APPENDIX A

CANADA MORTGAGE AND HOUSING CORPORATION
CMHC - (CONDENSATION)

CONDENSATION IN THE HOME:
WHERE, WHY AND WHAT TO DO ABOUT IT

CMHC
Canada Mortgage
and Housing Corporation

SCHL
Société canadienne
d'hypothèques et de logement

Condensation in the Home: Where, Why, and What to Do About It

NHA 5319 80/03

AIR MOISTURE IN THE HOME

Stained ceilings, water streaming from windows and mould on walls, the villain is a common one, excessive water vapour in the air. Cracking furniture, static electricity build-up and dry, scratchy throats are symptoms of the reciprocal problem, too little water vapour in the air.

Both these problems can be corrected although it is more difficult to control excessive humidity (the term used to indicate the amount of water in the air), than it is to add moisture to the air.

A few basic principles will serve to simplify a complex problem and make you a condensation trouble shooter.

What Is Condensation?

Condensation problems arise because air can hold only a limited amount of water vapour, an amount that varies with temperature, cold air being able to hold less water than warm air.

When air at a given temperature contains all the water vapour it can hold, it is said to have a relative humidity of 100 per cent. If it contains only half the water vapour it can hold at that temperature, then the relative humidity is 50 per cent. If the temperature changes, but no water vapour is added or removed, then the relative humidity will also change and will increase as the temperature falls. The relative humidity will continue to rise with the falling temperature until the dew point is reached, that is, the temperature at which the relative humidity becomes 100 per cent (dew point temperature). Any further decrease in temperature will force some of

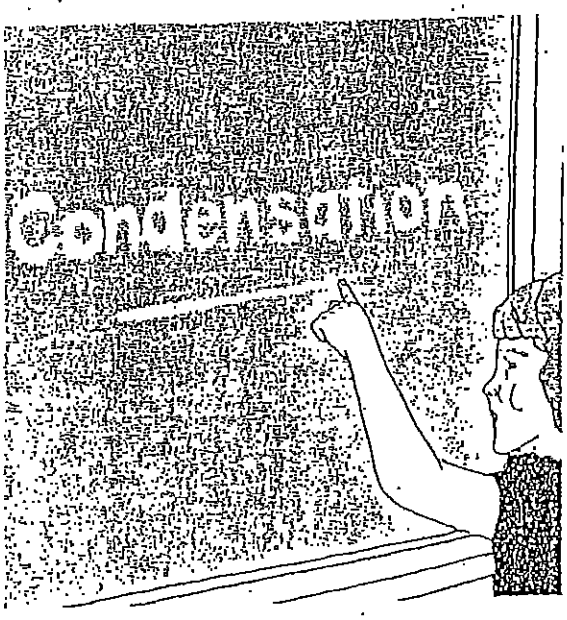

Figure 1 Condensation

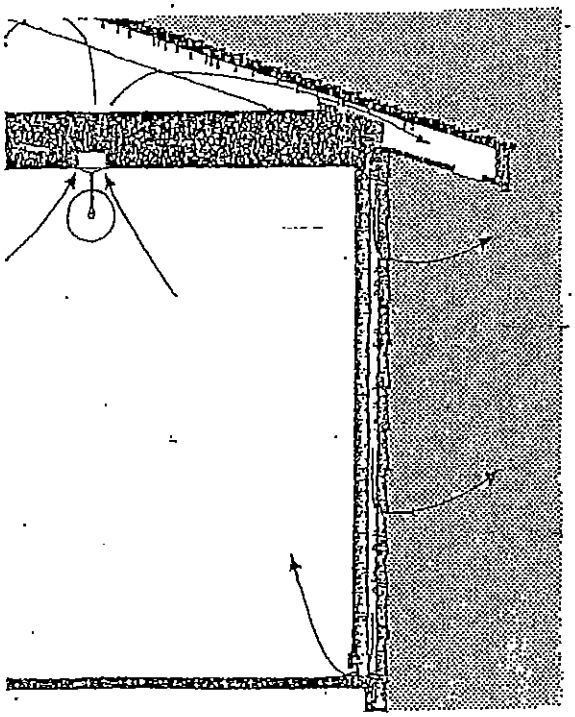

Figure 2 Structural causes of excessive condensation.

the vapour to condense as water (Figure 1), (when the temperature is above freezing), or as frost (when the temperature is below freezing). Air cooled by contact with cold surfaces such as windows will therefore deposit some of its water vapour on the glass or the metal sash whenever it has more water vapour than it can hold at its new temperature. This surface condensation is an indication of excessive water vapour in the air.

Basically there are two types of problems resulting from the moisture in the air: those from surface condensation on the interior of the building components, such as walls, windows, ceilings or floors, and those from concealed condensation within the building assembly, such as exterior wall cavities and attics. The major factors contributing to the amount of moisture in the two problem areas, surface or concealed are different. Interior surface condensation is caused by high humidity in the building and can occur even if it is well built. Concealed condensation on the other hand is caused mainly by the movement of moist air into the building envelope. Water vapour is also able to diffuse through the materials which make up the building envelope, but this is generally not as important as air leakage.

Surface Condensation

Where surface condensation is evident it should be considered as a warning sign. However, each person has his or her own level of personal comfort and the amount of condensation they are willing to accept, to maintain that level. If the occupants insist on a high level of humidity within the house, surface condensation must be expected when outside temperatures are low. Some indications of surface condensation are illustrated in Figure 4.

First Floor

1 Frost on door handles and hinges, or door frozen shut
2 Water or ice on windows
3 Damp spots or mildew on walls and ceiling
4 Damp spots or mildew on closet walls
5 Moisture on light fixtures
6 Moisture on water closets

Basement

7 Moisture on cold water pipes, walls and floors.

If you have too much surface condensation, the problem can usually be rectified by following the simple corrective action listed in this booklet.

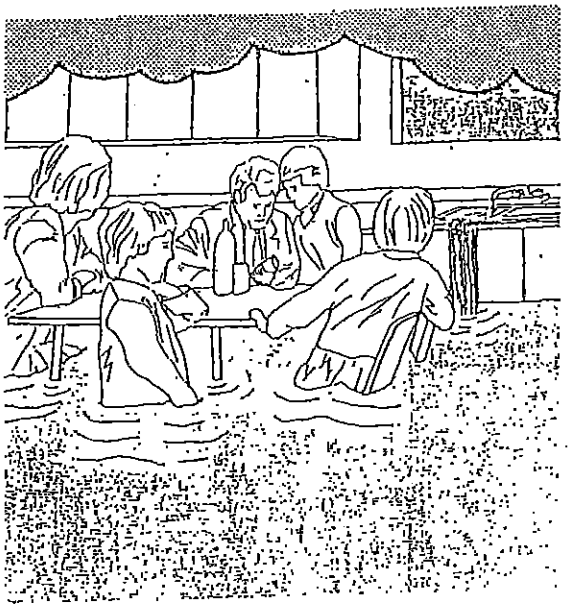

Figure 3 Set your own comfort level.

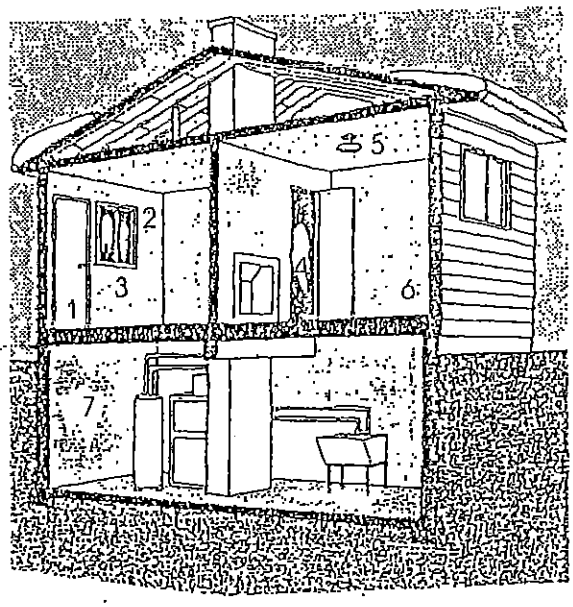

Figure 4 Surface condensation.

