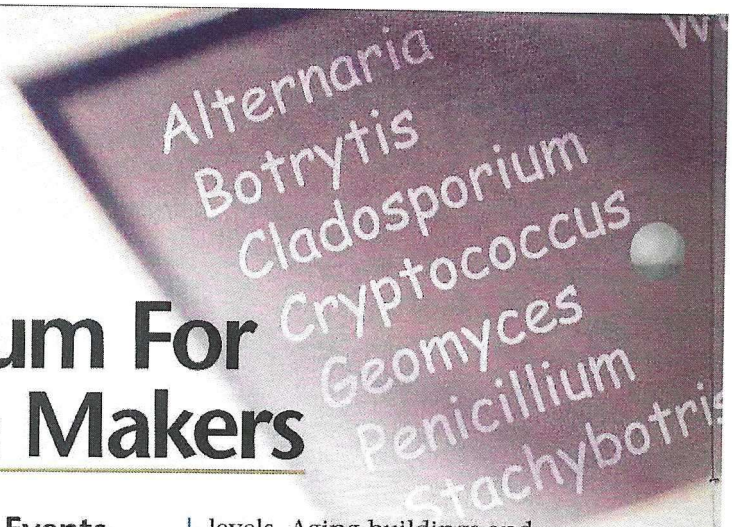
DOW Building Materials

United States | COMMERCIAL

Moisture Management

IN SCHOOLS AND UNIVERSITIES



A New Curriculum For School Decision Makers

Microbial contaminants – particularly molds – account for half of indoor air health complaints. That means as many as 7,500 public schools have indoor air problems related to mold.

(USA Weekend, August 20, 2000)

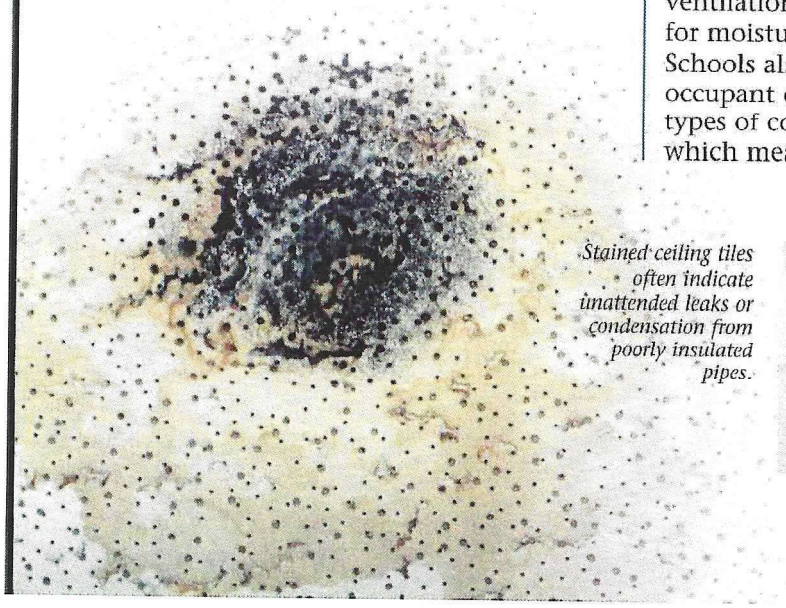
Current Events

U.S. public schools and universities are in the midst of a period of intense construction activity, representing billions of dollars invested in educational facilities. Nearly half of those dollars are spent on additions and renovations. (Source: College Planning & Management and School Planning & Management 2002 Construction Reports.)

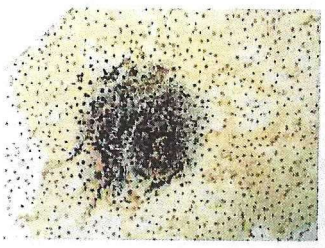
Managing moisture in school and university environments is one of many critical issues confronting educational facility managers today. Why are schools and universities particularly vulnerable to moisture-control problems? To answer this question – and develop an effective action plan – several key building science issues must be considered.

