

MOISTURE AND AIR

A Guide for Understanding and Fixing Interior Moisture Problems in Housing





CMHC — HOME TO CANADIANS

Canada Mortgage and Housing Corporation (CMHC) has been Canada's authority on housing for more than 65 years.

CMHC helps Canadians meet their housing needs. As Canada's authority on housing, we contribute to the stability of the housing market and financial system, provide support for Canadians in housing need, and offer objective housing research and advice to Canadian governments, consumers and the housing industry. Prudent risk management, strong corporate governance and transparency are cornerstones of our operations.

For more information, visit our website at www.cmhc.ca or follow us on **Flickr**, **Twitter**, **YouTube** and **LinkedIn**.

You can also reach us by phone at 1-800-668-2642 or by fax at 1-800-245-9274.

Outside Canada call 613-748-2003 or fax to 613-748-2016.

Canada Mortgage and Housing Corporation supports the Government of Canada policy on access to information for people with disabilities. If you wish to obtain this publication in alternative formats, call 1-800-668-2642.

CMHC does not assume responsibility for errors or oversights resulting from the information contained herein. Users must consult with the jurisdiction having authority concerning the design and installation of any of the products, components or systems described in this publication. The content of this publication is for information purposes only. It is not intended for the content to be relied upon as professional or expert advice or opinions. The information in this publication is a result of current research and knowledge. Readers should evaluate the information, materials and techniques cautiously for themselves and consult appropriate professional resources to see whether the information, materials and techniques apply to them. The images and text are guides only. Project and site-specific factors (climate, cost and esthetics) must also be considered.

ISBN 978-0-9948435-1-7

© 1982 Canada Mortgage and Housing Corporation and Newfoundland and Labrador Housing Corporation

© 1987 Canada Mortgage and Housing Corporation and Canadian Home Builders' Association

© 2004 Canada Mortgage and Housing Corporation Revised: 2006, 2008, 2011, 2012, 2015

This document or any discrete portion of this document (such as a chapter or section) may be reproduced for redistribution, without obtaining the permission of the copyright owner, provided that no changes whatsoever (including translation) are made to the text; that the entire document or discrete part is reproduced; that this copyright notice is included in its entirety in any and all copies of the document or any discrete part of the document; and that no use is made of any part of the document or the name or logo of the owner of the copyright to endorse or promote any product or service. For any use of this document other than reproduction or general reference purposes as set out above, please contact the Canadian Housing Information Centre (CHIC) at chic@cmhc.ca; 613-748-2367 or 1-800-668-2642. For permission, please provide CHIC with the following information: publication's name, year and date of issue.

Printed in Canada
Produced by CMHC

Table of Contents

p. 1	Introduction
p. 2	Moisture and Air Quality Problems
p. 3	Moisture Condensation Causes
p. 4	Condensation Solutions
p. 5	Find the Moisture Level in Your House
p. 6	Mould Problems, Prevention and Cleanup Methods
p. 7	General Inspection of Your Home
p. 7	Checklist Moisture Problems in All Living Areas
p. 9	Checklist Moisture Problems in the Basement
p. 11	Checklist Moisture Problems in Bathrooms
p. 13	Checklist Moisture Problems in the Kitchen
p. 14	Checklist Moisture Problems in Bedrooms
p. 16	Checklist Moisture Problems in the Attic and Roof
p. 17	Checklist Moisture Problems in Exterior Walls
p. 19	Mechanical Ventilation Options
p. 20	Moisture and Air Summary

Introduction

This guide has been prepared to assist in the identification of the signs and probable causes of indoor-generated moisture and moisture-related indoor air quality problems in houses and units in multi-unit residential buildings and to propose practical solutions.

More often than not, many household moisture problems can be solved if one or more of the following steps are taken:

- Find out where the moisture is coming from.
- Adopt strategies to prevent excess moisture in the home.
- Perform maintenance or minor repairs to address leaks.
- Hire a qualified contractor to make major repairs.
- Monitor after the remedial work has been done to ensure the problems have been solved.

