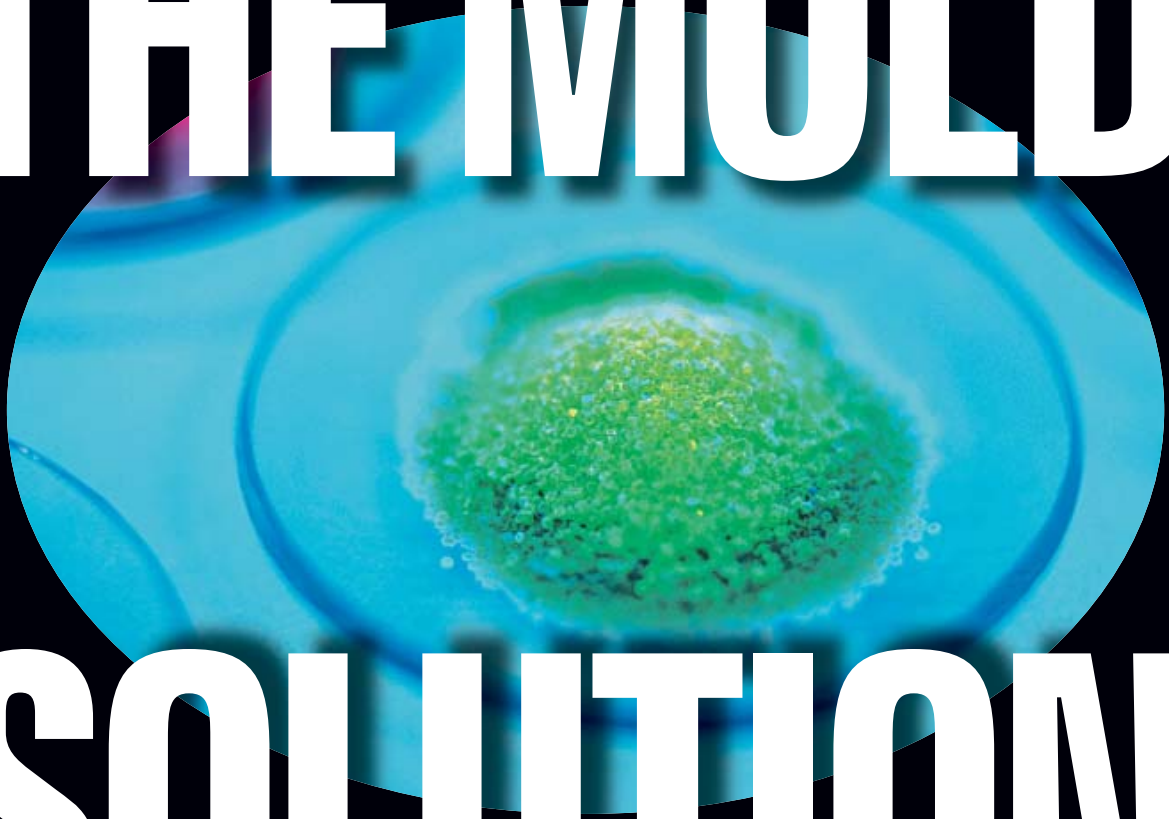
Concrete Masonry DESIGNS

CONTINUING EDUCATION AIA

THE MOLD SOLUTION



MOLD–What are the issues? What are the solutions?

This issue of *Concrete Masonry Designs* is dedicated solely to one topic—Mold—with the goal of explaining what mold is, why mold has suddenly become such a hot topic, and how building materials, construction practices, and design details can relate to mold growth.

The concerns stemming from mold growth can impact all aspects of business practices in all sectors of the construction industry. Unfortunately, breaking down the mold topic is very complicated. Until consensus design and construction practices are established, here is a brief list of what we know, and don't know, about mold growth in construction.

Mold has been around longer than any human, yet our understanding of this issue is only in its infancy. We do know the environments under which mold can grow and flourish—areas with food, moisture, moderate temperatures and oxygen. We do know that moisture within buildings can come from numerous sources —rain penetration, condensation, improperly sized air conditioners, showers and baths, and zoned HVAC systems to name a few. We do know that an increased demand for builders to erect structures faster has increased the possibility of construction errors that may result in leaks in both the structure and plumbing. We do know that continued efforts to reduce the cost of initial construction has resulted in more and more use of lighter-weight materials that provide more food on which mold can grow. Research on building sciences has dictated that we strive to reduce air leakage in our structures to make them more energy efficient. We do know that the deleterious side effect of this practice is a reduced buffer against the formation of mold. And, unfortunately perhaps, we know that there is no feasible method of completely eliminating mold from the environment.

While the mechanisms that can lead to mold growth are well understood, the reasons for observing more prevalent problems in recent years are not. It is likely that the increased frequency of the presence of mold in buildings is a by-product of the evolution in how we build and design our structures. Unlike other deleterious substances, mold has no established permissible exposure level. As such, many have adopted a zero tolerance level, which is impossible to comply with in an environment where mold is omnipresent. Upon exposure to mold, inhabitants of a building can experience a wide range of physical reactions, varying from none to severe depending upon the individual, the concentration, and type of mold.

As a design professional, you are challenged with all of these issues in reducing the potential for future mold growth in the finished structure. Selecting concrete masonry as your building material will not, by itself, guarantee that mold will not become a problem in your building. However, concrete masonry does have a lot of inherent properties that can be taken advantage of to reduce the potential of mold formation: it does not provide a food source for mold, it does not rot, and it can be cleaned.

