

Home Wreckers in Search of Moisture

Research at the Forest Products Laboratory (FPL) related to durability and disaster mitigation includes damage by decay fungi and termites and contamination by mold fungi. All these household pests are attracted to excess moisture, which can result from inadequate surface drying of condensation, leaks in pipes and foundations, poor ventilation, or flooding.

Homeowners are increasingly concerned about moisture management and indoor air quality (IAQ). However, chronic moisture problems in a home can lead to more than poor IAQ—persistent high moisture can lead to a cascading biological succession from mold to decay to termite damage.

Mold

Contamination with mold can render a home unlivable, and cleanup may require gutting the entire structure. In some cases, cleanup costs for toxic molds can equal the value of the home!

- Mold occurs on the surface of wood exposed to excessive humidity or wet/dry cycling.
- Visible mold growth is a good indicator of damp conditions or excess moisture.
- Water vapor in humid air will not wet wood sufficiently to support decay fungi, but it will permit mold growth.
- Mold, though unsightly, causes insignificant strength loss to structural wood components.
- Common mold fungi can cause allergic symptoms; however, some molds (*Stachybotrys* sp.) produce mycotoxins, which cause illness and make homes uninhabitable.
- New York City Department of Health and the U.S. Environmental Protection Agency have established guidelines for the assessment and remediation of mold fungi in indoor environments.



Blue-black color on walls shows evidence of mold growth. (Photo used with permission from A&J Specialty Services, Inc.)

Decay

Deterioration by decay fungi is the most destructive type of microbiological damage because it causes structural failure, sometimes very rapidly. Billions of dollars are spent annually to replace wood damaged by decay fungi.

- Brown-rot fungi cause the most destructive type of deterioration of wood in service.
- Decay is initiated when the moisture content of wood is above the fiber saturation point (average 30%); simply keeping wood dry prevents decay.
- Certain species of brown-rot fungi can transport moisture across barriers for long distances.
- Many brown-rot fungi are copper tolerant, enabling them to decay wood treated with copper-based preservatives.
- Strength loss during early stages of decay can be significant, depending on the fungus and, to a lesser extent, the type of wood involved (10% weight loss equals 50% strength loss).
- Chemical preservatives provide the best protection against brown rot, especially in ground contact.



Rotten rafters caused by decay. (Photo used with permission from KBA Engineering.)



Destructive damage caused by termites. (Photo by Guadalupe Rojas, USDA ARS.)

Termites

Termites cause 1 to 2 billion dollars worth of damage annually to homes in the United States. Homes infested with Formosan subterranean termites, which often have to be demolished, are labeled “knockdown houses.” Under many circumstances, these costs are not covered by homeowner’s insurance.

- Termites seek water near air conditioners, leaky pipes and roofs, and other damp areas.
- Termite feeding increases on wood decayed by some brown-rot fungi.
- Moisture condensation on floor joists and subflooring, which is favorable for decay, may contribute to termite infestation.
- Established termite infestations result in further moisture accumulation from the conversion of cellulose to carbon dioxide and water.
- Barriers (for example, chemically treated surrounding soil, penetration-proof foundation materials, and good crawlspace ventilation) provide the best protection against termite infestation.
- Research has shown that under conditions of high termite hazard, DOT (disodium octaborate tetrahydrate), CCA-C (chromated copper arsenate), and NHA (N,N-naphthaloylhydroxylamine) give adequate protection.

Summary

Prevention of mold and deterioration is achieved by moisture control and keeping wood dry. Realistically, moisture control is determined by a combination of factors, including architectural style, quality of work, building materials and practices, weather, energy efficiency, occupant lifestyle, and maintenance and repair schedules. Protection of wood from biological agents can be achieved by preservative treatments with biocides, but current building practices utilize little treated wood in homes.

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