



Air & Noise  
Climate Change GHG  
Occupational Health & Safety  
Building Science  
Environmental Management & Financial Due Diligence  
Indoor Air Quality & Microbial Contamination  
Hazardous Materials Management (Asbestos, Mould, Lead)  
Laboratory Services (Asbestos, Mould, Lead, Odour)



# Mould, Moisture and Related Building Envelope Failures

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## Mould Growth in Buildings

Organic surface + moisture + time → mould growth



## Causes of Mould Growth in Buildings

- Poor construction practices
- Building envelope failures
- Floods
- Condensation
- Wet sections of air handling units, ductwork



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## Health Canada 2004

Review of medical literature to 2001:

“...this review indicates that living or working in a building with material mould damage is harmful to health ... mould growth should be prevented by appropriate control of moisture sources and timely remediation of water damages. Mould growing in buildings should also be removed under safe conditions using established remediation protocols.”

*Fungal Contamination  
in Public Buildings:*

*Health Effects and  
Investigation Methods*



Canada

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## Health Canada: Residential Indoor Air Quality Guideline for Moulds (March 2007)

“After reviewing the most recent scientific evidence regarding moulds and their effects on health, the Minister (of Health) recommends

- To control humidity and diligently repair any water damage in residences to prevent mould growth; and
- To clean thoroughly any visible **or concealed** mould growing in residential buildings.

These recommendations apply **regardless of the mould species found to be growing in the building.**”



## Regulatory Responses to Mould in Buildings



## Ontario Ministry of Labour Hazard Alert, 2000

“Mould growth on the interior surfaces of buildings is a risk factor for health problems.”

“Employers are required by Section 25 (2)(h) to take every precaution reasonable under the circumstances for the protection of worker.”

“The OHS Act places a responsibility on constructors, employers and supervisors to ensure the health and safety of workers. **This includes protecting workers from mould in workplace buildings.**”

Area of Interest	Applicable Acts and Regulations	Responsible Parties
Employment Practices	Occupational Health and Safety Act	Employers
Health	Occupational Health and Safety Act	Employers and Supervisors
Other Act	Occupational Health and Safety Act	Supervisors

**ALERT**

**MOULD IN WORKPLACE BUILDINGS**

**Hazard Summary**

Workers and the public may be exposed to mould on water-damaged building materials inside buildings and during building maintenance and repair operations. The most common types of mould are generally not hazardous to healthy individuals, but some moulds may be hazardous to certain individuals.

People who have asthma, bronchitis, hay fever, other allergies, or have weakened immune systems are more likely to react to mould. The most common symptoms are runny nose, eye irritation, skin rash, cough, congestion and irritation of airways. Symptoms usually disappear after mould exposure stops. (1)

**Hazard Location**

Mould (fungi) can grow on many common building materials and surfaces.

Any building may have mould. However, buildings with a history of water leaks, floods, fire and problems with indoor air quality (e.g. poor humidity control, lack of fresh air) should be considered at greater risk of mould growth. Water-damaged drywall, wood materials, paint, wallpaper, and carpeting are prone to fungal growth.

All moulds need water to grow. Mould can grow anywhere there is water damage, high humidity or moisture. Most often moulds are confined to areas with the source of water. When mould material becomes dislodged or disturbed, mould spores can be released into the air. Exposure occurs if people inhale the spores.

**Precautions**

The sustained and/or excessive growth of any visible mould on the interior surfaces of a building is unacceptable. Mould growth on the interior surfaces of buildings is a risk factor for health problems.



## Public Health, City Bylaw and Building Departments

- Public Health Unit or municipality may act on mould in general use or rental housing:
  - Health Promotion and Protection Act.
  - Residential Tenancies Act 2006 O. Reg. 517/06 .
  - Property standard bylaws.
- Municipal Clerk now responsible to assess for safety when marijuana grow houses or meth labs identified (Bill 286).



# Standards of Care for Mould Assessment and Abatement

## Canadian Construction Association Mould Guidelines, 2004

- Written to assist contractors in reducing risk of mould
  - Background
  - Legal
  - Insurance
  - Health concerns
  - **Design, construction practices to prevent mould growth**
  - Assessment of mould
  - **Mould remediation guidelines**
  - Hazard communication
  - Demolition considerations
  - Choosing a contractor
- [www.cca-acc.com](http://www.cca-acc.com)

## Flood Remediation



- Mould growth occurs rapidly after wetting. After 48 hours, must be suspected on susceptible materials.
- Some materials may be difficult to effectively dry (ceiling tiles, fibrous glass insulation, cellulose insulation). Proactive removal should be considered.
- Where the water source contains human pathogens (i.e., sewage), abatement practices have to be enhanced. Remove all porous materials and carefully disinfect.



