

## How to prevent mould and improve indoor air quality



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# Mould and Indoor Air Pollution

## Mould and Indoor Air Pollution – No one wants them. No one has to put up with them.

Nobody wants mould and indoor air pollution in their home or building. It's that simple. If you apply modern building science principles and use appropriate new materials, no one has to put up with them. We're that certain. Here's why.



## Mould and indoor air pollution in buildings are not new phenomena. Why the concern now?

### Mould

Mould has long been recognised as a potential allergen. The word mould describes a large family of microorganisms that produce spores. Airborne mould spores contain proteins that have been identified by the research community as having the ability to trigger adverse reactions in people who suffer from allergies, asthma or other respiratory problems. The familiar 'mildew' smells that we associate with basements arise from these moulds that are growing in damp spots.

Some forms of indoor mould produce toxic compounds called 'mycotoxins'. Exposure to mycotoxins can represent a health risk to both non-allergic and allergic individuals. While it is not clear how much mould toxin exposure it takes to cause illness, or what kind of symptoms are likely, recent research does demonstrate that mold toxin is a potential health hazard.<sup>1</sup>

Mould is not going away anytime soon, unless changes are made by all disciplines involved in building design and construction. A recent survey of Indoor Air Quality Professionals indicated that the majority of these experts believe that mould problems will continue to increase.

### Indoor Pollutants

In 1994, the American Lung Association, the American Medical Association, the U.S. Consumer Product Safety Commission, and the U.S. Environmental Protection Agency (EPA) put health professionals on alert to recognise the many effects of indoor pollutants on human health. Studies from Europe and the United States show that individuals in industrialised nations spend more than 90 percent of their time indoors. The U.S. EPA underlines the seriousness of indoor pollution: "... the concentrations of many pollutants indoors exceed those outdoors. The locations of highest concern are those involving prolonged, continuing exposure – that is, the home, school and workplace."<sup>2</sup>

Companies specialising in indoor air quality investigations have seen an eight-fold increase in all types of mould related complaints over the past five years.<sup>3</sup>



## Mould and Indoor Air Pollution: Why do they occur?

Mistakes or oversights in a building's design, construction, use and/or maintenance may contribute to a mould or indoor pollution problem. The problem comes to the forefront when we are presented with repairs that are extremely expensive and health consequences that are debilitating. Some of the conditions most often contributing to mold and IAQ problems include:

### 1. Rain leakage and other moisture penetration:

- Rain or melted snow can enter through leaks in the roof or exterior sheathing.
- Ground water can enter through the basement or crawlspace.

### 2. Plumbing problems:

- Plumbing pipes and fixtures may ultimately corrode and fail, given enough time. Without prompt repairs, the resulting leakage can cause considerable water damage and mould growth.
- Similarly, washing machines and dishwashers can malfunction and allow water leakage that often results in building damage and mould growth, particularly if it is not detected early.

### 3. Walls and ceilings that allow air to flow through 'the building envelope':

- There can be a great deal of air leakage through outside walls and ceilings (together refers to 'the building envelope'). Air leakage through this building envelope can allow moisture to condense within the walls and ceilings, depending on the outdoor temperature and humidity.
- In northern (winter) climates, moisture-laden air going out through the walls can cause condensation when it reaches the cold outer layers of the wall. In southern climates, warm, humid outside air leaks inward and can cause condensation when the air reaches air-conditioned materials inside (e.g. the backside of drywall, or cold air-conditioning ducts).

### 4. Poor insulation and 'cold spots' that attract moisture:

- Some buildings may have no insulation, or there are places where the insulation is inadequate or has settled over time. In winter climates, this can leave cold spots that attract moisture condensation and cause mould growth. In humid southern climates, inadequate insulation may expose air-conditioned materials inside to the warm moist air from outside, again leading to condensation and mould growth.

### 5. Materials that emit pollutants:

- Building materials using adhesives such as urea-formaldehyde glue.
- Common household products such as cleaners and personal toiletries can be pollutants.
- White-board markers, candles and air fresheners.

### 6. Inadequate or faulty ventilation:

- Excess moisture from all the normal activities of daily living (showers / cooking) and stale air can accumulate without adequate controlled ventilation.

A poorly designed or improperly maintained building can contribute to pollution problems.