For renters, report all plumbing leaks and moisture problems immediately to your building owner, manager or superintendent. For the owners of condominiums, if the moisture problem is coming from inside your unit, it is likely something you will have to deal with. If the moisture is coming from outside the unit (leaks through walls, windows, doors, ceilings or plumbing), contact your condominium manager.



Indoor-generated moisture and moisture-related indoor air quality problems in houses and units in multi-unit residences will be discussed in this helpful guide.

Moisture and Air Quality Problems

Moisture is continually being released inside every home: 10 to 50 litres (2 to 10 gallons) every day. In a heating season lasting 200 days, when windows and doors are typically closed up, 2,000 to 10,000 litres (400 to 2,000 gallons) of moisture can be trapped inside. Laundry hung to dry, improperly vented clothes dryers, bathing and cooking are common sources of moisture. A cord of wood stored inside can release more than 270 litres of moisture. Excess moisture can result in moisture problems, which can lead to air quality problems.

10–50
litres

are released inside
a home every day

Moisture Problems

There are two types of moisture problems: leaks and condensation. This guide focuses on condensation problems.

When warm, moist air comes into contact with a surface that is too cold, the moisture in the air condenses—or forms water—on the cold surface. The water and frost that can be seen collecting on windows are visible examples of condensation.

Condensation can also collect in the attic and inside the exterior walls where it can, over time, cause mould, wood rot and structural decay.

Over time, if the air inside is too humid, the result may be damage to the house structure, finishes, furnishings and personal possessions and possibly even the health of those living in the home. Controlling moisture in the home is the best way to prevent mould problems.

Leaks from roofs, through walls and from plumbing also cause moisture problems in homes but are more readily detected and solved than indoor condensation-related problems.

Moisture-Related Indoor Air Quality Problems

A home should have an exchange of air between the indoors and outdoors. Without this air exchange, a home can accumulate moisture and mould can become a problem, and you can experience poor air quality.

Mould growing in the home can release mould spores, toxins, odours and this can represent a health concern for members of the household. The exchange of stale air in the home with fresh outdoor air reduces potential air quality problems and helps to prevent moisture buildup in the home.

Indoor-outdoor air exchange also can help deal with harmful chemicals that can be released from synthetic fabrics, furnishings, household products, cigarette smoke and burning candles.

Moisture Condensation Causes

Condensation occurs on cold surfaces when the following three conditions happen at the same time:

1. Too much moisture in the air;
2. Inadequate indoor-outdoor air exchange (known as “ventilation”).
3. The availability of cold surfaces upon which moisture in the air can condense.

Too much moisture in the air may come from:

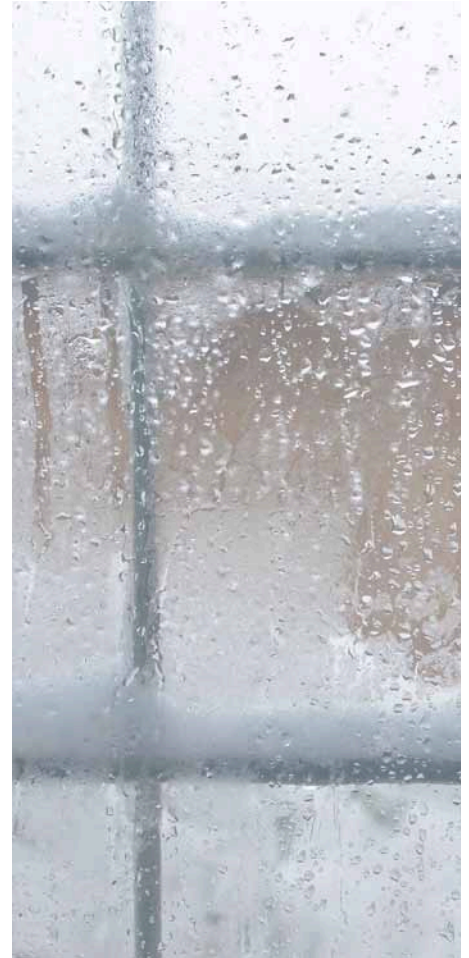
- showers, washing dishes and clothes, cooking, aquariums, standing water, people, pets and plants;
- drying laundry indoors;
- improperly vented clothes dryers;
- damp basements;
- earth floor basements or crawl spaces;
- improperly set humidifiers; and
- humid outdoor air.

