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START

Use of Coatings to Prevent Mold and Mildew Damage

Use of Coatings to Prevent Mold and Mildew Damage

Presented by: Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, IL 60061

Description: Provides an overview of advances in antimicrobial mold and mildew-proof primers, paints, wallcovering installation systems, waterproofing coatings and remediation cleaners. Permeability of wallcovering and coatings to install them with, plus green building specification information for high performance, low VOC coatings for the prevention of mold and mildew are also reviewed.

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Purpose and Learning Objectives

Purpose: Provides an overview of advances in antimicrobial mold and mildew-proof primers, paints, wallcovering installation systems, waterproofing coatings and remediation cleaners. Permeability of wallcovering and coatings to install them with, plus green building specification information for high performance, low VOC coatings for the prevention of mold and mildew are also reviewed.

Learning Objectives:

At the end of this program, participants will be able to:

- identify the factors that influence the conditions for mold and mildew growth
- list the best practices for prevention of mold and mildew
- define ASTM D3273, ASTM D5590, SCAQMD Rule 1113 and other criteria and features of a high performance mold and mildew-proof coating
- specify the components of a complete wallcovering system and describe the utility of its parts where moisture infiltration from the wall cavity is a concern
- summarize the construction guidelines for preparation and application of mold and mildew-proof coatings and finishes, and
- compile and analyze product manufacturers information that supports claims of high performance mold and mildew-proof coatings.

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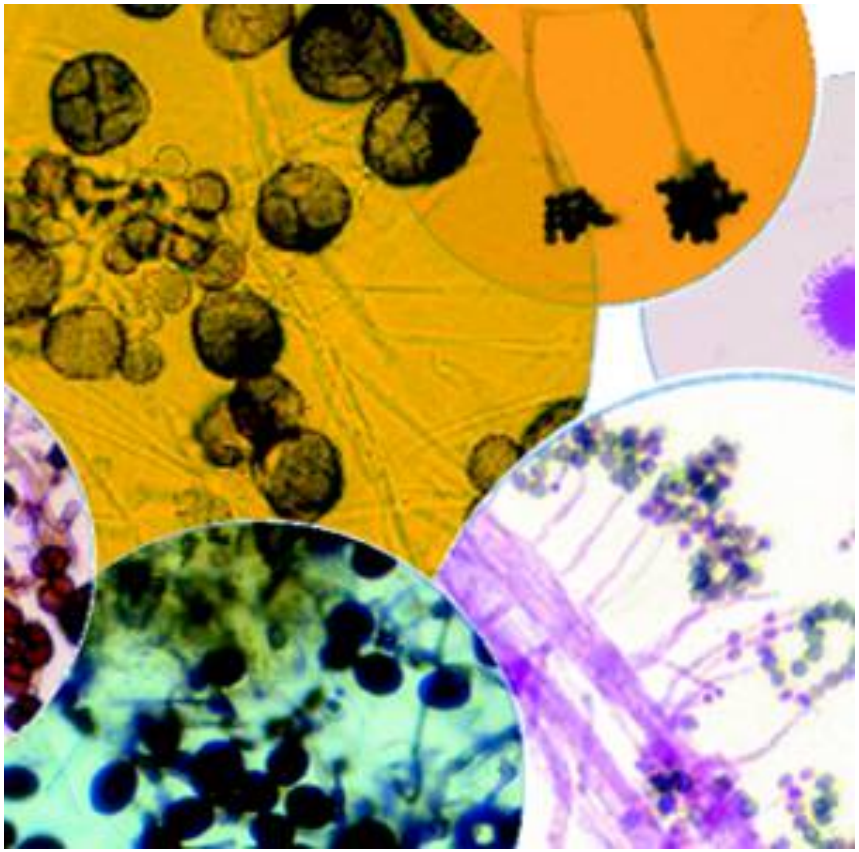


Introduction

Advances in Antimicrobial Coatings

Mold represents one of the fastest growing concerns in the construction industry today. Mold can grow on organic matter common in most building materials such as wood, gypsum drywall, carpet, wallcovering and even conventional interior and exterior paint. When excessive moisture accumulates in buildings or on building materials, mold growth will occur, particularly if the moisture problem remains undiscovered or unaddressed.

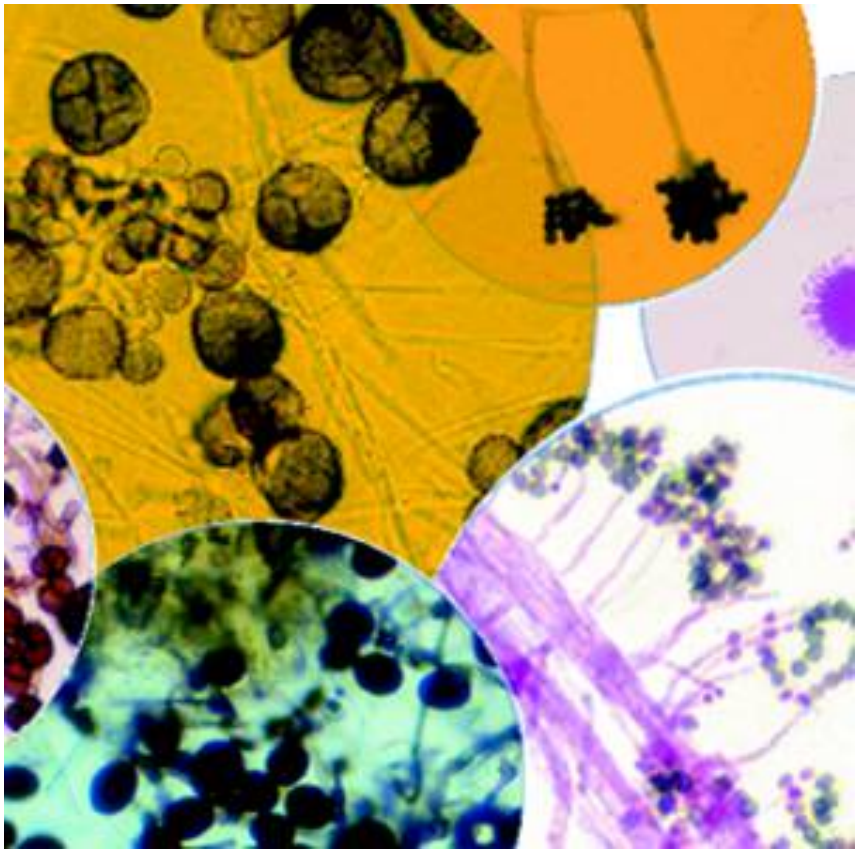
Mold can thrive in airtight spaces and spreads in the presence of moisture even in places hidden from view, like wall cavities or under wallcovering, where early detection is difficult. To combat this, the use of state-of-the-art antimicrobial coatings that provide long term protection against mold growth on interior and exterior surfaces has become a growing trend in modern building design practices.

Advances in Antimicrobial Coatings

New types of advanced mold and mildew-proof coatings and EPA registered cleaners include:

- Interior and exterior primers and paints
- Wallcovering installation systems
- Waterproofers
- Inner wall cavity coatings
- Mold killing remediation cleaners

The first steps in understanding how the use of high performance mold and mildew-proof coatings can provide long term protection is to look at: 1) why mold grows, 2) what is it about mold that causes concerns, and 3) why mold has become a more prevalent problem.



Causes and Effects of Mold and Mildew

Mold and Mildew

Mold and mildew are types of fungi. Fungi is a Heterotroph (an organism that requires organic substrates for growth).

There are four types of fungi:

Mold: A simple one or multi-celled microscopic organism that relies on an organic food source. *Aspergillus* (black) and *Penicillium* (pink) are the most common molds found in moist, humid environments. Molds are often mistakenly called mildew.

Mildew: A gray dust that typically affects plants and reproduces through sporing. They are found on building materials, paper, wood and fabrics.

Yeast: A single-celled fungi that reproduces by budding. They are found typically on or in biological materials or organisms.

Mushrooms: Any visible, above-ground fruiting body of a fungus, which has a shaft and a cap. Single units are large.

Food Sources for Mold & Mildew

Molds are found both outdoors and indoors. Molds are nature's way of breaking down organic matter, such as leaves or fallen trees, turning them into compost. However, molds can destroy organic matter found in ordinary construction materials inside and outside of buildings.

Food Sources for Mold & Mildew

Mold feeds off of common organic food sources in buildings such as:

- Standard drywall and wood
- Insulation and ceiling tiles
- Conventional paints, texture finishes, fabric- or paper-backings on wallcoverings
- Caulks and sealants
- Upholstered furniture, fabric and draperies
- Carpets, rugs and flooring

Mold can cause paint to crack, peel and discolor. It can cause wallcovering to stain and lose adhesion. It can decompose drywall and masonry, and promote the decay of wood.

Effects of Mold & Mildew

In addition to destroying property, mold and mildew left unchecked can be unhealthy, offensive and produce:

- Pungent, musty odors
- Allergens and irritants

A wide variety of molds can produce compounds called mycotoxins, some of which are toxic to humans and animals. In high concentrations, mold fragments, spores, and mycotoxins can trigger symptoms even in individuals with no allergies. For many people with low tolerance levels, mold exposure can trigger allergic reactions, asthma attacks, and irritation of the eyes, skin, nose, throat and lungs to a greater or lesser degree.

Effects of Mold & Mildew

Tolerance levels are different for each person making “acceptable standards” difficult. Since no EPA or other Federal threshold limits have been set for mold or mold spores, sampling cannot be used to check a building’s compliance with Federal mold standards (http://www.epa.gov/mold/i-e-r.html#Sampling) [1]

Currently, there are no EPA regulations or standards for airborne mold contaminants. (http://www.epa.gov/mold/moldresources.html) [1]

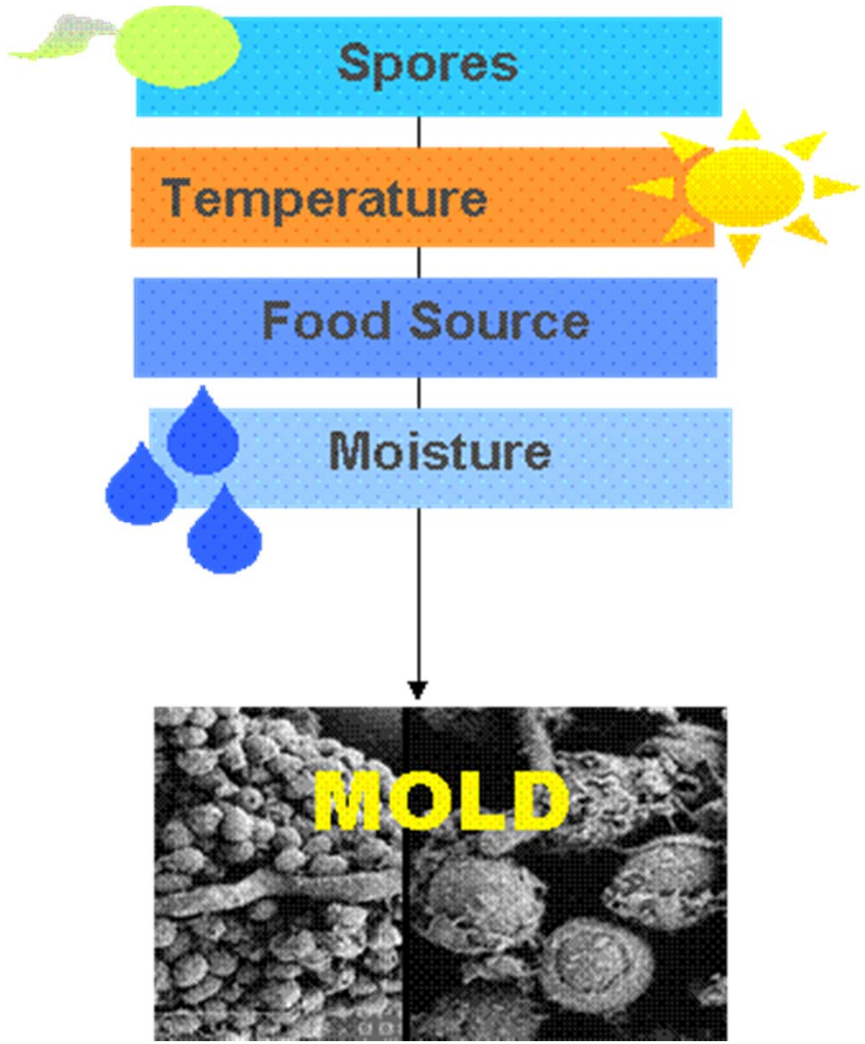
Source 1: Environmental Protection Agency

Mold & Mildew Need Four Key Elements to Grow

There are four conditions that must be present in order for mold to grow:

- Mold spores
- Warm air (40ºF – 100ºF / 4ºC to 38ºC)
- An organic food source
- Moisture {>60% Relative Humidity (RH)}

Stopping mold growth requires eliminating one or more of these elements.



