No Water, No Mold

By Steven Ferry

We've been hearing a lot about water intrusion, and mold in buildings and everyday building materials over the last several years, and the media reports point the finger at poor workmanship. From Texas we read about "legal and health experts are blaming contemporary building materials and design for a mold 'plague' in the Rio Grande Valley ... at least 10 Texas school districts have reported mold problems in the past 12 months ... health claims by some 1,600 students and school personnel are pending." And elsewhere in the state, "Homeowners are pushing for a 'home lemon law' to protect them from mold problems they say are the direct result of shoddy workmanship."

From Illinois we hear that "$12.2 million won't
be enough for the reconstruction planned at St. Charles East High School and the Norris Cultural Arts Center after mold was discovered there last spring.”

In Miami there are reports of “mold and mildew problems plaguing the district since the mid-1990s,” and in California, the Board of Trustees at a university has named the general contractor, several subcontractors and a few product manufacturers as defendants in a lawsuit seeking millions of dollars in repair or replacement costs for a 15-story student apartment building that has been closed since toxic mold was found in its walls. Within a year of occupancy, students reported soggy carpets, leaky roofs and moldy, water-stained walls. The GC is suing many of its subcontractors, who in turn are suing each other. And meanwhile, none of them have been able to establish why the building is leaking. Perhaps the findings of an independent team hint at some of the reasons: interior face exposed gypsum board, sealant failures, surface cracking and water ponding on the roof.

None of the half-dozen contractors, all of whom are members of the Association of the Wall and Ceiling Industries—International, that we surveyed had run into legal problems over mold or experienced any real problems with it, which is not surprising, given that the fly-by-night operators who generally can be found behind all the trouble are not likely to pause long enough to ask for membership in AWCI. Two members did note that they have run into mold as a potential issue when “asked to proceed on a project that didn’t have the correct environmental conditions to be hanging drywall.” The way this fellow New York contractor deals with having to work at a site before it is “fully closed up or when fireproofing is done after the wallboard, is to send in paperwork when materials become damp, stating that we were instructed to install the product and are not responsible for problems from other trades. That way we are paid to come back and rebuild.”

You Want What?

Each of the contractors canvassed had heard rumbles about mold becoming an issue. While none had experienced problems obtaining insurance because of mold, they all became aware that this was about to become an issue. One in Michigan, in fact, was about to renew his coverage and was not sure what to do about insurers “plain not wanting to quote you at all, or putting restrictions on policies.”

Bill Williams, vice president of Acordia’s Construction Division for the Southeast and known as “the walls and ceilings guy” by his clients, provides a close-up on what contractors are picking up on their long-range radar. He explains, “The insurance companies have notified us that they are going to add mold as an exclusion and will issue an absolute endorsement. I have not seen one yet to know what the language will be. That means there will be no coverage. It’s obviously not retroactive and will probably be area-specific to start, as it isn’t a big issue in Arizona, for instance, but is in the Southeast. Insurance companies are generally slow to respond on these things, and we may wait a year or two before these endorsements find their way onto policies.”

His advice is for contractors to negotiate with their insurance carriers to find some way of buying back the coverage. Do your job diligently and watch your contract language. Try to get several quotes and compare the language in the endorsements, as each carrier will be different until there is a standard exclusion. ISO, Insurance Service Office, drafts the language for standard insurance forms, and I have not seen one relating to a mold exclusion yet. If you do business with a large brokerage that has access to and can negotiate with most of the carriers, you have a better chance of finding one who can meet your needs.”

As for the long-term insurance prospect, Williams continues: “The market will be tight. Insurance was sold too cheap for too long in certain segments—like general liability and umbrella coverage policies. The rates were already starting to go up to remedy this so the insurance companies could stay in business, when Sept. 11 rocked the insurance world. It was far worse—between $36 billion and $58 billion for every form of insurance, compared to the worst recorded, single incident in history, 1992’s Hurricane Andrew, which hit $19.65 billion. Insurance rates are going up from 10 percent to as much as 300 percent for those that are heavily property oriented.”

Substandard workmanship, design and excessive moisture are real problems—whether the issue is licensing requirements and policing, price-driven, uneducated consumers, or the criminally inclined person op-
erating out of a pick-up truck—but they are not the whole story.