Inadequate ventilation may be caused by:

- no bathroom exhaust fans, outside-ducted kitchen range hoods, air exchanger or heat recovery ventilator to vent moist air from the home;
- broken or disconnected exhaust fans, ventilation system;
- exhaust fans not being operated because they are too noisy or ineffective; and
- no circulation of air within the home and the rooms in the home.

Cold surfaces may be due to:

- very cold weather outside;
- inadequate heat or insufficient heat provided to areas of the home (that is, floor vents or baseboard heaters blocked by furniture, spare bedroom heat blocked off if the room is not used regularly, an unheated basement);
- wide swings in inside temperature (that is, thermostat setbacks, uneven heat distribution from use of wood stoves, unheated or poorly heated rooms);
- poor local air circulation within a room due to furnishings such as beds against the exterior walls; and
- older, leaky windows.



When the temperature becomes colder outside, the risks of condensation can increase.

Condensation Solutions

Reducing the amount of moisture in the indoor air is the priority as it is often the least costly and most effective strategy.



Effective strategies to reduce moisture sources involve:

- removing or reducing indoor moisture sources;
- dealing with basement moisture problems;
- prudent use of humidifiers; and
- using a dehumidifier in the basement during fall, spring and summer.

Keeping surfaces warm is the next priority. This can be done by:

- upgrading windows to energy-efficient ones with double or triple panes, low-e coated glass, argon gas between the panes, insulated spacer between the glass and insulated frames;
- keeping drapes and blinds open during cold weather and overnight;
- keeping walls and ceilings warm by adding insulation;
- careful use of programmable setback thermostats so condensation-susceptible surfaces do not get too cold; and
- providing sufficient heat to all indoor areas in the home and ensuring it flows over exterior walls, ceilings, windows and doors.

Providing adequate ventilation is also part of the overall strategy. This is done by:

- installing ventilation equipment to achieve the right amount of indoor-outdoor air exchange;
- providing good air distribution throughout the home and circulation within each room; and
- using the ventilation systems as needed to maintain moisture level in an acceptable range.

Reduce condensation in the air in your home by controlling moisture sources, providing good ventilation, using dehumidifiers (when necessary) and keeping all surfaces at an equal temperature.

Find the Moisture Level in Your House

The amount of moisture in the air is often called “relative humidity” or “RH” for short. RH is important because it provides a way to assess moisture conditions and condensation risk in a home.

Key points about relative humidity:

- The relative humidity in a home can be measured with a hygrometer. RH measurements run from 10 per cent to 100 per cent and provide an indicator of how much moisture is in the air relative to what it can hold. Dry air has lower RH readings and moist air has higher.
- Hygrometers can be purchased at a local hardware or building supply store. They are relatively inexpensive.
- In very cold weather, a level of 30 per cent or lower may be needed to prevent window condensation.
- In the winter heating season, the relative humidity should not exceed 45 per cent.
- Upgraded, energy-efficient windows can support a higher level of relative humidity without condensation occurring.
- Low RH is good for controlling moisture but can be a comfort problem for household members. Low RH can be associated with dry eyes and nasal and throat discomfort.



A hygrometer is an instrument used for measuring the moisture content in the atmosphere.



Moisture condenses when cold surfaces meet warm moist air. Condensation will make surfaces wet, which can cause water damage or help mould/mildew grow.

Mould Problems, Prevention and Cleanup Methods

One of the main consequences of moisture problems in a home is mould. Mould is part of a group of micro-organisms called fungi that also include mushrooms and yeasts. Mould is familiar to most people as food spoilers on items such as bread or fruit. Mould is nature's decomposer in the food chain. However, if allowed to grow inside dwellings, mould can be a problem.

Mould can cause:

- unsightly stains;
- damage to paints, wood, drywall, ceiling tiles and fabrics;
- damage to personal items;
- allergies; and
- illness.

While mould itself does not cause damage to the structure of a house or building, it is a sign of potentially problematic moisture conditions that may eventually rot out wood framing and corrode structural steel.

