Moisture and Mold Control

Introduction

"The key to mold control is moisture control," according to the EPA (U.S. Environmental Protection Agency). Mold spores are all around us in the air, they float through the air until they find a suitable place to grow. Mold spores need fours main resources in order to survive: water, oxygen, a food source, and a safe place to grow. With these four necessities met, mold will begin to grow exponentially as long as the four resources are available. Often a safe place for mold will be behind and wall, thus out of sight and with exponential growth this can quickly become a very large problem.

The solution to moisture control is to have a watertight building. This all begins with the conception, design, and construction of the building. Every building should be watertight and mold should be prevented; however, there are certain types of buildings where the growth of mold is much more harmful to the users of the building and certain types of buildings where mold can become more easily an issue. There are also considerations that can be carefully planned to help reduce the possibility of developing a mold problem during and after construction. Lastly, there are procedures that can be taken during construction, the most critical time of the building in regards to mold growth, to keep the building free and mold growth. The solution to keeping mold under control has three steps:

1.) Evaluating the risk of mold with an initial design evaluation of the building

2.) Assessing the design criteria that could affect mold growth

3.) Having a list of procedures to following during the construction process.

A guide containing the most important consideration can direct you through the conception, design, and construction to help reduce the risk of mold growth.

Initial Design Conception Evaluation

There are three categories in which mold can quickly become an issue for the building to consider at the conception of the project: the type building, the major materials used, and specific room types. First, the type of building and the type of user are important factors that determine whether mold should closely be monitored. According to The Mold Litigation Task Force of the Associated General Contractors of America, Inc.:

> "In recent years, the media has begun to portray [molds] as something inherently dangerous. The scientific evidence does not, however, support hat proposition. Certainly, molds can trigger allergic reactions in sensitive individuals, and the country has seen an increase in the number of opportunistic infections amount people with compromised immune systems. At the same time, molds appear to have only minor effects on the healthy adult population."

Thus, over exposure to mold is most critical to the young, old, and the ill; therefore, mold in primary education, elderly, and healthcare facilities is most significant.

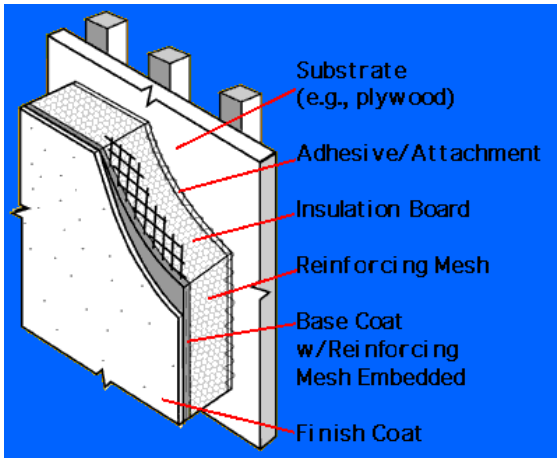

Figure 5

In addition, some commonly used materials can increase the likelihood of mold growth. All natural materials, such as wood and gypsum products, provide an abundant source of food and nourishment for mold. The last major building material that can cause mold is EIFS (exterior installation and finish systems); a section of EIFS can be seen in *Figure 5*. EIFS can be a breading ground for mold. The insulation board helps to drain moisture from with in the system; however, this also causes moisture to be trapped with in the system, which creates a perfect place for mold to grow.

Lastly, buildings whose design contains rooms that produce a large amount of moisture should raise concern about mold growth. Buildings that contain large laundry rooms, large shower facilities, and swimming pools are examples of these types of buildings. These rooms require at the minimum a good ventilation system to dissipate the excess moisture.

Design Criteria

There are eight major areas or systems of the building, which can increase the possibility of a mold problem if not addressed during the design phase of the project. The areas or systems are the building envelope, roofing system HVAC system, plumbing systems, elevator shafts, permanent drainage systems, foundation damp proofing, and interior materials. There are simple considerations that can be taken to reduce the risk of mold.

The building envelope, if not constructed correctly, can provide mold with the four necessities - water, food, oxygen, and a safe place - need for mold to survive. For example, using different materials for the façade creates joints between the materials, which can easily let water infiltrate the building envelope. Other important details to keep on top of are the flashing, window caulking, and door sweeps details. These are very important features that provide great protection against water infiltration if applied correctly, but can easily allow water to enter the building envelope if not.

The roofing system is another aspect of the building that is a great means of protecting the building from moisture. When selecting the brand of roofing system to use on the building it is important to choose one of high quality and one with an extensive warranty. Another possible cause of roof leakage could be skylights; the seals of the skylight could cause leaks if not properly sealed.

The HVAC system can be another common source of mold growth. It is also important to locate fresh air intakes away from standing water, bare soil, plant debris, or accumulated bird or animal droppings. The HVAC intake can draw these materials into the ductwork within in the building, supplying moisture or a food source for mold to grow. The ductwork itself provides a safe environment for mold growth as well so it best to take any measure to reduce the additions of any of the other requirements molds need to grow.

