Canada Mortgage and Housing Corporation

Société d'hypothèques de logement

MOISTURE AND AIR

PROBLEMS AND REMEDIES

HOUSEHOLDER'S GUIDE

Canada

Helping to house Canadians

NHA 5968

Printed in Canada
Produced by the Public Affairs Centre

The use of any materials and/or methods described in this booklet is at the sole discretion and responsibility of the reader.

Cette information est disponible en français sous le titre L'air et l'humidité, LNH 5969.

This booklet is intended to help you find some of the typical signs of moisture and air quality problems in your house, to identify the probable causes and to propose practical solutions.

A householder can solve many household problems by:

— changing practices;
— performing maintenance or minor repairs; and/or
— having a professional contractor make major repairs.

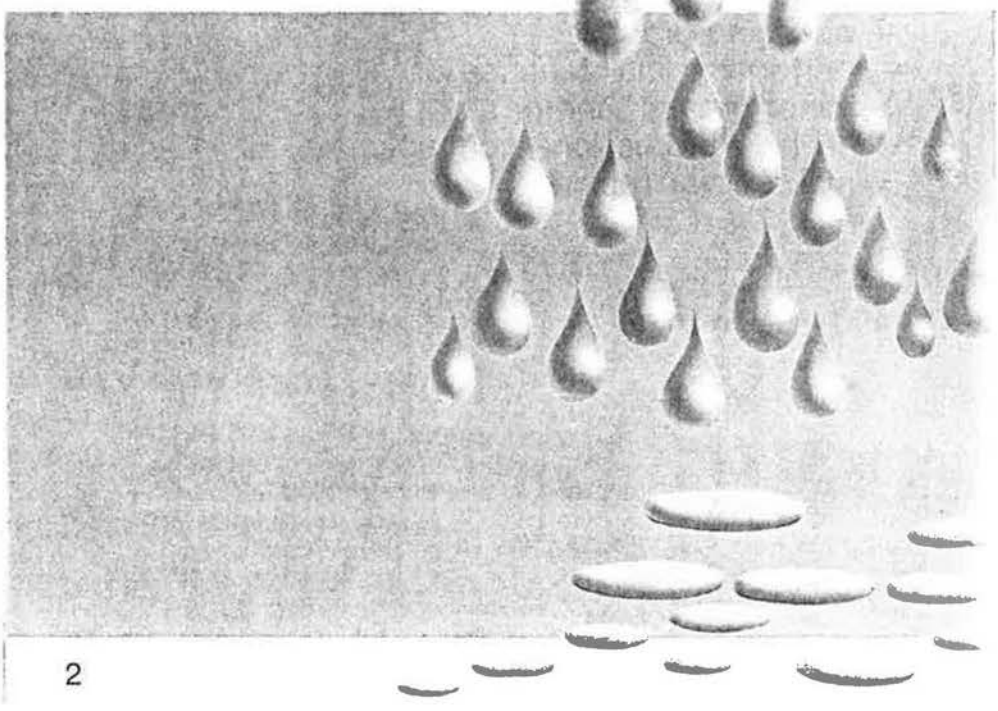
MOISTURE PROBLEMS

If the air in your house is too moist, your house structure and your personal possessions may be damaged. Air can hold only so much water.

When warm, moist air comes into contact with a surface that is too cold, it releases "condensation". The water and frost that you see collecting on windows is a visible example.