Conditions for Mold & Mildew Growth

The following is a closer look at the conditions that support mold growth:

- **Moisture:** Opportunity for mold increases when the Moisture Content (MC) in the air is above 24%. The greater time building materials remain wet, the greater the chance for contamination, therefore it is important to keep building materials dry before use in construction.

- **Humidity:** >60% RH = potential problems. Mold growth does not require the presence of standing water; it can occur when high relative humidity or the hygroscopic properties (the tendency to absorb and retain moisture) of building materials allow sufficient moisture to accumulate.

- **Temperature:** Mold grows best in moderate conditions and moderate temperatures between 68°F and 86°F (20°C and 30°C). The chance for mold activity declines dramatically in temperatures above 100°F (38°C) and below 40°F (4°C) and is essentially inactive in temperatures below 35°F (2°C).

Conditions for Mold & Mildew Growth

- **Air Velocity:** Most indoor fungi are Saprophytes (living off of decaying organic matter) and they grow best when the ambient air is stagnant. This may be why mold problems are often found in closets, attics and wall cavities where there is less air circulation. Mold does not grow well when the air velocity is greater than two feet per second.

- **Light:** Most mold prefers darkness or low light. This helps to explain why we typically find more mold inside wall and ceiling cavities and in poorly lit attics and basements.

- **Organic Food Source:** Mold prefers natural materials-- such as organic materials or those with some organic composition found in conventional building products-- to synthetic ones. Ordinary coatings, paper or paper-covered materials, wood or wood-based building products, textiles, materials that contain binding agents, or those that use binding agents, all provide ideal nutrients for mold to grow.

Mold & Mildew in Construction

Mold infestations in commercial buildings can be costly. Those risks are now at the top of many property owners' lists of concerns. In hospitality and healthcare facilities especially, there is a great risk of lost revenue due to out of service rooms, in addition to the considerable direct expense for the remediation itself.

Mold & Mildew in Construction

Further, mold infestations can carry liability risks. Over the last decade there has been an enormous increase in legal cases claiming property and health damage and related losses due to mold problems. The threat of a mold-related lawsuit has driven many investors, CFOs, and lenders to require mold insurance as a prerequisite for financing, particularly on properties located in humid mildew-prone regions where the stakes are high.

At the same time, insurers are requiring building owners to have an indoor air quality (IAQ) plan that addresses mold management as an underwriting requirement before they will issue a policy that covers mold.[2]

As a result of these issues, along with tightening federal Environmental Protection Agency (EPA) and state indoor air quality (IAQ) regulations, new design practices to address mold and mildew concerns are cascading throughout the construction industry and beyond.

Source 2: Environmental-Expert.com, Troy E. Johnson, Environmental Education Foundation, http://www.environmental-expert.com/resulteacharticle4.asp?cid=8607&codi=5934

Factors in Building Design

Buildings are dynamic environments. Factors in building design that influence conditions for mold and mildew growth include:

- Geographic location
- Climate
- Types of materials used in construction
- Heating and air-conditioning (HVAC) system design and operation
- Ventilation
- Moisture intrusion
- Human activities

Spread via airborne spores, mold and mildew can enter buildings through open doors or windows and is circulated throughout a property via the HVAC system or simple air movement, making it nearly impossible to eliminate completely. The one thing that can't be controlled is that mold spores are always present. They are everywhere.

Sources of Moisture in Buildings

Since mold spores are found practically everywhere and they thrive within the same average temperature range as people (40º-100ºF), and because most common construction materials provide food for mold, eliminating sources of moisture is the most effective method to preventing mold growth.

According to the Hospitality and Lodging Travel Research Foundation, up to 28% of interior moisture can come from building occupants and their activities in hotel and motel rooms in hot, humid climates.

Sources of Moisture in Buildings

Typical sources of moisture in buildings are caused by:

- **Water infiltration** from the outside as a result of leaky building envelope and moisture generation from the inside by occupants and their activities. The greater the water source contamination and the greater the spores, the more rapid the growth.

- **Building tightness** which does not allow moisture to escape to the outside or to be removed from the inside air through dehumidification.

- **Condensation** of moisture on or near mold-susceptible building materials or components. The greater time that building materials remain wet, the greater the chance for mold infestation. The chance for infestation greatly increases after just 24 hours of saturation.

A more detailed assessment of these factors and why they contribute to high moisture levels that can lead to mold and mildew growth follows.

Water Infiltration and Moisture Generation

There are a number of sources that may allow liquid water and water vapor to penetrate and accumulate on mold-susceptible building materials. These sources include:

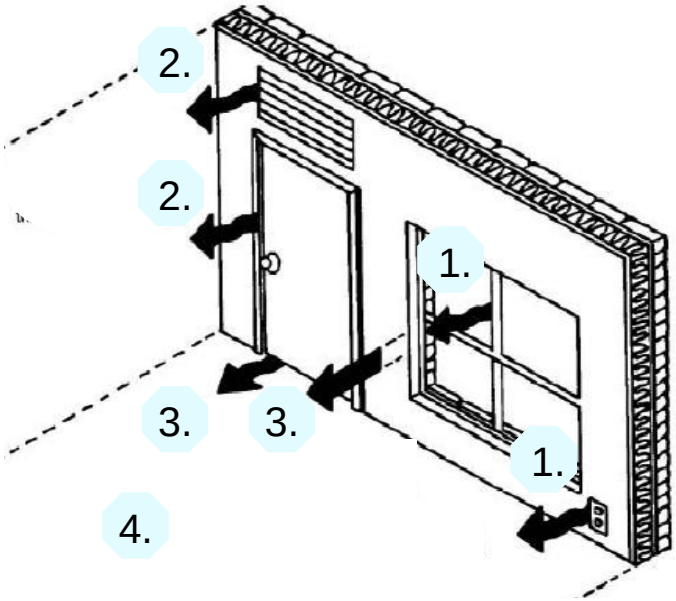
1. **Liquid (bulk) water passing through cracks and then evaporating** – Large quantities of water can pass through small cracks/openings in a building structure, particularly if they are located at critical drainage paths. Some sources include: leaky windows and door openings; roof and plumbing leaks; missing, inadequate, or poorly designed flashing; lack of gutters or drainage systems; and foundation leaks.

2. **Air leakage** (air carrying moisture) - by door openings and wall vent systems and through cracks and crevices.

Water Infiltration and Moisture Generation

3. **Vapor diffusion through walls and doors** – Diffused vapor flow occurs through leaky or porous materials and assemblies, such as fibrous insulation, uncoated masonry or other porous building materials.

4. **Internal moisture release** – by people and their activities, i.e. showers, wet clothes, towels, etc.



Moisture gain in a building. The EPA maintains that the key to mold control is moisture control. Unless the moisture/water problem is fixed, mold will keep returning**.**

Source: Environmental Protection Agency

Building Tightness

As a result of continued advances in building materials and design techniques of thermal insulation; air, water and vapor barriers; and the operation of mechanical HVAC systems, building envelopes in modern building structures are more airtight and energy efficient than ever before. Although airtight building enclosures address energy conservation concerns, several undesirable consequences include:

Reduced indoor air quality as a result less ventilation of outdoor air which has given rise to increased concerns with odor emissions from building materials and coatings.

Increased problems with mold and mildew as a result of greater moisture levels in interior spaces, in terms of relative humidity, moisture content and water activity in building materials, and condensation.

Faulty design can result in mold problems when the building envelope will not allow moisture to escape to the outside or when moisture is not removed by dehumidification or ventilation systems.

Condensation

Wherever moisture-laden air condenses in the building structure, mold infestations have the potential to arise.

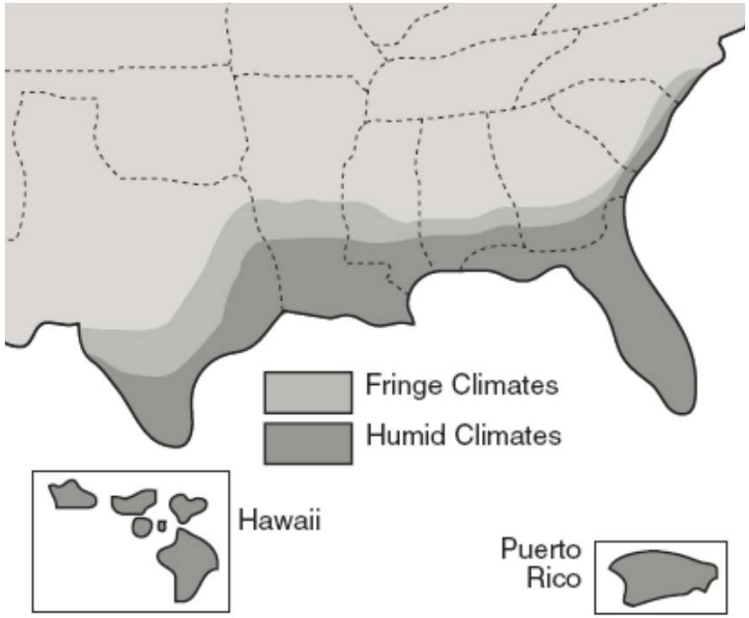
Condensation occurs in a wall system when warm moist air travels through a wall to a colder side. As warm air begins to cool, it reaches it's "dew point", the temperature at which it is forced to release moisture. When there is a significant temperature difference across a wall cavity, the dew point will occur somewhere within the envelope.

Climate Zone Considerations

Effective control of condensation problems requires proper design of the building envelope and HVAC systems that accommodate the climate and change of seasons.

Mold problems in buildings will occur if wetting exceeds drying. Consequently, in order to prevent growth of mold and mildew as a result of moisture problems, it is essential to design the enclosure, vapor barriers and HVAC system to protect against wetting and promote drying.

