

# Managing moisture and mold

By Catherine Marx Kaake, P.E.  
Southern Pine Council

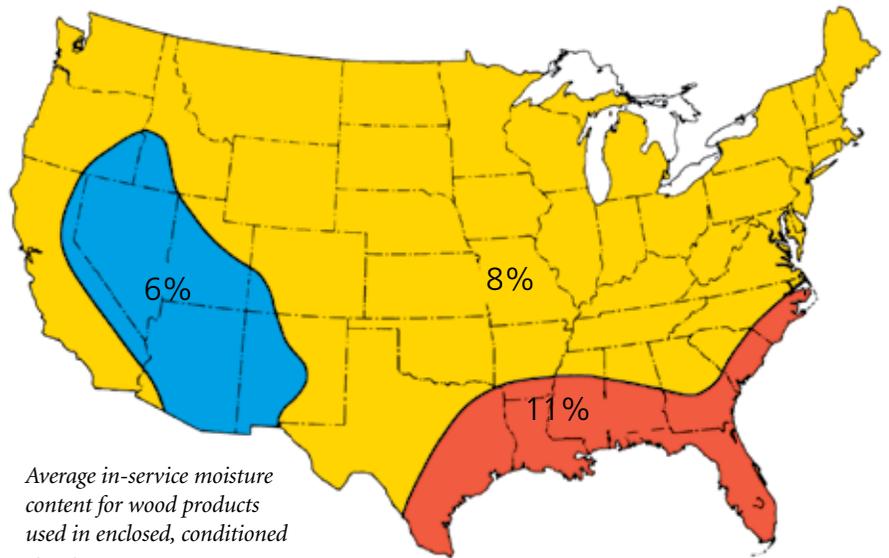
**M**old is a simple microscopic organism, present virtually everywhere, indoors and outdoors. Mold grows naturally in an outdoor environment, and spores can enter a house through open doorways, windows, heating, ventilation, and air conditioning systems. Once indoors, it can find conditions suitable for growth.

Generally, the majority of common molds are not a concern to healthy individuals. Currently, the Environmental Protection Agency does not regulate mold or mold spores in indoor air. Some forms of mold, however, may pose potential health risks under certain conditions.

According to the Center for Disease Control (CDC): "There are very few case reports that toxic molds (those containing certain mycotoxins) inside homes can cause unique or rare health conditions, such as pulmonary hemorrhage or memory loss. These case reports are rare, and a causal link between the presence of the toxic mold and these conditions has not been proven." Nevertheless, mold-related lawsuits have increased dramatically in recent years, resulting in large settlements paid by builders and others involved in the construction industry. It is important for construction industry professionals to understand under what conditions mold develops, how to prevent its growth, and what to do when it is found.

Mold spores can be found almost anywhere. They can grow on virtually any substance, provided moisture is present. There are more than 100,000 species of mold, and at least 1,000 varieties are common in the U.S. Mold is most likely to grow indoors where there is water or dampness, such as in bathrooms and basements.

Molds are fungi; ubiquitous organisms that (under proper conditions) can grow on organic matter. Surface molds, which can come from a variety of sources including airborne spores, feed off the sugars and starches readily available



*Average in-service moisture content for wood products used in enclosed, conditioned structures.*

in wood and other organically-based materials. Fiberboard, fibrous insulation, and other building materials may be especially susceptible to moisture and mold growth.

When unprotected wood is exposed to the elements, excessive moisture, or ground contact, it is susceptible to decay. Four conditions are required for decay to occur: moisture, favorable temperature (approximately 50 to 90 degrees Fahrenheit), oxygen, and a source of food. If any of these four conditions is removed, decay or infestation will not occur. Mold requires moisture to survive, so protecting lumber and wood structures from moisture will prevent mold growth and decay.

Under favorable conditions, mold will grow almost anywhere indoors. Oxygen and temperature conditions necessary to support life will generally support mold growth. Food sources for mold include a long list of common household materials such as paper, cardboard, ceiling tiles, wood products, paint, wallpaper, insulation, drywall, carpet, and fabrics.

Mold can use moisture from almost any source, ranging from condensation on windows to roof leaks. It can also draw moisture from any type of wood if the moisture content exceeds 19 percent.

Protecting building materials from

moisture is key to preventing mold growth. Properly dried lumber (MC 19 percent or less) and most engineered wood products do not contain enough water to support the growth of mold. However, all wood products, including lumber, plywood, oriented strand board, laminated columns, beams, and I-joists are equally vulnerable to mold growth if not protected from moisture during transportation, storage, and construction.

The key to preventing mold growth is moisture control. In order for mold to grow, it requires ample moisture, either in liquid form or conditions of high humidity. If present on lumber and wood building products, mold needs a moisture content greater than 19 percent to survive. A relative humidity of at least 70 to 90 percent will also support mold growth. Once growth occurs, molds can spread by the production of spores.

Structural framing lumber should be dried to a moisture content of 19 percent or less before enclosure. Southern Pine dimension lumber is typically kiln-dried to a moisture content of 19 percent or less. The moisture content will be identified on the grade stamp. Discoloration aside, mold generally has little effect on the structural integrity of framing lumber.