The concrete masonry industry is dedicated to providing technical information on the proper design and construction of concrete masonry structures to keep moisture out of the building where it can result in damaging effects. For more information about how to achieve these objectives, refer to the literature and resources available from NCMA at www.ncma.org.

While concrete masonry is not the only answer—it is an answer. Consider the susceptibility of your building materials as carefully as you make all of your design decisions. ■

TECHNICAL RESOURCES

e-TEK

NCMA's TEK series is available online FREE to architects, engineers and specifiers. The TEKs include more than 130 technical bulletins on various topics related to concrete masonry with a new a TEK published monthly. In addition, many others are revised and undated to reflect code or building design changes as necessary.

The Web site-accessible e-TEK service can be reached through NCMA's member Web sites that sponsor the program. A listing of sponsors complete with hot-links to their sites can be found at www.ncma.org. Click on the TEK manual icon and a map pops up where you can then select your local concrete masonry producer. Either search by keyword or click on the table of contents and then select the TEK desired. Each TEK is complete with details and photos. This service allows viewers to be supplied with the latest up-to-date information on concrete masonry. For those of you who still prefer the hard copies of the TEK, NCMA will still be making those available as well as the TEK update service for the TEK Manual binder. ■

Concrete Masonry DESIGNS

1/03

ON THE COVER:

Concrete masonry is a solution to the mold problem because it is not a food source.

FEATURES

DEPARTMENTS

Concrete Masonry Designs showcases the qualities of design and construction using concrete masonry.

Concrete Masonry Designs is completely devoted to design techniques using standard and architectural concrete masonry units; concrete brick; unit concrete pavers and segmental retaining walls; and other concrete masonry products around the world. We welcome your editorial comments, ideas and submissions.

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MOLD ATTACK!

It's been called "the new asbestos of litigation." So what's the lowdown on mold hysteria?

by David Holzel

Every child learns that penicillin is made from mold, and that bread will not rise without the help of yeast, a relative of mold. These facts have helped draw a benign face on the microscopic fungi that are otherwise associated with decay and neglect. But all the positive spin from a powerhouse public relations firm won't help in the mold hysteria that is spreading fears about "black mold" and "toxic mold syndrome," and resulting in multi-million-dollar insurance claims.

The $32.1 million that a jury awarded a Texas family for mold damage in the unfortunately named town of Dripping Springs is already legendary. Mold has been called "the new asbestos of litigation" and insurance companies from coast to coast are reacting by raising premiums, petitioning states to cap damages and, ominously, declining to write new policies altogether.

In this unstable environment, the building industry is taking a new look at how it can adjust its practices to make new homes less susceptible to mold infestation. "Mold is one of the most important issues that builders face," Bruce Smith, president of the National Association of Home Builders, said last year.

If there's any good news, it is that mold growth *can* be discouraged, contained and remediated. So what is mold? How does it grow and do its damage to people and buildings? And what can be done about it?

Molds are a type of fungus, which spread by means of airborne microscopic spores, just as plants propagate from seeds. ("Mold" and "mildew" are often used interchangeably, with "mildew" also specifically referring to fungal growth on plants, such as "powdery mildew.") Mold spores are everywhere in the environment, outdoors and in, but to flourish they require four things:

- **Oxygen**;
- **Moderate temperature**—40–100° F (4–38° C);
- **Food source**—The food of choice in buildings is cellulose, making wood, dust, paper, drywall, adhesive, ceiling tiles, batt insulation, paint, plywood and cardboard fodder for a mold colony. One building product not on any mold's menu is concrete block or provide food for mold growth. So unlike organic building materials, concrete does not rot;
- **Moisture**—Mold doesn't require standing water, leaks or floods to grow. A high relative humidity is enough to encourage mold to flourish.

Without all the above four elements together, mold cannot grow and spread. And of these, for existing structures, moisture is the easiest to control. So when experts are confronted by a mold problem, they turn to the presence of moisture.

Three ordinary sources can lead to moisture in the home:

- **Leaks and flooding**—A slow long-term leak resulting from poor construction or homeowner neglect can cause serious problems if left uncorrected. Chronic sources of water infiltration include roofs, flashing problems, ice dams, doors, windows and foundations.
- **Condensation and airborne moisture vapor**—Like a sweaty can of cold beer on a hot day, warm air can condense on a cool wall, whether inside the wall cavity or inside the residence, and provide a homestead for mold growth.

Moisture in the air can encourage mold if the relative humidity reaches about 60 percent. Relative humidity refers to the ratio of the amount of moisture in the air to the maximum amount of moisture the air can hold. Warm air can

hold more moisture than cool air. So in the winter a home can reach the threshold of 60 percent humidity with relatively less moisture than in the summer. It's also why cool basements often feel humid or damp, and can become musty smelling—a sign of mold growth.

■ **Air leaks**—Forced air leaking into the house under sill plates and around doors, windows and electrical outlets can lead to vapor condensation in wall cavities and mold growth.

The Damage Done

Sometimes it's the little things you miss the most. Like roof overhangs.

"A lot of buildings are constructed now with no overhang on the top floor. The result is rain infiltration," says Michael Glassco, operations manager for Theodor Sterling Associates, indoor air quality and mold consultants in Vancouver, British Columbia.

Like many, Glassco sees the recent spike in mold problems partly as the result of increased public awareness. "Mold has been around longer than we have," he quips.