## Risk Assessment



- All species of mould growth pose a health risk to occupants and must be abated.
- Mould within wall and ceiling cavities degrades air quality in occupied space. Must investigate for and remediate hidden mould growth.
- Risks must be communicated to occupants:
  - In workplaces, joint health and safety committees must be informed of inspection, invited to see testing, and receive any report.
  - Standards recommend disclosure to all occupants.
  - Consider need for evacuation.



## Sensitive Occupants



- Particularly susceptible occupants or settings (health care facilities, infants, elderly, immunocompromised, etc.) require additional care:
  - May be a need to immediately relocate reacting or susceptible individuals.
  - During remediation, susceptible individuals should be re-located from the immediate area, and possibly from adjacent areas.



## Remediation Plan



- Underlying causes of mould growth (excess moisture) must be identified and remedied prior to completion of cleanup.
- “Building materials supporting fungal growth must be remediated ***“as soon as possible”***”.



## Remediation Procedures



- Detailed procedures given for multiple levels of work, depending on extent of mould growth
  - Work area isolation
  - Worker protection (PPE and hygiene precautions)
  - Waste packaging
  - Cleaning
- Professional oversight, quality assurance measures recommended for remediation of medium and large scale contamination.



## Basis of CCA/EACO Mould Remediation Guidelines

Extent of Mould-Affected Material	Method
General Areas: <math><1\text{ m}^2</math> (<math><10\text{ sf}</math>)	Level I (Small)
General Areas: <math>1\text{-}10\text{ m}^2</math> (<math>10\text{-}100\text{ sf}</math>)	Level II (Intermediate)
General Areas: <math>>10\text{ m}^2</math> (<math>>100\text{ sf}</math>)	Level III (Large)
HVAC Contamination: <math><3\text{ m}^2</math>	HVAC, Small
HVAC Contamination: <math>>3\text{ m}^2</math>	HVAC, Large





## Mould Abatement

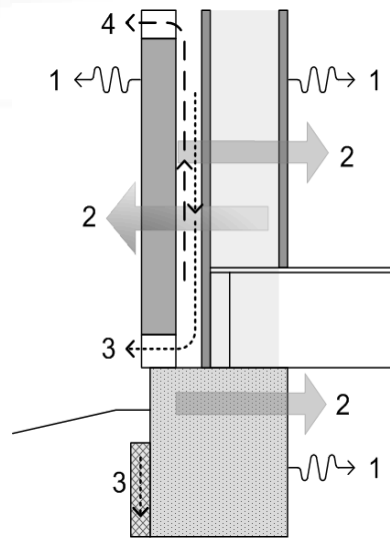


## What's New?

- Insurance? Mould investigation and remediation likely covered, if mould is due to a covered peril.
- New mould resistant construction materials available.
- Mould prevention training available for contractors.
- Building officials increasingly involved with mould investigations.
- Property managers increasingly adopting due diligence practices: Mould Management Programs.
- More lawsuits? Yes, and no.
- WSIB considers mould in buildings to be a cause of occupational illness, has awarded benefits.



# Moisture in Buildings



## Moisture Sources in Buildings

- Building Envelope - Water Infiltration
- Building Envelope - Air Infiltration
- Mechanical – Pipes, vents, condensate pans etc
- Building Use – Pools, showers, kitchens etc
- Unreported Incidents – Spills, open windows etc.