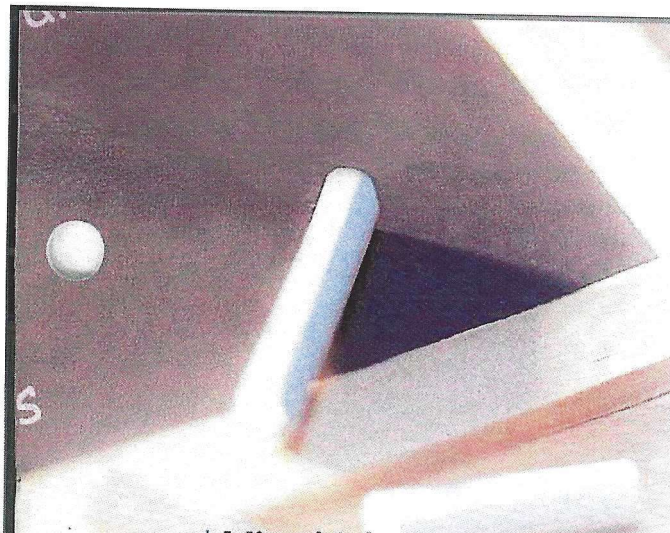
To reduce energy loss, many educational buildings are sealed tight. But this practice, begun during the "energy crisis" of the 1970s, also reduces natural ventilation, making it difficult for moisture to evaporate. Schools also have a higher occupant density than other types of commercial buildings, which means higher humidity levels. Aging buildings and many retrofitted heating, ventilating and air conditioning (HVAC) systems can make humidity control and maintenance more difficult.

But how does moisture get into the building in the first place ... and why is it a concern? Water is ever present in the air in the form of vapor. HVAC systems are intended to help create a more comfortable indoor environment by maintaining humidity and temperatures at optimum levels. Other sources of moisture in buildings include leaking roofs or plumbing, improperly cycling air conditioning systems, design or construction defects in the building envelope and condensation in or on building materials. Sometimes, the first indication of a potential problem is a stained ceiling tile resulting from saturated and dripping pipe insulation, or a puddle below. Often, a problem may not be discovered until building occupants begin to complain about musty odors and possible health concerns associated with high mold concentrations.



Stained ceiling tiles often indicate unattended leaks or condensation from poorly insulated pipes.





According to the American Industrial Hygiene Association (AIHA), studies have shown that perhaps 50 percent of microbial problems in buildings are not visible.

Microbiology

Mold is a generic term referring to any number of spore-bearing micro-organisms, or fungi, that feed and grow on cellulosic (organic) substrates. Mildew is the name given to the discoloration caused by mold when it grows on a substrate. Several common molds are all around us in small concentrations, and are harmless to most people in typical outdoor concentrations. However, the California Research Bureau reports that "all molds under proper conditions are capable of eliciting a negative health response in humans through other methods such as inflammation, allergy or infection."** The conclusion: a few molds have the potential for harm.

Tiny and lightweight, mold spores travel easily through the air. Preferring a temperature range between 40°F and 100°F and having simple needs – a food source and moisture or high humidity – the spores can remain dormant indefinitely, later to flourish when the conditions are just right. Enclosed areas, such as those where chilled water lines run, provide the ideal mold breeding ground.

Many common building materials are cellulosic and, as a result, they can become ideal mold food sources.†† Mold concentrations can quickly grow to high levels under the right conditions:

- Ready availability of nutrients
- Moist, humid environment
- Building designs that limit fresh-air ventilation
- Poor maintenance practices

Piping systems for air conditioning and other utilities designed to control humidity and enhance comfort can actually be a big contributor to this problem, especially if the pipes are not protected with adequate insulation.

Mold has captured the attention of the media, the legal establishment and the insurance industry, and is increasingly implicated in the destruction of homes and public buildings and as a threat to public health. In 1999, occupational health experts from the Centers for Disease Control (CDC) began a five-year initiative on work-related asthma in offices and schools, with an emphasis on moisture and mold exposures. As part of that initiative, CDC is funding the Institute of Medicine to evaluate the relationship between damp or moldy indoor environments and the manifestation of adverse health effects.