But it's also true that changes in the construction industry—such as the trend toward the use of organic materials—have been good for mold growth. "Certain molds like to grow only on certain materials," he says. "Building materials have changed over the years, so these molds have become problems."

Ironically, the trend since the energy crisis of the 1970s to make homes more energy efficient has also created more fertile breeding grounds. According to the National Association of Homebuilders (NAHB), homes built today are 50 percent more energy efficient than those of 30 years ago, largely by tightening the envelope. A drafty old house will more likely have the air circulation necessary to permit moisture from cooking and bathing, thus discouraging mold.

But improper building techniques can also be the culprit. Vancouver, B.C. is suffering from what's been dubbed the Leaky Condo Crisis, a billion-dollar mold problem, Glassco says. Wood-framed multistory buildings, faced with synthetic stucco, developed mold infestations within a few years of construction.

Investigators found rot and mold in tenants' suites and in the cavity between the synthetic stucco and wood. "The problems had to be remedied by scaffolding the whole structure and tearing off the stucco and the rotted and wetted materials," he says, and then replaced with new materials.

In addition to being subject to major repairs, the buildings were given roof overhangs and rain screens that allow rain to drain from wall cavities.

But it doesn't take such wholesale destruction to cause major problems. "The North American insurance industry estimates that within the past 10 years about 9,000 toxic-mold lawsuits were filed in the United States and Canada. The number continues to increase dramatically with no end in sight," according to a report in *Professional Roofing*, a publication of the National Roofing Contractors Association.

The result is the increasing reluctance of insurers to insure. The *San Jose Mercury News* reported that "State Farm, California's largest insurer, decided…that it would no longer write new policies in the state…in large part due to the rising cost of mold related claims." Other insurance companies are putting a moratorium on writing new policies. And, one state insurance administration after another is receiving insurer requests to limit or exclude mold coverage.

Insurers would clearly rather be safe than sorry, according to *The Washington Post*. "Industry spokesmen say they can't offer much in the way of hard data on mold claims because until recently they have generally been a subset of water claims," *The Washington Post* wrote. "But the insurance industry is built on probabilities—and the insurers don't like their odds with mold litigation."

So how much mold is too much? The fact is there is no health-based standard for exposure to mold. "Because there is a lack of established standards in this area, businesses have no way of evaluating the safety level of its existing air quality," writes W. Edward Carlton, an attorney with the Dallas firm of Strasburger and Price, who focuses on indoor air quality, toxic tort, construction defects and product liability claims.

Concrete masonry is NOT a source of food for mold

Preventing a Mold Attack

Mold consultant Michael Glassco talks about homes in Vancouver that are so moist, mushrooms grow in dark places in the family room behind the TV. But mold is not just a problem in regions commonly considered to have damp, rainy climates. The largest number of mold claims—some 70 percent—are being filed in Texas, according to *The Washington Post*.

To prevent mold, the primary focus should be on eliminating sources of excessive moisture. Obvious sources of moisture infiltration are from leaks in the exterior envelope of the building, but high indoor humidity can be just as damaging. As such, the NAHB recommends keeping humidity levels below 40 percent during the heating season and below 60 percent during the cooling season.

Unlike building products that contain organic materials such as wood and paper, concrete masonry is not a source of food for mold. However, dust or other organic debris that accumulates on the surface of a block can sustain mold growth. Even so, the design and construction of any building must consider the building as a system—a system comprised of a building envelope, HVAC systems, architectural and interior design elements—each weighed against the intended use and application of the building. When all of these design variables are considered together combined with materials that do not provide food sources, the chance of mold growth occurring is virtually eliminated. ■

Prevent MOLD by Preventing MOISTURE

By Maribeth Bradfield, P.E.

Occupants and building owners are increasingly concerned about indoor mold exposure, particularly in schools, where children are the primary occupants. The U.S. Environmental Protection Agency (EPA) estimates that about one of every five U.S. residents spends their days in elementary and secondary schools, about one-half of which have health problems linked to poor indoor air quality (ref. 11). This was brought home in Madison, Wisconsin, where pride and excitement over the first new public elementary school in thirty years quickly waned when the school was closed only three months after opening to undergo a $1.5 million mold and moisture remediation program.

Last fall, the Madison Metropolitan School District engaged industrial hygienist Sharon Bessa, principal with Sharon J. Bessa & Associates, to investigate complaints about air quality at Cesar Chavez Elementary School. After a full inspection, sizeable mold blooms were found in about one-third of the school's rooms. According to Bessa, "we started pulling back baseboard and kept finding more and more mold. This is not atypical of a mold problem. The initial discovery of mold leads to the discovery of mold in other areas as well, often from various sources." Remediation began almost immediately, with the largest effort going into removal and replacement of gypsum wallboard partitions with visible mold.