Some symptoms:

- discolouration on surfaces such as walls, ceilings or furnishings;
- black marking or accumulation at the bottom of window frames and on windowsills;
- stains on carpets;
- mould on drapes and backs of furniture against exterior walls;
- stains on personal items close to affected areas such as storage boxes and clothing;
- musty smells; and
- rotting wood.

Mould Prevention

Mould requires moisture and a food source to grow. Some mould species can start growing if the RH of the indoor air is high enough while others require water.

To avoid most mould problems, keep materials dry by controlling moisture, providing ventilation and keeping indoor surfaces at high enough temperatures to prevent condensation.

If mould is present, clean the affected area as soon as possible, and identify and fix the source of moisture that allowed the mould to grow.

Mould Cleanup Methods

Small areas of mould can be cleaned using an unscented detergent and water. The mould area is considered small if there are fewer than three patches and each patch is smaller than one (1) square metre. If there is more than three patches or the areas are larger than one square metre, a trained mould remediation professional should assess the situation and recommend a solution. A trained contractor may be needed to clean extensive areas of mould.

When cleaning even small areas of mould:

- use household rubber gloves;
- use a mask, rated N95, capable of filtering fine particles;
- use protective glasses;
- after the clean up, rinse well with a clean, wet rag; and
- dry completely and quickly using fans and heaters.



Mouldy ceiling tiles and carpets are typically difficult to fully clean and should be removed and discarded. Drywall that remains stained after cleaning with detergent and water may need to be removed as well. Try washing fabrics but if the mould odour or stain persists, they should be discarded.

The proper cleaning procedure involves removing the mould. Chemicals such as bleach and fungicides are not recommended. It is important to remove all mould residues as they can cause allergies or illness.

General Inspection of Your Home

The following checklist can be used to identify, diagnose and solve moisture and mould problems inside homes. For each room, it specifically describes typical signs, possible causes and practical solutions. When inspecting the home, keep in mind that moisture may not originate from the same room—or in the case of multi-unit residential buildings—within the same unit. The source may be located elsewhere inside or outside the home.

Moisture Problems in **All Living Areas**



Typical Signs

- Condensation on windows
- Rotting windowsills
- Damaged gypsum board and bubbled or flaking paint
- Musty smell
- Mould on walls
- Mouldy drapes, carpets or furniture
- Mould in closets



Possible Causes

- Poorly set and controlled humidifiers
- Excessive moisture from damp basement or crawl spaces
- Many moisture-producing activities by occupants—cooking, bathing, washing
- Too many people/pets in the home
- Uncovered aquarium
- Large number of plants
- Firewood stored inside
- Poor air circulation between rooms or within a room
- Cold surfaces due to inadequate insulation
- Large air leaks at electrical fixtures and outlets, window frames, etc.
- Closed drapes preventing warm room air from warming window surfaces
- Closet contents stuffed against colder exterior walls
- Rooms kept too cool, programmable thermostats setback too aggressive
- Inadequate ventilation, ventilation equipment not used
- Air conditioner poorly maintained, condensation on cold water pipes during the summer

Moisture Problems in **All Living Areas** (cont.)



Practical Solutions

- Discontinue or control humidifier use.
- In summer use a dehumidifier.
- Fix sources of moisture in basement or crawl space.
- Install and use quiet, energy-efficient kitchen and bathroom exhaust fans.
- Cover aquarium.
- Reduce number of potted plants or make covers for the soil.
- Circulate air between rooms by running furnace fan continuously on low speed. Ensure air can circulate within rooms—particularly over colder surfaces.
- Properly insulate cold surfaces.
- Wipe up condensate that may form on windows during colder weather.
- Seal air leaks.
- Reduce stored items—particularly those in proximity to outside walls, basement floors that limit air circulation.
- Open drapes and blinds to promote air flow over windows.
- Ensure 2.5-cm (1-in.) gap at the bottom of closets and doors; leave closet doors open during cold weather.
- Provide heat to all areas.
- Install a balanced ventilation system, such as a heat recovery ventilator, and use it regularly.
- Keep air conditioning drip pans clean and the drain lines unobstructed and flowing properly.