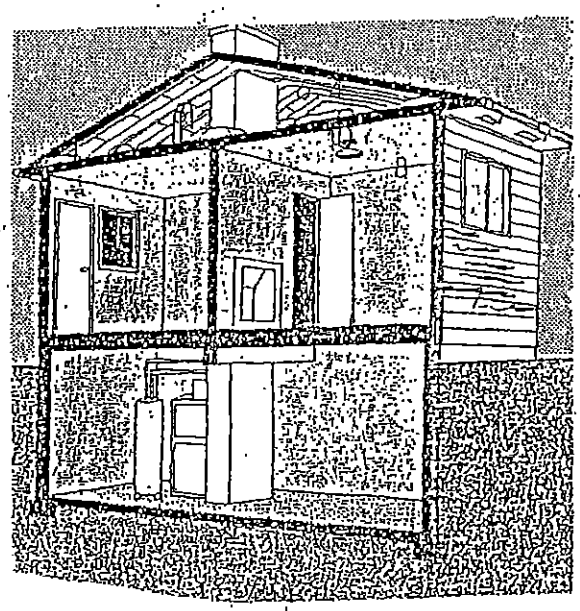

Figure 5 Concealed condensation.

Concealed Condensation

Concealed condensation problems, when identified, require remedial action, since serious damage can result to the structure. Some indications of concealed condensation resulting from excessive air leakage from inside the structure are:

Attic Unheated

1 Apparent leaky roof
2 Frost on underside of roof sheathing, over interior partitions, and where services penetrate the ceiling membrane
3 Frost or water on soil, vent or waste-pipes
4 Frost or water on nails penetrating roof sheathing
5 Frost on cold surfaces over soffit
6 Moisture or mildew staining of roof sheathing as observed from attic.

Storey Above Grade

7 Paint peeling
8 Damp spots on walls and ceilings
9 Water or ice forming near soffit vents
10 Damp spots around light fixtures or water collecting in light fixtures.

One difficulty in identifying the source of these problems is that some of them may be caused by a leaky roof or water penetrating the wall cladding.

A key factor in the amount of air leakage is the tightness of the exterior building envelope. A vapour barrier is used to reduce moisture entering the wall or ceiling by diffusion. It also acts as a barrier against air movement from within the house into the wall or ceiling cavity and is therefore an air barrier. In most instances the amount of moisture entering the wall cavity by air leakage is far greater and more damaging than that from vapour diffusion.

Sources of Moisture

The principal sources of moisture in the home are household activities. These vary with the living habits of the family. Some idea of the quantities of moisture released by these activities in a family of four is given in Table I.

Approximately 7 to 9 kg of moisture per day may be introduced into a small house under normal living conditions rising to as much as 18 to 23 kg per day on wash days, amounting to almost 64 kg per week. Heavy use of the moisture producing utilities will increase this amount considerably.

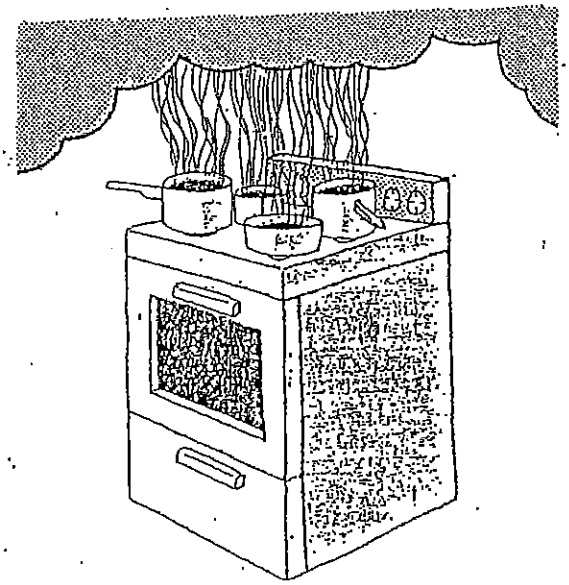

Figure 7 Cooking three meals a day releases .90 kg of moisture.

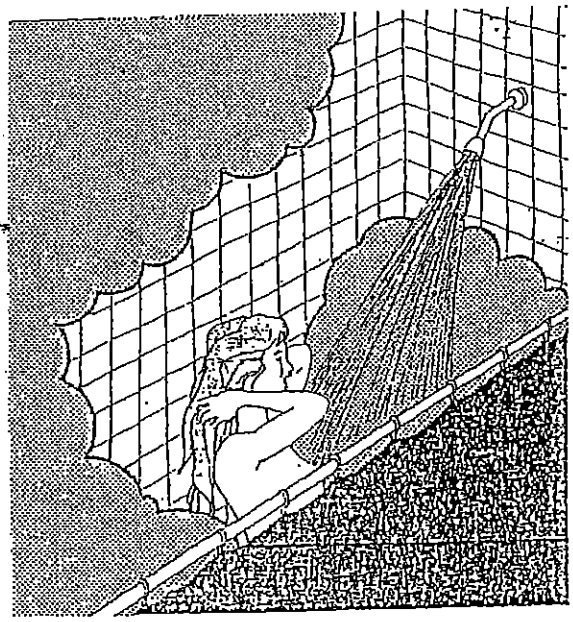

Figure 6 Showering releases .45 kg of humidity into the atmosphere.

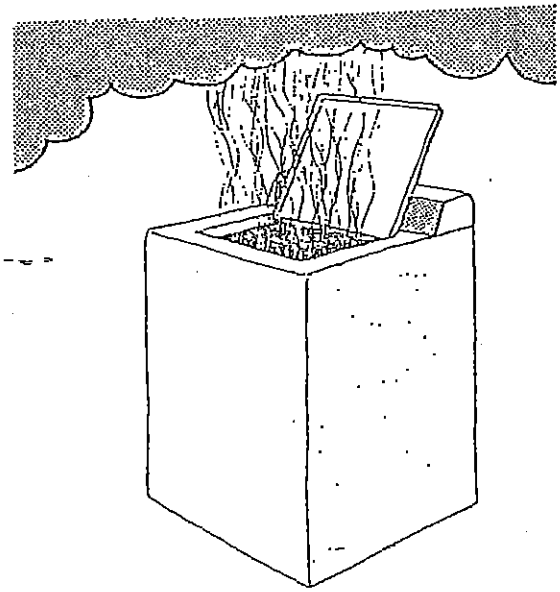

Figure 8 Moisture given off by a washing machine can amount to 1.81 kg per week.

Table 1

Moisture Produced by Various Household Activities for a Family of Four

Activity	Moisture Produced Kilograms
Cooking (3 meals per day)	.90
Dishwashing (3 meals per day)	.45
Bathing — Shower	.45
Bathing — Tub	.045
Clothes washing (per week)	1.81
Clothes drying indoors or within unvented dryer (per week)	11.8
Floor mopping (per 10 m^2)	1.36
Occupants (family of 4 per day)	5.45

This table shows how the living habits of a family of four may produce up to 23 kilograms of moisture per day. As liquid water this would be 23 litres. If a container holding 23 litres were suddenly spilt on the floor there would be a lot of mopping up to do. Yet this much moisture can be added to a household atmosphere almost daily without the occupants being aware of it — simply because it cannot be seen.