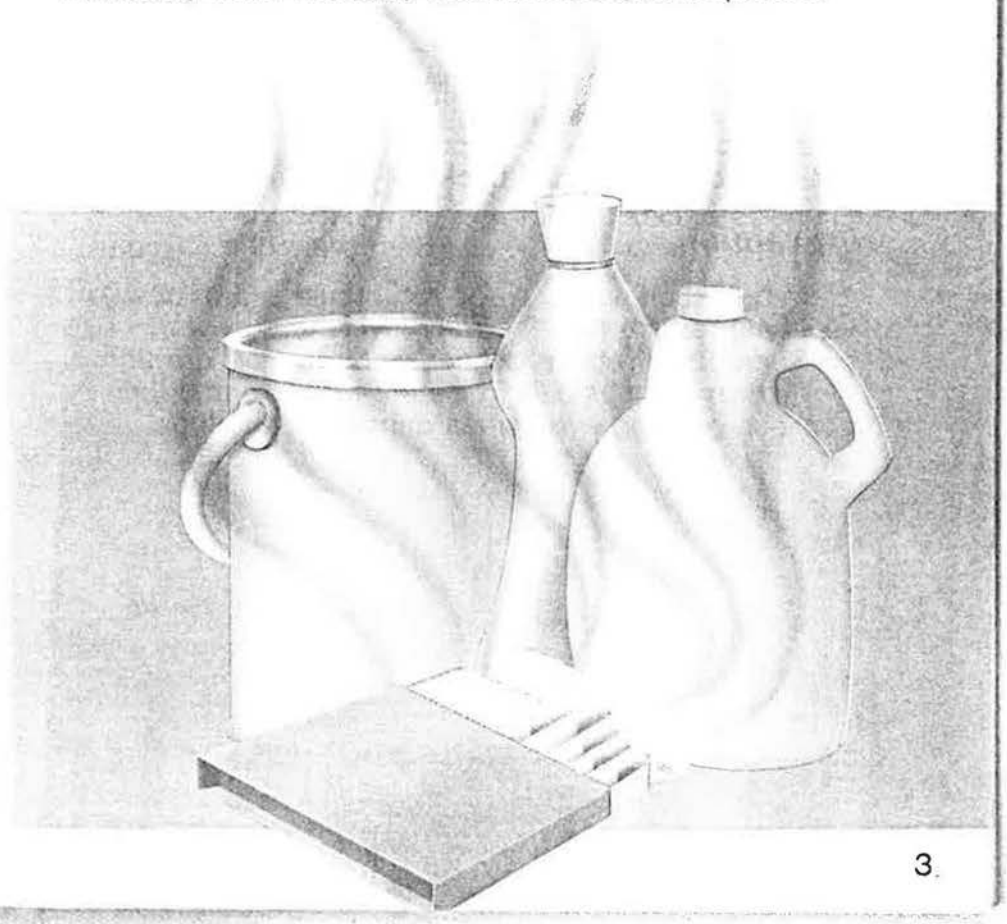
Condensation may also be soaking into your roof sheathing, exterior walls and insulation, where hidden leaks are releasing humid house air to the outside.

Over the long term, the result may be damage to the house structure.



AIR QUALITY PROBLEMS

Stale air is a health hazard. For the health of everyone in your home, your house (like you) should "breathe" properly. If it doesn't, the air in your home can become polluted with harmful chemicals released from synthetic fabrics, furnishings, household products, cigarette smoke and improperly maintained or vented combustion devices such as cooking stoves, furnaces, water heaters, wood stoves and fireplaces.



MOULD AND MILDEW

Problems

Mould and mildew fungi can cause:
— unsightly stains;
— damaged paint, wood, drywall and fabrics;
— allergies; and
— illness (in the case of some moulds).

Some symptoms

- Musty smells.
- Green or black marks on the inside surface of outer walls or ceilings.
- Stains in wet areas of carpets.
- Mildew on drapes and backs of furniture.

Prevention

Fungi (such as the wood rot, mould and mildew varieties) require high humidity levels to survive.

Some fungi require condensation to start growing.

Certain fungi actually generate moisture and then continue growing even when condensation stops.

TO AVOID MOULD AND MILDEW PROBLEMS,
KEEP MATERIALS DRY.