Moisture Problems in the **Basement**

A damp or wet basement, especially if heated, may generate much more moisture than all other sources combined.



Typical Signs

- Wet or damp floors or walls
- White powdery stains on exposed concrete walls or floor
- Stains on carpet
- Condensation on windows
- Rotting windowsills
- A stuffy, damp smell
- Mould on overhead joists behind insulation
- Mould on stored items (that is, cardboard, clothing, etc.)
- Mould in cold cellar
- Mould in corners of outside walls or ceiling
- Condensation dripping from cold water pipes



Possible Causes

- Earth floor in crawl space or basement
- Water leaks through cracks in walls or floors
- Leaky appliance or plumbing
- High RH during the summer
- Uninsulated walls
- Flooding
- High water table
- Exterior grading of grass, walks, paved surfaces, gardens near basement walls slopes toward house
- Sump pump not operating properly
- Open, water-filled sump pump pit
- Uncontrolled or improperly set humidifier
- Carpet on concrete floor
- Hot tub or pool inside home
- Firewood stored in basement
- Unvented dryer (or dryer duct leaky or disconnected)
- Wet clothes hung inside
- No exhaust fan in bathroom
- Items stored against wall or on floor reducing air circulation over cold surfaces
- Unheated basement or crawl space
- Blocked footing drains
- Flue gas condensation leaking from chimney
- Spillage of combustion gases from furnace or water heater

Moisture Problems in the **Basement** (cont.)

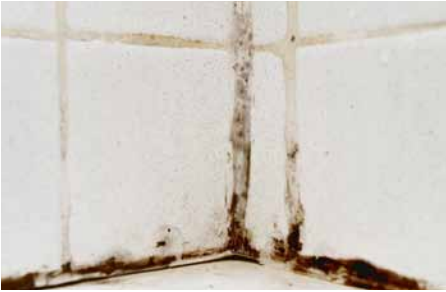


Practical Solutions

- Cover earth floor in crawl space or basement with polyethylene with sealed joints or install a concrete floor with polyethylene sheet underneath.
- Fix cracks and leaks in basement.
- Excavate and repair/replace exterior moisture barrier system.
- Fix leaky plumbing and appliances.
- If the water and/or mould damage was caused by sewage or other contaminated water, call in a professional who has experience cleaning and fixing buildings damaged by contaminated water.
- Fix landscape grading around the house—ensure all surfaces slope away from the building.
- Repair sump pump.
- Install a tight-fitting cover on the sump pump.
- Do not humidify the home unless absolutely necessary. Ensure controls are operating and properly set if humidifier used.
- Remove carpets.
- Cover or empty hot tub when not in use to prevent evaporation.
- Store firewood outside the house.
- Vent clothes dryer to outside—ensure joints are sealed with foil tape.
- Do not hang clothes to dry in the basement.
- Install bathroom fan ducted to the outside.
- Minimize stored materials in the basement.
- Provide sufficient heat to the basement.
- Have footing drains inspected and improved, if necessary.
- Dehumidify basement during the warm months (with windows closed).
- Remove ceiling tiles if they have mould.
- Insulate cold water pipes with closed-cell foam pipe insulator.
- Insulate walls (but only if moisture problem solved).

Moisture Problems in **Bathrooms**

Bathrooms generate a good deal of moisture through showers and bathing. Ventilation is important.



Typical Signs

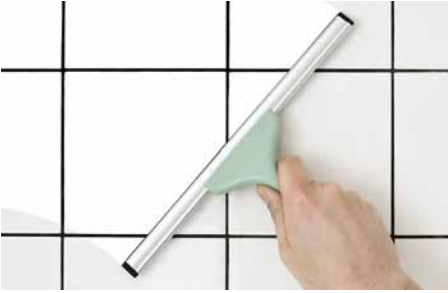
- Condensation on windows
- Condensation or staining on walls or ceilings
- Water dripping from exhaust fan grille
- Mould between ceramic tiles
- Rotting windowsills
- Damaged gypsum board under windows
- Bulging gypsum board
- Peeling paint or wallpaper
- Musty smells
- Visible mould damage, staining or growth on floor or carpet
- Curling floor tiles
- Loose floor and wall ceramic tiles
- Water pooling around toilet, sink or tub
- Toilet is unstable—moves easily
- Mould on walls or ceiling
- Condensation on toilet tank
- Mould under toilet tank