Applied Science

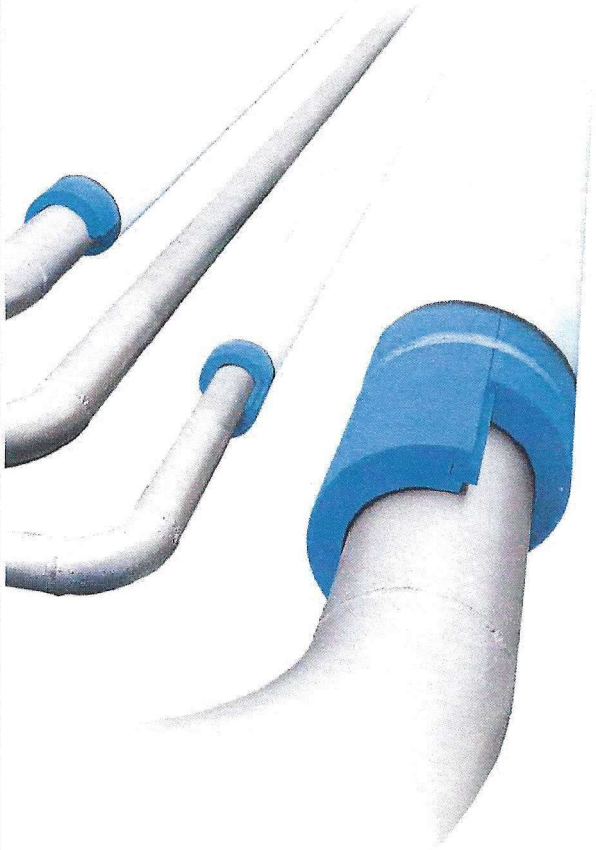
Just as water droplets form on the outside of a cold glass of water on a warm, muggy day, any time the surface temperature of a chilled water or other utility pipe operates below the dew point of the ambient (surrounding) air, condensation can form on the exterior pipe surface. Insulating these pipes isolates them from the moisture-laden air and keeps the exterior surface above the dew point temperature, protecting pipes from the harmful effects of water and water vapor. Water is the enemy of insulation effectiveness, and the wrong type of insulation can allow water to wick through the system, making it less energy efficient. Water-saturated insulation can cause pipe corrosion and system failure. It can also drip on other building materials, providing a welcoming environment for mold growth. In addition, mold can grow on and in some types of insulation.

Glass fiber pipe insulation offers little resistance to the effects of moisture, including pipe corrosion and mold formation. Paper-backed all-service jacket (ASJ) is typically used as a vapor retarder over glass fiber pipe insulation. ASJ's delicate foil covering tears easily, allowing dirt, water and mold spores to enter the fibrous insulation. The paper backing on ASJ also provides a nutrient source for mold.

**California Research Bureau, *Molds, Toxic Molds and Indoor Air Quality*, 2001

††U.S. Environmental Protection Agency, *Building Air Quality: A Guide for Building Owners and Facility Managers*, 1991

The right pipe insulation system is a step in the right direction.



Do you know what pipe insulation your contractor is using? You should. After all, your knowledge about moisture management may be the only thing standing between a fully operational facility ... and millions of dollars of maintenance and repair costs down the road.

Current scientific and engineering literature offers abundant information about moisture control. Putting that knowledge into practice requires a comprehensive approach.

There is no single solution to managing moisture and reducing the potential for mold growth in buildings.

Sealing roofs, installing appropriate flashings around window and door openings, upgrading HVAC systems and engaging in other sound building and maintenance practices are all steps in the right direction. Choosing the right pipe insulation system is another important step. In a single school building, thousands of feet of pipe may be used as part of the heating and cooling system. That's thousands of feet of opportunity to minimize water condensation and potential moisture-related problems.

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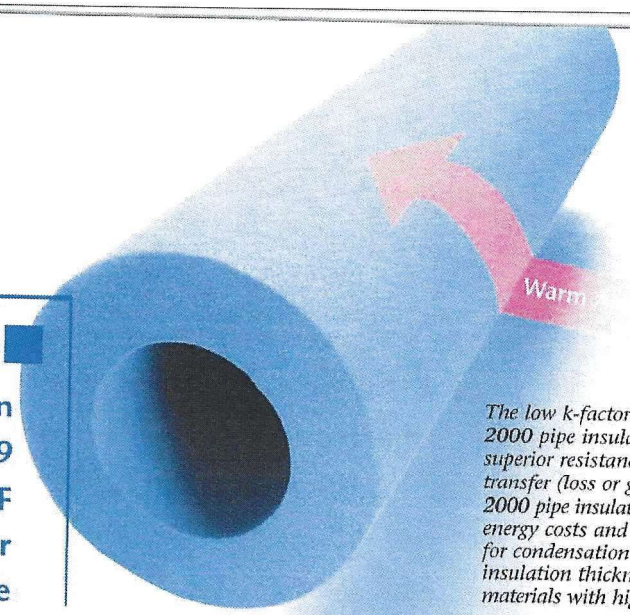


The low k-factor of ***Trymer*** *2000 pipe insulation gives it superior resistance to heat transfer (loss or gain).* ***Trymer*** *2000 pipe insulation can reduce energy costs and the potential for condensation with less insulation thickness than materials with higher k-factors.*

Trymer 2000 pipe insulation has a low k-factor of 0.19 BTU•in/hr•ft²•°F at 75°F mean temperature. The lower the k-factor, the better the insulating performance.

An Educated Choice: Trymer 2000 Pipe Insulation

Trymer* 2000 polyisocyanurate pipe insulation is a closed-cell, high-performance insulation for pipe, vessel, equipment and duct applications. It is the most cost-effective choice on the market for chilled water and other commercial pipe insulation systems with service temperatures in the 35°F to 300°F range. (In fact, **Trymer 2000** pipe insulation is used extensively in a variety of applications within the service temperature range of -297°F to 300°F.)