The plumbing system can be another source of excess moisture in the building if it is not constructed correctly. It is important that cold water pipes have proper installation; there should be drawings in the construction documents that show the details of the installation. If the pipes are left with insufficient installation, condensation can form which if left alone can begin to drip, leaving standing water in the building. It is also important to thoroughly review the plumbing plans to ensure that no drainage pipes are left unconnected. Another area where water can easily enter the building is the elevator pit because it is the low point of the building. a solution to this is to install a sump pump to dispose of any excess water. It is also advisable to review the civil plans and compare them with the actually conditions to be sure that water will property drain away from the building. It is also important to be sure that foundation damp proofing is properly leveled and covered during construction.

Some interior materials can provide a source of food for mold if there is excess moisture. Natural materials, such as gypsum products or woodwork, are sources of food for mold to grow on. If these interior materials are installed in the building prior to activities that produce very high amounts of moisture, such as fireproofing and placing concrete, it creates an environment where mold will grow quickly.

Construction Procedures

The most important practice to adapt in the prevention of mold would be to perform daily inspections for water infiltration and mold growth. If standing water is found it should be removed within 24 to 48 hours to prevent mold growth in that area. If mold is found it should be cleaned or removed immediately to prevent the spread of the mold growth. It is also advisable to use dehumidifiers during activities such as fireproofing or placing concrete, which produces high amounts of moisture in the air.

Also, HVAC filters and ductwork can cause a problem. The nature of the ductwork provide and ideal place for mold to growth. If the filters are not cleaned regularly, the dirt trapped in the filter is another source of nourishment for mold. The mold will begin to grow in the filter and the nature of the circulation of air will blow the mold into rooms. The insulation used with the ductwork can also cause a problem. Lined ducts can become breading grounds for mold if they become wet.

Recommendation

There are simple practices that can be adopted that can greatly reduce the risk of mold growth in a building whose user would be sensitive to mold spores. The design team, contractor, and the owner should adopt these practices in order to help reduce the risk of mold in the building. Using the issues previously discussed, a simple guide can be created to help the design team and contractor through these issues easily. The following is a guide that if followed will help reduce the possibility of mold. The guide first determines, in Section I, whether mold will be an issue based on the user of the building and other design element of the building. Next, in Section II, the guide introduces considerations that should be taken during the design phase, if mold will be an issue to the building. Lastly, Section III is a checklist of actions that should be taken during the construction phase to keep the growth of mold under control. This Threat of Mold Evaluation is a simple way to prevent a very serious issue.

Threat of Mold Evaluation

Section I: Types of Buildings

1. Is the building any of the following types?

   Healthcare facility
   Primary school facility
   Elderly facility
   Renovation of an abandoned building

   ☐ YES ☐ NO

   If YES continue Section II, if NO continue to item 2.

2. Are any of the following building materials major components of the design?

   Wood frames
   Gypsum products
   EIFS
   Plywood sheathing
   HVAC filters and ductwork

   ☐ YES ☐ NO

   If YES continue to Section II, if NO continue to item 3.

3. Does the building design contain any of the following?

   Large laundry rooms
   Large shower facilities
   Swimming pools

   ☐ YES ☐ NO

   If YES continue to Section II, <u>if NO there is no elevated risk of mold</u>.

Section II: Design Considerations

The following are items for different systems of the building that should be considered during the design process to reduce the growth of molds during construction.

1. **Building Envelope**
   - ☐ Multiple materials building envelopes can lead to leaks between joints.
   - ☐ Flashing details should be included in the contracted documents.
   - ☐ Window caulking and door sweeps should have detailed specifications.

2. **Roofing System**
   - ☐ The roofing system should have a substantial warranty.
   - ☐ Skylights can cause leaks if not seal adequately.

3. **HVAC System**
   - ☐ Lined ducts can become breeding grounds for mold if they become wet.
   - ☐ Locate fresh intakes away from standing water, bare soil, plant debris, or accumulated bird or animal droppings.

4. **Plumbing System**
   - ☐ Having insufficient insulation on cold water pipes can cause mold to grow.
   - ☐ Be sure drain pipes are not left unconnected.

5. **Elevator Shafts**
   - ☐ Elevator lowest point of building, a sump pump will help to rid of standing water.

6. **Permanent Drainage Systems**
   - ☐ Review civil plans and actual conditions to ensure moisture will drain away from building after construction is complete.

7. **Foundation Damp Proofing**
   - ☐ Property leveling and covering with gravel can help prevent mold growth.

8. **Interior Materials**
   - ☐ Natural materials, such as gypsum products or woodwork, are a source of food for mold if they grow on these products.
   - ☐ Placing concrete or fireproofing after gypsum and wood products creates a lot of moisture in the building. The gypsum and wood products are excellent sources for mold to grow.

After these items have been carefully considered during construction, continue to Section III for a list of considerations during construction.

Section III: Construction Procedures

When the construction is underway, simple procedures can be taken to keep mold under control. The following is a checklist of items that should be checked everyday to ensure the building is free of water infiltration.

- ☐ Inspection of roofing system and flashing.
- ☐ Check integrity of sealant at all penetrations.
- ☐ Close and secure all doors and windows daily.
- ☐ Insure positive drainage at perimeters of building.
- ☐ Immediately remove any water due to building or plumbing leaks.
- ☐ Use dehumidifiers during process that generate large amounts of water in the air (i.e. concrete or fireproofing).
- ☐ Test the moisture contain and humidity of the air inside the building and take appropriate measures to reduce if necessary.
- ☐ Check all installed materials and systems for excess water or condensation.