Possible Causes

- Leakage, spillage from bathtubs and shower stalls during use
- Moisture (often referred to as “steam”) from hot baths and showers
- No bathroom fan
- Bathroom fan not used
- Uninsulated exhaust fan duct—condensation forms in cold duct
- Backdraft damper on exhaust fan housing inadequate—allows cold air in from outside when fan not operating, which cools surfaces and makes them prone to condensation
- Leaky plumbing
- Plumbing leaking behind walls
- Dampness from wet bath mats, towels and drying clothes
- Inadequate air circulation
- Temperature kept too low/poor heat distribution to bathroom
- Seal lost around shower stall or tub, cracks in tiles
- Uninsulated toilet tank resulting in cold tank surface and humid weather condensation problems

Moisture Problems in **Bathrooms** (cont.)



Practical Solutions

- Turn on exhaust fan when showering or taking a bath.
- Install a bathroom fan exhausted to outside (windows are not a reliable source of ventilation).
- Allow fan to run for 15 minutes or longer after the shower or bath to remove moisture.
- Squeegee or towel dry surfaces in the shower stall or bath enclosure after use.
- Close bathroom door and run bathroom fan when showering.
- Install a humidistat that turns exhaust fan on and off automatically.
- Fix leaky plumbing.
- Supply adequate heat and ventilation to the bathroom.
- Caulk joints in shower stall, tub and around sink. Repair/replace/seal grout joints in tiled floors and walls.
- Properly insulate walls and ceilings.
- Consult a professional contractor for replacement of mouldy walls.
- Have insulated exhaust fan ducts properly installed.
- Remove carpet.
- Install a 4.5-litre (1-gallon) toilet—these do not tend to “sweat” as they hold less cold water.
- Clean surfaces regularly.

Moisture Problems in the Kitchen

Cooking and cleaning activities in the kitchen can generate a great deal of moisture.



Typical Signs

- Condensation on windows, ceilings and/or walls
- Damaged walls under windows
- Peeling paint
- loose or damaged flooring
- Moisture and mould under sinks or kitchen counters
- Rotting cabinetry under sinks
- Mould in cupboards and corners of interior surfaces of outside walls
- Musty odours



Possible Causes

- Excessive moisture in home (there are moisture sources in other areas)
- No kitchen exhaust fan/range hood over stove
- Recirculating-type kitchen range hood installed
- Prolonged or continuous simmering and boiling of foods and liquids
- Combustion moisture from gas ranges
- Leaks around sinks and fittings
- Plumbing leaks
- Garbage or wet items contributing to moisture
- Mould growing behind refrigerator condensate pan
- Items in cupboard against outside walls preventing air circulation
- Temperature too low or fluctuating
- Leaky dishwasher or dishwasher service pipes



Practical Solutions

- Control overall house humidity.
- Install and use a quiet kitchen exhaust fan vented to the outdoors.
- Cover liquids and foods when simmering or boiling.
- Use range hood while operating gas stove.
- Caulk sink and fittings to counter.
- Repair plumbing leaks and leaking appliances.
- Occasionally clean condensate pan under refrigerator.
- Keep items a few inches away from exterior walls.
- Open cupboards occasionally to allow heat in.
- Keep compost or garbage in covered containers under the sink.

Moisture Problems in Bedrooms

Bedrooms that are crowded with furniture, bedding, personal possessions can experience moisture problems.



Typical Signs

- Condensation on windows
- Rotting windowsills
- Mould around windowsills
- Damage or stained, peeling paint on gypsum wallboards or ceiling
- Peeling wallpaper
- Cracked or bulging ceiling
- Musty odours
- A damp, musty closet
- Mould in closets, surfaces of outside walls, behind furniture or hanging artwork, etc.
- Water dripping from ceiling lights



Possible Causes

- Frequent use of room humidifier
- Excessive house humidity levels (moisture may be coming from another part of the house)
- Lack of air circulation within room
- Older leaky windows
- Closed drapes and blinds preventing heat from reaching window
- Lack of air circulation in closet
- Inadequate gap at bottom of closet door
- Bedroom temperature much lower than in other rooms
- Bed and bedroom furniture too close to outside walls, preventing air movement, blocking warm air floor grille or baseboard heater
- Too many furnishings preventing proper air flow and heat circulation in room
- Old, musty carpet
- Inadequate insulation in outer walls or attic
- Plants, aquariums
- Bedroom door closed for too much of the day

Moisture Problems in **Bedrooms** (cont.)