## Dimensional stability

Proper seasoning and storage helps provide optimal dimensional stability of lumber in service. To minimize shrinkage, Southern Pine grading rules require that dimensional lumber 2 inches or less in thickness be kiln-dried or seasoned to a moisture content of 19 percent or less. Additional conditioning will take place as lumber is stored or used where it will reach equilibrium moisture content.

## Blue stain is not mold

Blue stain is not mold. Blue stain, or sap stain, is a bluish or grayish black discoloration of the sapwood caused by the growth of certain dark-colored fungi on the surface and interior of the wood. Blue stain can occur under the same conditions that favor the growth of other fungi.

With some molds and the lesser fungus stains, there is no clear-cut way to differentiate between the two. In general, however, the difference between molding and staining is made primarily on the basis of the depth of discoloration. Unlike mold fungus, typical sap stain or blue stain fungus penetrates deeply into the sapwood and cannot be removed by surfacing or chemical cleaners.

Under Southern Pine Inspection Bureau grading rules, stain and discoloration due to exposure to the elements are characteristics allowed on Southern Pine lumber. Stain is an appearance characteristic only and is allowed in varying degrees in all lumber grades. It does not affect lumber strength or utility, nor does it pose any health risk.



*Protecting wood products from exposure to moisture requires vigilance and teamwork by all parties in the chain of custody.*

## Mold removal and remediation

A detergent and water solution or a 10 percent bleach-to-water solution (1-1/2 cups bleach per 1 gallon of water) can be used to clean mold. Do not mix bleach with ammonia or with any other detergents or cleaners that contain ammonia. Mixed together, bleach and ammonia form a lethal combination, similar to mustard gas. Many household cleaners contain ammonia, so be extremely careful when selecting the type of cleaner to mix with bleach. Protect eyes and skin from contact

with the bleach solution and provide ventilation if using bleach indoors.

Using a bristle brush or scrub sponge, clean the surface using the recommended solution. Rinse the brush/sponge frequently. Thoroughly dry the material after cleaning.

Large mold colonies should be addressed by an experienced professional. High-efficiency particulate air vacuuming after cleaning may also help remove any remaining mold spores.

Note: This cleaning process will not prevent future mold growth. Only changing the environmental conditions (i.e. eliminating the moisture) can prevent future growth.

## Stopping mold: From mill to builder

When properly kiln dried to 19 percent or less moisture content, Southern Pine dimension lumber will not support the growth of mold. Unfortunately, lumber can be exposed to adverse weather or moisture during shipment, storage, or the construction process before final installation.

## Manufacturer role

The manufacturer should provide the customer with wood and other building materials that are properly dried to a moisture content of 19 percent or less, and properly grade marked. The manufacturer should also ensure proper binding, handling and storage of lumber at the mill site. At the purchaser's request, the manufacturer will properly wrap the lumber and order the shipment covered with a tarp during transport.

At the purchaser's request, the manu-

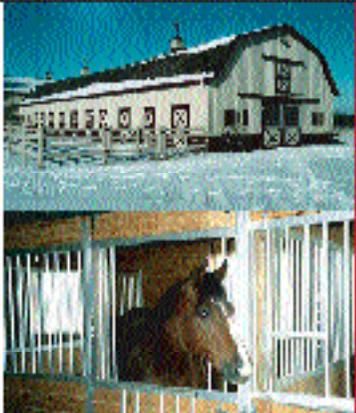


- Country Sliders
- Death Doors
- Bale Doors
- Windows
- Walk Doors
- Insulation
- Round Track Trolleys
- Square Track Trolleys
- Polycarbonate



- Steel Horse Stalls  
Black, Gray, Green, or Red
- Alum. Horse Stalls  
Mill or Black

655 Lawrence Avenue • P.O. Box 235 • Walnut, Wisconsin 53183-0235  
Tel: 408-366-2161 • Fax: 408-366-4526 • Fax: 408-366-4566



Call today! Free literature & accessories • New frame building construction • Big frame building construction • Equine • Horse feed

**Circle Reader Service #1318**

facturer may add a mold inhibitor to pressure-treated lumber. Mold resistant chemicals may only be effective for a limited time after application. If intended for use in an enclosed structure, it is recommended that pressure-treated lumber be specified kiln dried after treatment to a moisture content of 19 percent or less.

## Purchaser and transporter role

Wrapping and shipping options are chosen at the purchaser's discretion. The purchaser may choose not to wrap the shipment, or may choose a paper wrap that covers each unit (lumber on five sides) or individual pieces (laminated column on all six sides). Method of shipment is also a purchaser choice.

Most wood products ship from the manufacturer on either open rail cars or flatbed trucks. For shipment on flatbed trucks, the purchaser may also choose to order a cover, usually a full tarpaulin, to

increase the level of protection.

The transporter is responsible for proper handling and timely delivery of the shipment. If requested by the purchaser, it is the transporter's responsibility to cover the lumber with a tarp and maintain that cover from pickup to delivery.