In addition to the activities shown in Table 1, if there are pets, plants, aquariums, self-defrosting refrigerators or freezers in the residence, much more moisture will be generated.

What we are talking about is excessive condensation, that is, condensation that covers windows with moisture or frost, or water that runs off to stain woodwork and walls. If this kind of condensation exists, then corrective action is necessary. A balance between desired comfort and surface condensation must be reached. Recommended steps are offered in this booklet to reduce surface condensation to an acceptable level.

The first step in solving condensation problems in your home is a willingness to reduce humidity.

The Great Humidity Myth

Some humidity is necessary for comfort and health. With many houses it is a struggle to keep enough moisture inside the house and maintain an acceptable comfort level for the occupants. Frequently humidifiers are installed to add moisture to the air but their use must be controlled or surface condensation problems may result. Unfortunately a dry house may indicate a high leakage rate, (depending on the amount of moisture added by the householder) and, this in turn, contributes to concealed condensation.

In some of the newer homes, however, air leakage has been controlled to such an extent that the problem really is how to get rid of moisture. Yet many householders go on adding moisture to the air. They aren't discouraged by the danger signal of condensation on windows, mould growth, or the damp spots on ceilings and room-side surfaces of exterior walls.

Because windows do not provide much resistance to heat loss, they are often the coldest component of a building enclosure, and can be an indicator of humidity problems. As condensation occurs on inside window surfaces, whenever surface temperature falls below the dew point temperature of the room air, it may be a warning signal to reduce the humidity in your residence.

Table 2

Inside Relative Humidity for 21°C with Double Glazing

Outside Air Temp.	Indoor Relative Humidity
-28°C or below	not over 15%
-28°C to -23°C	not over 20%
-22°C to -17°C	not over 25%
-16°C to -12°C	not over 30%
-11°C to -6°C	not over 35%
-5°C to 4°C	not over 40%

If moisture can be reduced to the humidities shown above, it may help cure troublesome surface condensation problems.

PRACTICAL STEPS TO CONTROL SURFACE CONDENSATION

Here are the steps you should take to reduce surface condensation in your home.

1 If the furnace is equipped with a humidifier or if you operate a separate humidifier, turn it off until the amount of condensation is reduced.

2 Crawl spaces under the home should have the floor covered with a watertight membrane.

3 Use the kitchen exhaust fan while cooking pots are emitting steam (Figure 9).

4 Make certain the clothes dryer is vented to the exterior and not into your home, the basement or crawl space. Avoid hanging wet clothes inside the house; they contribute a substantial amount of moisture to the air (Figure 10).

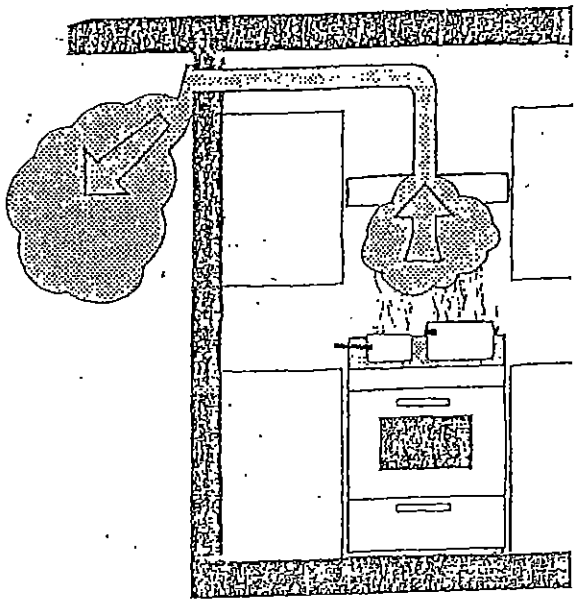

Figure 9 Kitchen exhaust fan.

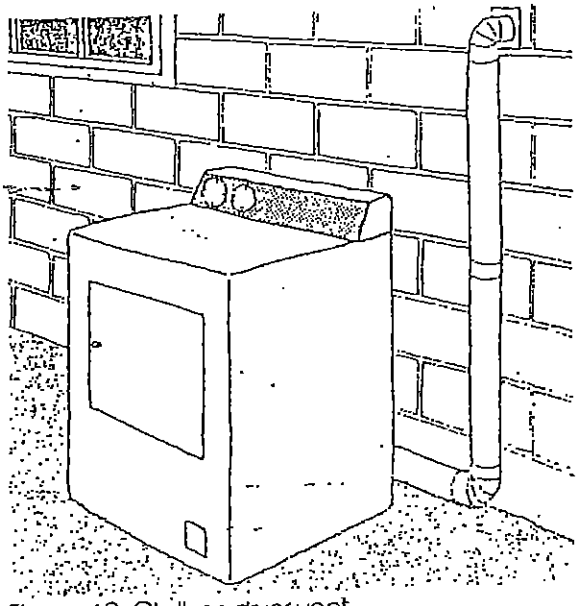

Figure 10 Clothes dryer vent.

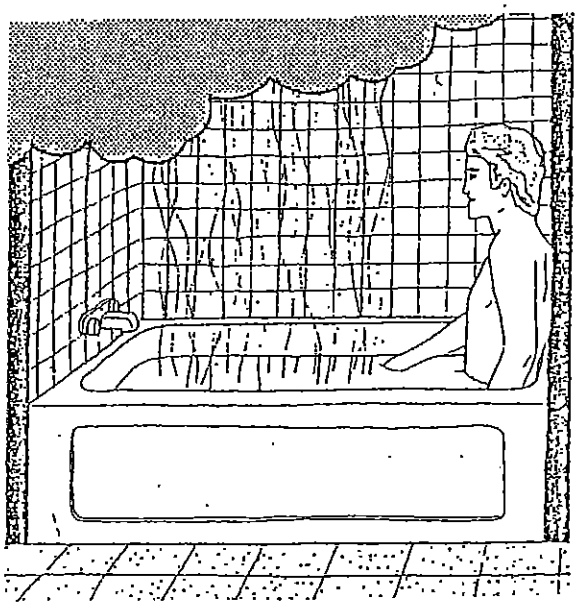

Figure 11 A bathroom exhaust fan can help reduce condensation in the house.

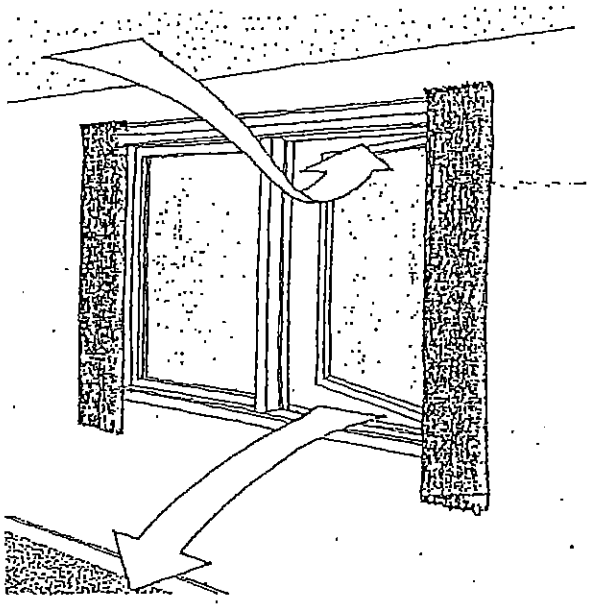

Figure 12 Opening a window helps reduce localized condensation

5 The bathroom can be a troublesome area (Figure 11). If the bathroom door is closed during and after the use of a bath or shower, the excess humidity can be dispersed by:

(a) using a bathroom exhaust fan to the exterior
(b) using the furnace circulating fan if there is a return air register in the bathroom
(c) opening the bathroom window until the room is cleared.

