

WOOD ROT, MOLD, MILDEW, AND FUNGI

IN RESIDENTIAL CONSTRUCTION

Wood Rot, What is it?

The microscopic organisms that discolor and decay wood belong to a huge group of primitive plants known as fungi. Unable to produce their own food, fungi feed instead on natural substances that make up organic materials like leather, cloth, rattan, paper, and wood.

Mushrooms that spring from lawns and tree trunks are fungal "fruits".

They release millions of dust-size spores that are scattered helter-skelter by wind. When the conditions of the surface they eventually settle upon are right, spores germinate, sending out thread-like filaments called hyphae. Enzymes secreted by hyphae break down organic matter so fungi can use it for food.

Before fungi can colonize wood, four requirements must be met: an oxygen supply, temperature in the 40 to 100 (F range), a supply of sufficient moisture, and a food source (wood). Infection can be prevented by eliminating any one of the requirements.

Obviously, it's hard to limit oxygen. Temperature control is tough too, since most living things thrive in this range. And even at subfreezing temperatures, many fungi don't die, they just go dormant.

The most effective "method" of preventing fungal deterioration of wood is to keep it dry. Most fungi need a wood moisture content of at least 20% to carry on. With the moisture content of wood indoors over most of the United States cycling annually between 6% and 16%, it's too dry for most microorganisms to get started.

In exterior or other situations where wood can't be kept dry, decay has been delayed traditionally by using naturally rot-resistant woods like Western redcedar and redwood. Nature has partially protected these woods from fungi by depositing toxic extractives in their heartwood. But supplies of naturally durable woods are too small to meet today's demand at an ecologically and economically acceptable price. In imitation of Nature, less naturally durable woods are impregnated with pesticides like CCA (chromated copper arsenate) that extend their service life by 30 to 50 years or longer (pressure treated lumber, the green colored wood).

Defeating mildew

Occurring outside and inside homes, most mildews are black, but reds, greens, blues, and browns are possible. Even the familiar gray color of weathered wood is the work of mildew. Masses of dark spores and hyphae give mildews their characteristic splotchy look. Merely discoloring the surface they grow on, mildews have no appreciable effect on wood itself. Some mildews that feed on airborne organic matter can even grow on inorganic vinyl and aluminum sidings. Dew and rain supply needed moisture.

Mildews appear most often on eaves, decks, and porch ceilings. North-facing walls and those shaded by foundation plantings, trees and other obstructions that restrict sunlight and airflow are also candidates.

Virtually all exterior finishes -paints, solid color and semi-transparent stains, and water repellants alike- are susceptible to mildew. Oil-base formulations, especially those with

linseed oil, are particularly vulnerable. Among water-base coatings, acrylic latexes have proven the most mildew-resistant. Defend against mildew on siding and trim by using only primers and topcoats that contain mildewcide, or by mixing in the add-it-yourself types paint shops sell. Finishes with zinc oxide pigments also deter mildew.

Beware, finishes applied over mildewed surfaces that are recoated without first killing the fungus will quickly discolor as the mildew grows through the new coating.

Ridding wood of mildew is easy. But first, do a simple test to see if splotches are mildew, or just plain dirt. Place a drop of fresh household bleach containing sodium hypochlorite on the suspect area. The dark color of mildew will fade in a minute or so, while dirt is unchanged. Clean surfaces by brushing or sponging with a solution of 1/3 cup household detergent, 1 to 2 quarts household bleach, and 2 to 3 quarts of warm water. Or use commercial cleaners, we use [Sodium Percarbonate](#). Wear eye protection and gloves, and rinse surfaces with water.

Mildew occurs indoors most frequently in baths, basements, and other areas prone to high relative humidity. It also shows up in places with poor air circulation such as behind furniture against exterior walls, and in closets and closed-off rooms. Mildew can form whenever the relative humidity of air near a surface exceeds 70%. This can happen when warm air near the ceiling cools as it flows down colder wall surfaces. The relative humidity of 70 (F air, for example, rises from 40% to 70% when it's cooled to about 52 (F. Spores and musty odors emitted by mildew growing in indoor microclimates can trigger allergic reactions.