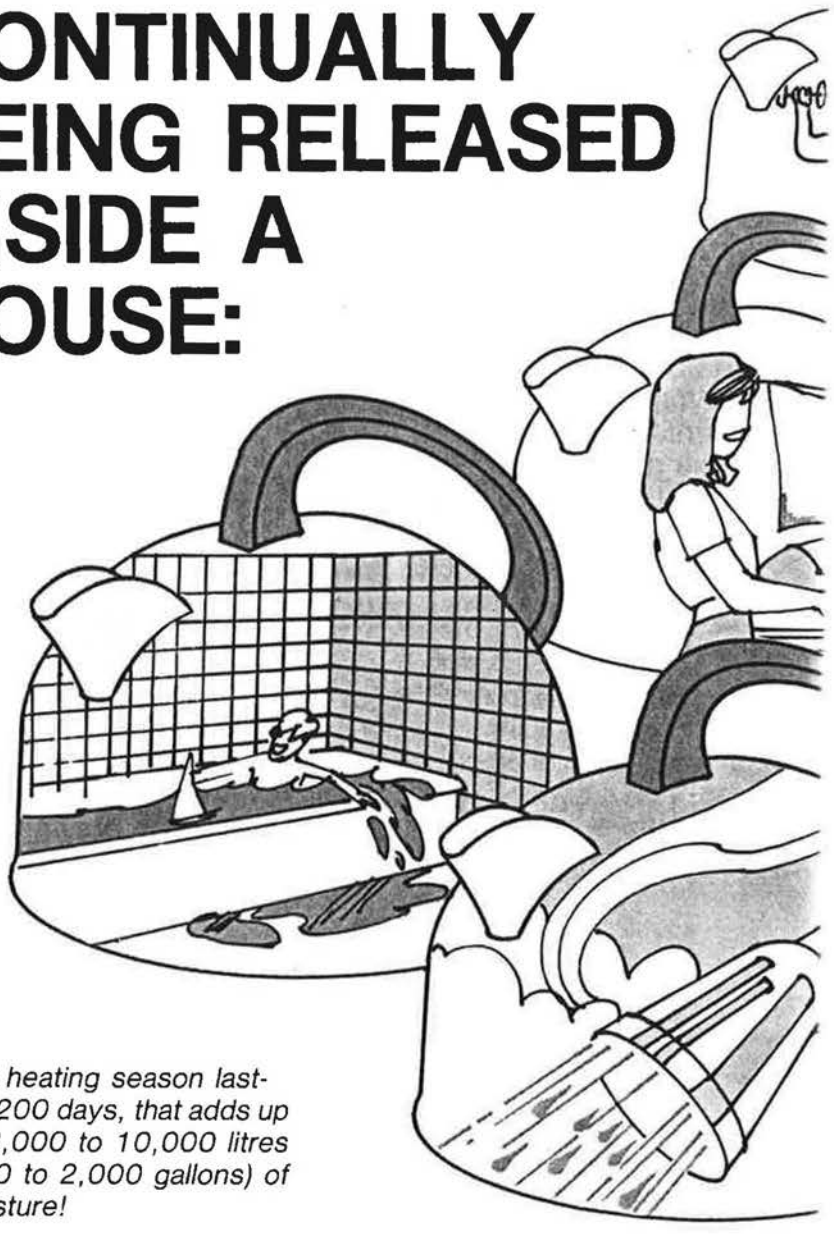
Clean-up methods

Mould and mildew on surfaces can be cleaned up by using a solution of one part chlorine bleach in four parts of water.

When applying:
— ventilate well;
— use gloves;
— let stand 10–15 minutes;
— rinse well, then
— keep surfaces dry.

Mould and mildew stained fabrics should be removed and discarded.

MOISTURE IS CONTINUALLY BEING RELEASED INSIDE A HOUSE:



* *In a heating season lasting 200 days, that adds up to 2,000 to 10,000 litres (400 to 2,000 gallons) of moisture!*

10 TO 50 LITRES OR 2 TO 10 GALLONS EVERY DAY *

Find the moisture level in your house

The amount of moisture in the air is normally measured as its Relative Humidity (RH).

Purchase a Relative Humidity sensor (hygrometer) at your local hardware store or building supply dealer.

Inside your house, the Relative Humidity should be brought down to approximately 45% during the winter heating season.

In very cold weather, a level of 30% may be needed to prevent window condensation.

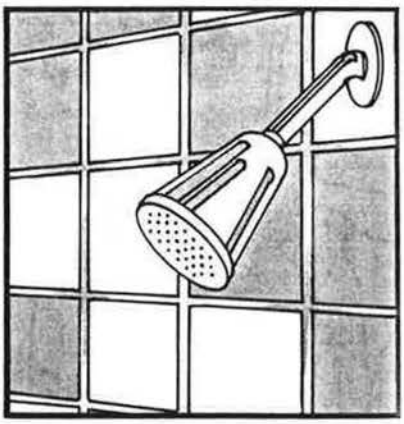
Upgraded windows can support a higher level of Relative Humidity without condensation occuring.

If you reduce the amount of moisture released in your house each day, you can reduce ventilation and save energy.

A WET OR DAMP BASEMENT ESPECIALLY IF HEATED, MAY GENERATE MUCH MORE MOISTURE THAN ALL OTHER FAMILY ACTIVITIES COMBINED

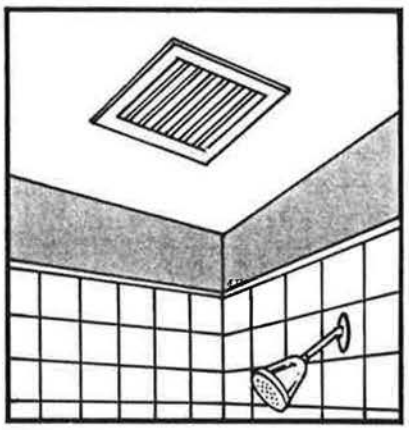
PROBLEMS IN YOUR
BATHROOM?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



TYPICAL SIGNS

- ☐ Steady streaming of water from windows.
- ☐ Condensation on toilet tank and bathroom fixtures.
- ☐ Mould and mildew between ceramic tiles.
- ☐ Condensation on walls.
- ☐ Peeling paint or wallpaper.
- ☐ Rotting window sills.
- ☐ Damaged gypsum board under windows.
- ☐ Mould and/or mildew in corners of interior surfaces of outside walls and/or ceiling.
- ☐ Curling floor tiles.
- ☐ Musty smells from inside walls.
- ☐ Water dripping from vents.



PROBABLE CAUSES

- Excessive house humidity levels.
- Moisture from hot baths and showers.
- Dampness from wet bath mats, towels and drying clothes.
- Inadequate ventilation.
- Uninsulated vent ducts.
- Paint or wallpaper not designed for use in bathrooms.
- Cold outside air leaking through or past insulation.