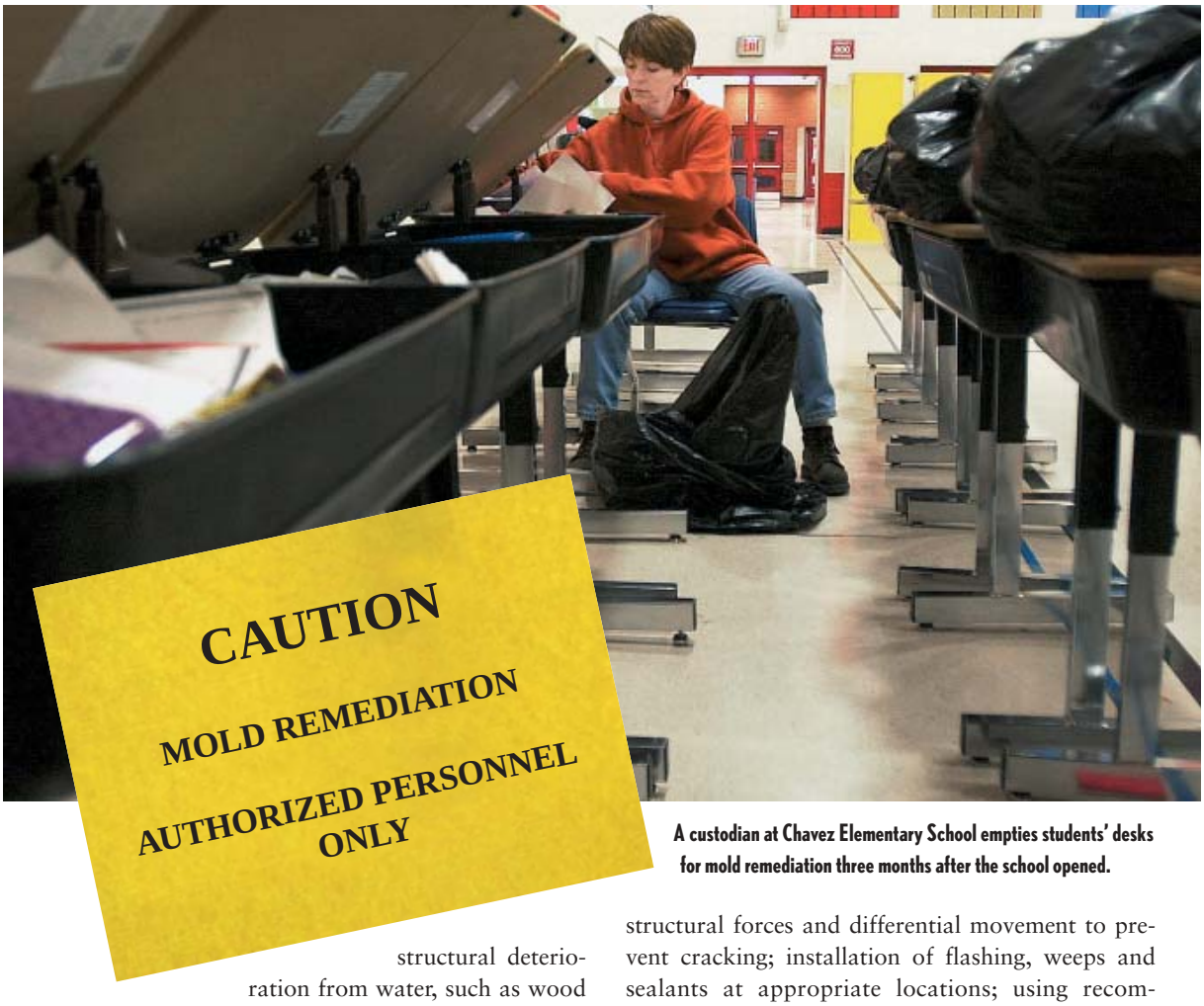
With the removal and replacement of substantial areas of new wallboard, insulation and acoustic ceiling tiles, Chavez Elementary is now fully functional again. Fortunately, mold problems such as this can be prevented with steps to control moisture. In addition, building with exposed concrete masonry interior partition walls eliminates the need for drywall—a breeding area for mold.

Mold

Molds are part of the natural environment. In nature, molds work to help break down organic matter such as downed tree limbs and leaves. While not typically a problem indoors, they will, unfortunately, grow and consume organic matter in the indoor environment as well if conditions are favorable. Not only can mold growth in buildings be destructive to the structure, some studies have linked some mold types to catalyzing or aggravating health problems.

Moisture Prevention

Moisture, typically liquid water, can cause a variety of problems in buildings. The severity of the problem depends on the exposure and the building material. For example, some materials are subject to



A custodian at Chavez Elementary School empties students' desks for mold remediation three months after the school opened.

structural deterioration from water, such as wood rotting or rusting of steel components. While all building materials can act as a substrate for which mold can grow on, only organic materials provide a food source to sustain mold growth.

Just as mold spores are blind to the type of substrate they'll grow on, they do not recognize or prefer one moisture source to another. In addition, liquid water is not necessary for mold to occur, as high indoor humidity levels will also support mold growth. Mold can flourish with moisture sources as diverse as a leaky roof, condensation, failure to cover partially constructed walls during rainstorms, unvented combustion appliances, poor site drainage or something as simple as installing carpeting in a perpetually wet area, such as under a drinking fountain.

Eliminating moisture sources requires a comprehensive approach, encompassing good design and proper material choices, quality construction procedures as well as follow-through on an appropriate building operation and maintenance plan.

Methods to reduce environmental water entry are well documented for concrete masonry construction, and include such items as: proper design for structural forces and differential movement to prevent cracking; installation of flashing, weeps and sealants at appropriate locations; using recommended construction and cleaning procedures; and detailing to protect roofs, windows, joints and other features to minimize water entry. As a complete discussion is beyond the scope of this article, the reader is referred to the sources of detailed information included in the reference list.