Regardless of the climate, if moisture and condensation are not controlled, the stage is set for mold growth.



Climate Zone Map. This map shows regions that the U. S. Department of Housing and Urban Development (HUD) has designated as a cooling (humid and fringe) climate. Buildings in these areas are the most susceptible to mold and mildew issues, however mold and mildew can be as extensive in cooler climates as in warmer climates if moisture is not controlled.

Moisture Problems in Walls

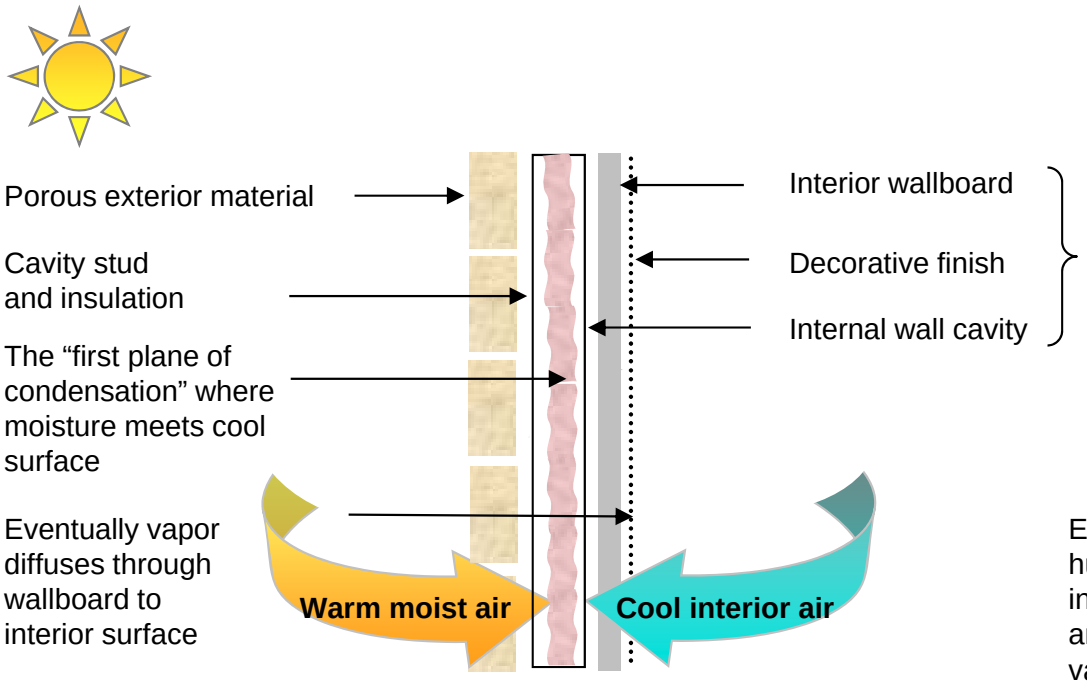
In hot, humid and fringe “cooling” climates, mold and mildew can occur wherever air-conditioned buildings draw warm, moist air in through exterior walls in the building envelope. This is particularly an issue if the outer wall is made of porous exterior materials such as masonry or pre-cast concrete that tend to absorb and retain moisture or if moisture penetrates through any crack or breach in the exterior surface.

Moisture in the outer wall is changed to vapor in the heat and drawn to the cooler side of the wall. Vapor condenses within the building envelope and can saturate or diffuse through the wallboard. When this condition prevails, the interior wall system becomes an ideal place for mold growth.

Mold in wall cavity

Moisture Problems in Walls

In cold weather conditions, the opposite moisture flow can occur, where warm interior air can infiltrate into the wall cavity and condense on the internal side of cold exterior walls or ceilings thus creating optimum conditions for mold and mildew to grow.



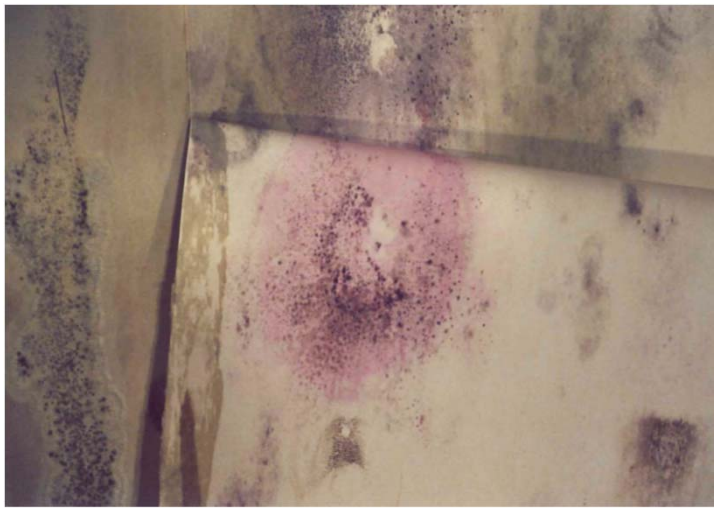
Use of mold & mildew-proof primers, paints, wallcovering installation systems here reduce risk of mold & mildew.

Example of vapor diffusion in walls in hot, humid climate. Internal wall cavities and interior drywall surfaces are prone to mold and mildew problems when moisture vapors condense.

Mold Destroys Finishes

When mold and mildew growth occurs in a building enclosure it creates several undesirable consequences: musty odors, unsightly stains, paint failure, and loss of adhesion of wallcovering. Mold and mildew destroy interior finishes.

It must be understood however, **that coatings, paint, wallcoverings or their backings do not cause mold and mildew to grow**. In virtually all cases, the mold and mildew growth is due to excess moisture lurking behind the wall surface through leaks in the building envelope, vapor diffusion or condensation.



The existence of fungal growth behind wallcovering will typically result in pink or black stains which is why some people mistakenly believe that the wallcovering is the cause rather than the symptom of the “real problem” lurking behind the wall surface—moisture.

Permeability Testing

As a result of vapors that can diffuse through and condense in the building cavity, and other unseen moisture issues behind walls, permeability of building materials, coatings and wallcovering can be an important consideration in the moisture control equation.

The U.S. Department of Housing and Urban Development (HUD) classifies permeability of building materials into two categories.[3]

- Vapor permeable (greater than five Perms)
- Vapor non-permeable (less than one Perm)

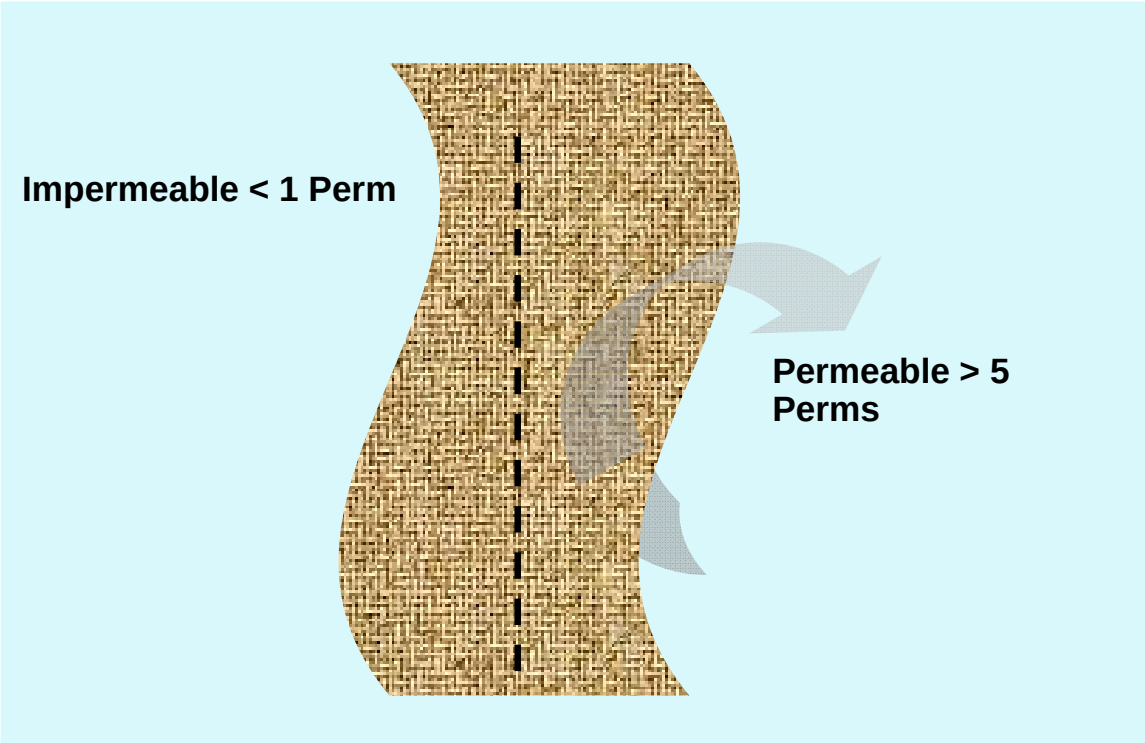
Vapor non-permeable materials are called vapor barriers or vapor retarders. Other terms often used to describe vapor permeable versus non-permeable materials are “breathable” and “non-breathable,” respectively.

Source 3. Department of Housing and Urban Development, 24 CFR Part 3280 [Docket No. FR-4578-F-02], Condensation Control for Exterior Walls and Manufactured Homes. Sited in Humid and Fringe Climates; Waiver, (Federal Register / Vol. 57, No. 79, Wednesday, April 24, 2002 / Rules and Regulations)

Permeability Testing

Measurement of vapor permeability is expressed in Perms: the higher the Perms, the higher the ability of materials to allow vapor diffusion.

Because permeable materials allow vapor and air to pass through, they help lower the chance for mold growth.



Permeability Testing of Building Materials, Coatings and Wallcoverings

There are several recognized test methods in the construction industry for measurement of water vapor transmission characteristics of building materials, coatings and wallcoverings. The two most common permeability testing processes are the “desiccant” method and the “water” method which both are specified by the American Society of Testing and Materials standard ASTM E-96-00. The two variations include:

- Service conditions with low humidity on one side and high humidity on the other (desiccant method)
- Service conditions with one side wet (water method)

Agreement should not be expected between results obtained by different testing methods.

Permeability Testing of Building Materials, Coatings and Wallcoverings

HUD recommends the desiccant method (also called dry cup) as described in the ASTM E-96-00 standard to measure Water Vapor Permeability (WVP) of coatings and wallcoverings as it more nearly represents actual conditions of use.[4]

Their position is that the wall system to and/or from the wall cavity, (i.e. drywall, primer and paint or drywall, primer, adhesive and wallcovering), should have a total WVP of 5 Perms or greater to allow moisture to escape and effectively control mold growth while the exterior walls should be designed to provide a vapor barrier at 1 Perm or less.[5]

Source 4, 5: Department of Housing and Urban Development, 24 CFR Part 3280 [Docket No. FR-4578-F-02], Condensation Control for Exterior Walls and Manufactured Homes. Sited in Humid and Fringe Climates; VI. Final Waiver A & B., (Federal Register / Vol. 57, No. 79, Wednesday, April 24, 2002 / Rules and Regulations)

Permeable Decorative Wallcovered Finishes

As a result of HUD guidelines, permeable decorative wallcovered finishes have become increasingly specified in areas where the likelihood for moisture problems and mold growth are the greatest, such as on the interior wallboard surfaces of exterior walls.