PRACTICAL SOLUTIONS

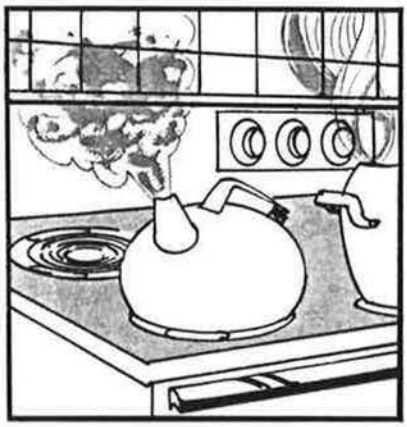
- Close bathroom door when using shower or bathtub and turn on fan.
- Install a powered or unpowered ceiling vent exhausting to outside.
- Dry very wet clothes or bath mats and towels in a vented electrical dryer, or by hanging them to dry outside.
- Use correct moisture-proof paint and wallpaper.
- Properly insulate walls and ceilings.

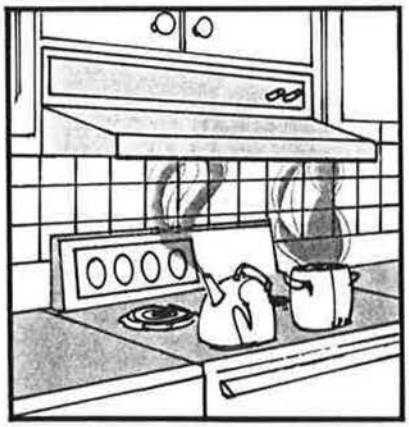
PROBLEMS IN YOUR
KITCHEN?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS

TYPICAL SIGNS

- ☐ Water streaming off windows.
- ☐ Condensation on walls.
- ☐ Damaged walls under windows.
- ☐ Wetness under sinks or kitchen counters.
- ☐ Peeling paint or curling tiles.
- ☐ Mould in cupboards and corners of interior surfaces of outside walls.
- ☐ Doors difficult to open and close.





PROBABLE CAUSES

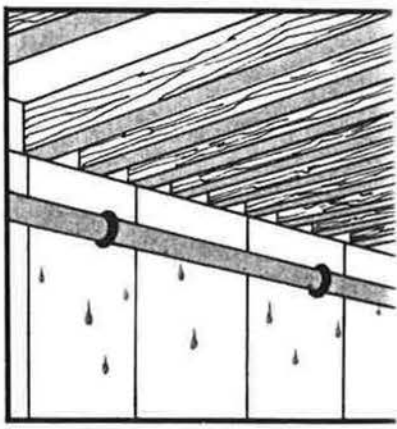
- Excessive house humidity levels.
- Inadequate ventilation.
- Leaks around sinks and fittings.
- Cooking food (especially simmering and boiling of foods).
- Washing dishes.
- Washing the floor.
- Leaking water pipes.
- Cold outside air leaking through or past insulation.
- Combustion moisture from gas ranges.

PRACTICAL SOLUTIONS

- Operate *vented* exhaust over oven range when cooking (if your existing fan is too noisy, replace with a quieter fan).
- Install a ceiling vent.
- Don't let liquids and food simmer uncovered for unnecessary lengths of time.
- Trim cupboard doors so that air can circulate.
- Properly insulate walls and ceiling.
- Caulk sink and fittings to counter.

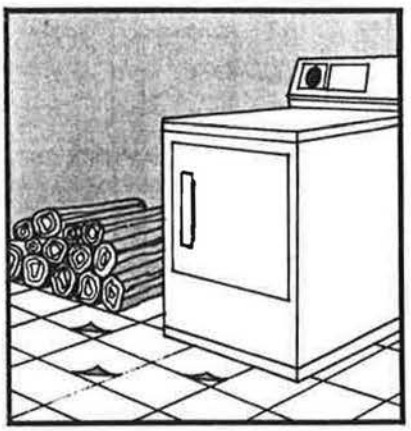
PROBLEMS IN YOUR
BASEMENT?

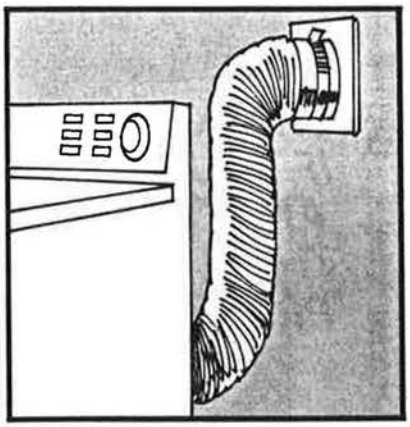
CHECK IF YOU HAVE ANY OF THESE PROBLEMS



TYPICAL SIGNS

- ☐ Wet or damp floors or walls.
- ☐ Groundwater running down walls and across floors into sump.
- ☐ White powdery stains on exposed concrete walls or floor.
- ☐ Condensation on windows.
- ☐ Condensation dripping from cold water pipes.
- ☐ Mould on joists behind insulation.
- ☐ A stuffy, damp smell.
- ☐ Water seeping through cracks in chimney.





