwood. Outdoor lumber and millwork items in old houses often wear out from environmental erosion (rain and the ultra violet rays of the sun) long before they rot for at least two reasons: they may have been made from heartwood or they may have been treated with very effective preservatives now banned due to environmental policies [5].

During the last century, after the original forests in the country had been harvested, more open forests allowed trees to grow faster. In addition, within the last ten to twenty years, cutting has been restricted on millions of acres of federal forests with mature trees. Much of the lumber presently on the market is from fast growing second and third plantings grown on privately managed forestland. Wood harvested from these trees rots faster than wood from older, slower growing trees. To combat the expected rapid decay, highly toxic wood preservatives came into general use. These preservatives, among them creosote and pentachlorophenol, were poisons that destroyed the food value of the sapwood. They were applied, sometimes under pressure, to poison the nutrients [6]. With no food available there were no organisms, therefore no rotting.
In the second half of the twentieth century, with publication of Rachel Carson's book Silent Spring and the advent of the environmental movement, many of the most toxic treatments for wood preservation including creosote and pentachlorophyl were banned. Those presently acceptable for use by licensed pressure treatment plants go by the acronyms CCA, ACQ, ACZA, plus copper azole that may be known by several different acronyms.

These chemicals are unique in that, under pressure, they can be forced into the sapwood cells of some species such as southern pines, eastern pine and eastern hemlock, thus preserving them. Treatability is largely a function of sapwood content because only sapwood is treatable [6]. The more pressure used in the treatment the greater the penetration and preservative action of the chemicals. Although southern pines generally have a lot of sapwood they have become the predominant wood for outdoor building projects. Southern pines are good for decks and general construction but are not well-suited or widely used for millwork items (windows, doors, and shutters).
Consumers, contractors, millwork manufacturers and other non-licensed applicators use less toxic, less effective, shorter lasting preservatives than do licensed pressure treatment plants. These preservatives are sold by paint, lumber and hardware dealers.
Preservatives must form a protective shield that completely envelops the wood [7] [8]. This shield helps control surface mold and mildew when the preservative has been applied to the whole board after the wood has been cut, drilled, and shaped --- then the wood must be finished to ensure that it sheds water. Dipping the whole board in a preservative is a method used by many window and door manufacturers.

A consumer may find just the right size, species, and color of wood to replace rotting exterior trim on a building, a woodworker may spend many hours shaping it to produce what is needed, but he may not be doing the consumer any favors.
Without thorough and appropriate preservative treatment the chances are that the finished item will be a sweet piece of sap filled wood just waiting to grow a garden of organisms.

A builder can take steps to increase the life of wood used outdoors by: using adequately preserved lumber, designing buildings with projecting roofs to prevent direct rainfall from wetting exterior wood, coating wood with stain or paint so water does not penetrate it, installing wood with air passage on all sides to allow rapid drying, and allowing sunshine to reach possible problem areas.

The following pictures illustrate bark, sapwood, heartwood, and bacterial action in logs in a forest setting.

The tree in the top picture has more sapwood because it was a faster growing tree or grew in an open forest. The tree in the lower picture grew in a densely forested section of the Adirondack Mountains. This may explain it's having so little sapwood. The species of tree may also make a difference. "The differences in color are related to the differences in moisture content and nutrient levels between the heartwood and sapwood. In the upper picture, the sapwood appears to be darkened by either bacterial action and/or enzymatic staining which occurs when the sapwood sugars are exposed to oxygen [9]."

"In the lower picture, the sapwood is heavily infested with mold fungi that thrive on rich nutrient sources with high moisture content. The white mycelium forming at the heart/sap boundary is probably from a decay fungus [9]."

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For further information:

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