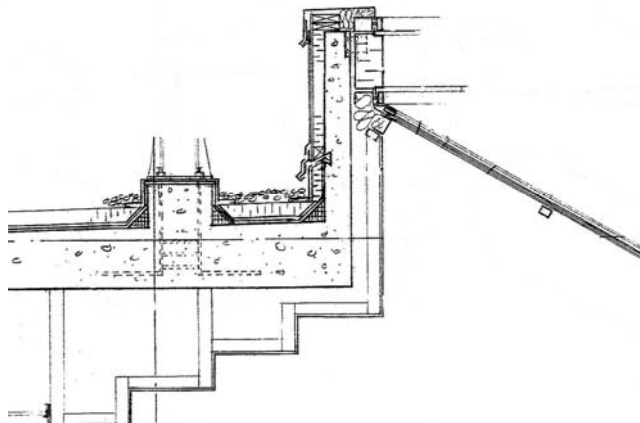


## Building Envelope Description

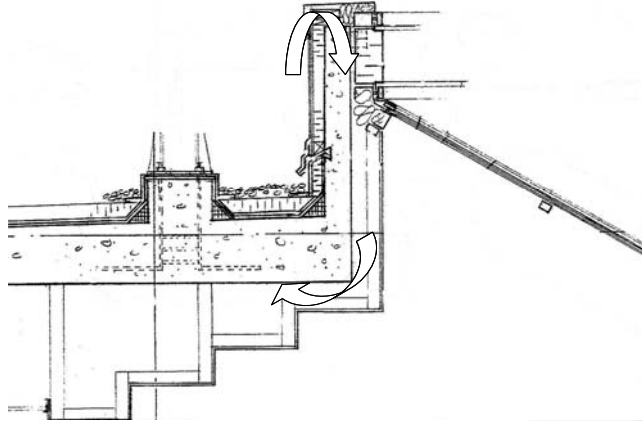
- **Components**
  - Roof
  - Walls
  - Fenestrations (windows, skylights, entrances)
  - Foundation (below grade)
- **Function**
  - Keep the weather out
  - Reduce heating/cooling costs
  - Exterior aesthetic appeal of building



## Air Infiltration - Roofs

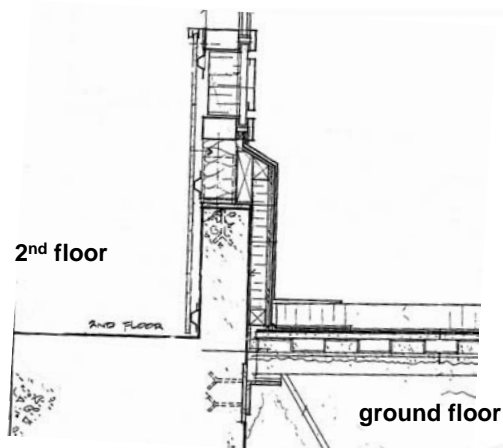


## Air Infiltration - Roofs



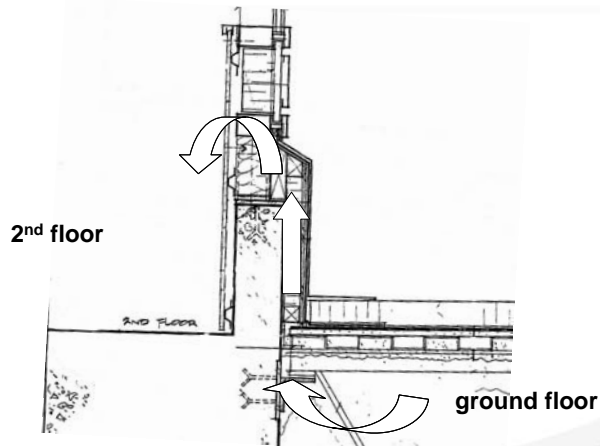
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## Air Infiltration – Canopies & Soffits



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## Air Infiltration – Canopies & Soffits



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## Air Infiltration – Walls

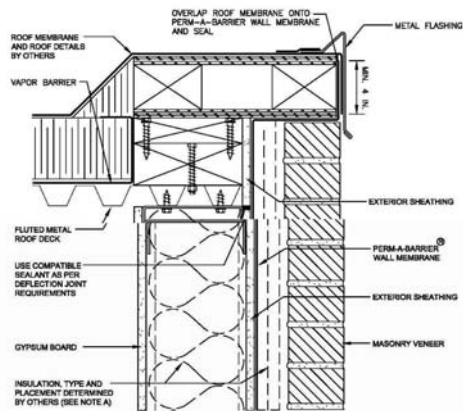


- No effective vapour barrier, no insulation on walls of dormer.
- Numerous complaints of being colder in upstairs bedroom areas.

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## Water Infiltration – Roof

- Roof leaks generally occur at transitions and penetrations.
- The path of ingress is not always obvious.