Permeable Decorative Wallcovered Finishes

Permeable interior wall systems have been shown to allow moisture to pass through from the internal wall cavity through the drywall and its permeable finish to cooler interior spaces. When properly designed, the building HVAC system then performs its dehumidification process, reducing the probability of the wall cavity reaching the dew point, hence preventing water condensation within the wall.

When a permeable decorative wallcovered finish is desired, it must be installed with an appropriate permeable, antimicrobial wallcovering primer and adhesive over new bare breathable drywall to achieve a complete breathable decorated wall system.

Mold & Mildew on Exterior Walls

Mold and mildew on exterior surfaces such as masonry, paint and wood also present concerns to designers and property owners. Left unchecked, mold and mildew on exterior walls can destroy paint and masonry. It is a problem commonly found on walls with a northern exposure, on the underside of eaves, and on areas that remain damp and receive little to no direct sunlight.

Mold & Mildew on Exterior Walls

Exterior corners are common locations for mold and mildew growth in climates where indoor heating is prevalent and in poorly insulated buildings in hot humid climates. They tend to be closer to the outdoor temperatures than other parts of the building surface for one or more of the following reasons:

- Poor interior air circulation
- Exterior wind-washing
- Low insulation levels
- Greater surface area of heat loss

Buildings with forced air heating systems and/or room ceiling fans tend to have fewer mold and mildew problems than buildings with less air movement, all other factors being equal.

Best Practices in Building Design for Prevention of Mold & Mildew

Today's design strategies involve the complete and long term prevention of mold and mildew by proper building design, eliminating moisture sources, controlling condensation and selecting the right materials and finishes specifically developed for mold and mildew prevention. Best building practices include:

- **Eliminate sources of moisture** – Design envelope and wall systems to prevent moisture from entering the building while at the same time providing a way for any accumulation in wall systems to escape.

- **Design appropriate ventilation system(s)** - Control condensation, manage air pressures, air flow and relative humidity inside the building.

Best Practices in Building Design for Prevention of Mold & Mildew

- **Know how and when to use non-permeable (envelope barriers) or permeable materials to control moisture and condensation** – Effective moisture control requires designing the wall system and implementing appropriate strategies to accommodate the climate and change of seasons.

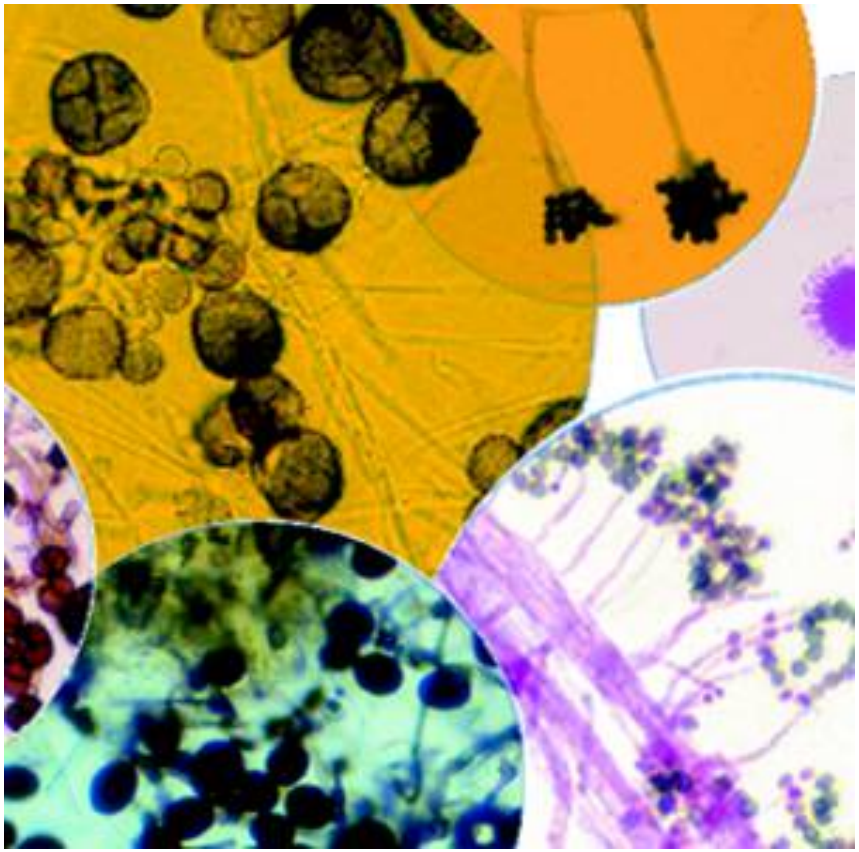
- **Select high performance mold and mildew-proof materials and finishes to prevent mold** that:

  1) effectively refuse water and moisture entry,

  2) have superior antimicrobial properties,

  3) allows moisture to pass through or a combination thereof.

Antimicrobial primers, paints and adhesives should complement proper water and moisture control, not replace them. If the moisture source is not eliminated, mold will grow.



Trends and Regulations

Trends in Coatings & Finishes

In the past decade, property owner expectations in building materials, coatings and finishes has evolved. Federal and state indoor air quality (IAQ) regulations, concerns about mold and mildew and how these things relate to safety and liability issues associated with occupants have been top of mind.

Trends in Coatings & Finishes

This has resulted in the emergence of products that rise to a new level of performance expectations. Manufacturers have brought to market technologically advanced coatings and finishes that are either low in volatile organic compounds (VOCs) and non-volatile aromatic compounds, offer mold and mildew-proof performance or provide a coating that combines all of these performance characteristics into one maximum performance finish. The specification of this new generation of low-VOC, low odor, antimicrobial finishes is a trend that continues to grow in importance in building construction.

Trends in Coatings & Finishes

New trends in coatings, adhesives, and cleaners include:

- 100% highly durable acrylic latex formulations
- Low or zero-VOC levels
- Low odor, non-corrosive formulations
- Higher sheens and lighter colors
- Mold and mildew-proof performance characteristics with antimicrobial protection that inhibits the growth of bacteria, mold and mildew on the paint film, primer film or adhesive film that can cause stains, odors and product deterioration
- Permeable performance to allow vapor to pass through and evaporate
- Meeting third party “green” standards for volatile organic compound (VOC) content, mold and mildew resistance and overall indoor air quality guidelines
- Manufacturers providing written long term performance guarantees

Low to Zero-VOC Regulations Are Driving Coating Trends

Solvent-based paint formulations containing alkyd resins have high VOCs that emit strong odors -- an unavoidable by-product of solvents in the formulations. Solvents in alkyd, oil-based and some latex coatings have been critical to strong paint bonding, penetration and superior curing characteristics that resulted in the desired damage-resistant coatings.

Despite the historic important function of solvents in coatings, stringent VOC limits set in the 1990's for architectural coating products by the U.S. Environmental Protection Agency (EPA) forced manufacturers to develop new lower VOC, lower odor, water-base technologies and resin systems.

Another regulatory body that is having a huge impact on VOC content in paints and coatings is SCQAMD, the South Coast Air Quality Management District. Its rule 1113 is limits VOC content in field applied architectural coatings. Although designed for a particular area of California, they have been widely adopted across the country and by the LEED® Rating System. Their purpose is to protect urban outside air against smog, especially against formation of ground level ozone. SCQAMD 1168 is a similar rule applying to adhesives and sealants.

Advanced Resin Systems and Mildewcides

In addition to limiting VOCs and odor emitting ingredients, certain high performance primers, sealers and paints specifically formulated for the purpose of long term mold and mildew-proof performance are made with a unique combination of highly durable resin systems and maximum levels of proprietary EPA registered mildewcides providing long lasting overall performance.

It is important to note that although some coatings may claim mildew resistance, and they do in fact have some additional ordinary biocide additives for a short term mildew resistance claim, there is a significant difference between mildew resistant coatings and a coating that has been formulated to provide long term mold and mildew-“proof” performance.

The quantity and quality of mildewcides, resins and additives in combination with how all of these agents perform together after the coating has dried determines whether or not the coating is simply mold and mildew resistant or provides maximum mold and mildew-proof protection.

Key Factors that Denote a Mold & Mildew-Proof Coating

High performance “mold and mildew-proof” coatings are designed for use in areas where the architect and property owner are looking for maximum long term mold and mildew-proof protection such as bathrooms, interior spaces in humid mildew prone areas, basements, crawl spaces, internal wall cavities (particularly on walls facing the exterior), and exterior walls. These types of coatings include interior primers, paints, sealants, and exterior coatings and waterproofers.

Special features and performance criteria that denotes a mold and mildew-proof coating include:

- **100% acrylic latex unique resin system** that is breathable and flexible, allowing moisture to pass through the film without micro-cracking, chipping or collecting dirt – a food source for mold and mildew. Top quality coatings with the highest content of acrylic ensure the highest scrubbability and cleaning agent resistance.

- **A proprietary package of EPA registered antimicrobial agents** and other formula ingredients that produce a coating film that will not allow mold and mildew growth on the surface film even under the most extreme conditions.

Key Factors that Denote a Mold & Mildew-Proof Coating

- **Formulated with low VOCs** that complies with VOC content limits set by the EPA, OTC, SCAQMD rule #1113 and GreenSeal GS-11 standards (primers).
- **Formulations that meet stringent performance requirements in third party "green" building certification** programs such as "Leadership in Energy and Environmental Design" (LEED®).
- **A proven success record in the field** under the harshest conditions and backed by a **long term performance warranty**.
- **Proven independent laboratory ASTM test results** for maximum fungal resistance.

Key Factors that Denote a Mold & Mildew-Proof Coating

Coating manufacturers making mildew resistant or mold and mildew-proof claims should be able to document claims with independent lab test reports to demonstrate performance in accordance with American Society of Testing and Materials (ASTM) standards for antimicrobial efficacy in preventing the growth of mold, mildew and stains and odor causing bacteria.

For over a century the ASTM organization, known today as ASTM International, has been a world-wide trusted source for technical standards for materials, products, systems, and services. Recognized for their high technical quality and market relevancy, ASTM International standards have an important role in the information infrastructure that guides design, manufacturing and trade in the global economy.

Two ASTM standards recognized by the coatings industry for testing antimicrobial efficacy are ASTM D3273 (*Accelerated Environmental Chamber Testing for Interior Coatings*); and ASTM D5590-00 (*Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerating Four Week Agar Plate Assay*).

Key Factors that Denote a Mold & Mildew-Proof Coating

The D5590 test method is a moisture-leach test designed for testing in extreme exterior conditions making it more aggressive than the D3273 test which uses an unleached method in interior conditions.

For coating manufacturers making “mold & mildew-proof” claims, challenging both interior and exterior coatings to the more severe D5590 test is more appropriate to show overall fungal resistance and performance. In this test, coatings are exposed to *Aspergillus niger, Penicillium funiculosum, Aureo basidium pullulan*-the most common and problem-causing mold spores in today’s environment.