## How to Minimize the Risk – A New Approach to Healthy Buildings developed in Canada

In their simplest form, buildings are boxes of air that provide comfort and shelter from outdoor environments, but in reality, they are a complex, interconnected set of building materials and systems carefully woven together. Change one part of a building and you can affect many others. Any product used in constructing the building must be able to work in a positive and mutually beneficial manner with all the other building components.

A construction system is balanced like a chain of elements assembled to optimize energy consumption. If just one of the links in the chain is defective, the balance is broken.



This inter-dependency is the underlying principle behind the 'systems approach'. The systems approach is a method of design, construction, inspection and testing that accounts for the interactions of the various building components, such as the foundation, walls, roofs, doors, insulation and mechanical systems, along with factors like site, climate and occupant behavior.<sup>4</sup> If these interactions are not accounted for, Mother Nature will prevail and problems inevitably occur.

Combining the systems approach with proven, new building materials allows designers and builders to create mould resistant, healthy buildings and homes that are good for the adults and children who occupy them.

Builders get fewer callbacks and complaints. Building owners get better value. Architects are assured that their concepts can become reality. All decrease their risk of property loss or damage and any associated liability, while building occupants avoid unnecessary health risks. These are results everyone can benefit from.

What are some of the most important procedures that are necessary to follow in order to create healthy buildings?

- ✓ Use a full rain-screen and drainage plane around the entire building.
- ✓ Establish good drainage away from the building.
- ✓ Eliminate air leakage in walls and ceilings.
- ✓ Insulate to provide a continuous thermal barrier.
- ✓ Choose low-emission materials.
- ✓ Install adequate ventilation.



# Icynene helps prevent mould growth

## What Products Will Help You Accomplish This? The Icynene Insulation System® –a Key Factor in Creating Healthy Buildings

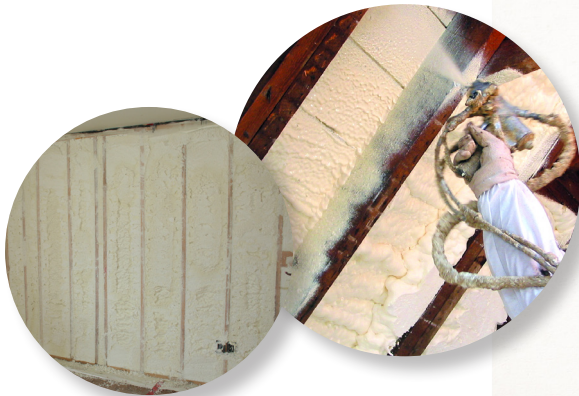
Building materials have evolved dramatically over the past ten years. Proven technologies that meet the needs of a systems approach to building design are readily available. Icynene spray foam insulation, a prime example, helps make buildings Healthier, Quieter and More Energy Efficient™. Made in Canada since 1986, Icynene offers a range of spray foam insulation products for use in all types of construction. Its unique characteristics allow it to simultaneously insulate and air-seal the building to form a protective barrier.

### Air & Moisture Control

Icynene® is applied by licensed dealers who create continuously insulated, tight walls and ceilings – exactly the leak-free ‘building envelope’ that is needed to avoid moisture, condensation and mould. By eliminating air leakage, there is no moisture transport through the building envelope. This helps to prevent condensation and the potential for mould growth within the walls or ceilings. Icynene® has been tested by Texas Tech University and proven not to be a food source for mould.

### Continuous Thermal Barrier

Icynene® is sprayed into walls, ceilings, floors and basements as a liquid and expands 100 times its volume in seconds to fill all cracks and voids in the building envelope. The resulting blanket of foam insulation forms a continuous thermal barrier that eliminates cold spots and significantly reduces heating and cooling costs.



# An insulation system that helps improve indoor air quality

## Healthy Base – No Harmful Emissions

The Icynene Insulation System® is the ideal base for a healthy indoor environment. The first insulation certified by the Envirodesic™ Certification Program for Maximum Indoor Air Quality™, this foam insulation does not contain formaldehyde, CFCs, HCFCs nor any volatile organic compounds! Icynene® also minimises the intrusion of mould spores, pollens and other outdoor pollutants. When combined with proper ventilation and other low-emission materials, Icynene® helps improve the quality of indoor air.