PROBABLE CAUSES

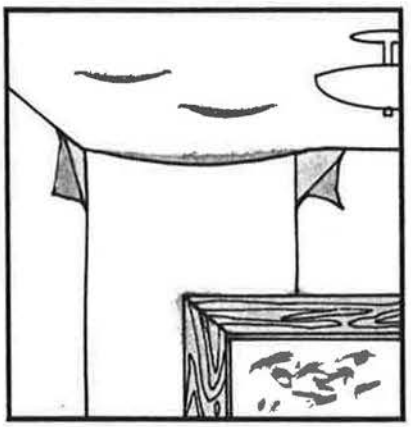
- Humidifying device on your furnace.
- Drying firewood.
- Unvented dryer.
- Wet clothes on line.
- Moisture from new concrete.
- Cracks in walls.
- Blocked footing drains.
- Improper exterior grading of ground near basement walls.
- Flue gas condensation leaking from chimney.
- Rain entering wall.
- Exposed soil in crawl space or basement.
- Spillage of combustion gases from furnace and/or water heater.

PRACTICAL SOLUTIONS

- If you have a humidifier on your furnace, permanently disconnect or remove it.
- Dry and store firewood outside the house.
- Install dryer vent to outside.
- Connect washer water outlet directly to drain pipe.
- Insulate cold water pipes.
- Cover exposed soil in crawl space or basement with an air/vapour barrier.
- Caulk cracks in walls and chimney.
- Moisture-seal basement floor and walls.
- Caulk along edge where wall joins floor.
- Insulate basement walls.
- Cover and vent the sump to outdoors.
- Provide fresh air intake to basement.

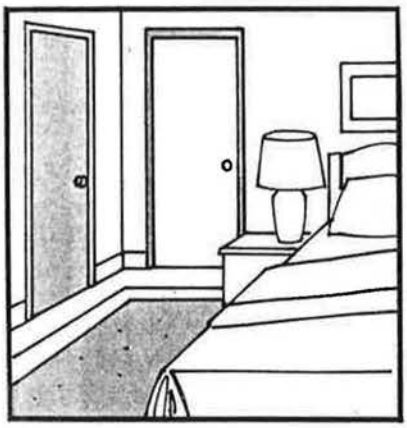
PROBLEMS IN YOUR
BEDROOM?

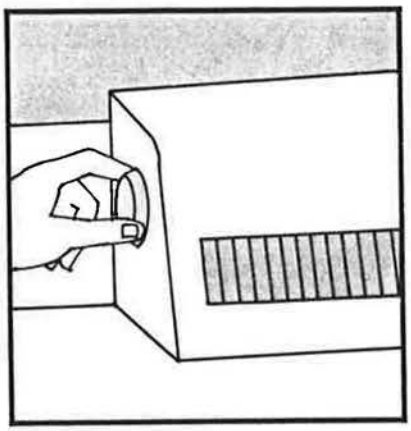
CHECK IF YOU HAVE ANY OF THESE PROBLEMS



TYPICAL SIGNS

- ☐ Water streaming from windows.
- ☐ Rotting window sills.
- ☐ Damaged gypsum wallboard.
- ☐ Cracked or bulging ceiling.
- ☐ Peeling paint or wallpaper on interior surfaces of outside walls.
- ☐ A damp, stuffy clothes closet.
- ☐ Mould in closets, corners of interior surfaces of outside walls, behind furniture, etc.





PROBABLE CAUSES

- Excessive house humidity levels.
- Lack of air circulation throughout the house.
- Closed door.
- Lack of air circulation in closet.
- Bedroom temperature too low in comparison to other rooms.
- Ineffective insulation in outer walls or attic.
- Furniture too close to outside walls.
- Closed drapes.
- Use of unvented ranges or combustion heaters in other rooms.

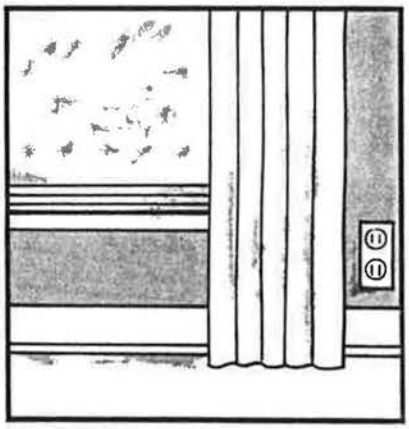
PRACTICAL SOLUTIONS

- Increase bedroom temperature.
- Open drapes.
- Install a central circulating fan and ducting.
- Leave bedroom door open to allow better circulation, or trim bottom of door to create a gap.
- Trim top and bottom of closet door to allow air to circulate, or install louvered doors.
- Properly insulate cold outer walls and/or ceiling.
- Keep furniture away from outside walls.
- Discontinue use of unvented heaters.
- Install or use ventilation systems.