ASTM Testing Methods Prove Coatings are Mold & Mildew-Proof

In addition, certain manufacturers go beyond the D5590 standard by opting in a more aggressive mold strain such as *Stachybotrys chartarum* (toxic black mold) to the ASTM testing protocol in order to test products under the harshest possible conditions. *Stachybotrys chartarum* is known to produce mycotoxins and is frequently associated with poor indoor air quality that arises from fungal growth on water-damaged building materials.[6]

These manufacturers require the most stringent “zero” rating under the D5590 test method which they designate as “mold & mildew-proof” where the standard “mildew resistant” rating is one or two. Using these standards should be the benchmark for maximum mold-proof performance of products making mold & mildew-proof claims. Meeting this criteria also supports any durability warranty.

Manufacturers should be able to provide independent testing demonstrating their products meet or surpass the ASTM D3273 and D5590 mold and mildew resistance testing standards.

Source 6: Fog Nielsen K (2003). “Mycotoxin production by indoor molds”. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi

Examples of Coating Samples in Mold Infested Petri Dish

In this example of an ASTM D5590 test, both “mildew-resistant” and “mold and mildew-proof” coating samples were placed in a moisture-leached agar plate that was inoculated with the most problem-causing mold spores in today’s environment.

At the end of the test, the “mildew-resistant” coating showed significant mold growth on the paint film and was rated two (2). The “mold & mildew-proof” samples showed no contamination and received a “zero” rating for mold growth.

High Performance “Mold & Mildew-Proof” Coating
Mold Growth Rating: 0 (No growth)

Premium “Mildew-Resistant” Coating
Mold Growth Rating: 2 (Significant mold growth)

Product Efficacy Claims are Regulated by the EPA

The EPA has established procedures for the registration of antimicrobial pesticides and products. For products claiming to protect human health or control or kill mildew, the EPA requires that data supporting the claims be submitted and the EPA reviews this data to assure that the product can perform according to it's claims under the Federal Insecticide, Fungicide and Rodenticide Act.

The hallmark of approval is issuance of a stamped-accepted label and Notice of Registration by the EPA; however, the EPA provides for an exemption from regulation under FIFRA in 40 CFR 152.25(a) for certain "treated articles or substances" (*an article or substance treated with, or containing, a pesticide to protect the treated article or substance itself such as paint treated with a pesticide to protect the paint coating*) if specific conditions are met.

Product Efficacy Claims are Regulated by the EPA

Known as the “Treated Articles Exemption,” section 152.25(a) provides an exemption from all requirements of FIFRA for qualifying articles or substances treated with, or containing a pesticide, if:

(1) the incorporated pesticide is EPA registered for use in or on the article or substance, and;
(2) the sole purpose of the treatment is to protect the article or substance itself.

To qualify for the treated articles exemption, both conditions stated above must be met. If both are not met, the article or substance does not qualify for the exemption and is subject to regulation under FIFRA.

Product Efficacy Claims are Regulated by the EPA

The EPA considers some claims related to mold and mildew as public health claims. In order to obtain approval by the EPA of an antimicrobial pesticide or product containing the antimicrobial pesticide, it is necessary for the applicant to submit efficacy data based on label directions for use and claims.

Articles or substances making “kill” or “control” claims, i.e. “antibacterial,” “kills mold and mildew”, “controls mold and mildew causing microorganisms,” are required to register with the EPA as a pesticide product.

Products making label claims such as “Mildew Resistant” or “Mold & Mildew-Proof” claims are likely to be considered under the EPA’s Treated Article Exemption and products do not require registration.

Product Efficacy Claims are Regulated by the EPA

All manufacturers of coatings making these product efficacy claims under the Treated Articles Exemption are required to follow the EPA Regulatory Guidelines which requires that the seller explain that the product contains a mildewcide to prevent the growth of mold and mildew on the coating film only, since a mold and mildew-proof coating claim can only be made for protection of the coating itself and not underlying or adjacent surfaces.

Higher Sheens, Medium Depth to Pastel Colors

Part of the trend towards the use of environmentally friendly and mold and mildew resistant finishes is to design facilities for increasing occupant comfort by using comfortable furnishings, softer fabrics and softer colors. This trend is particularly evident in the increasingly softer color choices of low odor, low VOC, antimicrobial coatings being recommended for buildings.

One consideration driving the softer color trend is the effect the addition of colorant has on the gain in VOC levels and loss of mildew resistance of paint. Colorants typically contain organic solvents and other ingredients that produce additional VOCs that are generally unaccounted for in a paint's stated VOC level.

Higher Sheens, Medium Depth to Pastel Colors

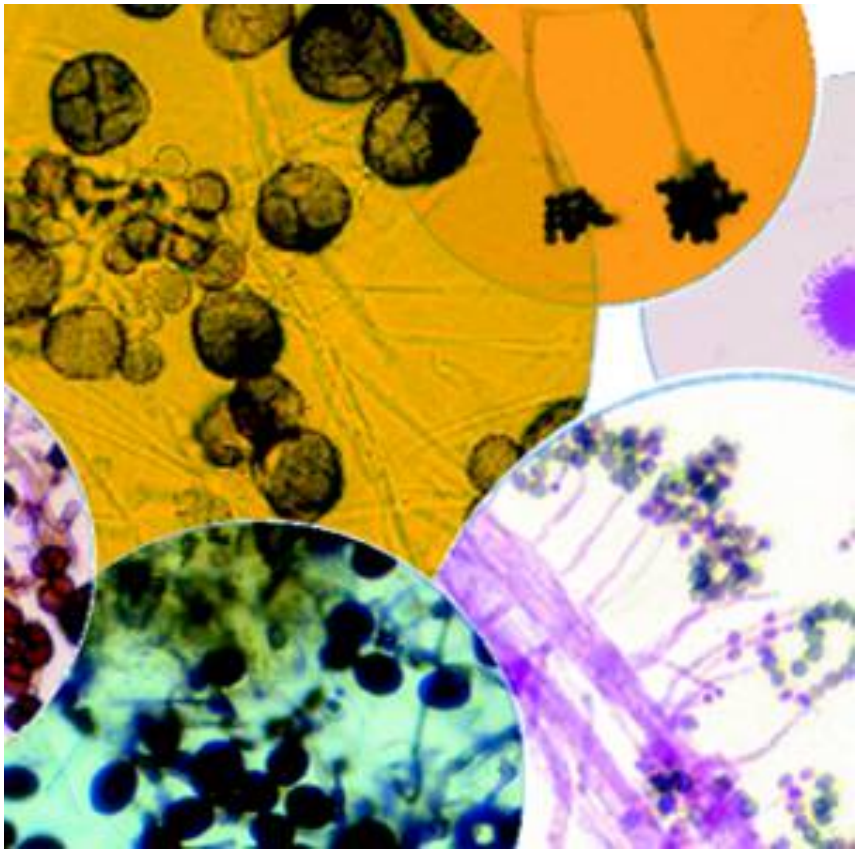
Some colorants are organic based and provide a food source for mold. The more colorant added, the more it interferes with the mildew resistant performance of the paint. As a result, light or pastel to mid-tone colors offer better long term resistance to mold growth versus bright or dark colors.

In addition, softer colors help to add light reflectants to a room. A light-filled environment discourages mold and mildew growth. It is for this reason that high performance paints offering low VOCs, low odor and the highest mold and mildew resistance will limit tintability of a paint to off-white, pastel to mid-range tones of color.

Higher Sheens, Medium Depth to Pastel Colors

Higher sheen paints tend to resist mildew better because they are less porous and more moisture resistant than flat finishes. Pores in the surface of coatings can house dirt that contains organic nutrients that can allow mold and mildew to grow. Eggshell, satin or low luster paint is somewhat less porous than flat paint, higher sheen semi-gloss paint has even less porosity. The less porous the finish, the higher the scrubbability the coating.

In areas prone to mold and mildew growth limiting colorant, use of light colors and higher sheen levels are recommended to discourage mold and mildew.



Wallcovering Installation Systems

Vinyl Wallcovering Provides Highest Durability of All Finishes

Aside from the durability offered by highly durable paint coatings, vinyl wallcovering is still one of the most commonly used wall finish materials in modern construction because it is known to provide the greatest durability and lowest maintenance of any type of wall finish.

Because the hard non-porous surface of vinyl wallcoverings is easy to clean, it is easy to remove dust and allergens ultimately improving indoor air quality long term. When installed with a mold and mildew-proof installation system (primer and adhesive), vinyl wallcoverings can provide an extremely durable and cleanable surface that will extend the lifespan of walls and time between redecorating cycles ultimately reducing maintenance and renovation cost.

VOCs in Wallcoverings

Other than emissions from paint, building designers today are also concerned with VOCs that can originate from many other materials in a building project, including interior decorating materials such as carpet, fabric, furnishings, wallcovering and the products used to install them.

As with most manufactured interior products, some newly installed standard types of vinyl wallcovering may have an initial characteristic odor or “new smell” during the first few days of installation. This slight odor can be attributed to additives, such as the organic or solvent-based inks used for color, or the stabilizers and plasticizers used to make wallcovering flexible that ultimately become an inert part of the finished vinyl material. During the manufacturing process, residual odors from these additives may become trapped when these newly manufactured products are packaged for shipment. This is typically what we smell when a roll of vinyl wallcovering is initially opened for installation.

VOCs in Wallcoverings

Upon installation according to manufacturer's recommended procedures, any lingering odors remaining after vinyl wallcovering has been unrolled have been shown to quickly dissipate through normal ventilation and go away completely.[7]

Today, many types of vinyl made with water-based inks have little to no odor when newly opened.

Tests by independent laboratories have shown that with adequate ventilation, the initial odor in vinyl wallcoverings will dissipate much faster than the odor of virtually any paint.

Source 7: CFFA Chemical, Fabrics and Film Association.

Vinyl Alternative Wallcoverings

In addition to advances in vinyl wallcovering, new types of vinyl alternative and natural wallcoverings have also emerged on the market and are rapidly growing in popularity.

This new generation of wallcovering materials include innovations in non-polyvinyl chloride (non-PVC) materials that look, feel and perform like vinyl, glass textiles, plastic-based textiles, and a return to wallcoverings made from natural fibers and grasses, glass beads, fiberglass and more.

To address mold and mildew concerns many of the latest wallcoverings now contain mold inhibiting additives to enhance mold resistance properties of the finished surface and wallcovering backing and are tested for fungal resistance in accordance with ASTM G21-96 (2002) *Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi*.

However, this alone does not ensure mold and mildew will not occur under the wallcovering or on the wall surface or adhesive when wallcovering is installed with a conventional primer and adhesive and moisture is present.

Wallcovering and Installation Products – A Complete System

Five year case studies conducted by a leading manufacturer of mold and mildew-proof wallcovering primers and adhesives have shown, if an ordinary primer is used to prepare surfaces prior to installation of wallcovering and a standard pre-mixed starch-based adhesive is used to adhere the wallcovering, the stage is set to feed mold growth, if there are moisture or condensation issues after installation.

For this reason wallcovering should be specified as a complete system that includes the use of high performance antimicrobial primer and adhesive to protect wallcovering and wall surfaces against damaging effects of mold and mildew long term.

Wallcovering and Installation Products – A Complete System

Today there is a growing demand for such wallcovering systems by savvy architects, designers, specifiers and property owners who desire the durability and design of a wallcovered finish but want to protect against mold problems long term.