If these suggestions are not effective, the bathroom door should be left open after completion of the bath or shower, and the circulating fan on the furnace run continuously until the excess humidity is reduced.

6 Leave radiator pans empty until humidity decreases.

7 Install storm windows and storm doors.

8 The free circulation of air is important. Leave drapes open as much as possible so the air can circulate freely over the windows or put your furnace on circulating fan for a few hours each day.

9 If necessary you can open your window to reduce localized condensation (Figure 12).

10 Do not leave basement windows open during hot humid weather

11 Caulk the perimeter of doors and windows to reduce air leakage

PRACTICAL STEPS TO REDUCE CONCEALED CONDENSATION

1 Ensure that vents in the attic and basement crawl spaces are open and free from obstruction. In extremely cold regions it may be necessary to have vents that can be closed during cold dry periods (Figure 13).

2 Seal all holes in the air barrier, i.e. attic hatches, over interior partitions, and around chimneys, plumbing stacks, and electrical wiring.

3 Increase the attic ventilation.

4 Consult with local specialists.

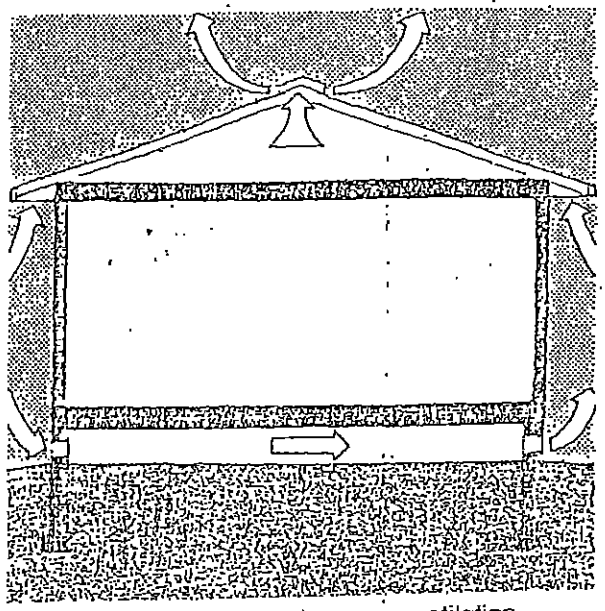

Figure 13 Attic and crawl space ventilation.

Canadian Home Builders' Association

Association canadienne des constructeurs d'habitations

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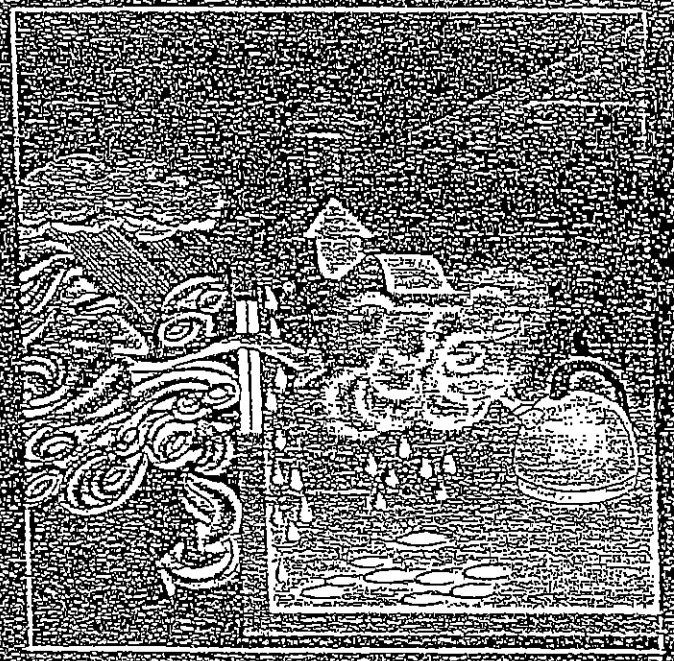
CMHC SCHL

Helping to house Canadians

MOISTURE AND AIR

PROBLEMS AND REMEDIES



HOUSEHOLDER'S GUIDE

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Canada

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.

Many household problems can be solved if a householder does one or more of the following:

— change practices
— perform maintenance or minor repairs
— have a professional contractor make major repairs

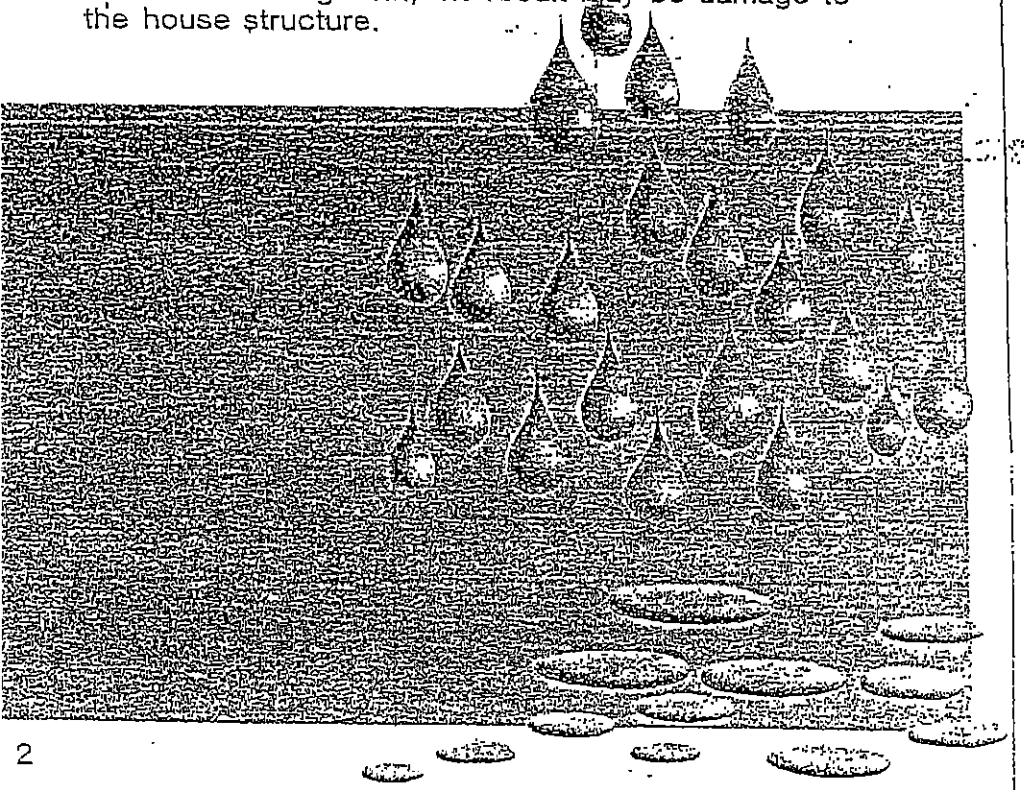
MOISTURE PROBLEMS

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.

