THE PREVENTION OF DECAY
OF WOOD IN BUILDINGS

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In the great majority of cases it is cheaper to prevent decay than to repair or replace the rotted lumber. Unsatisfactory service from wood in buildings is very often directly traceable to a lack of appreciation of the conditions that favor decay. To understand these conditions the architect, builder, and owner need to know only a few basic facts.

Decay is caused by fungi which grow on and in wood and destroy the wood substance as they grow. Generally speaking, the most important factor limiting their growth is moisture. However, temperature also affects the rate of growth, and consequently the rapidity of their destructive action. They are slowed up or stopped as the thermometer drops toward the freezing point, and they are killed by high temperatures. But they cannot grow at all, no matter how favorable the temperature, unless the moisture content of the wood is suitable for their development.

Dry wood will not decay. Wood is food material for fungi, but they cannot use the food unless it contains at least 15 to 20 per cent of its weight in water. On the other hand they cannot use the food when water is present in excess, that is, when the wood is thoroughly soaked through or is submerged in water. The latter conditions are found only under exceptional circumstances, for example, in piling which is driven below water level, and they therefore are out of the picture as far as ordinary buildings are concerned. The conditions most favorable for decay occur when the moisture content is somewhat above 20 per cent and somewhat under the complete saturation point.

Certain chemicals, like creosote, zinc chloride, sodium fluoride, and bichloride of mercury, for example, protect the wood from decay even when there is enough moisture present to favor fungus growth. The simplest explanation of the action of such preservatives is that they poison the fungus food material.

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With these facts in mind the principles of decay prevention can be reduced to the following general rule:

To prevent decay, control the moisture content of the wood or, if the conditions of use are such that moisture content cannot be controlled, use wood treated with a suitable preservative.

Infection may and often does take place before wood is ever placed in a building, either through fungus spores that are always floating in the air, or because the lumber has been carelessly stored on the ground, under leaky sheds, or in direct contact with decaying timbers. After wood has been built into a structure infection may result from contact with dirt or rubbish, with moist foundation walls or basement floors, or even with the ground itself. Water from leaky roofs, walls, window frames, rain spouts, or plumbing fixtures may not only carry the infection, but also make conditions just right for rapid growth of the organisms.

Certain of the more destructive building-rot fungi in the United States form conducting strands which run from the ground up supporting columns or basement walls to the sills and timbers of the ground floor. These conducting strands carry water from the ground to the wood and, as a result, wood that was reasonably dry when installed may be supplied with moisture sufficient to keep the fungus going.

The architect and builder should take every reasonable precaution to prevent infected material getting into any permanent construction. This is not a simple task because recognition of the earliest stages of decay is nearly always extremely difficult, and often it is impossible. The best practical safeguard is a specification which calls for properly dried lumber. In any case the wood should be allowed to dry before it is sealed in, in order to stop the growth of any fungi that may be present.

After the building is up the duty of keeping the wood dry falls on the owner or tenant. The architect should plan and the builder should construct so that it will be practicable for the owner or tenant to do his part. Any construction which favors the absorption or the retention of moisture by wood should therefore be regarded as bad practice. Under such practice the wood does not have a fair chance to give the service that the owner feels he has a right to expect from it. For example, it is bad practice to lay a wood floor directly over a brick, a cinder, or a concrete basement floor, because the wood may absorb sufficient moisture from the floor foundation to bring about very rapid
decay. If a wood floor must be so laid the floor sleepers should be treated with a preservative. In addition, to secure maximum service, the ground should be provided with adequate drainage, the concrete or other base should be waterproofed, and in some cases the sleepers should be set so that the wood floor is raised several inches above the surface of its foundation. Thorough provision should be made for draining and ventilating the air space under the wood.

Oiling or painting floors before the wood is dry is very likely to lead to rot. Covering damp wood with oilcloth or linoleum will frequently bring about the same result. In both cases the decay is due to the retention of moisture, which favors the growth of fungi.

Cold water pipes should never be installed in such a way that the water which condenses on their surfaces drips or runs on to adjacent wooden framing or supports.

Building-rot fungi grow best in damp, stagnant air. It follows that good practice forbids the complete enclosure of the spaces under porches or under other floors that are built over unexcavated ground. Provision should be made for adequate ventilation. The same applies to basements in general. It would be well, in addition, to make sure that the basements and the spaces under the floors are thoroughly drained.

All of the preceding suggestions are based on the principle that if the wood used is reasonably dry, and if it is kept dry, it cannot decay. If these facts are clearly recognized by architects and contractors many of the present building rot problems will soon cease to exist. However, there will always be some cases where treated wood should be used. Under certain conditions of service keeping the wood dry will be practically impossible. Foundation timbers laid directly on the ground, and roof planks for use in industrial plants where the humidity is purposely kept high, may serve as examples. Such foundation timbers should be treated, because they may be wet a great part of the year. In cool weather moisture condenses from the humid air in industrial establishments and collects on the under side of the roof planks. The water is absorbed by the wood, and conditions favoring decay are set up. This roof problem may be partially solved by any one of several methods: by insulating the outside of the roof against atmospheric temperature in order to reduce the condensation on the under side of the boards; by the use of only the most durable woods; by installing a battery of steam pipes near the roof to keep the roof planks drier; or by the use of treated wood.
In repair work the contractor is faced with two important tasks; the replacement of the decayed wood with sound material, and the remedying of the conditions that led to the decay. Usually the wood is infected for anywhere from a few inches to two or three feet beyond the point where the rot appears. When such wood is removed, therefore, it is a good plan to cut out for at least a foot or two beyond the rotten areas, as far as this is practicable. New, clean, untreated lumber should never be nailed against old, infected material, since this exposes the new wood to immediate attack with the result that decay may be very much more rapid than in the case of the original wood. The conditions that favored the decay will most frequently be found to be tied up in some way with damp foundation walls, damp basement floors, seepage water, or leaks. Leaks, of course, should be repaired promptly. Increased drainage and better ventilation may be necessary to remedy other faulty conditions.

Foundation walls and posts and the unexcavated ground under porches, or under parts of the house proper, can temporarily be rendered sterile, as far as wood-destroying fungi are concerned, by applying effective wood-preserving chemicals with an ordinary garden spraying outfit. The wood around the area which is being repaired can be treated in a similar manner, or by painting on the preservative with a brush. Local conditions will determine how often the treatment should be repeated. Where the odor is not objectionable, creosote will be found suitable for either spraying or brushing. A 5 per cent solution of zinc chloride, made by mixing five pounds of the chemical with 11-1/2 gallons of water, or a four per cent solution of sodium fluoride can be used in place of creosote. Under careful supervision and for special purposes bichloride of mercury may be employed. In the case of wood, however, it should be remembered that the chemicals applied to the surface do not reach the interior of the wood, and they therefore cannot kill fungi which have worked their way well into the lumber. Where the decay hazard is bad, either the most durable of woods or well treated material should be used on the repair job. In any event, the general rule for decay prevention set forth in the early part of this article holds good, -- either control the moisture content of the wood or use treated wood.