## Innovative Solutions – New Residential

Icynene®'s consistent insulation and airsealing properties have also allowed innovations in building design and use. For example, in humid southern climates, ventilated attics have been prone to energy inefficient operation, condensation on air-conditioning ducts and mould growth. With Icynene®, insulation can be placed under the roof deck, and the attic becomes conditioned space allowing for right-sizing of air-conditioning units and additional energy savings.

## Innovative Solutions – Existing Residential

Icynene® has proven to be ideal for reconstructing older buildings and for rebuilding after mould remediation. Its consistent insulation and air-sealing properties help prevent mould re-growth. By using Icynene® in combination with proven design principles, any older building can be converted from a problem building into an efficient, healthy building.



## Innovative Solutions – Commercial, Institutional, Industrial

Icynene® has been used in dozens of different applications, from commercial construction to industrial and agricultural buildings, hotels, schools, stores and warehouses. Specific case studies can be found at [www.icynene.com](http://www.icynene.com). These studies describe how Icynene® has been used and the many measurable success stories.

For mould remediation, Icynene®'s highly trained Network of Licensed Dealers work closely with diagnostic and remediation experts to ensure that the building is rebuilt correctly.

### The Bottom Line

No one wants mould or indoor pollution in their home, school or workplace. Now there are products like The Icynene Insulation System® that can help prevent mould and improve indoor air quality.

### The Icynene Insulation System

Healthier, Quieter, More Energy Efficient™ - We'll Change the Way you think about Insulation! Icynene® is ideal for residential, commercial, industrial and institutional indoor applications.

### Icynene is:

#### Healthier

Water based. No CFCs, HCFCs, formaldehyde, or volatile organic compounds. Seals out dust, pollen and other allergens from entering the structure. Air-sealing minimises the potential for condensation, mould and mildew.

#### More Energy Efficient

Up to 50 % energy savings versus traditional insulation when used in identical situations.

#### Quieter

Air-sealing blocks out airborne noise from entering the structure. Minimises noise in plumbing run walls.



### References

1. Murtoniemi, T., Nevalainen, A., Suutari, M., Toivola, M., Konulainen, H., and Hirvonen, M-R. "Induction of Cytotoxicity and Production of Inflammatory Mediators in RAS264.7 Macrophages by Spores Grown on Six Different Plasterboards". *Inhalation Toxicology*, 2001; 13:233-247.
2. American Lung Association, American Medical Association, U.S. Consumer Product Safety Commission, and U.S. Environmental Protection Agency. "Indoor Air Pollution: An Introduction for Health Professionals". 1994. U.S. Government Printing Office 1994-523-217/81322. Available U.S. Environmental Protection Agency, (6607) Washington, D.C. 20460. (page 1)
3. AERIAS®, <http://www.aerias.org>. Better health through indoor air quality awareness.
4. R. Nicklas, Controlled Environments Inc.

### Additional Literature

- Canada Mortgage and Housing Corporation has a number of mould-related publications illustrated on its website <http://www.cmhc-schl.gc.ca> or through its Canadian Housing Information Centre at 1-800-668-2642, CMHC, 700 Montreal Road, Ottawa K1A 0P7.
- Indoor Air Quality Handbook, by Spengler, J.D., Samet, J.M., and McCarthy, J.F., eds., McGraw-Hill, 2001, ISBN 0-07-445549-4. Contains extensive bibliographies of scientific papers on all current indoor air quality issues.
- Ontario Lung Association, 2002. "Indoor Air Pollutants in Residential Settings: Respiratory Health Effects and Remedial Measures to Minimize Exposure". Available online at the Lung Association website [http://www.on.lung.ca/cando/IAPRS\\_contents.html](http://www.on.lung.ca/cando/IAPRS_contents.html). (see Section 2.3.2.3 "Summary of Selected Evidence [on mold]").
- American Academy of Pediatrics, Committee on Environmental Health. "Toxic effects of Indoor Molds". *Pediatrics* 1998; 101(4):712-714.



THE ICYENE INSULATION SYSTEM • HEALTHIER, QUIETER AND MORE ENERGY EFFICIENT



MADE IN CANADA IN AN ISO 9001-2010 CERTIFIED FACILITY  
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