Condensation can occur within the walls or roof of a building as well as on interior surfaces. To prevent condensation, surface temperatures must be kept above the air's dew point temperature. The dew point temperature increases as the air's relative humidity increases, i.e., humid air will condense at warmer temperatures than will drier air. Therefore, controlling indoor humidity levels helps prevent condensation.

Condensation control focuses on preventing air flow (which can carry significant amounts of water vapor) through the building envelope; interrupting water vapor diffusion, typically by using a vapor retarder; and maintaining temperatures above the dew point for surfaces exposed to moisture, typically by installing insulation. The first place condensation occurs is near a room's coldest surface. For example, a gap in insulation at the wall/ceiling

"I don't usually see an issue with concrete masonry."

interface results in a cold area where condensation is more likely to occur. Hence, ensuring the continuity of insulation and air and vapor retarders, if used, also helps prevent condensation.

Condensation can occur in either summer or winter, depending on climate and moisture conditions. Design strategies for moisture control under heating conditions often differ from those for cooling conditions, even though the basic principles of moisture transfer are the same. Recommendations for positioning air and vapor retarders relative to insulation and relative to each other depend on whether the building requires predominant heating, predominant cooling or a mixture. Reference 3 contains detailed information for condensation control in concrete masonry walls.

To inhibit mold growth due to high indoor humidity levels, the Centers for Disease Control and Prevention (CDC) recommends keeping the indoor humidity below 60 percent as well as ventilating areas where water vapor is generated, such as kitchens and bathrooms.

Action Plan for Wet Areas

Even the most well designed and constructed buildings can experience unexpected moisture due to factors such as floods, plumbing leaks or water spills. At Chavez Elementary, pressure testing of a rainwater leader led to localized flooding in the kindergarten wing, where mold was first discovered.

To prevent subsequent mold growth after water exposure, both the EPA and CDC recommend rapid response to remove standing water and dry affected areas within 24 to 48 hours. In addition, some materials should be removed and discarded once wet because of the difficulty in thoroughly drying them. For wet concrete masonry, EPA guidelines recommend removing water with a water-extraction vacuum. Gypsum wallboard may be dried in place if there is no obvious swelling and the seams are intact. If this is not the case, however, the wallboard should be removed, discarded and replaced. Ceiling tiles and fiberglass or cellulose insulation should typically be discarded and replaced. Plastics, metals, ceramic tile and vinyl flooring should be vacuumed or damp-wiped with water and a mild detergent and allowed to dry. Once as much water as possible has been removed, continuous ventilation, dehumidifiers, fans and/or heaters can be used to accelerate drying. Additionally, the source of moisture must be identified and eliminated.

Mold Susceptibility and Remediation

Under moist conditions, all building materials are subject to mold growth, even products as impervious as glass. The following provides a very brief overview for several building materials. Note that the table should not be used to determine a remediation plan. Mold remediation should include professional judgment of the situation, as well as consideration of such factors as personal protective equipment and containment.

Building materials:	Susceptible to mold growth?	Provides food source for mold?	Susceptible to deterioration from mold?	Recommended remediation if mold is present (refs. 1, 7)
Concrete masonry	Yes	No	No	Wet vacuum or high-or high-efficiency particulate air (HEPA) vacuum
Gypsum wallboard	Yes	Yes	Yes	Remove and discard if possible, or HEPA vacuum
Wood surfaces	Yes	Yes	Yes	Wet vacuum, damp-wipe or scrub surfaces, HEPA vacuum, or remove and discard if a large area is affected or if there is significant potential for occupant exposure during remediation
Vinyl, linoleum	Yes	No (although the adhesive used to lay them may be)	Yes	Wet vacuum, damp-wipe or scrub surfaces, HEPA vacuum, or remove and discard if a large area is affected or if there is significant potential for occupant exposure during remediation
Plastics, metals	Yes	No	No	Wet vacuum, damp-wipe or scrub surfaces, or HEPA vacuum

Typical mold spores found at Chavez Elementary School.

When Mold Occurs

According to the EPA (ref. 1), the basic steps to mold remediation are:

- plan remediation: assess the size of the problem and consult health professionals and remediation managers, as appropriate,
- identify the source of moisture,
- fix the moisture problem,
- clean and dry or discard moldy materials, as appropriate (see sidebar), and
- check for the return of the moisture and mold problem.

The choice of mold remediation methods will depend on the severity of the problem and the materials or areas subject to mold. For materials such as concrete masonry that are not damaged by mold, the approach is to clean the mold, dry the area and ensure the moisture source is eliminated. Most sources do not recommend trying to eliminate mold spores using bleach or other chemicals. According to Bessa, "I don't usually see an issue with concrete masonry. When it does occur, the mold should be physically removed."

The Importance of Follow-up

In schools and other large buildings, the EPA cites insufficient or delayed maintenance as a contributing factor for moisture problems. The building facilities team at Chavez has a plan in place for immediate response to any water in the building, as well as periodic visual inspection of areas previously exposed to water. Roofs, ceilings, floors, walls and carpeting should be inspected for water leakage, mold growth or moldy odors. A regular maintenance and inspection schedule helps prevent building or material failures from allowing further water entry, and makes containment easier should water entry occur.

Today, Chavez Elementary is clean and dry, providing the quality education experience that the Madison community has come to expect. It appears that several varied factors contributed to the mold at Chavez, but they all allowed moisture—either as water or water vapor—into the building. Mold can be prevented using one basic strategy, regardless of the building material involved—keep the building dry.