## Receiving facility role

The condition of the lumber should be checked immediately upon delivery to the receiving facility. Storing lumber under cover in an open shed or a climate-

### Wood moisture content (MC) and decay conditions

- Optimum decay condition, MC 25 percent-plus
- Marginal decay condition, MC 20 - 25 percent
- No decay, MC 20 percent or less

controlled facility would be ideal, but not common practice. If stored outdoors, it is suggested that lumber be pre-ordered with a plastic or paper wrap, or covered with a vapor-permeable tarp.

Lumber packs need to be properly bunched underneath (4x4s are recommended) to separate the material from ground contact. Storage time should be kept to a minimum in order to reduce exposure to moisture and the elements.

## The builder's role

The builder should check the condition of the lumber immediately upon delivery to the site. On the building site, lumber should be stored in an orderly fashion and protected from moisture. Again, lumber packs need to be properly bunched underneath (4x4s are recommended) to separate the material from ground contact. Keep lumber covered with a tarp or other vapor-permeable cover.

**Horseshalls**  
by **WOODSTAR**  
Wood Products Division, 2001, 3127

Quality Construction  
Peak Performance  
Proven Technology  
Award Winning Service

WOODSTAR PRODUCTS, INC.  
1-800-638-5115

Circle Reader Service #1663

**For Everlasting Coverage...**

- Innovative Products
- Heavier Galvanizing
- G100™ in Stock
- Superior Strength

888.339.0059

229 N. 5th Ave.  
Lebanon, PA 17046

24 JR Maine Drive  
Bridgton, ME 04009

7160 N 050 E  
Horse, IN 46746

**Everlast Roofing, Inc.**  
www.everlastroofing.com

Circle Reader Service #1499

Practice good housekeeping and segregate scraps from the lumber storage area. Scraps scattered about on moist ground are food for mold.

Once the builder is assured that all framing lumber is dried to a moisture content of 19 percent or less, the structure should be enclosed as soon as possible. Purchase of a moisture meter might be a good investment.

### General tips for mold control

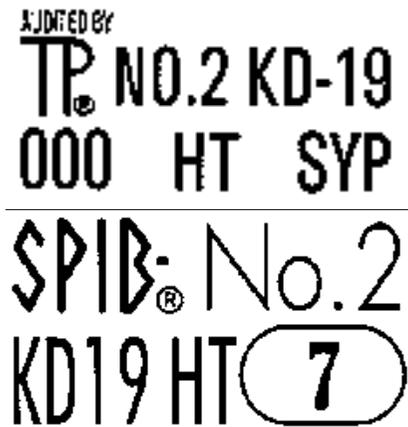
**Paper wrap** — Typically, manufacturers offer buyers the option to wrap units (lumber on five sides) or individual pieces (laminated columns on all six sides) with special paper wrapping for additional protection during shipment and storage. Effective paper wrap can be damaged during transit or storage, so it should not be the only step taken to protect wood products stored in the lumberyard or at the jobsite.

**Proper shipping** — Most wood products are shipped from the manufacturer on open rail cars or flatbed trucks. Paper wrapping can increase protection against moisture intrusion; covering units loaded on flatbed trucks with a full tarpaulin will increase the level of protection as well.

**Jobsite** — Inspect the wood products immediately upon delivery to the jobsite.

Verify an industry-certified grade mark. Stamped on every piece of material, this mark ensures the builder that the manufacturer has graded the material in compliance with the appropriate product standards. Southern Pine or other kiln-dried lumber stamps should include “KD19” or “SDRY” as part of the grade mark indicating the material has been kiln-dried to a moisture content of 19 percent or less.

Confirm the moisture content with a



moisture meter if questions arise concerning the material’s delivered moisture content. Once the builder has verified that all framing material delivered to the site has a moisture content of 19 percent or less, the material should be used as quickly as possible.

Protect lumber stored at the building site from moisture. Units need to be properly supported at least 4 inches off the ground, and covered with a tarpaulin or other vapor-permeable cover. To limit exposure to moisture, jobsite storage time should be minimized and the structure enclosed as soon as possible. Practice good housekeeping and segregate scraps from the lumber storage area. If mold is found on wood products during construction, clean the material and allow it to dry before using it within the structure.

**Water damage** — In a remodeling or flood recovery situation, clean any mold found on or in an existing structure. Identify and correct any moisture sources. Allow all framing material to thoroughly dry below 19 percent moisture content before enclosure. Ventilation is the key to proper drying. Keep all doors and windows open and, when possible, use fans to accelerate the removal of moisture.

### Conclusion

Although poor construction and maintenance practices can create conditions that exacerbate the growth of mold, the presence of mold in modern buildings has not necessarily increased. However, extensive media coverage of high-profile mold litigation has heightened public awareness about mold and alleged mold-related illnesses. Some building owners and other parties have used the presence of mold in buildings to pursue legal action against construction industry professionals. Builders and suppliers should take appropriate steps to avoid mold growth, and architects and engineers should keep ventilation, condensation and drainage aspects in mind, to avoid potential problems that may arise from mold infestation. ■