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PREVENTION AND CONTROL OF DECAY IN DWELLINGS¹

Decay of wood is caused by minute, threadlike plants, known as fungi, growing in the wood. The most conspicuous part of these fungi is the fruiting structure (conk, mushroom, toadstool), which is produced on the surface of the wood and bears spores. The spores are liberated to the air and function like seeds, germinating and starting new fungus growths in wood wherever conditions are favorable.

There are two ways in which fungi can be kept from attacking wood that is not naturally decay resistant: (1) by treating the wood with a preservative chemical and (2) by keeping it dry.

A preservative should be applied by a standard type of pressure treatment if the wood is likely to be subjected to a damp situation for long periods. Surface treatment (brushing, spraying, soaking) is worthwhile only where the wood is subjected to intermittent wetting, as in the case of porches, steps, and some other exterior millwork.

Wood, when kept dry, is a permanent building material. To decay, it must contain moisture in an amount greater than 20 percent of its dry weight. The moisture content of wood protected from rain or other forms of wetting usually will be considerably less than 20 percent. Since wood will not rot while it is dry, the term "dry rot" usually refers to rot that leaves the wood, when dry, in a brown, often crumbly, condition suggestive of extreme dryness, rather than to the condition of the wood in which rot is actively taking place. However, it also is sometimes used to refer to decay caused by a certain few fungi that, by means of special water-conducting strands, are able to carry water from the soil into buildings where they moisten and rot wood that would otherwise be dry.

¹See also Technical Note 242.

Prevention of Decay in New Buildings

In order to avoid decay in buildings, the basic principles are to build with dry lumber, use designs that will keep the wood dry, or if the latter is impossible, to use preservative-treated wood. The following specific points, particularly, should be kept in mind:

1. Build on a well-drained site, if possible. Try to avoid marshy locations and make sure that the grading brings about drainage away from the house. This applies particularly to houses without basements. Rain water and melting snow should be drained from the building, and the drainage of the general area should be made to keep the ground beneath and around the structure as dry as possible.
2. Obtain stock from lumberyards where it is kept off the ground and protected from rain. Dealers should deliver lumber at the building site sufficiently dry to prevent decay and to give minimum trouble from shrinking and swelling after installation. Once delivered, lumber is often handled with apparent disregard of the objectionable dimensional changes and decay that may result if it is allowed to become wet. During temporary storage on the building site, the stock should be protected from rain and should never be piled directly on the ground. If unseasoned or other wet wood cannot be avoided, it should be thoroughly dried before it is enclosed; this is especially important if the wood shows any signs of decay infection or is heavily blue-stained. Infected stock is potentially the forerunner of serious decay and should be weeded out, if possible.
3. Maintain sanitary conditions with respect to foundation, basement, and masonry. All wood scrap, forming, stakes, stumps, and the like that might furnish food for fungi should be removed from under or near the building.

If dirt-filled porches or terraces are used, the wooden sill back of the fill should be completely isolated from the soil by a noncorrosive metal flashing extending between the sill and the foundation upon which it rests, bent upwards over the outside face of the sill, and extending upward beyond the porch floor and under the siding or other surfacing of the building.

4. As a general rule, place no untreated wood within 18 inches of the ground. The wide variations in temperature, rainfall, prevalence of

extremely destructive fungi, and availability of the more decay-resistant woods in different sections of the country permit considerable latitude in the application of this rule with respect to contact with the ground. The 18-inch clearance should always be observed, however, unless ample local experience over a long period has definitely demonstrated that there is no risk in violating it. Whenever there is uncertainty as to the safety of using unprotected material in any particular location in a building, the lumber should be thoroughly impregnated with a suitable preservative.

In some localities, so far as decay is concerned, buildings may be safely supported on piers or posts of decay-resistant or pressure-treated wood if the posts are provided with concrete footings extending above the soil.

Although decay does not always follow, it is bad practice to lay a floor of untreated wood directly on a brick, cinder, or concrete base at or below the soil grade line, because the wood may absorb sufficient moisture to bring about decay. Good practice necessitates protecting the floor sleepers with a damp-proof membrane, such as roofers felt mopped on with asphalt, or by preservative treatment. A concrete subfloor should be thoroughly dried before the wood floor is laid.

Partition plates, stair carriages, and wood pillars should be on concrete bases and preferably separated from the concrete by a damp-proof membrane.

Similarly, embedding the ends of girders in masonry or concrete walls is not good practice unless the point of contact is well above the outside grade line so that the wall does not become damp and transmit dampness to the wood, or unless the ends are preservative-treated or protected against serious wetting. Methods of keeping embedded joists dry include moistureproofing the outer face of the walls and providing air space around the ends.