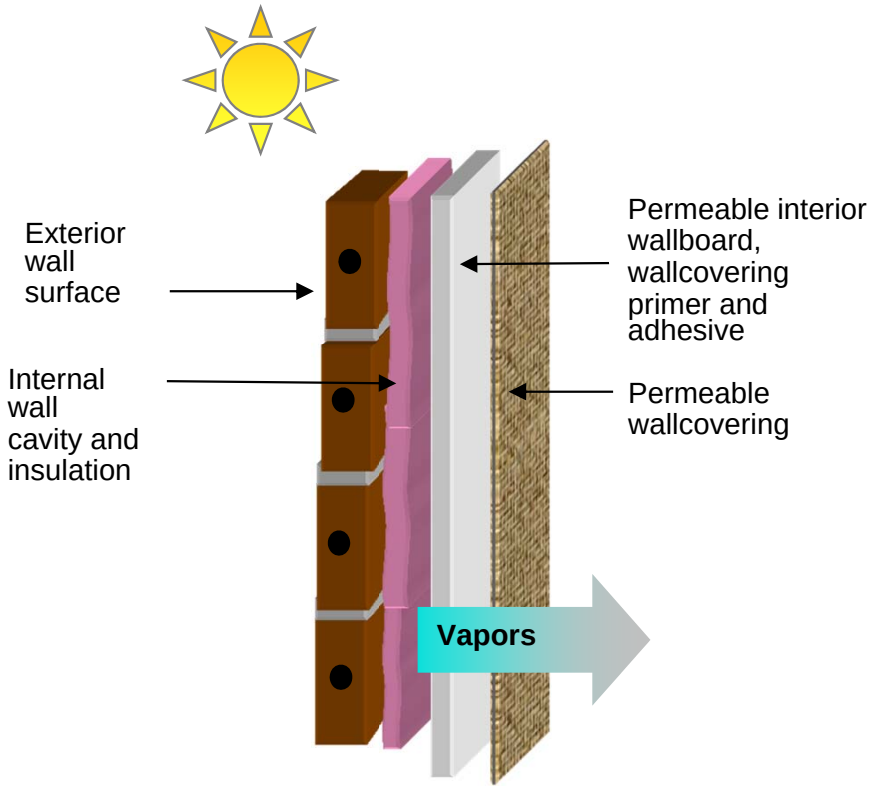
Field Trials. Laboratory tests and 5 year long field trials have proven that ordinary wallcovering primers and adhesives are food for mold and mildew. Mold infestations can occur if moisture becomes part of the equation.

Use of Permeable Wallcoverings to Help Prevent Mold & Mildew is a Growing Trend

Another growing strategy in building design today is the use of highly permeable wallcovering for use where a breathable wall system is desired.

This type of wall system is used in cases where moisture or moisture infiltration from the wall cavity is a concern, such as on external walls in hot climates where air conditioning is common.

When installed with a “vapor permeable” wallcovering primer and adhesive, a permeable wallcovering system allows vapor to escape into the room and then evaporate or be removed through the HVAC system.



Example of permeable wall system. Moisture vapors in wall cavity escape through permeable wall components and then HVAC system removes vapor through dehumidification and ventilation.

Permeability Ratings of Wallcoverings

The permeability of a particular type of wallcovering varies depending on composition, weight and porosity of the material. For example, a Type I non-perforated vinyl wallcovering weighing 12 oz. to 19 oz. may have a Perm Rating of 1 up to 5 (semi-permeable), whereas a Type II vinyl wallcovering weighing 20 oz. and higher may have a Perm Rating of less than 1 (impermeable). New alternative wallcovering materials such as non-PVC or those made with natural fibers are generally known to be considerably higher in permeability than standard vinyl with ratings starting at 5 and reaching 100 Perms or greater (permeable).

To increase permeability of standard vinyl wallcovering, some manufacturers have introduced a process called “microventing”. This process punches hundreds of invisible penetrations per square inch into the face of the vinyl wallcovering. These holes allow water vapor to escape. Most fabric-backed vinyl wallcoverings can be “microvented”. Most “microvented” wallcoverings have a permeability rating of 8 and above, qualifying them as permeable.

Permeability Ratings of Wallcoverings

Permeable wallcovering however, cannot compensate for water intrusion caused by poor building envelope design, faulty construction, HVAC operation failure or improper maintenance practices.

Permeability Chart

Classification	Type (Wallcovering or Coating)	Estimated Perm Rating
Impermeable	Standard Vinyl (Type II and III), Mylar or Foil	Less than 1
Semi-permeable	Standard Vinyl (Type I) Most primers and paints	Between 1 up to 5
Permeable	Paintable paper, pre-pasted paper, non-woven, non-PVC laminated to non-woven backing or “micro-vented” vinyl (All types) Textiles (Fabric and synthetic-based) Natural materials “Vapor Permeable” primer and adhesive	5 or greater *(Some super permeable types offer in excess of 50 Perms or more.)* 34 or greater

Use of Complete Permeable Wall Systems to Address Condensation Issues

A key part of this strategy when using permeable wallcovering is selecting the appropriate drywall and wallcovering installation system that best supports permeability of the entire wall system and also offers antimicrobial benefits for additional protection.

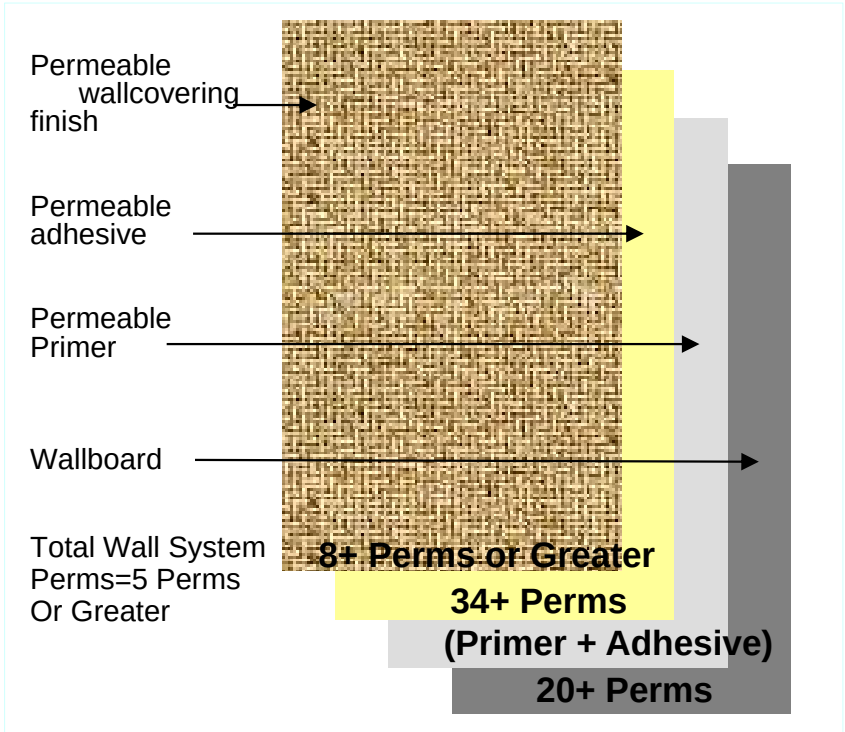
To understand the dynamics that wall components have on the overall permeability of interior walls, “A Technical Assessment of Permeability of Wallcovering Systems Using Common Commercial Drywall” study by James J. Calienni Ph.D. found that “the degree of permeability of each component was critical to the overall final permeability of the wall system (drywall, primer, adhesive and wallcovering).”

The study concluded that when permeable wallcoverings were installed using a common primer/sealer and adhesive, that the resulting Water Vapor Permeability (WVP) of the wall system was significantly reduced to less than the desired 5 Perm Rating. However, when the same wallcovering was installed with a state-of-the-art permeable primer/adhesive system, the Perm Rating of the wall system well exceeded the HUD stated standard by 50% or more.[8]

Source 8: Technical Assessment of Permeability of Wallcovering Systems, Zinsser Co., Inc.

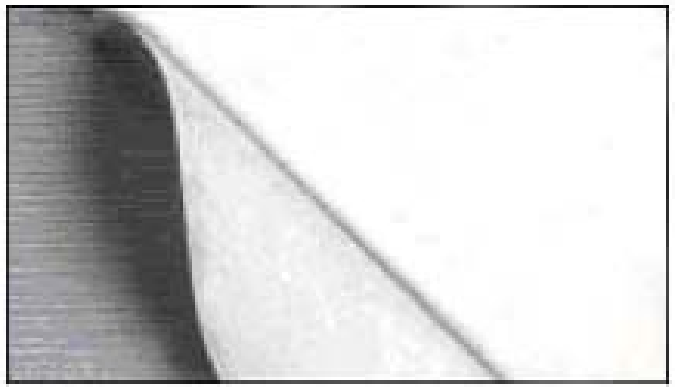
Use of Complete Permeable Wall Systems to Address Condensation Issues

In order to reach a HUD recommended 5 Perm Rating for an interior wall, a system consisting of: 1) state-of-the-art primer and adhesive that rates at least 34 Perms, 2) micro-vented vinyl or other types of permeable wallcovering that is at least 8 Perms, 3) drywall of at least 20 Perms should be used.



Mold & Mildew-Proof Wallcovering Installation Systems Defined

With so many types of wallcovering materials, tightening regulations, and property owner concerns over indoor air quality and mold and mildew, questions regarding what type of primer and adhesive to specify is top of mind with specifiers and property owners when writing specifications for their projects.



With mold and mildew-proof primer and adhesive
No mold growth; clean, undamaged drywall and zero growth rating.

With ordinary primer and adhesive
Significant mold growth; seriously deteriorated drywall.

Mold & Mildew-Proof Wallcovering Installation Systems Defined

When specifying a mold and mildew-proof primer and adhesive, specifiers should look for a system that offers state-of-the-art properties and performance features:

- Contains very efficient properly formulated coatings containing EPA registered antimicrobial agents and other formula ingredients that prevent mold and mildew growth under wallcovering on the primer film and adhesive and inhibits musty odors even under the most extreme conditions

- A rating of “0” growth in mold and mildew-resistance ASTM testing using ASTM *D3273 (Accelerated environmental chamber testing for interior coatings)*; and enhanced ASTM D5590 (*Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerating Four Week Agar Plate Assay*)–the most extreme testing method with a more aggressive mold strain such as *Stachybotrys chartarum* (black mold) added in

- Formulated with low VOC’s and complies with VOC content limits set by the EPA, OTC, particularly standards established by SCAQMD Rule #1113 and GreenSeal GS-11 (primers), and SCAQMD Rule #1168 and GreenSeal GS-36 (adhesives)

Mold & Mildew-Proof Wallcovering Installation Systems Defined

- **Formulations that meet stringent criteria in third party "green" building certification programs** such as "Leadership in Energy and Environmental Design" (LEED).

- **When a permeable wallcovered finish is desired**, a permeable wallcovering primer and adhesive system that offers at least 34 perms.

- **Has long term proven success in the field** in the most challenging humid environments.

- **Backed claims with a long term written warranty** guaranteeing protection of walls and wallcovering from damaging effects of mold and mildew growing on the primer film or adhesive for at least 5 years.