PROBLEMS IN ALL

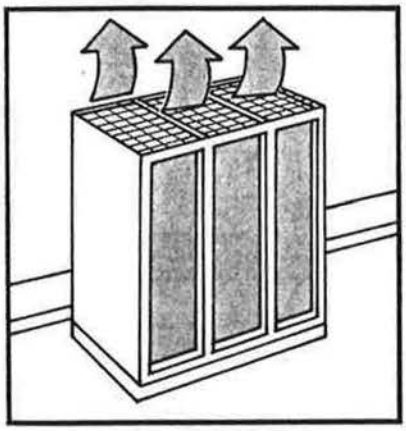
LIVING AREAS?

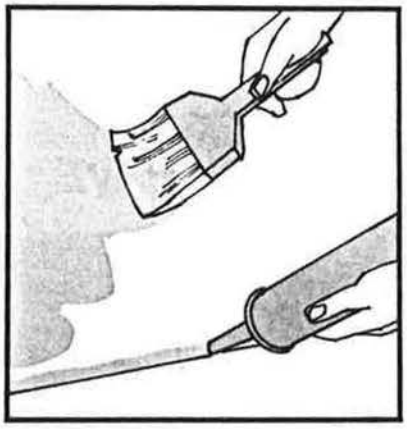
CHECK IF YOU HAVE ANY OF THESE PROBLEMS



TYPICAL SIGNS

- ☐ Excessive condensation on windows.
- ☐ Rotting window sills and door jams.
- ☐ Damaged gypsum board.
- ☐ Mould and mildew in corners of interior surfaces of outside walls.
- ☐ Mould and mildew in closets.
- ☐ Mouldy drapes, carpets or furniture near outside walls.





PROBABLE CAUSES

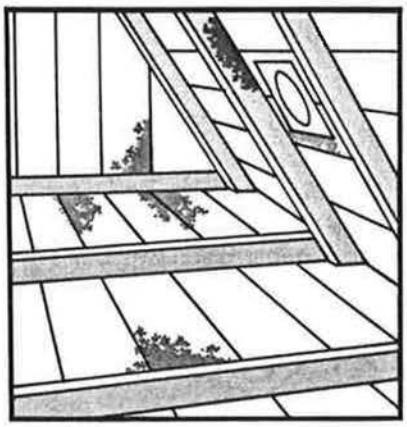
- Operation of humidifier(s).
- Excessive moisture gains in basement or crawl spaces.
- Excessive boiling of food.
- Inadequate ventilation with fresh air.
- Poor air circulation between and within rooms.
- Cold surfaces due to ineffective insulation.
- Large air leaks at electrical fixtures, window frames, etc.
- Closed drapes.

PRACTICAL SOLUTIONS

- Discontinue use of humidifier(s).
- Moisture-seal basement walls and floors.
- Caulk basement floor to wall joint.
- Install a balanced ventilation system — and use it regularly.
- Circulate air between rooms.
- Open drapes.
- Properly insulate cold surfaces.
- Seal large air leaks.

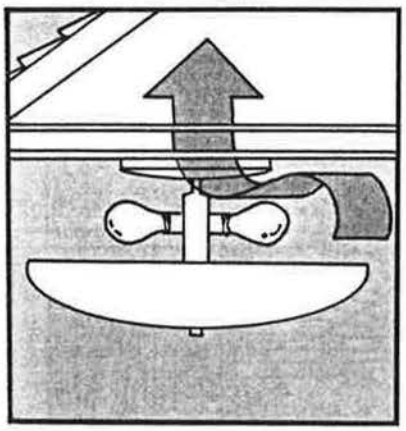
PROBLEMS IN THE
ATTIC AND ROOF?

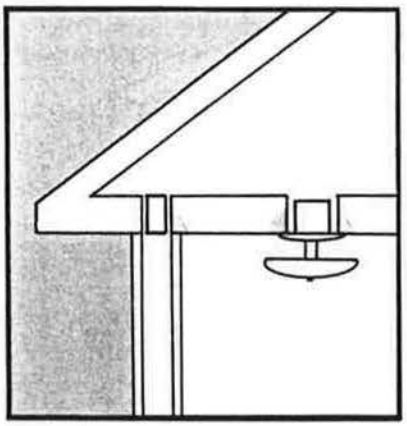
CHECK IF YOU HAVE ANY OF THESE PROBLEMS



TYPICAL SIGNS

- ☐ Extreme condensation, frost and dark mould on roof trusses and sheathing.
- ☐ Condensation near vents or waste pipes.
- ☐ Condensation near wiring or electric fixtures.
- ☐ Water draining from soffit vents.
- ☐ Stained ceilings.
- ☐ Water draining from ceiling fixtures.