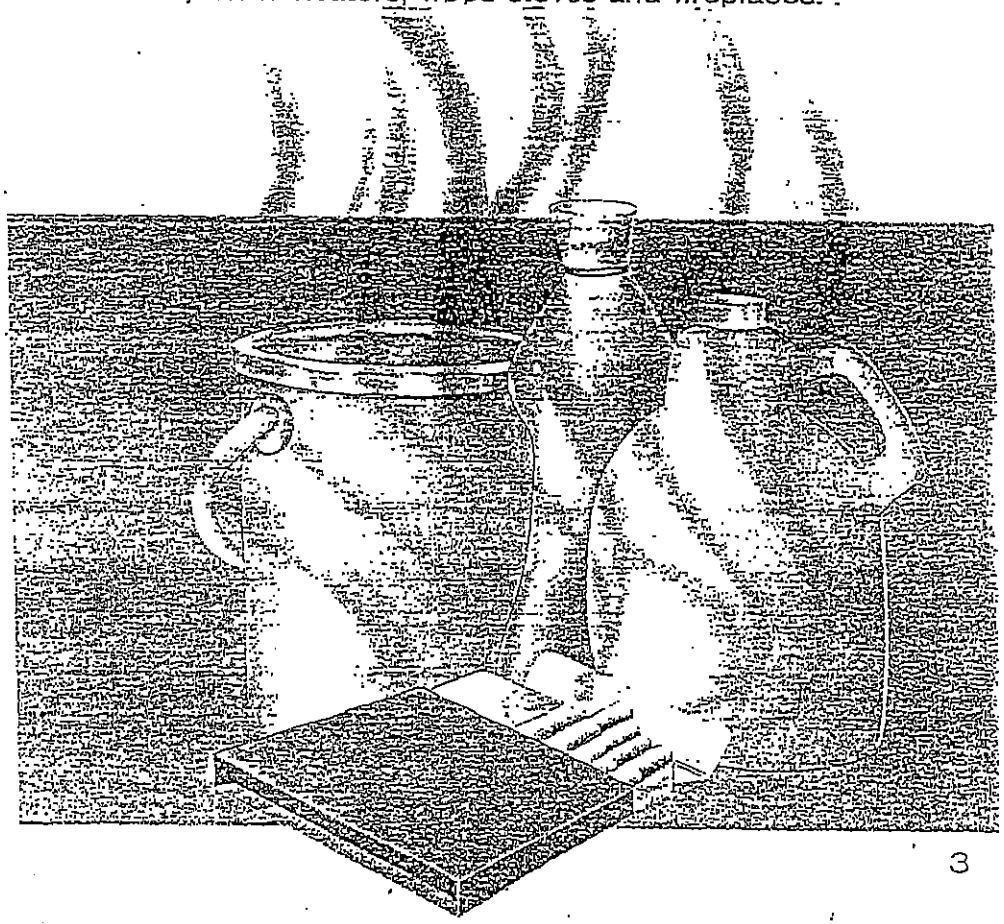
Condensation may also be soaking into your roof sheathing, exterior walls and insulation, where hidden leaks are releasing humid house air to the outside.

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

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 MOST MOULD AND MILDEW PROBLEMS,
KEEP MATERIALS DRY.

Clean-up methods

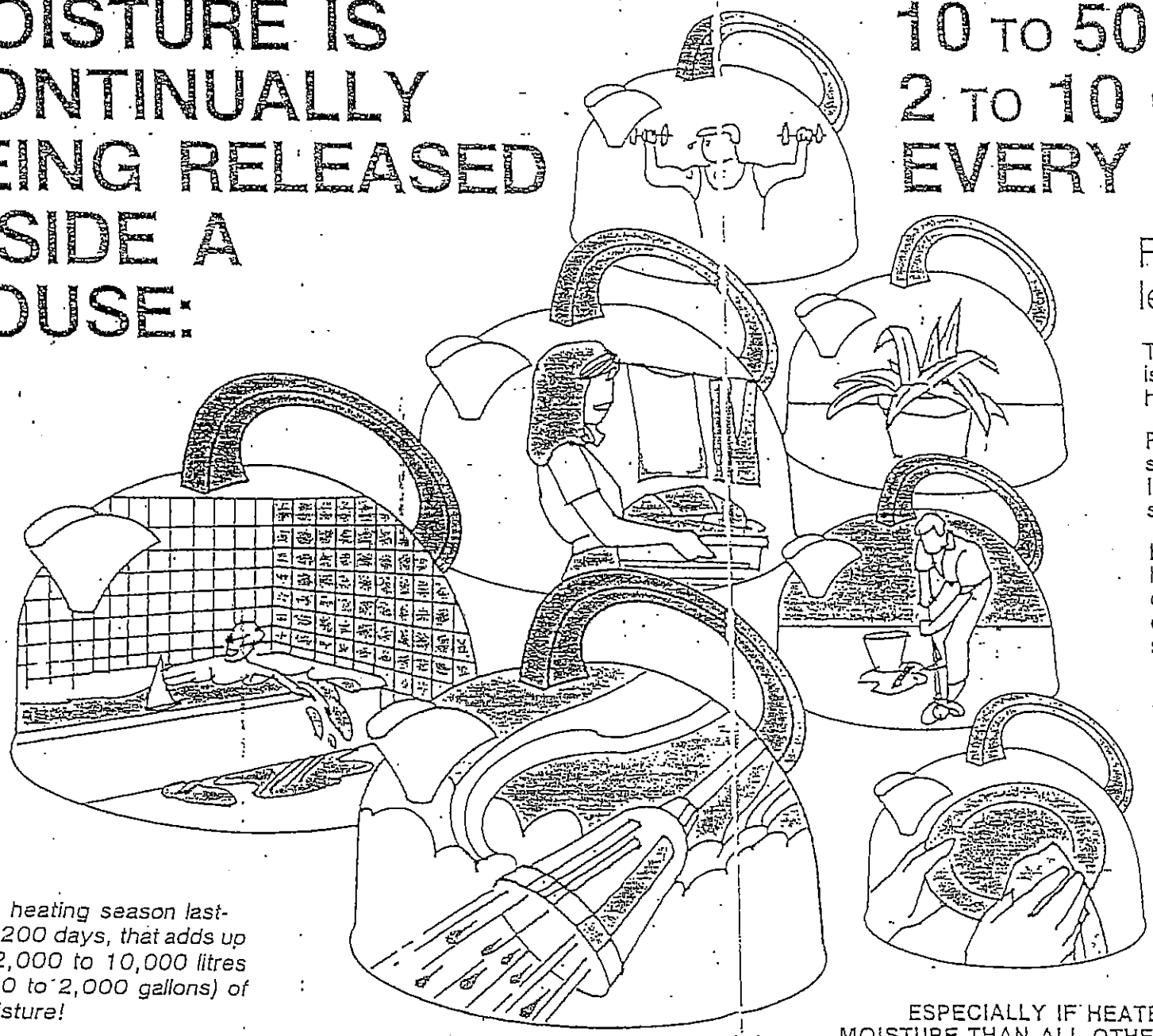
Mould and mildew on surfaces can be cleaned up with a solution of one part chlorine bleach in four parts of water.

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:

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.

Purchase a relative humidity sensor (hygrometer) at your local hardware store or building supply store.

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.

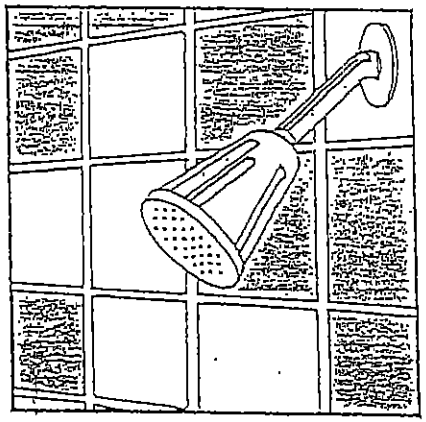
A WET OR DAMP BASEMENT, ESPECIALLY IF HEATED, MAY GENERATE MUCH MORE MOISTURE THAN ALL OTHER FAMILY ACTIVITIES COMBINED

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

PROBLEMS IN YOUR

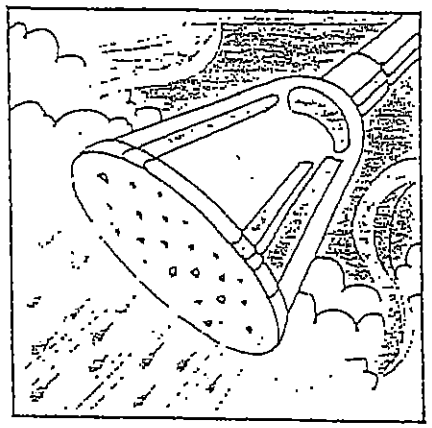
BATHROOM?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



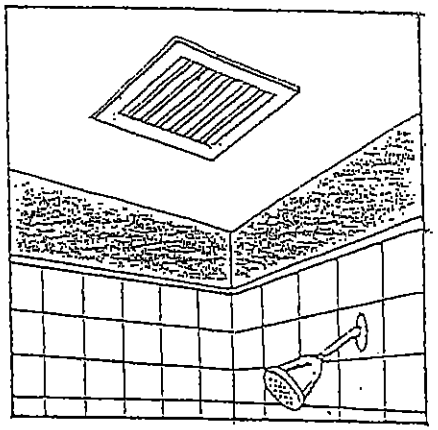
TYPICAL SIGNS

- ☐ 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 or mildew in corners of interior surfaces of outside walls 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.