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PROFILES

Mold and Mildew: The Concrete Masonry Advantage

By Harry Deitzer

CONTINUING EDUCATION AIA

North Carolina is a great place to live, but like in many climates throughout the United States, residents regularly deal with issues created by the presence of water. Whether it is the highly humid days of summer or the driving rainstorms of hurricane season, the presence of water can be a source of many problems in a home, including the growth of mold.

Mark Correll of Bost Construction in the Raleigh-Durham area of North Carolina, notes that one of his first priorities in home design is "keeping the water out." And more frequently today this means "a design that deals with mold and mildew sources."

Consumer awareness of this issue is much greater today than in the past, according to Correll, vice president of operations for Bost. Contributing in part to this situation was the highly publicized problems in the mid-1990s associated with mold and fungus growth in wood-frame homes covered by an exterior insulated finishing system (EIFS). Homebuyers today reflect a knowledge of these matters and want to better understand the home designs Bost offers from this perspective.

Mold is a fungus a biological kingdom of more than 100,000 species that include mushrooms and yeast. Mold originates from very small spores ranging in size from 3–40 microns (1 micron = .001 mm) that travel easily through the air. They can be filtered but cannot be eliminated. Given a food source of essentially any organic substance, such as paper-faced drywall, wood framing or plywood along with proper conditions of temperature and moisture and mold will result. Mold will grow at temperatures between 40–100°F, easily encompassing those normally maintained in the home. Mold requires a relative humidity above 60 percent for sustained periods and only experience rapid growth above 90 percent relative humidity. Since residential environments are most comfortable between 40–50 percent humidity, control can be an effective method of mold growth.

Good wall design is a key element in the prevention of water entry into the home. At Bost Construction this is an essential part of the homes they build. They design both above- and below-grade walls to prevent the entry of water. In homes with concrete masonry wall systems, the walls are

Learning objectives:

After reading this article, you should understand:

1. The causes and conditions required for mold growth.
2. The sources of moisture and water penetration that can contribute to mold growth.
3. How recent changes in construction methods and techniques affects mold growth.
4. The health effects associated with mold exposure.

waterproofed with spray on membranes and incorporate good drainage techniques such as flashing and weep holes. Drain tiles below grade prevent the build up of water in this area and the possibility of penetration into the basement.

Mold has been around longer than any construction. So why have these microscopic spores only recently become an issue? While there is much speculation around this answer, most experts agree that many leading causes can be traced back to new construction materials and methods that have been implemented over the past few decades.

For example, while energy-efficient construction has been in the spotlight since the early seventies, practices associated with such construction techniques in mind tend to decrease the buffer between conditioned interior air and stagnant interior air. In other words, today's buildings are constructed "tighter"—with more insulation and less drafts. As a result of tighter construction, moisture present within a building (stemming from any source) does not have as direct of path back out of the building. It is this accumulation of moisture that can lead to the development of mold colonies.

Another possible reason for the increase of mold and mildew infiltration is that today's buildings are constructed with more moisture-sensitive materials. Mold can proliferate exponentially on materials such as processed lumber and paper. The incorporation of materials such as paper-faced drywall, which has all but replaced earlier versions of lathe and plaster construction, can provide an ideal setting for mold growth.

A third reason for the rising prevalence of mold and mildew may stem from the increased use of centralized HVAC systems, and more recently, zoned HVAC systems. Such equipment circulates more air more frequently. Besides becoming breeding grounds for mold, leaky ducts or zoned systems can pressurize/depressurize regions of a building, pulling unwanted moisture from attics, crawl spaces, or the outdoors into the building.

Finally, construction of new homes and buildings has continued on a scale not seen before in history. Buildings are constructed faster than ever, increasing the potential for design or workmanship flaws.

Concrete masonry can be cleaned. It doesn't need to be replaced.

This increased pace also leads to the use of greener (wetter) materials, which add to the moisture load of a newly constructed building and may take years to sufficiently dry.

Each of these practices in one form or another has changed the dwell time of moisture in today's buildings. As such, building elements that get wet tend to stay wet longer. While there is not hard evidence that specifically supports any one of these criteria as being the sole culprit, most agree that taken individually or as a group, these issues increase the potential for unchecked mold growth to occur.

Health effects associated with mold exposure range from no impact in some people to some very severe conditions. The sensitivity of individuals varies so widely that there has been no "safe" threshold defined by the authorities at the Center for Disease Control and Prevention. While most people experience no reaction to exposure others, such as children, senior citizens and those with weakened immune systems, may be more vulnerable. Some medical research has raised the question of a connection between indoor air quality, mold levels and the increased incidence in recent years of asthma in children.

While concrete masonry products do not provide a food source for the growth of mold, organic materials used in the construction of these walls may be a food source for the establishment of a mold colony. While there may be a number of strategies for controlling the entry of water into the home through concrete masonry walls, some efforts at remediation have also been proposed. Recently, some new products that chemically combine with concrete have appeared as mold inhibitors. While these materials may be used as pre-treatment strategies, they have shown value as controlling mold in high moisture environments after clean up from an initial occurrence of mold growth. Jay Johnson of Kodi Construction in Leesburg, Virginia, has applied an anti-mold coating on the basement wall of a 45-year-old home with an existing mold problem. Six months after the application the basement remains dry and mold free.