Thermal conductivity (k-factor) is a key consideration in choosing the right pipe insulation. The low k-factor of **Trymer 2000** pipe insulation gives it superior insulating ability, helping to keep the cold pipe surface as isolated as possible from the surrounding air. This isolation prevents water in humid air from condensing on the pipe. And the low permeability rating of **Trymer 2000** pipe insulation gives it excellent resistance to the vapor drive found in cold service applications, further reducing the potential for water penetration into the system. Finally, **Trymer 2000** pipe insulation is not known to be a nutrient source for mold growth, and its closed-cell structure does not wick water or sustain mold growth within the insulation material.

The uninsulated area of this glass illustrates the dew point condensation that is a common challenge in cold piping systems. (The dew point is the temperature at which moisture from the air condenses into liquid water.) Without insulation (e.g., a cozy), water droplets form on the glass surface.

By isolating the glass surface from the humid air, the insulated cozy keeps condensation from reaching the glass.

Trymer pipe insulation and *Saran* Vapor Retarder Film and Tape are used effectively in school and university chilled water systems. For example, Trymer/*Saran* systems meet the specifications of the Mobile County (Alabama) School District and Georgia Tech.

To learn more, request case study form numbers 179-08058 and 179-08067 from your Dow representative.

The low vapor permeance of **Saran** *Vapor Retarder Film keeps water from entering the pipe insulation system.*

Saran *Vapor Retarder Film and Tape provide continuous protection from water vapor drive, even at elbows and fittings.*

The First Line Of Defense: *Saran* Vapor Retarder Film And Tape

A vapor retarder is an insulation system's first line of defense against water and water vapor. Regardless of the insulation's quality, if the vapor retarder is breached, moisture will eventually penetrate the insulation and degrade its insulating efficiency. This is especially true – and happens very quickly – with open-cell or fibrous insulations such as glass fiber, which offer very little resistance to water vapor movement.

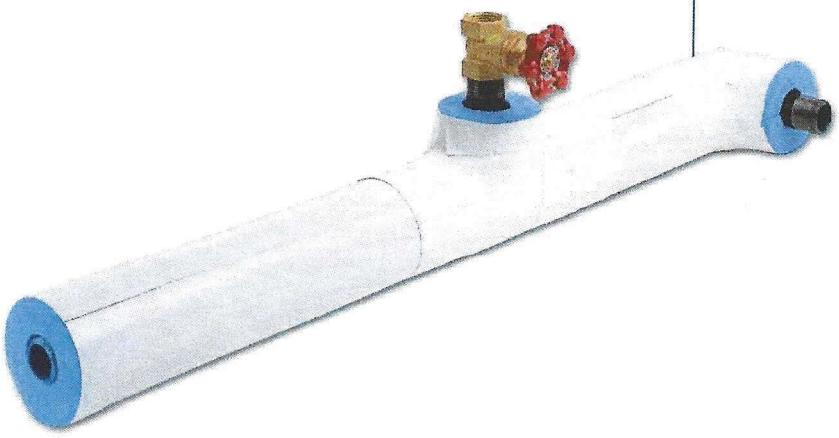
While **Trymer 2000** pipe insulation provides excellent resistance to water penetration and is not known to be a nutrient source for mold growth within your insulation system, covering the system with ***Saran**** Vapor Retarder Film and Tape can provide long-term protection.

Alternative insulation systems frequently use all-service jacket (ASJ) as a vapor retarder. But ASJ has a thin, delicate layer of foil and a paper backing – which can be easily damaged to allow the moisture into the insulation system. As water compromises the performance of the entire pipe system, cellulose in the ASJ paper backing provides food for mold to grow and flourish. ***Saran*** Vapor Retarder Film is not known to be a nutrient source for mold growth and protects the entire insulation system – even elbows and fittings – from water penetration.

The exceptional strength of **Saran** *Vapor Retarder Film enables it to resist damage during installation and system operation.*

*Trademark of The Dow Chemical Company

The right pipe insulation system is vital to effective moisture management. Ask your contractor about **Trymer 2000** pipe insulation and ***Saran*** Vapor Retarder Film and Tape for your next pipe project.



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COMBUSTIBLE: Protect Trymer pipe insulation from high heat sources. For more information, consult MSDS and/or call Dow at 1-866-583-BLUE (2583). In an emergency, call 1-989-636-4400. Local building codes may require a protective or thermal barrier. Contact your local building inspector for more information.

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