PROBABLE CAUSES

- Holes and cracks in ceiling.
- Incomplete air barrier.
- Unsealed electrical or plumbing fixtures, vents, etc.
- Exhaust fans (from kitchen and bathroom) vented into attic.
- Uninsulated and unsealed attic hatch.
- Poor ventilation in attic.
- Missing chimney firestop.
- Leaking roof.

PRACTICAL SOLUTIONS

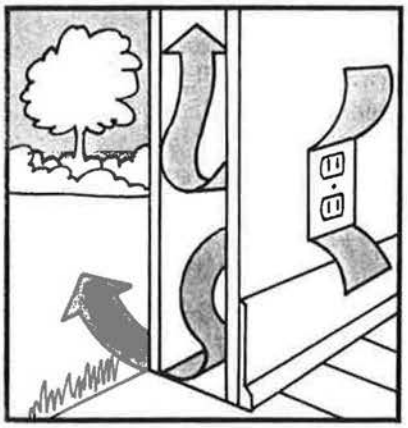
- Repair holes and cracks in ceiling.
- Reduce excess humidity levels in the house.
- Repair air barrier in ceiling (at interior and exterior walls, fixtures, etc.).
- Seal and insulate attic hatch.
- Install and seal chimney firestop.
- Seal light fixtures.
- All vents should exhaust directly to outside. Ducts must be carefully sealed and insulated in the attic.
- Repair roof and flashings.

PROBLEMS IN THE
EXTERIOR WALL?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS

TYPICAL SIGNS

- ☐ Bulging, buckled or rotting siding.
- ☐ Blistering or flaking paint.
- ☐ Dark stains from behind siding.
- ☐ Puddles next to foundation.
- ☐ Wet stains or chalky deposits on brick or stucco.
- ☐ Light markings on brick or stucco.



PROBABLE CAUSES

- Warm moist, inside air leaking out through air barrier in wall.
- Wind-driven rain causing water to penetrate the wall cladding from outside.
- Inadequate or missing flashings.
- Poor drainage and grading and missing splash block.
- Broken downspout.

PRACTICAL SOLUTIONS

- Reduce excess moisture in the house.
- Improve house ventilation.
- Seal all openings into outer walls.
- Install or repair flashing to lead rain out of wall.
- Regrade ground to drain surface water away from building.
- Hire an experienced contractor to inspect your house to identify the cause of the problem and make the necessary repairs.

NOTE: *Poor surface drainage around your house may cause dampness to show inside your basement.*

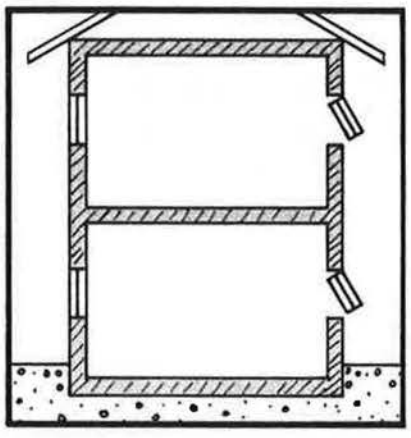
VENTILATON ALTERNATIVES

After reduction of moisture sources, ventilation may be used to improve indoor air quality.

All ventilation systems should be balanced, i.e.: air in=air out, with intakes sized to allow easy entry of enough air to supply all exhaust devices.

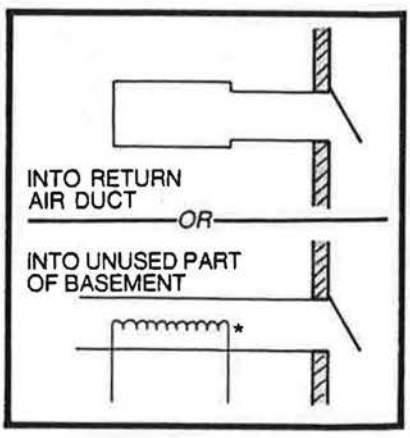
Temporary passive ventilation

On the same wall, open upper or lower section of windows slightly to get temporary relief and/or to prove to yourself that ventilation helps.



Combined active/passive ventilation

Add passive intakes to complement existing exhaust fans, heaters, stoves, fireplaces, etc.