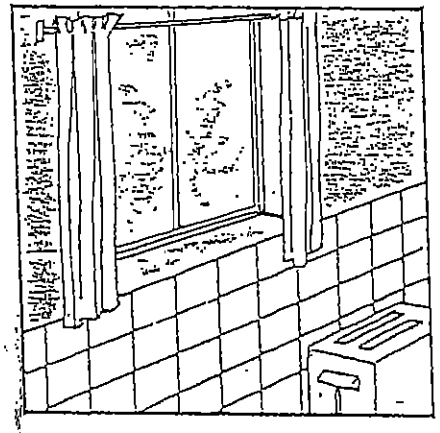
PRACTICAL SOLUTIONS

- 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 hang them to dry outside.
- Use moisture-proof paint and wallpaper.
- Properly insulate walls and ceilings.

PROBLEMS IN YOUR

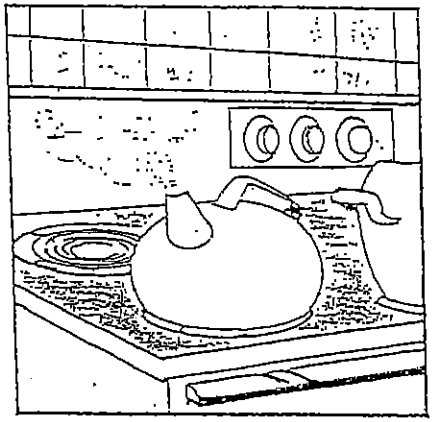
KITCHEN?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



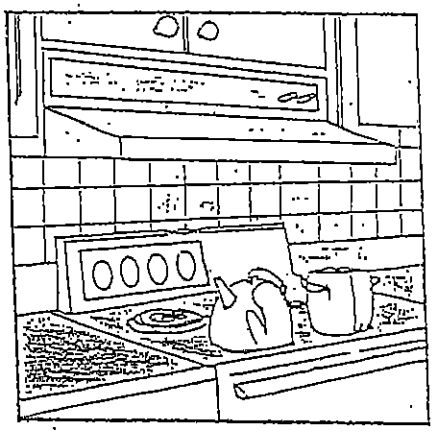
TYPICAL SIGNS

- ☐ Water streaming off windows.
- ☐ Condensation on walls.
- ☐ Damaged walls under windows.
- ☐ Moisture 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.



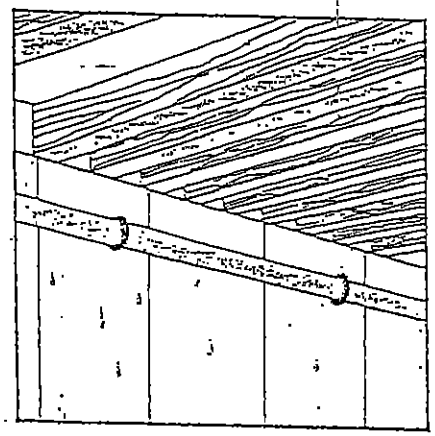
PRACTICAL SOLUTIONS

- 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

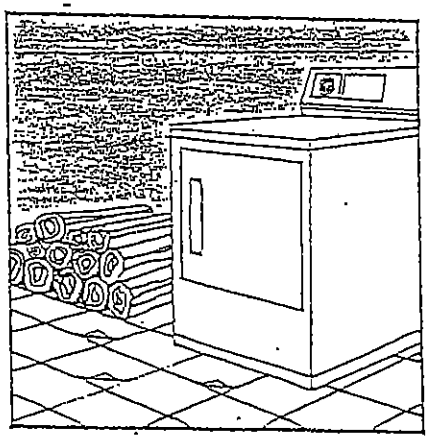
BASEMENT?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



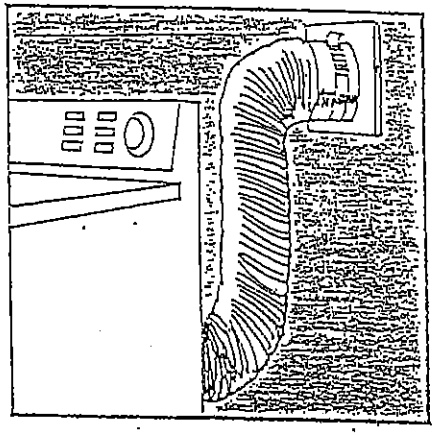
TYPICAL SIGNS

- ☐ 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 or water heater.



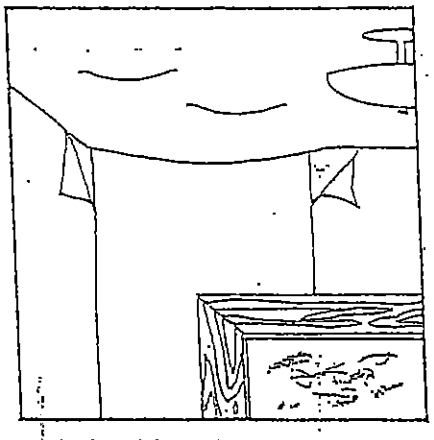
PRACTICAL SOLUTIONS

- 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 or 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

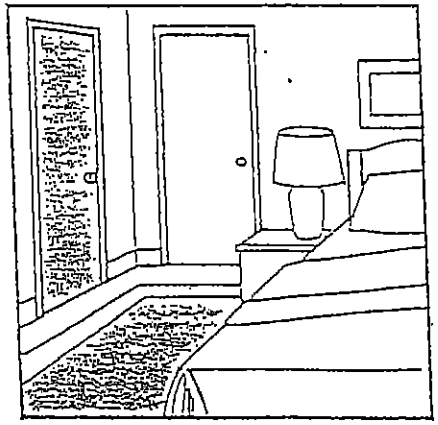
BEDROOM?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



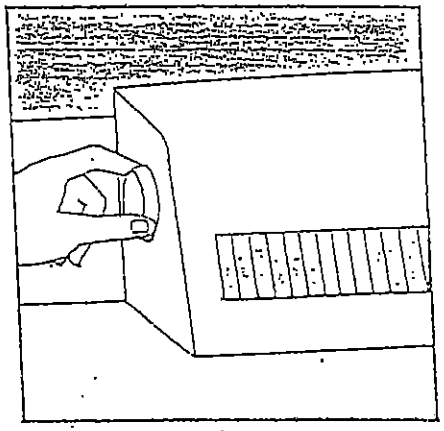
TYPICAL SIGNS

- ☐ 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 much lower than in 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.



