Keeping mold and moisture at bay

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Mold and moisture in buildings have become front-page issues. While people search for causes, we know it is not caused by energy building standards. Even areas of the country without energy requirements in their building codes still have these problems.

There are hundreds of different types of mold – not all are harmful. A couple can be deadly. There have been many cases of mold problems in older homes without insulation, which have no house tightening requirements. We will continue to have mold issues in the future. Here are some things to consider.

Moisture in a hotel closet from a steam iron leads to mildew problems in this enclosure. Photo courtesy of the Oregon Department of Energy.

Adequate Ventilation

There are plenty of homes built in the 1900s whose construction allows them to "breathe" (also referred to as drafty). Many of these homes end up having rot problems. Rot is not a new problem associated with modern, energy-efficient homes. The percentage of rot is currently no higher than it was prior to stringent energy code requirements.

Allowing a house to breathe does nothing to assure adequate ventilation. The exterior envelope of a house must be 1) tight on the interior side, 2) allowed to breathe on the exterior side, and 3) provided with mechanical ventilation that gets used by the occupants or operates continuously. There are times (referred to as buffer periods), generally late spring and fall, where outdoor and indoor temperatures are nearly identical. During these periods, when there is no wind, you can open a window and not tell if air is coming in or going out. Even a drafty house that breathes has no natural ventilation in these conditions.

Even with code-complying ventilation installed, homeowners may have misconceptions about how to use ventilation. They may assume that ventilating draws warm air out of their building, increasing operating costs and causing drafts.

Construction Practices and Scheduling

There are also other factors – construction practices and scheduling – that increase mold and moisture problems. We are not referring to all builders because this is not happening to most homes.

How the exterior of a house is sealed is often neglected or it is assumed that a good caulk will do the job. Caulk has a life of about five years before it deteriorates and loses its seal. Proper installation of flashing, windows and the "weather barrier" around windows is often not understood. A window that has been poorly installed and subsequently caulked well may not have any problems for a couple of years. However, caulk should be a secondary preventative measure, not the primary measure.

Installing single wall panels such as T1-11 or Hardi-Board without building paper complies with code. However, not providing a drainage plane such as that created by properly installed building paper, may not keep water from entering the wall at the seams.

Prior to 1990, most home construction did not occur during the winter rainy season. Homes under construction would get weather-tight (roof and walls on) before winter. Since about 1992, home building has been year-round. Some homes constructed during the rainy season are not allowed to adequately dry out prior to insulation and drywall, even though code requires it.

Exteriors

Exterior Insulation Finish Systems (a synthetic stucco-like material) does not create moisture and rot problems. It is the improper installation of the Exterior Insulation Finish Systems (EIFS) that creates problems. Water will get behind EIFS, just like it can brick, masonry or any other type of siding. By not providing proper sealing and flashing, moisture is allowed to get into walls.

EIFS is probably the best method of insulating concrete or concrete-masonry unit (CMU) buildings and many are using it on ICF (insulated concrete form) homes.

Naturally Humid

Consider this scenario: you have a 6-by-8-foot bathroom with an 8-foot ceiling and a 50 cubic feet per minute (CFM) fan. Due to standard ducting practices, this fan may actually be removing only 25 CFM under best conditions. The room contains about 380 cubic feet.

You forget to turn the fan on before getting into the shower. The fan will help reduce the humidity in the room as the shower elevates moisture levels. Getting out of the shower you notice the mirror beginning to fog over, which means the room relative humidity is saturated, so you turn on the exhaust fan. Five minutes later you're done and shut off the fan when you leave the room.

There are two potential problems with this scenario. 1) The bathroom door has been closed so no makeup air is provided – so the fan is not really exhausting anything; and 2) 380 cubic feet / 25 cubic feet per minute = 15.2 minutes or the amount of time it would take to fully turn over the air in the room.

A better practice is to have a crank timer in the bathroom, which will be turned on prior to bathing and will run at least several minutes after leaving the bathroom.

Simply saying we need to insulate less and

let the house breathe is not the solution. Less insulation means increased heating bills and decreased comfort. Allowing the house to breathe is not a viable way to assure ventilation without creating an uncomfortable environment.

Mike Steffan, quality director at Walsh Construction Co., created a good, concise report on the best practices for mold and rot prevention.

Other Building Science Issues

Building Pressurization: We have seen some risky standard construction practices. These include:

1) Large volume exhaust fans such as downdraft ranges or commercial-grade hoods.

2) Depressurization caused by lack of return air ducts or system integration.

3) Locating air handlers where toxic materials are stored.

Large volume exhaust fans: Downdraft ranges or commercial-grade hoods have become popular in new homes. A commercial-grade exhaust hood cannot be installed in a commercial kitchen without the required make-up air capability (Mechanical Code requirement - that is not contained in the Oregon One and Two-Family Dwelling Specialty Code). The exhaust capacity of most downdraft range fans is substantial enough to cause depressurization.

The kitchen is almost always an open room – not enclosed by walls and a door. There is generally enough transfer air via adjoining rooms to provide make-up air for the exhaust. But, even when one of these fans is installed in an old leaky house, a high negative pressure may be created. The path of least resistance can be via the chimney (even with the damper closed) in the adjoining room. This becomes a problem when the fireplace just recently had a fire in it. The negative pressure can pull in soot and ash that will stain light-colored carpeting.

Combine this negative pressure with a clothes dryer located in a hall closet, which is nothing more than a big exhaust fan. Then add the negative pressure that is described in the depressurization section below. Toss in a gas water heater that is not a sealed combustion unit (most are not), and there is the potential for back drafting into the house when the water heater is located within the house.

Depressurization: Caused by lack of return air ducts or system integration, depressurization is becoming very common especially in larger homes. Home systems would function much better if installed as commercial heating, ventilation and air conditioning (HVAC) systems where there is a supply and a return air duct in each room.

If a small house has a single return air duct, the supply air can be returned when the doors in all rooms are left open. When the doors to individual rooms are closed, negative pressure is created in the areas and adjoining zones surrounding the return air register.

Systems integration may include a way to prevent system depressurization. An example would be louvers in the doors, louvers above the doors (where structurally feasible), or an undercut door that allow adequate air movement when the door is closed.

Keeping those measures mentioned above in mind, larger homes may require more than one return air register for each air handler.

Toxic Materials: Some people store harmful household chemicals in their garage rather than under the kitchen sink or elsewhere. The most common location for installing the air handler is in the garage. Most air handlers are notorious for being leaky. This means that not only is cold garage air drawn into the system, it could be pulling in residue from the chemicals stored in the garage.

Locating the air handler in a central part of the house it is serving is much more efficient, safer and healthier.

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