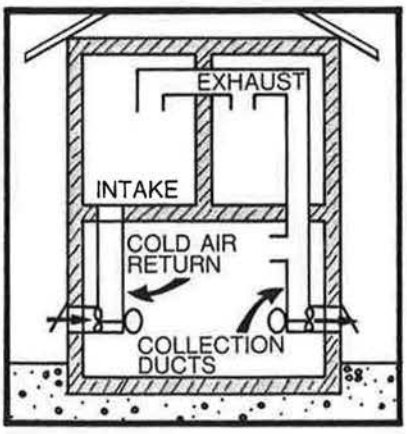


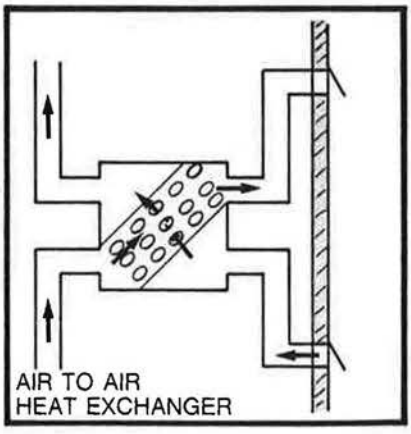
* *Duct heaters are now available to prevent cold drafts.*

Balanced active ventilation

Heat recovery ventilation

Balanced ventilation systems (with matched intakes and exhausts) do not upset combustion appliances. However, combustion and draft openings are still required for furnaces, water heaters, cooking stoves, fireplaces, etc.





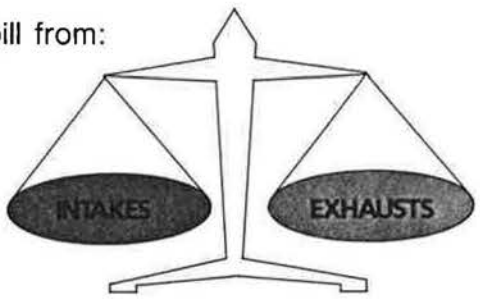
NOTE: In some houses that employ combustion devices (gas/oil/wood furnaces, water heaters, fireplaces, etc.), a fresh air supply may be required to match the flows of exhaust-only ventilation systems.

COMBUSTION SPILLAGE

CAUSES

Combustion gases can spill from:

- Furnaces.
- Water heaters.
- Wood stoves.
- Fireplaces.



Gases always spill from unvented cooking devices and space heaters.

Use of unvented combustion devices is not recommended in tightly built houses.

Spillage from vented devices with chimneys can still occur when:

— Chimney and flue pipes are poorly designed, built or maintained.
— Powerful exhaust fans are used in tightly built houses. (Some older Canadian homes are quite tightly built.).
— Adequate air supply capacity is not provided to match exhaust capacity.

SOLUTIONS

- Appliances, flue pipes and chimneys must be inspected at least once each year.
- Flue pipes and chimneys must be gastight and should be insulated to suit the combustion appliance they serve.
- Mid and high efficiency appliances must have well insulated flue pipes and chimneys.

NOTE: Powerful exhaust devices may require powered fresh air supplies to be safe and effective.

CMHC and others are studying ways to provide draft-free fresh air to match the flows of exhaust devices such as:

- *kitchen range hoods;*
- *bathroom fans;*
- *clothes dryers;*
- *"whole house" vacuum cleaners;*
- *fireplaces;*
- *wood stoves; and*
- *"whole house" ventilators.*

FREQUENT SPILLAGE FROM COMBUSTION APPLIANCES CAN BE A HEALTH HAZARD

HIGHLIGHT SUMMARY

CAUSES

Condensation occurs on surfaces because they are too cold for the amount of moisture present in the indoor air. That results from:

- Excessive moisture production:
  - — by ventilation with "muggy" warm and humid outdoor air (a common climatic problem in Spring or Fall and in coastal areas);
  - — by evaporation from wet floors, dishes, cooking, people, plants and damp basements; and
  - — inappropriate use of humidifiers.

- Inadequate ventilation with outdoor air.

- Inadequate circulation of indoor air.

- Unusually cold surfaces:
  - — insufficient glazing layers in windows;
  - — inadequate insulation levels in ceilings and walls;
  - — cold air penetrating insulation (a typical cold-climate winter problem); and
  - — a cool basement in summer.

SOLUTIONS

- Reduction of excess moisture production is the first priority:
  — control evaporation;
  — keep the basement dry; and
  — discontinue use of humidifiers if window condensation is common.

- Keeping surfaces warm is the second priority:
  — window glazing should be appropriate to the climate (triple glazing in cold regions);
  — well insulated walls and ceilings keep indoor surface temperatures high; *but*
  — cold outside air must be prevented from penetrating insulation (wind barriers, attic air deflectors, etc.).

- A reasonable ventilation rate, plus good circulation of indoor air, are important and effective methods to help prevent all indoor air quality problems.


FRESH
AIR

PROTECT YOUR HOUSE AND YOUR HEALTH

MOIST STALE AIR

ALL **MOIST STALE AIR** SHOULD BE REPLACED WITH **FRESH AIR** EVERY **3** TO **4** HOURS.

Canadian Home Builders' Association

Association **canadienne** des constructeurs d'habitations

CMHC & CHBA gratefully acknowledge the contribution of the Newfoundland & Labrador Housing Corporation (NLHC) in the original development of this publication as part of a consumer education program undertaken jointly by CMHC and NLHC in 1983.