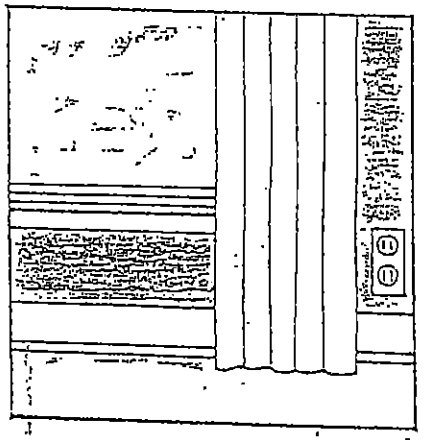
PRACTICAL SOLUTIONS

- 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 ceiling.
- Keep furniture away from outside walls.
- Discontinue use of unvented heaters.
- Install or use ventilation systems.

PROBLEMS IN ALL

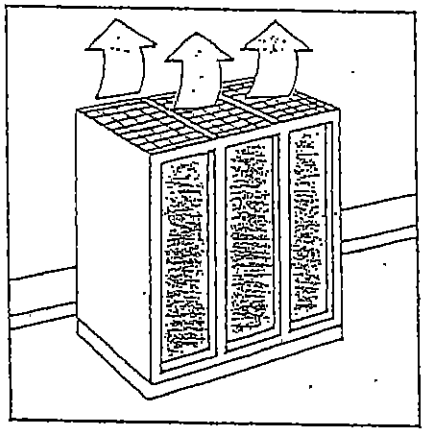
LIVING AREAS?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



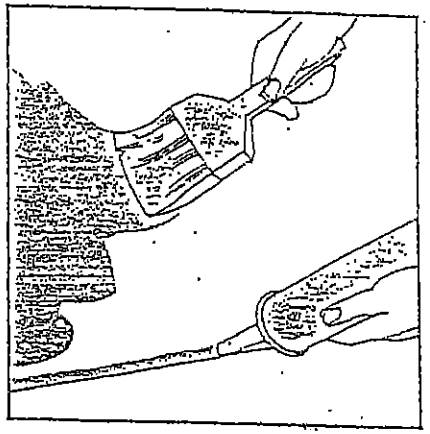
TYPICAL SIGNS

- ☐ Excessive condensation on windows.
- ☐ Rotting windows sills and door jambs.
- ☐ 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 humidifiers.
- Excessive moisture gains in basement or crawl spaces.
- Excessive boiling of food.
- Inadequate ventilation with fresh air.
- Poor air circulation between rooms or within a room.
- Cold surfaces due to ineffective insulation.
- Large air leaks at electrical fixtures, window frames, etc.
- Closed drapes.



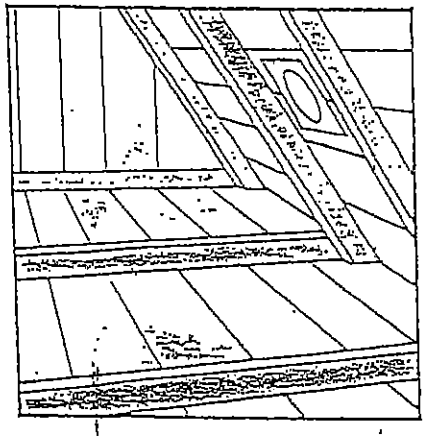
PRACTICAL SOLUTIONS

- Discontinue use of humidifiers.
- 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

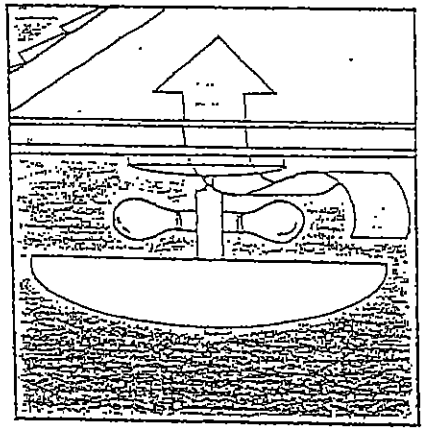
ATTIC AND ROOF?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



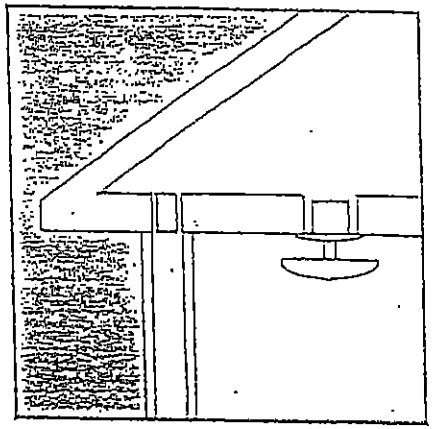
TYPICAL SIGNS

- ☐ 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.
- Kitchen and bathroom exhaust fans vented into attic.
- Uninsulated and unsealed attic hatch.
- Poor ventilation in attic.
- Missing chimney firestop.
- Leaking roof.



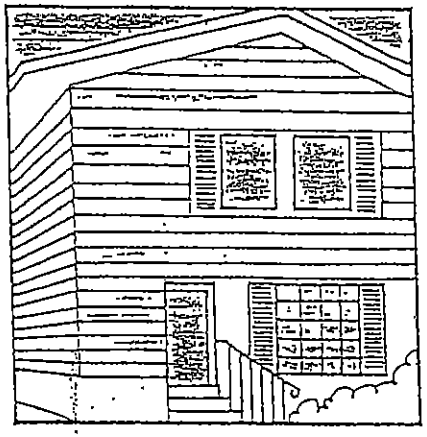
PRACTICAL SOLUTIONS

- 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.
- Exhaust all vents directly to outside. Carefully seal and insulate attic ducts.
- Repair roof and flashings.

PROBLEMS IN THE

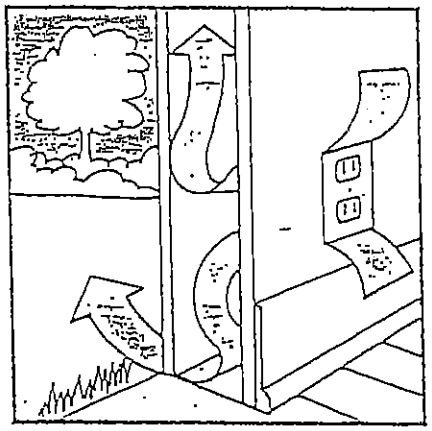
EXTERIOR WALL?

CHECK IF YOU HAVE ANY OF THESE PROBLEMS



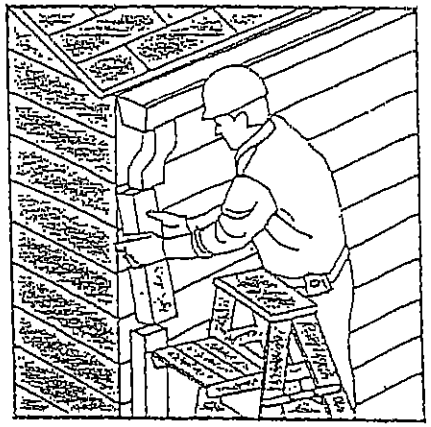
TYPICAL SIGNS

- ☐ 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 inside your basement.

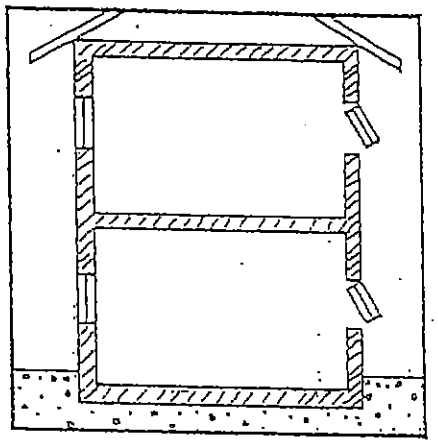
VENTILATON ALTERNATIVES

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.