5. Beneath all buildings without basements leave a crawl space with at least an 18-inch clearance under wood girders and joists. Also, it is a good precaution to provide adequate cross ventilation so that no dead air pockets exist. This is best accomplished by placing vents at opposite places in the foundation wall or skirting and as near the corners as practicable. Good ventilation prevents the hazardous wetting of sills and joist ends that tends to occur during cold weather as a result of condensation of moisture vapor liberated to the crawl space from damp ground. For most houses, 1 square foot of unobstructed vent area per

25 linear feet of wall is considered sufficient; additional area is desirable if the vents are partially blocked by screens, grills, or louvers.

Another way to prevent serious condensation in the crawl space and one that also is useful in conjunction with vents that are to be closed in winter, is to cover the ground under the house with 55-pound or heavier roll roofing. The roofing should be rolled out with a 2-inch lap, but no weighting down or fastening is needed.

Porches elevated above the ground should be so built as to insure ample circulation of air beneath them.

6. Avoid all forms of construction that will trap moisture in the wood. Make all exterior joints tight enough to keep moisture from accumulating in the adjacent wood. The most critical places are the corners of the building, around windows, doors, and porches. Unless shutters and garage doors are made from naturally decay-resistant heartwood or properly preserved wood, avoid outside battens and cross rails, which frequently create decay hazards. In general, architectural frills or novel forms of construction should be studied carefully to determine whether they provide entrance points or pockets in which moisture may remain long enough to make wood susceptible to decay. Provide drainage through bases of porch columns and at the bottom rails or porch screens to avoid trapping water behind these members.

A good roof overhang and gutters will do much to keep rain from getting into outside walls and associated structures.

7. Porches, exterior steps and platforms, porch and step rails, window frames, and other types of exterior millwork often present a decay hazard that cannot be fully avoided by construction practices. In these connections, worthwhile protection, although not as long lasting as that provided by pressure treatment, can be given by immersing the stock in a preservative solution after it has been cut and fitted for use. Solutions containing both water-repellent and preservative ingredients, and which do not swell the wood or impair its paintability, are marketed under brand names for the purpose. Commercially treated window sash and frames can be obtained from progressive lumber yards.

8. Avoid the condensation of moisture in outside walls and attics. In many parts of the United States, the water vapor in the air within the walls of a house may condense on the back of the sheathing or on the under side of the roof during cold weather. The amount of moisture eventually

taken up by the wood may be sufficient to permit decay as well as to cause swelling and paint difficulties. Moisture trouble of this sort must be particularly guarded against in houses that are artificially humidified or have insulated walls.

Wall and attic condensation can be greatly reduced by putting a vapor barrier on the inside face of the wall studding and on the lower face of the attic joists. Some building papers, especially those with a continuous internal layer of asphalt or with a shiny asphalt coating, are good vapor barriers. In houses already built, aluminum paint on the room side of outer walls and ceiling will provide an effective vapor barrier. Papers highly resistant to vapor should never be placed on the cold side of a wall; instead, a so-called breathing paper should be used.

The use of sound, dry lumber is important in walls and other exterior parts of a building as well as in the substructure.

9. In using new types of building material, keep in mind that plywood and fiberboard require, in general, the same precautions as lumber. Edges of exposed plywood should have a heavy coat of white-lead paint or other moisture-resistant coating. Horizontal joints should be avoided unless flashed. Exterior grades of plywood should be used not only where there will be exposure to rain, but preferably also where the material is likely to become damp, such as when used for roof sheathing or when placed in the crawl space.

Repair of Decayed Buildings

In repairing a building damaged by decay, the primary job is to determine the source of the moisture and remove it. If the adverse moisture condition cannot be fully remedied, the infected parts should be replaced with preservative-treated or naturally durable wood. It would be advisable also to remove material for a distance of at least 2 feet beyond any evidence of decay, because wood usually is infected beyond the point where rot is apparent. If the source of moisture can be definitely eliminated, it is necessary to cut out only such wood as has been rendered unserviceable and to replace it with dry, sound lumber.

Space is not available here to discuss the preservative treatment of lumber, but it should be emphasized that maximum protection is obtained from the use of wood that is pressure-treated with a good preservative.

The amount and depth of preservative needed in the wood depends on where the wood is used, on how near the ground it is, and how wet it is likely to get. As already mentioned, it is only in situations of intermittent wetting that worthwhile protection against decay is afforded by brush-treating, spraying, or soaking. Framing or cutting treated lumber, especially thick material, will often expose untreated wood. In such a case the original treatment should be supplemented with a heavy brush application of preservative to the untreated areas.