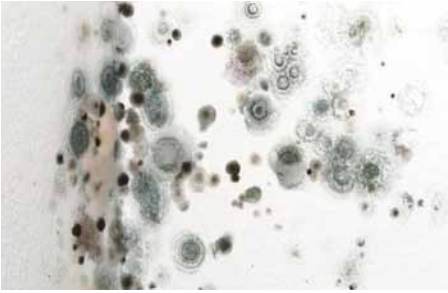


Practical Solutions

- Run humidifier only as necessary and for short periods of time.
- Control humidity throughout the house.
- Keep air registers, baseboard heaters unobstructed.
- Leave bedroom door open to allow better circulation.
- Windows may need upgrading to energy-efficient units.
- Open drapes or blinds to encourage warm air circulation over window surfaces.
- Do not store items in closet from floor to ceiling on outside walls.
- Open closet door to allow air to circulate or install louvred doors.
- Provide heat to bedroom.
- Keep furniture 15 cm (6 in.) from outside walls, ducts and cold air return.
- Properly insulate cold outer walls and ceiling.
- Reduce furnishings that obstruct air circulation.

Moisture Problems in the Attic and Roof

Insulation, airtightness and good roof repair are key to prevent moisture problems in the attic and roof.



Typical Signs

- Ice dams along roof eave
- Condensation, frost, black stains and mould on roof trusses and sheathing inside attic
- Condensation and black stains near vents or plumbing stack
- Condensation and black stains near wiring or electrical fixtures
- Water dripping from soffits
- Interior damage to ceiling (blistering paint, black staining, water leaks, bulging drywall)
- Water dripping from ceiling electrical fixtures



Possible Causes

- Ice dams that back water up under shingles and into the attic
- Gaps and cracks in ceiling around ducts, framing, pipes, electrical wiring and fixtures that allow warm moist air to escape to the attic where it condenses
- Missing chimney fire stop
- Kitchen and bathroom exhaust fans vented into attic
- Gaps between ceiling and partition walls in attics of row housing units
- Leaking roof
- Leaky, uninsulated ducts in attic



Practical Solutions

- Carefully seal all penetrations running through the ceiling into the attic to prevent warm moist house air leaking into the attic.
- Seal and insulate attic hatch.
- Install and seal chimney fire stop around chimney to reduce air leakage into attic.
- Vent all exhaust fans directly outside.
- Seal light fixtures.
- Repair roof and flashings.
- Reduce excess humidity levels in the house.
- Seal and insulate ducts passing through attic.
- Seal joint between partition wall and ceiling in the attics of row housing units.
- Insulate attic to prevent snow from melting on roof.
- Install waterproof membrane over roof sheathing at the eaves when shingles are replaced.

Moisture Problems in Exterior Walls

Moisture in exterior walls can come from exterior and interior sources.



Typical Signs

- Condensation on walls
- Bulging, buckled or rotting siding
- Blistering or flaking paint
- Appearance of frost condensation
- Wet stains or chalky deposits on brick or stucco
- Moisture-damaged window and door frames
- Moisture damaged drywall and flooring inside house next to exterior walls
- Damp or wet flooring at base of walls



Possible Causes

- Warm, moist, inside air leaking into exterior walls where the moisture can condense and wet surrounding materials
- Wind-driven rain causing water to penetrate the wall cladding from outside
- Inadequate or missing flashings around windows, doors, joints, etc.
- Overflow of rain barrel not properly drained
- Broken downspout or downspout termination on foundation
- No eavestroughs or gutters
- Broken, clogged or poorly sloped eavestrough/gutter
- Backsplash of rain from hard ground surfaces back onto walls
- Siding installed too close to ground with less than 200 mm (8in.) of clearance
- Poor drainage from porches and decks
- Outdoor tap/garden hose leaking against wall
- Little or no wall insulation causing condensation to occur

Moisture Problems in **Exterior Walls** (cont.)