While design and preventive systems are critical to controlling the introduction of moisture into the home and creating an environment for mold growth, the homeowner plays a large role in the successful control of this condition. Responsible homeownership includes the regular inspection and maintenance of the component systems in the house to ensure that water is not accumulating in the building. Mark Correll notes that the recommendations that they provide their clients are eagerly accepted and adopted. Included in this education are suggestions to maintain reasonable humidity levels and fresh air exchange rates at all times. Evidence of mold or moisture (visibly or by smell) should be addressed immediately to locate and eliminate the moisture source. Affected areas and materials should be thoroughly dried or removed and replaced.

Presently, the topic of mold and mildew growth has as many questions as answers. While the mechanisms that can lead to mold growth are well understood, the reasons for observing more prevalent problems in new construction are not.

More information on mold and mildew growth can be accessed through the following web links: Environmental Protection Agency: www.epa.gov/iaq/ The National Association of Home Builders Research Center: www.nahbrc.org ■

Concrete Masonry Designs' AIA/CES Distance Learning Program

AIA/CES Learning Units Reporting Form

To receive one learning unit, read "Prevent Mold" (page 6) and "CM Profiles" (page 10) and complete the following questions on both articles. Return this form to the National Concrete Masonry Association. Only original forms will be accepted for learning unit credit.

Forms received after April 15, 2003 will not be accepted for learning unit credit.

Replies will be submitted to AIA Records on April 15, 2003 and December 30, 2003.

Send completed Report Form and Exam to: AIA/CES National Concrete Masonry Association, 13750 Sunrise Valley Drive, Herndon, VA 20171-4662. If you have questions please contact NCMA at 703-713-1900.

January 2003

1. What are the properties of mold ?

2. What are the causes and conditions required for mold growth?

3. What sources of moisture and water penetration can contribute to mold growth?

4. How have recent changes in construction methods and techniques affected mold growth?

5. What are the health effects associated with mold exposure?

6. List five methods that can help prevent water entry into concrete masonry.

7. List the steps that should be taken when unexpected water is found in a building.

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I certify that the above information is true and accurate to the best of my knowledge. I have complied with the AIA Continuing Education Guidelines.

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Flashings at Copings and Caps

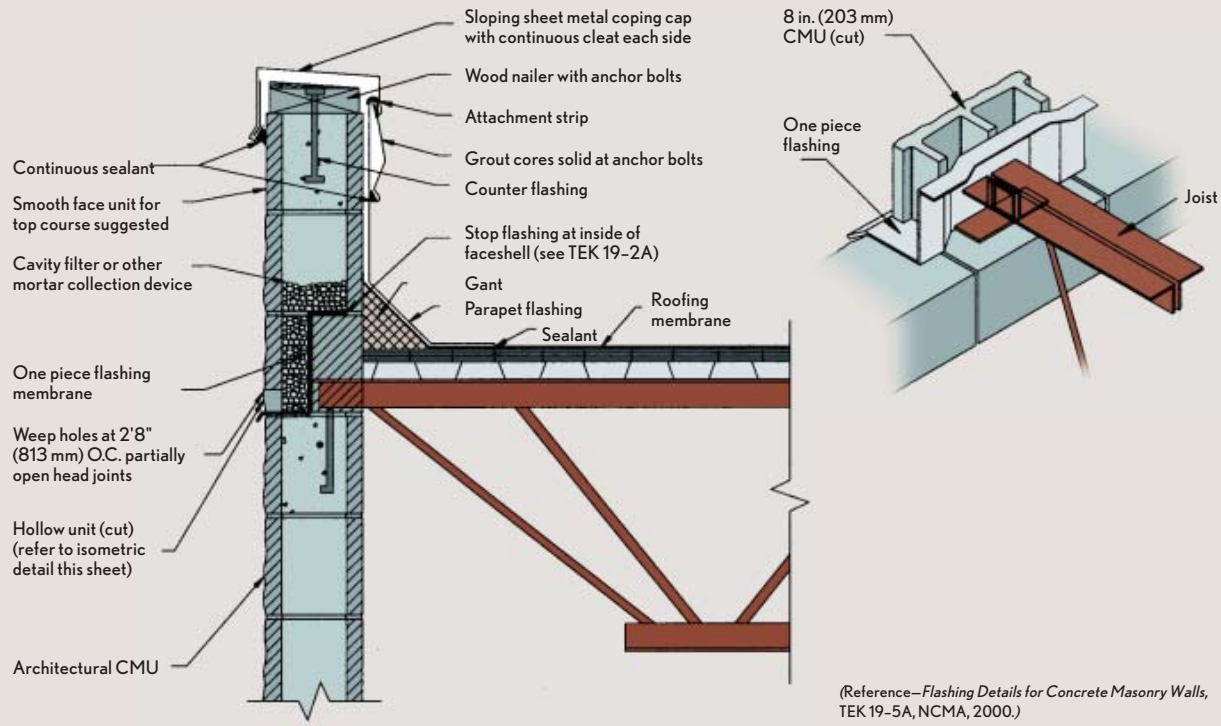
The type of flashing detail to use on low-sloped roofs will in part depend on the type of roofing membrane being used. As with any flashing detail, the materials used should result in a uniform and compatible design. For example, joining two materials with significantly different coefficients of thermal expansion (such as metal flashing and bitumen roofing membrane) can cause tearing and failure of the joint. Many roofing membranes also shrink as they age and if this movement is not provided for, fracturing of the upper course of the masonry parapet can occur. Counter flashing provides the solution to these problems as shown below. Counter flashing also facilitates the reroofing process by allowing easy removal and access to the flashing membrane fasteners.