Thermal bridges that lead to "hot spots" outside create "cold spots" inside. Exterior corners are notoriously mildew-prone because of poor air circulation inside and heat-robbing windwashing outside. In summer, water vapor from warm, humid air entering crawl spaces and basements below air conditioned rooms may condense on cooler joists and subflooring, creating conditions irresistible to mildew, as well as mold, and staining and decay fungi. Moisture condensed as ice from heated air leaking into attics in winter likewise wets rafters and sheathing when it melts.

Prevention: A few tips for helping to prevent mold and mildew are... Install and use a bath exhaust fan. Installing louvered doors ensures airflow in closets. Use a soil cover, and vent and/or insulate crawl spaces as site and climatic conditions dictate. The same is true for ceiling vapor retarders, and attic insulation and ventilation levels.

Managing molds

Molds need a wood surface moisture content of about 20% to get started. To provide that, simply surround wood with air at 90% relative humidity at any temperature from 40 to 100 (F, and presto! That's why mold and mildew sometimes suddenly appear on furniture during the dog days of summer.

Prevention lies wholly in controlling air moisture levels and condensation potential through proper site drainage and dampproofing, and use of soil covers, vapor retarders, insulation, and ventilation as ambient conditions call for.

Guarding against decay fungi

While discoloration by mildew, mold, and staining fungi poses an appearance problem, attack of wood by decay fungi threatens its structural integrity. Aptly termed the "slow fire", wood decays or rots because these fungi eat the very cellulose and lignin of which wood cells are made.

Moisture content is the critical factor determining wood's susceptibility to decay. It must exceed 28%, and liquid water must be present in cell cavities before fungi can gain a toehold. Once established, some fungi can carry on their destruction at a moisture content as low as 20%. When moisture content falls below this level, all fungal activity ceases. That's one reason why framing lumber is dried to 19% moisture content or less. In its early or incipient stages, decay can be difficult to detect, even with a microscope. Strength loss can be appreciable even at this stage. As the slow fire advances, wood's luster fades. Surfaces become lifeless, dull, and discolored. A musty odor is often evident. The rate at which decay progresses depends on moisture content, temperature, and the specific fungus.

It doesn't take a trained eye to recognize decay in its advanced stages. Wood is visibly discolored, spongy, and musty. Surfaces may be stringy, shrunken, or split across the grain. Cottony masses of hyphae called mycelia, as well as fruiting bodies, may be present. Decay extends deep into wood; strength loss is significant.

Brown rots and white rots

Decay fungi fall into three major groups: brown rots, white rots, and soft rots. The latter are rarely found inside homes, though they occasionally degrade wood shakes and shingles on heavily shaded roofs in wet climates.

Brown rots are so-named because infected wood turns dark brown. Most commonly colonizing softwoods, brown rots consume cellulose, hardly touching the darker lignin. Mycelia appear as white sheet-like or fluffy growths on wood surfaces. Brown-rotted wood shrinks excessively and splits across the grain as it dries. Friable and crumbly, surfaces then show brown rots' hallmark cubical checking.

Water-conducting fungi are a special type of brown rot that show up infrequently in the southeast, northeast, and Pacific northwest. Sometimes called dry rot fungi, the name unfortunately suggests that dry wood can decay. Dry wood can't decay, period. What builders, inspectors, and homeowners alike routinely mislabel "dry rot" is almost always, in reality, wood that got wet, rotted, and dried out before discovery. Unique in their ability to pipe moisture from the soil over long distances through root-like rhizomorphs, water-conducting fungi wet otherwise dry wood in advance of their attack. Infecting softwoods and hardwoods, their light-colored mycelia look like large, papery, fan-shaped sheets. Dirt-filled porches, damp crawl spaces, and wood in ground contact are avenues for entry.

White rots impart a white, gray-white, yellow-white, or otherwise bleached appearance to wood. Most often infecting hardwoods, they feed on both cellulose and lignin. In advanced stages of decay, white-rotted wood is spongy, has a stringy texture, and lacks the cubical checking of brown-rotted wood. A thin black line often marks the advancing edge of incipient white rot in hardwoods. Ironically, this partially decayed or spalted wood is coveted by woodworkers for its unique figure.