Practical Solutions

- Inside the home, seal all openings into outer walls that would allow air leakage.
- Reduce excess moisture in the house.
- Improve house ventilation.
- Install or repair flashing to lead rain away from wall.
- Direct overflow spout of rain barrel away from walls and foundation.
- Repair broken downspouts.
- Install and properly slope eavestroughs/gutters and extend away from the house.
- Repair or clean out eavestroughs/gutters to prevent overflows.
- Re-grade ground to drain surface water away from building.
- Fix leaky tap. Add hose extension to minimize water pooling under foundation.
- Provide adequate clearance between siding and ground and decks, patios.
- Caulk and seal exterior joints around windows, doors, joints in siding, flashing, balcony framing.
- Ensure walls are well insulated and air sealed.

Mechanical Ventilation Options

After reducing moisture sources, mechanical ventilation can be used to further control moisture conditions and improve indoor air quality. Ideally, all mechanical ventilation systems should be “balanced”—the amount of air drawn into the home should equal the amount of air exhausted out.

Types of Ventilation

Passive (or natural) ventilation

Many older houses have to rely on passive ventilation. While windows can be comfortably opened in the summer months, in the winter, it usually only possible to open one for a short time. This can provide temporary ventilation, but is not always effective or economical. Passive ventilation cannot be controlled and it is difficult to ensure ventilation is provided where needed. Passive ventilation can also cause comfort problems due to drafts and adds to space conditioning bills. In some areas, opening a window for ventilation can be a security concern.

Exhaust-only ventilation

The minimum mechanical ventilation system for many existing houses consists of exhaust fans in bathrooms and a range hood in the kitchen. Exhaust-only ventilation works well in the room where it is installed but other areas of the house may not get the ventilation needed. Caution: Exhaust-only systems can depressurize a dwelling and this can

cause dangerous combustion venting problems with some fuel-fired appliances, such as furnaces, water heaters and fireplaces. Exhaust-only systems may encourage dangerous soil gases to enter the house as well. The National Building Code of Canada contains measures to protect against house depressurization and prevent combustion spillage and soil gas concerns. If an exhaust-only system is considered, a qualified ventilation contractor should be consulted.

Balanced ventilation systems

Properly installed and operated, balanced ventilation systems don't have the same worries as exhaust-only systems. A balanced ventilation system can be as simple as installing an exhaust fan, or fans, to run in conjunction with a fresh air intake duct that is connected to the furnace return air duct. The exhaust fans draw air out of the kitchen and bathrooms while the furnace draws air into the home through the fresh air intake duct and delivers it to all the rooms via the forced air duct system. The problem with this approach is that the furnace fan has to be wired to run

when the exhaust fans run. Additionally, the introduction of cold outside air into the furnace ductwork also represents an added heating cost and the furnace fan electricity consumption can be significant over the course of a year. As well, it can be a complicated system to set up and properly to run in a balanced model.

Heat recovery ventilation

Heat recovery ventilators (HRVs) offer a well-engineered and simpler approach to achieving balanced ventilation but with the added benefits of recovering the energy in the outgoing exhaust air and using it to warm the incoming outdoor air. HRVs save on ventilation-related energy costs and help prevent occupant discomfort associated with the introduction of cool outdoor air into the home. HRVs can be installed in a number of configurations depending on space heating system type.

Moisture and Air Summary

Moisture and air are important to monitor to make your home healthy to live in.

Solving condensation-related moisture problems in the home is possible by:

- identifying and solving the source of moisture;
- providing mechanical ventilation to deal with recurring sources of moisture; and
- keeping interior surfaces warm and encouraging adequate, well-distributed air circulation.

By dealing with moisture problems as they happen, larger, more costly and disruptive problems can be avoided. All household members and, in multi-unit residential buildings, the property management have a role to play in controlling moisture problems.



To find more on this and other housing-related information products, visit our website at www.cmhc.ca

05-08-15



61033