Litigation is as inevitable (and ubiquitous) as mold, given the propensity of lawyers to feed on public fears. But where there is smoke there is invariably fire, or more accurately, where there is mold, there will be damp.

Rather than blame everything on everyone’s favoring whipping boy—lawyers—let’s review the facts so we can avoid not only the aggravation that mold brings for one and all, but also speak up when talking to customers, general contractors, owners, the media and, if it ever comes to it, lawyers. As Williams points out, “There is strength in adversity. This upcoming purge may be tough, but it will make the good guys look better and the bad guys go away.”

Mold 101

Without mold, life would be pretty rough, as mold is a vital ingredient in breaking down decaying organic matter into forms that can be utilized by subsequent generations of plant and animal life. Technically, mold grows on surfaces, and mildew grows on fabrics. They are both types of fungus, which make up a quarter of life on earth. So far, so good.

If you want to build something using materials that mold considers tasty, you need to look no further than wood and paper. Even inorganic matter like painted surfaces, metal and bare concrete have a mix of organic nutrients, such as dust or soil and moisture, which mold also finds tasty. That doesn’t leave a whole lot of alternative options for building materials.

Given the right conditions, mold can be off and running in two days flat. That doesn’t leave much room for error in terms of construction. So what is the Achilles’ heel of mold that will prevent it from running amok in construction environments?

Much like any life source, fungi need
three things to colonize: something to eat, something to drink and a comfortable temperature range.

In terms of food, modern houses are a veritable smorgasbord of succulent choices: gypsum wallboard, oriented strand board, ceiling tile, paints and fabric wall-coverings are rich in added binders and resins. Other porous materials are ripe for the plucking, as mold settles in and either breaks down the material itself or chomps on organic debris stuck in it. While traditional construction and finishing materials contain natural chemicals that help retard this process, modern products not only lack natural mold busters but offer them the finest of nutrients.

As for temperatures, like most people, molds don’t procreate too well in chilly environments, but crank up the temperature to 75 degrees Fahrenheit, and it’s not just humans that are happy.

So far, we’ve not covered anything that general contractors and subcontractors can do much about. Which brings us to the third element: something to drink. Molds need enough moisture for long enough to colonize, and that’s where architects and contractors come in. If a building is so tightly wrapped that moisture cannot escape, if water vapor condenses on substrates, or if the building envelope leaks, then we have a recipe for mold. We also have its Achilles’ heel.

Turning Off the Tap

If moisture is the point to attack, then in what ways does moisture enter a building? There are three principle conduits. New materials and production techniques over the last three decades have resulted in wonderfully energy-efficient, tight buildings. This rush to solve the energy crisis has created two more: building interiors with higher relative humidity and concentrations of pollutants following lower exchanges of air between interior conditioned spaces and the great, fresh outdoors.

Secondly, the ubiquity of mechanical HVAC systems means that tight building structures are now also subjected to continuous depressurization and pressurization, forcing moisture-laden air into wall cavities where thicker insulation takes longer to dry.

The internal surfaces of exterior walls also become damp in cold areas of the country, as the moisture in room temperature air condenses. In warm climes, the same surface is affected for the opposite reason:
the colder inside air condenses the humid air infiltrating the envelope from outside. So where envelope vapor barriers are placed on the cold side of insulation, moisture cannot escape.

Lastly, and most obviously, precipitation finding its way into a building through holes around windows, doors and roofs, etc., or loosely constructed building envelopes that allow humid air to waft in, all resulting in a regular party for mold colonies. All they need is about 75 percent relative humidity for a period of two days to be on a high. Or perhaps, as noted above by two contractors, the party began earlier when the materials became damp during construction.

Thinking Ahead Avoids Being Caught in the Rain

Rather than becoming another headline, therefore, the smart way to avoid mold eating away at the bottom line is to close the door on it during the design and construction process with proper water intrusion and moisture control measures. This means taking into account the different environmental factors a building will be subjected to, whether from the weather, the use the building is put to, and its occupancy and maintenance levels. It’s a question of knowing how building systems interact and designing them, choosing and then installing materials, so as to prevent water and moisture intrusion and build-up while maintaining a constant indoor RH below 60 percent.

In a nutshell, don’t let the water in but let accumulated water and moisture in wall systems either evaporate or drain to the building exterior. It’s no different with clothing being waterproof and yet breathable, and for a building, requires knowing how and when to use vapor barriers and how to manage inside air pressures and flow.