During placement of the final courses of masonry in parapets, and commencing with the second course below the coping/cap location, a grout stop should be placed over cores so that grout can be placed for the positioning of anchor bolts.

In coping installations it is imperative that penetrations of through-wall flashing be tightly sealed to prevent water infiltration. A full mortar bed is required to be placed on the through-wall flashing to allow proper positioning of coping units. Full head joints are placed between the coping units as well as properly spaced control joints. The joints between the coping units should then be raked and a joint sealant applied.

Coping units should be sized such that overhangs and a drip reveal occur on both sides of the wall. Metal caps require wood plates for anchorage which are usually attached to the wall with anchor bolts. The cap should be sloped to prevent water from draining onto the exposed surface of the masonry and should extend at least 4 inches over the face of the masonry and sealed on both sides. Smooth-face or uniform split-face concrete masonry units should be considered for use under the cap to ensure a relatively tight fit between the masonry and cap which might be hindered by uneven concrete masonry units such as split-face or fluted units. ■

Flashing Single Wythe Walls at Roof/Parapet Intersection



(Reference—*Flashing Details for Concrete Masonry Walls*, TEK 19–5A, NCMA, 2000.)

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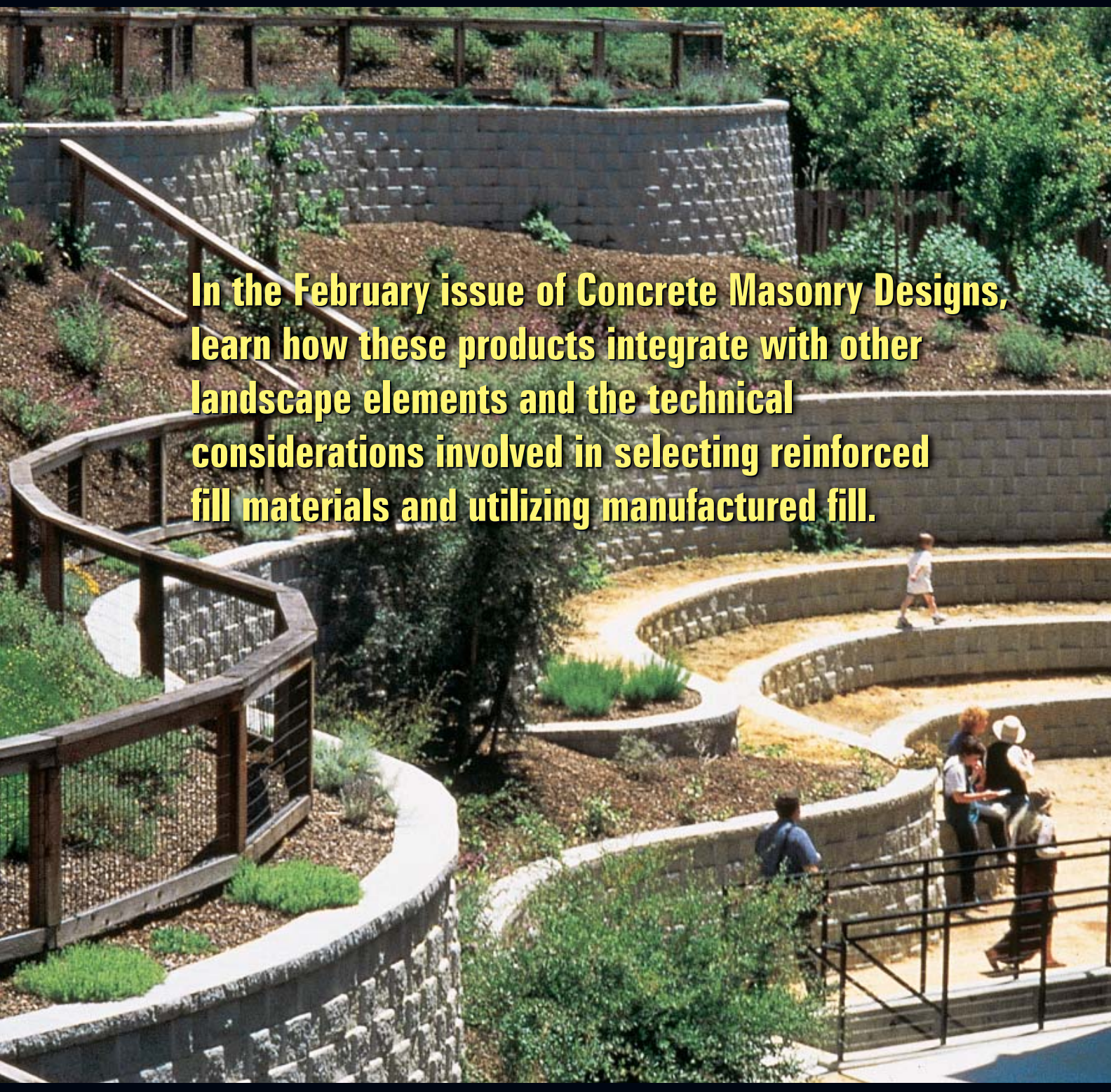

In the February issue of Concrete Masonry Designs, learn how these products integrate with other landscape elements and the technical considerations involved in selecting reinforced fill materials and utilizing manufactured fill.

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