## Water Infiltration – Roof





## **Metal Flashing - not meant to be watertight**

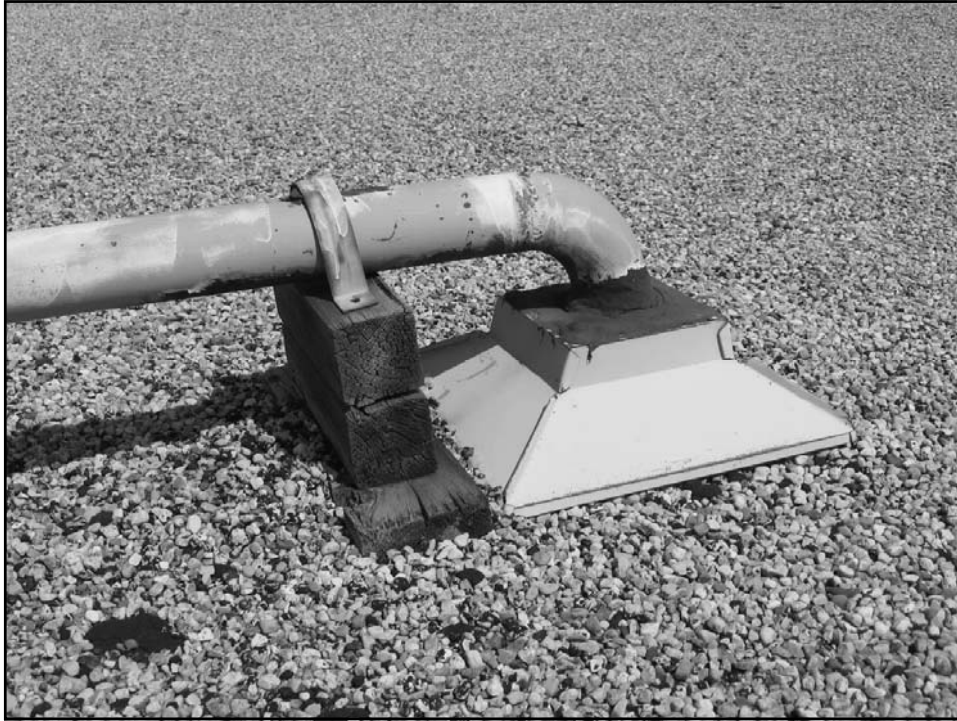


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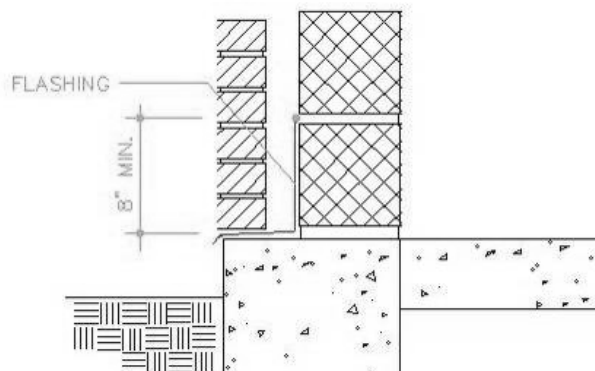


## Portland cement is only a temporary patch



## Water Infiltration – Walls

Blocked or failed through-wall flashing.



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## Water Infiltration – Walls



- Blocked or failed through-wall flashing.

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## Water Infiltration – Foundation

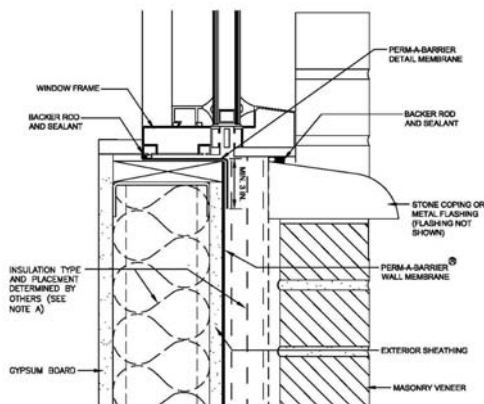


- Leak bypassing the foundation wall waterproofing

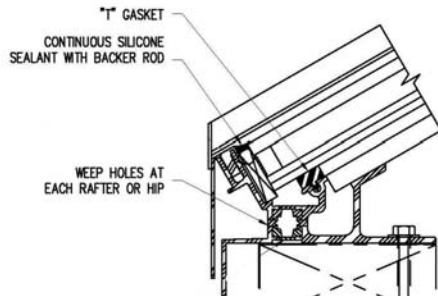


## Water Infiltration – Windows

How do you know it's the window leaking?



## Water Infiltration – Skylights



- Skylights are designed to leak.....a bit.



## Questions?

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