What does this mean specifically?

In terms of a tight building envelope, simply making sure that no gaps are left around window and doors or openings around joints at roof, ceilings, floors, soffits or wall vent systems. It means proper installation of flashing to direct water flow away from critical building elements.

To prevent water infiltration, create an effective rain barrier and drainage system on the exterior side of the stud cavity. And use materials that comply with the building code and install them per code and manufacturer’s recommendations.

As for controlling condensation, one first has to understand how different climates create condensation so one can provide the appropriate control measures. Pivotal questions to answer are: where to locate the air barrier, whether or not to use and where to locate a vapor barrier, and what type of wall covering or paint to use.

In hot, humid climates, the moisture outside has to be kept there. If it enters and encounters cooler indoor surfaces, it will condense. In this environment, the air barrier should be immediately by
the exterior wall, with the vapor barrier (if installed) positioned between the air barrier and the insulation on the external section of the building envelope. Insulation will help stabilize temperature and reduce moisture-causing fluctuations. Avoid vapor barriers in these climates, however, as they tend to trap moisture that then condenses on inside cold surfaces. Also steer away from impermeable wall coverings such as vinyl in favor of permeable paints and wall coverings on internal surfaces. Lastly, ensure the HVAC system maintains an overall positive pressure so as to prevent warm, moist air from entering the building.

Conversely, in cold climates, the idea is to keep warm, moist air inside, not leaking toward the exterior where it cools and condenses in the wall cavity. The ideal here is to locate the air barrier by the interior wall with the vapor barrier lying between the air barrier and the insulation. Vapor barriers should be placed on the warm side of the wall, between the drywall and the studs. Reduce indoor moisture levels at source and ensure good air circulation so interior surfaces experience an even and warm temperature. As a note, when measuring RH levels, realize that while a low ambient RH is desirable, the trick is to measure the RH right by the various substrate and so detect cold spots or water intrusion locations where the RH is actually above 70 percent.

Looking for Mr. Right

In deciding which materials and finishes to use, look for those that allow air and moisture to move freely through the wall system. Install permeable materials on the cold side of a wall system and low permeable ones on the warm side so water vapor migrates from the wall cavity into the interior space. With a positive pressure inside a building relative to the outdoor, dry indoor air will flow outward through the wall structure and lower the RH inside the wall structure. Building materials differ in their support of fungal growth. When organic materials are added, or the material surface becomes degraded through exposure to the elements, including ultra-violet radiation—turning their organic components into nutrients—then mold is more likely to occur. With temperatures in the
sixties and 90 percent RH, no building material can resist fungal growth. But given less benign environments for fungi, it takes longer and wetter conditions for them to colonize stone-based materials such as cement screed, gypsum wallboard, and concrete. It’s easier, on the other hand, for them to establish colonies (in other words, they need less moisture and time) in wood-based materials such as particleboard, fiberboard and plywood made of softwoods.

As always, where there is a problem, folks stretch the technology sooner or later to come up with a solution. In the case of mold, there is now a new system that uses calcium hydroxide, a naturally occurring biocidal agent. What is unique about this technology is it uses selected microencapsulating polymers to bind to the calcium hydroxide to keep it from rapidly degrading when the compound is exposed to ambient air. When either applied to or built into walls, ceilings and floors, this new technology kills fungi and prevents them from encroaching for years.

This technological advance may well be taken as a license by the pick-up truck mob to continue to build shoddy structures that will eventually bring them and their structures down. But for the rest of us, it is another tool in the box to complement the strategy of good design and workmanship, and another nail in the coffin of mold. For a full rundown on mold, how to avoid it and how to deal with when it does disfigure work done, the Foundation of the Wall and Ceiling Industry has commissioned the Chelsea Group, Ltd., a consulting company that specializes in indoor air quality and indoor environments, to write a white paper on the subject that will fill in all the blanks and hopefully, send lawyers looking elsewhere for their growth.

About the Author
Steven Ferry is a free-lance writer based in Dunedin, Fla.

For More Information
Call (703) 534-8300 to order a copy.

The Foundation’s publication, or visit www.awci.org to download it.

For more information on the subject of indoor air quality, visit www.chelseagrp.com.