Performance Features

In addition, a mold and mildew-proof wallcovering primer and adhesive should independently offer the following physical characteristics and performance features:

Specific to Wallcovering Primer

- **100% acrylic latex formulation.**
- **Contain unique resin system** that minimizes water absorption into the surface upon which it is applied. In cases where permeable wallcovering is desired, the system should be highly permeable to allow vapor to pass through.
- **Offer superior adhesion and inter-coat adhesion on a multitude of surfaces**, i.e. for use over new or existing, previously painted or wallcovered wallboard, masonry, paneling, etc.
- **Provide superior bonding properties to substrate for a hard, solid surface for double-cutting of wallcovering seams.**
- **Allow wallcovering to strip easily and prevent damage to drywall** later when its time to redecorate.

Performance Features

Specific to Wallcovering Adhesive

- **Formulated for versatile use with virtually any commercial wallcovering**, i.e. vinyl, non-PVC alternative, natural, glass textile, etc.
- **Provide superior wet tack and extended open time** for trouble-free booking and double-cutting.
- **Offer special “no-dilution” formulation** that is paste machine ready. (A no-dilution formula prevents fungal contamination in paste and reduction of mildewcides and adhesion by eliminating need to add water for use in a pasting machine. This special type of formulation can be whipped, stirred or shaken for reduction if needed).
- **Non-staining, easy to cleanup**.

Performance Features

Benefits from such a system include prevention of mildew stains, loose seams, buckling wallcovering and musty odors caused by mold and mildew growing under wallcovering giving property owners the opportunity to take advantage of the beauty and resilience of wallcovering, while protecting their investment against the damaging effects of mold and mildew.

Cost Benefits

Although new low VOC, antimicrobial, high performance coatings and adhesives tend to cost more than regular paints, their benefits often outweigh their costs. Over the long term, specifying a high performance coating will reduce the frequency and disruption of paint- or wallcovering-related renovation and maintenance projects.

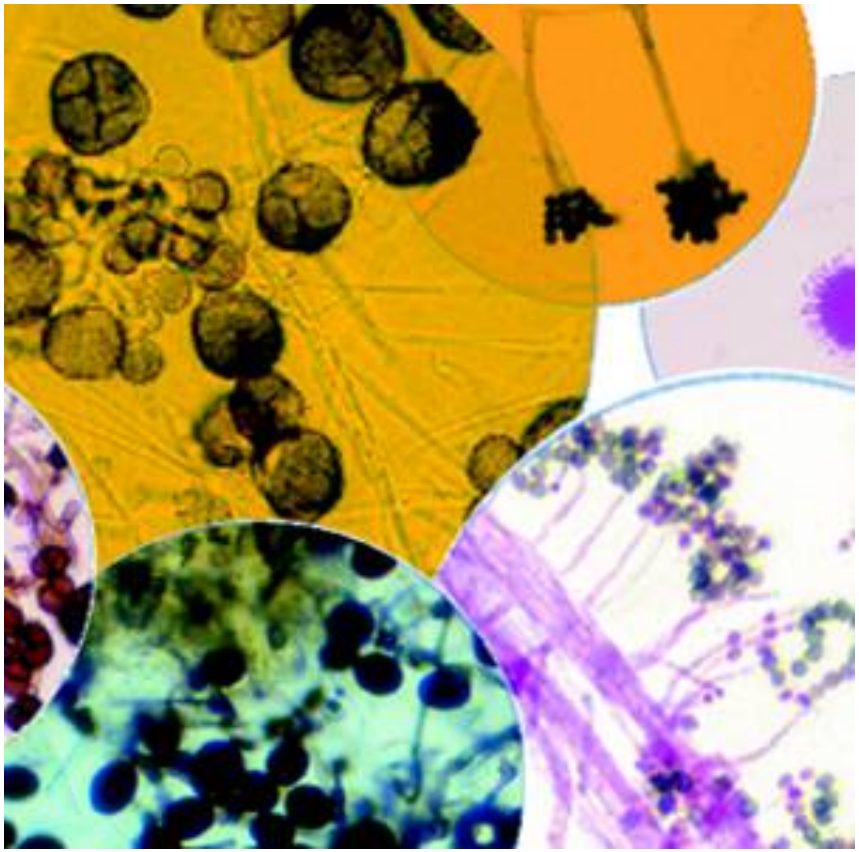
As a result, the cost of low VOC and antimicrobial coatings is minor when compared to the cost of the project as a whole and the long term cost-saving benefits such as:

- Extending lifespan of wall surfaces and wallcoverings;
- Eliminating frequent, costly redecorating;
- Reducing maintenance and repair costs;
- Eliminating out-of-service rooms.

Strategies - New Construction versus Existing Construction/Remodeling

Strategies for mold and mildew-proof coating treatments for new construction versus renovations may differ depending on a number of factors. For example, if a new building is being constructed in a mold prone climate zone, then permeable internal wall systems particularly on external walls may be wise to incorporate into the design.

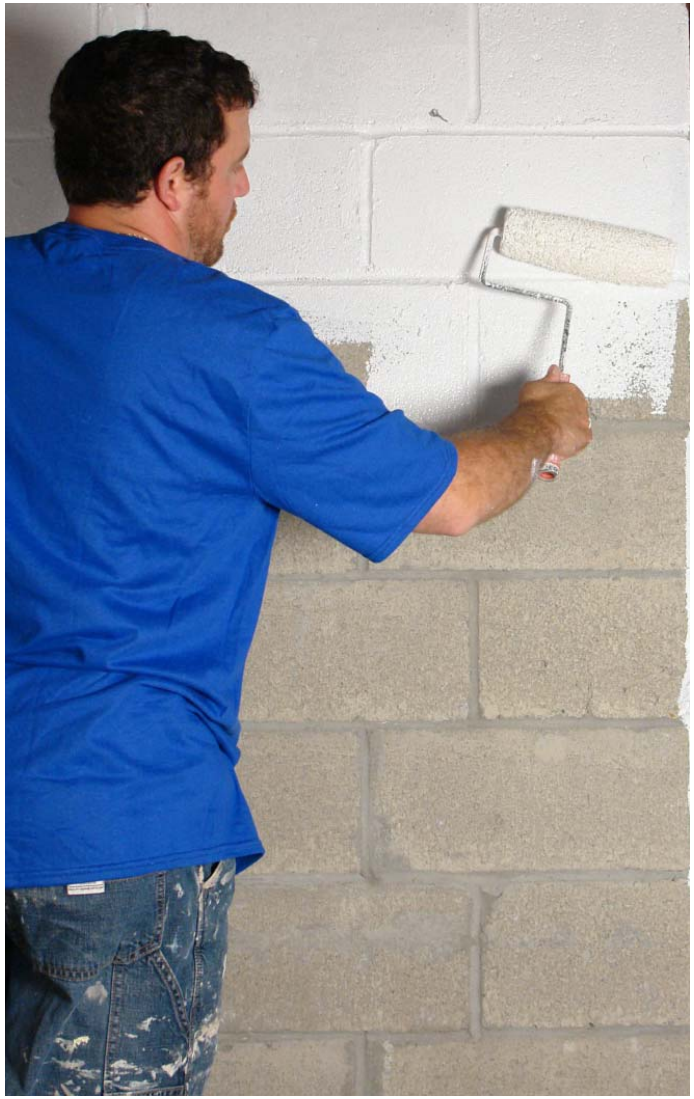
In other instances where a building is being remodeled and either a paint or wallcovering treatment is being applied over existing previously painted or wallcovered walls, or when standard vinyl wallcovering is specified, then a permeable finish would not be as beneficial. In these cases, use of semi-permeable high performance mold and mildew-proof coatings would provide long term protection.



Construction Guidelines

Construction Guidelines

During the construction phase, sequencing of construction, quality of surface preparation and application of antimicrobial coatings and finishes are critical.



Construction Guidelines

While product manufacturers can provide the most precise guidelines for proper surface preparation and application of their products, the following general considerations should be kept in mind, regardless of whether the building is new or existing:

- **Building materials and components that are susceptible to water and moisture damage must be protected** from the weather during transport to the job site, at the job site and after installation. Any building materials that have been exposed to fungal contamination should be treated with an advanced two-step mold and mildew prevention system that combines the use of a disinfectant, fungicidal wash with a mold and mildew-proof coating or sealer to protect and restore soundness of new, aged or recoverable water damaged material against mold and moisture.

Construction Guidelines

This type of system is ideal for new construction, disaster restoration, remodeling or remediation projects to prevent future mold growth on the coating film. It is great for interior wall cavities, trusses, frame and interior side OSB lumber, unfinished cement block or poured concrete basements and related painted surfaces.

Treat building materials, ceilings and inner wall cavities contaminated by moisture with a high performance antimicrobial cleaner and mold and mildew-proof sealer.

Construction Guidelines

- **In new construction, sufficient time should be allowed for the building to dry** out before drywall, coatings and wallcoverings are installed. Wall finishes should not be installed until joints and spackled areas are thoroughly cured, while cement or sprayed on fireproofing are still curing/drying, and/or before the water piping has been tested.

  For specifiers who want to treat cured interior or exterior masonry to *keep water out* and *keep mold and mildew away*, new advanced mold and mildew-proof waterproofers are available and can be applied to wet or dry surfaces, and have less odor than even latex paint, leaving a smooth, non-gritty finish that offers long term guaranteed waterproof and mold and mildew-proof performance.

- **During the interior finish phase, proper humidity should be maintained at all times both during occupied and unoccupied periods.** This should be of highest priority, particularly in hot, humid climates.

Construction Guidelines

- **Care should be taken to ensure that high moisture content in wallboard is due to relative humidity and not a leaky building or improperly stored building material.** According to the Wallcovering Association, in general, moisture content due to relative humidity of new drywall in a hot, humid climate may be up to 18% as measured by a moisture meter during cooling season. In other areas, normal moisture content should be typically under 6%.

- **Moisture-retaining substrates receiving the coating must be dry** and have moisture content within the manufacturer's allowed tolerances. Manufacturer's recommended moisture measurement techniques should be employed.

Moisture Meters. Moisture meters that detect, measure and locate moisture in building materials are an important diagnostic tool for mold prevention.

Construction Guidelines

- **In existing buildings, careful inspection of the wall surface should be made and any mold infestations should be remediated before application of mold and mildew-proof paints or wallcovering systems**. This should include correcting moisture intrusion problems, replacing porous materials such as drywall where mold was growing, completely cleaning off old wallcovering adhesives (if any) where wallcovering was removed, killing mold and mildew from infested internal wall cavities and non-porous surfaces with a special antimicrobial fungicidal wash or with an EPA-registered fungicide and only according to label directions. Remediation is an entire process. It includes reduction in spore content, containment to reduce the spread of spores during the removal process, and the proper removal of infected areas.