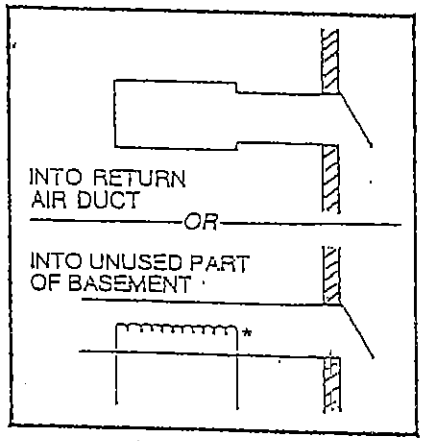
Temporary passive ventilation

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



Combined active/passive ventilation

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

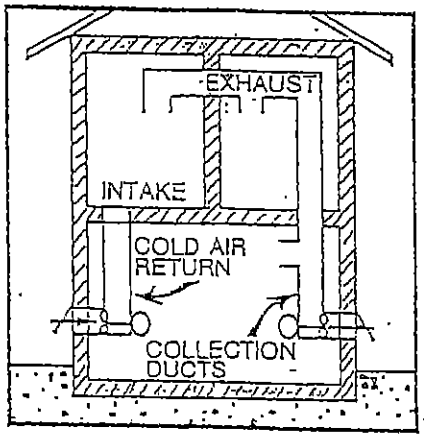


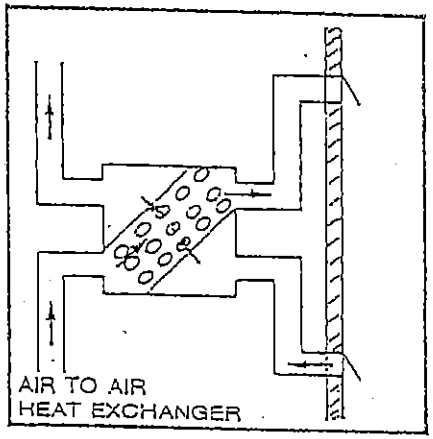
* *Duct heaters are now available to prevent cold drafts.*

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.



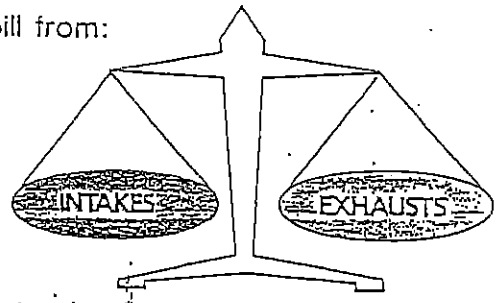


NOTE: In some houses that employ combustion devices gas, oil or wood furnaces, water heaters, firplaces, etc., a fresh air supply may be required to match the flows of exhaust-only ventilation systems.

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

- Inspect appliances, flue pipes and chimneys at least once a year.
- Flue pipes and chimneys must be gastight and should be insulated to suit the combustion appliance they serve.
- Provide well-insulated flue pipes and chimneys to mid and high-efficiency appliances.

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

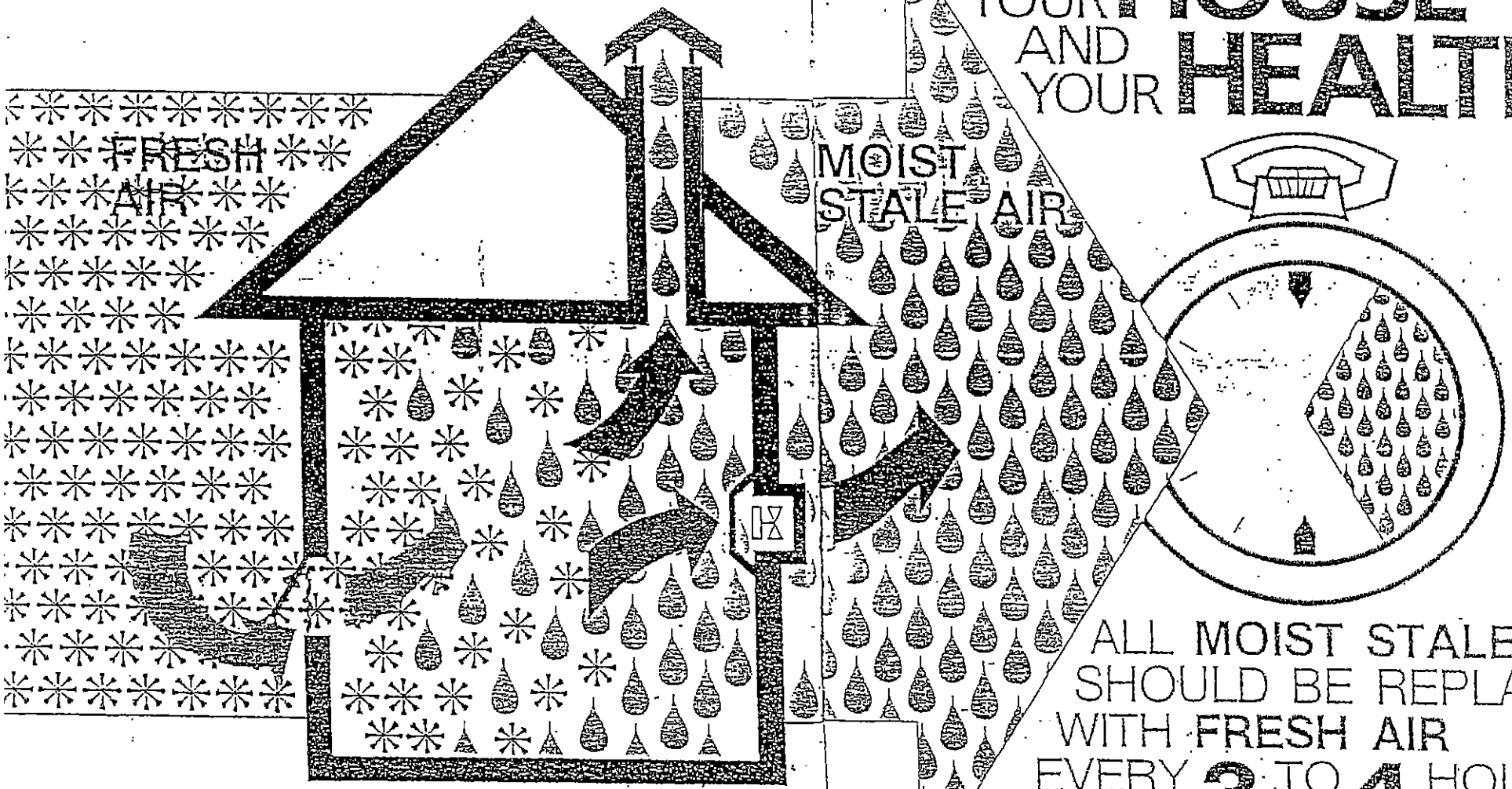
Condensation occurs on surfaces because they are too cold for the amount of moisture present in the indoor air. That results from:

- 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
  - — from inappropriate use of humidifiers.
- inadequate ventilation with outdoor air.
- inadequate circulation of indoor air.
- unusually cold surfaces because of:
  - — insufficient glazing layers in windows;
  - — inadequate insulation levels in ceilings and walls;
  - — cold air penetrating insulation (a typical cold-climate winter problem); or
  - — a cool basement in summer.

SOLUTIONS

- Reduction of excess moisture production is the first priority:
  - — Control evaporation.
  - — Keep the basement dry.
  - — 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.

PROTECT YOUR HOUSE AND YOUR HEALTH



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