Remediation

Construction Guidelines

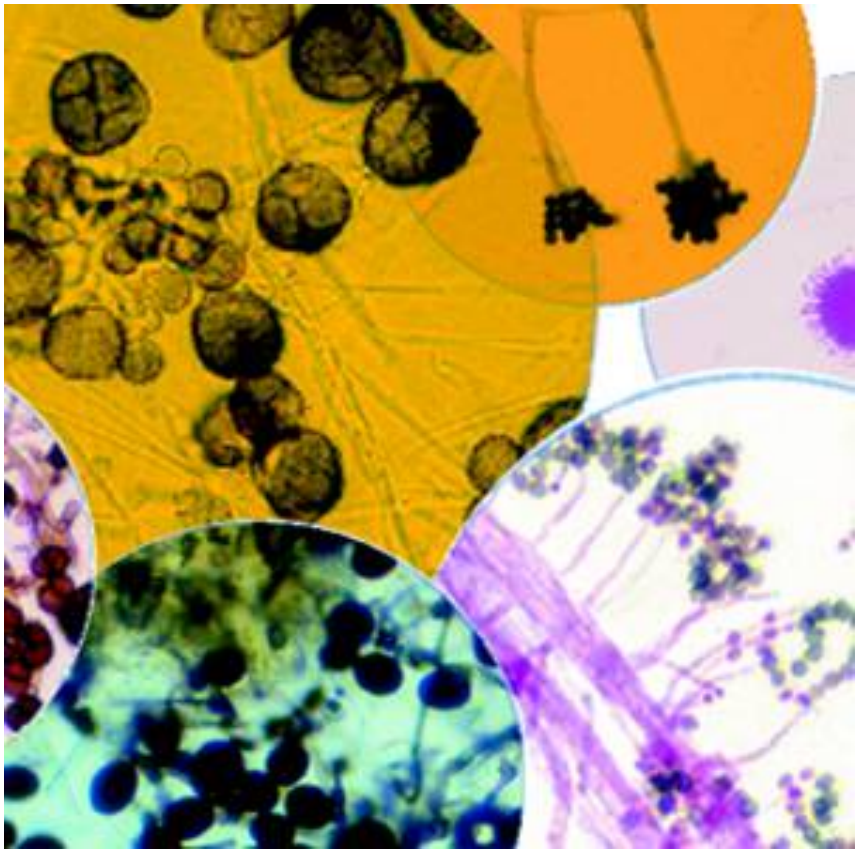
- **Coatings or adhesives should NOT be diluted, thinned, or added to** (unless instructed by manufacturer). Although some installation professionals alter the products to fit their application needs, such as cutting wallcovering adhesive with water, diluting an antimicrobial product will weaken its performance properties and may contaminate the product or application. If antimicrobial coating formulations are altered manufacturer's warranties and guarantees will be nullified.

Use special wallcovering adhesives with "no dilution" formulation that can be whipped or stirred to prevent contamination of paste and water.

Establish Specific Design and Construction Guidelines at Project Inception

The building owner and all members of the design and building team, including interior designers, drywall contractors and wallcovering installers, must be aware of these factors and work together to mitigate them, by being involved in the planning, design, construction, finishing and commissioning of the building.

To ensure long term mold and mildew-free building construction, establish specific design and construction guidelines at project inception, use periodic peer reviews throughout the design and construction process to compare results against original construction guidelines, and follow through to ensure contractors do not cut corners and are using specified antimicrobial coatings according to best practice guidelines.



Specifications, Certifications, Documentation, and Green Building Requirements

Specification Language

The specification of interior and exterior coatings and finishes represents a major component in a building project especially if prevention of mold and mildew long term is a concern. Product choice has a significant impact in a facility's function, appearance and future maintenance.

Specification language should be written to clearly indicate the level of mold and mildew prevention desired and/or should call out the specifier's product of choice.

Documentation Will Support Mold & Mildew-Proof Claims

With more stringent regulations and indoor air quality plan requirements by investors and insurers, manufacturer's documentation should help to identify environmentally preferred products best suited for a project and should also show that the products meet green building criteria.

Documentation Will Support Mold & Mildew-Proof Claims

When specifying a high performance mold and mildew-proof coating, specifiers should require product manufacturers to provide the following types of documentation to support claims including:

- Technical data bulletins that includes spread rates;
- MSDS sheets;
- Indoor Air Quality statements;
- Independent lab testing reports;
- Procedure to obtain a long term of written warranty against growth of mold and mildew on the primer or paint film or on the adhesive (typically 5-years);
- Information on history of mold and mildew-proof performance in real applications in the most extreme climates with testimonials;
- For low VOC, mold and mildew-proof products, certifications by third party watch groups such as Green Seal (GS) or GREENGUARD or certifications by the product manufacturer or independent lab that their products meet or exceed environmental group certification criteria.

LEED Green Building General Requirements

Programs like the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program also gives building owners, operators, insurers and investors the tools they need to identify low-emitting, eco-friendly products through a credit system that ensures building products used in construction meet the project's environmental performance goals.

The LEED Green Building Rating System has become the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. Within their rating system, LEED routinely refers to standards set by third party environmental groups such as Green Seal (GS) or South Coast Air Quality Management District (SCAQMD).

If products used in construction meet the outlined criteria, the building owner can receive "points" within different "credit" categories such as *Paints and Coatings* (Credit 4.2, 1 point) and *Adhesives and Sealants* (Credit 4.1, 1 point), toward earning a LEED building project certification.

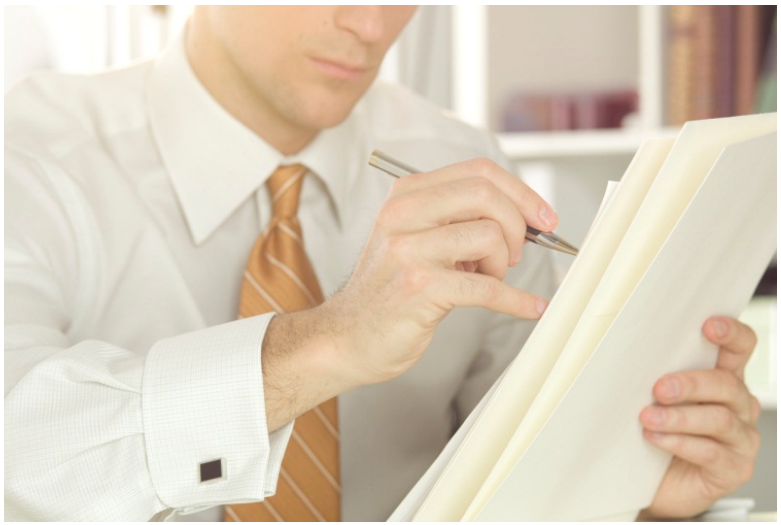
Green Building Product Performance Criteria

For example, in the category Indoor Environmental Quality (EQ) Low-Emitting Materials, under the credit classification *Paints and Coatings* (EQ Credit 4.2), and the classification *Adhesives and Sealants* (EQ Credit 4.1), the intent of the LEED credits and criteria for earning points is to reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Please remember the **exam password CONTAMINANTS.** You will be required to enter it in order to proceed with the online examination.

Product Certifications

Some coating and wallcovering manufacturers have sought third party environmental group product certifications, through organizations such as Green Seal or GREENGUARD as a means to show compliance with green building materials specifications. In general, these third party product certifications show that the products have been tested and passed that particular group's environmental standards.



Some leading product manufacturers have created their own "green product designations" that show that their products have been independently tested and meet or exceed third party environmental group certification criteria and will provide documentation to support project certification requirements such as LEED.

Product Certifications

As an example, the environmental standards set by Green Seal's GS-11 specification for paint, rates performance differences of new low to zero-VOC coatings and sets minimum requirements for scrubbability, hiding power, washability of interior topcoats and the hiding power of exterior topcoats to ensure these new environmentally preferred low VOC paints perform as well as or better than their solvent-based counterparts.

In addition to durability requirements, GS-11 further limits a product's aromatic compounds and restricts use of several chemical components including certain metals, aromatic solvents, semi-volatile organics and preservatives. Green Seal reserves a "Class A" designation for products without VOCs that also limits use of specific chemical ingredients.

Green Building Specifications

When issuing project guidelines, green building specifications should ensure that language outlining VOC limitations and maximum mold and mildew-proof performance product criteria are clearly stated in each section of the specification where paints, coatings, adhesives and sealants are addressed.

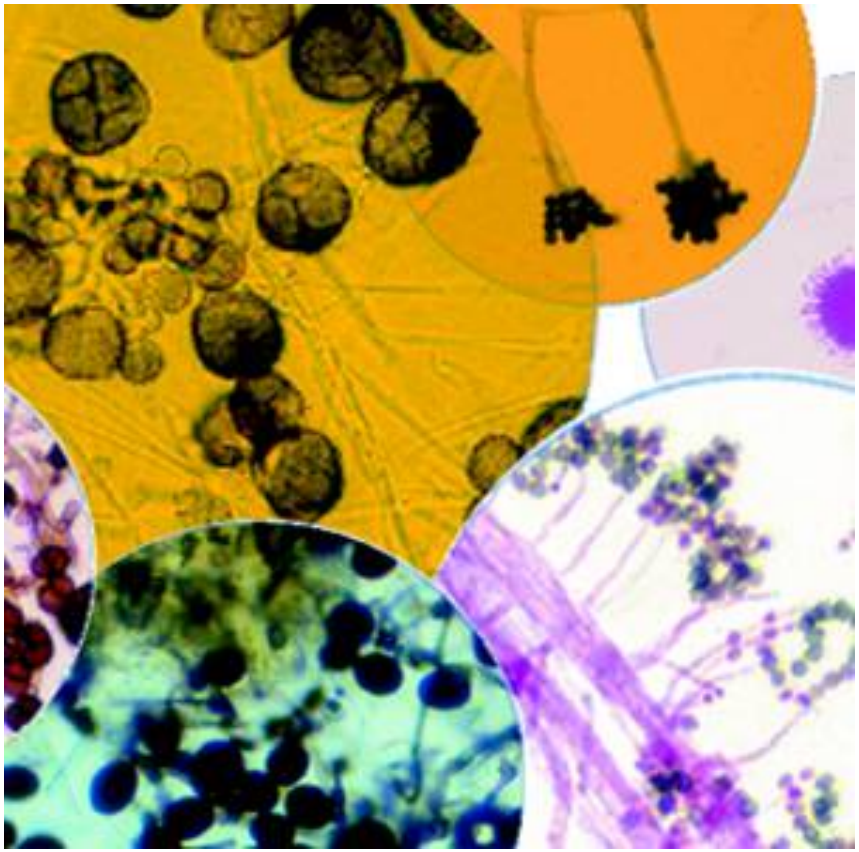
Product cut sheets, MSDS sheets, signed attestations, or other official documentation/literature from the manufacturer that clearly identifies the VOC content, level of mildew resistance and compliance with the third party standards should be required in construction documents.

Green Building Submittal Requirements

If a LEED project certification is desired, a LEED-CI letter template must be provided for each credit and signed by the architect, interior designer or other responsible party. It must list all the interior paints, coatings, adhesives, sealants, sealant primers and aerosol adhesives that are addressed by the referenced standards and declare that they meet the noted requirements.

The letter must warrant that the coatings or adhesives used on the project comply with the current VOC and chemical component limits and the chemical component restrictions of each standard. For each product in the listing, the VOC level must be stated along with the applicable standard, the classification of material and the VOC limit.[9]

Source 9: U.S. Green Building Council.



Conclusion

Conclusion

The damaging effects of mold and mildew growth in buildings can be costly. Mold can cause discoloration of wall finishes and odor problems, deteriorate building materials, and lead to a range of health problems.

There are multiple factors that contribute to mold growth. The most prevalent is moisture infiltration into the building cavity. Control moisture and stop mold.

To ensure long term mold and mildew-free buildings, specifiers today are using high performance mold and mildew-proof coatings and wallcovering installation systems from manufacturers with long-standing proven successful track records in the field.

Benefits of these products for interior and exterior applications include long-lasting beautiful finishes that can withstand high humidity and regular cleaning—ultimately reducing maintenance and frequent redecorating costs.

Conclusion

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