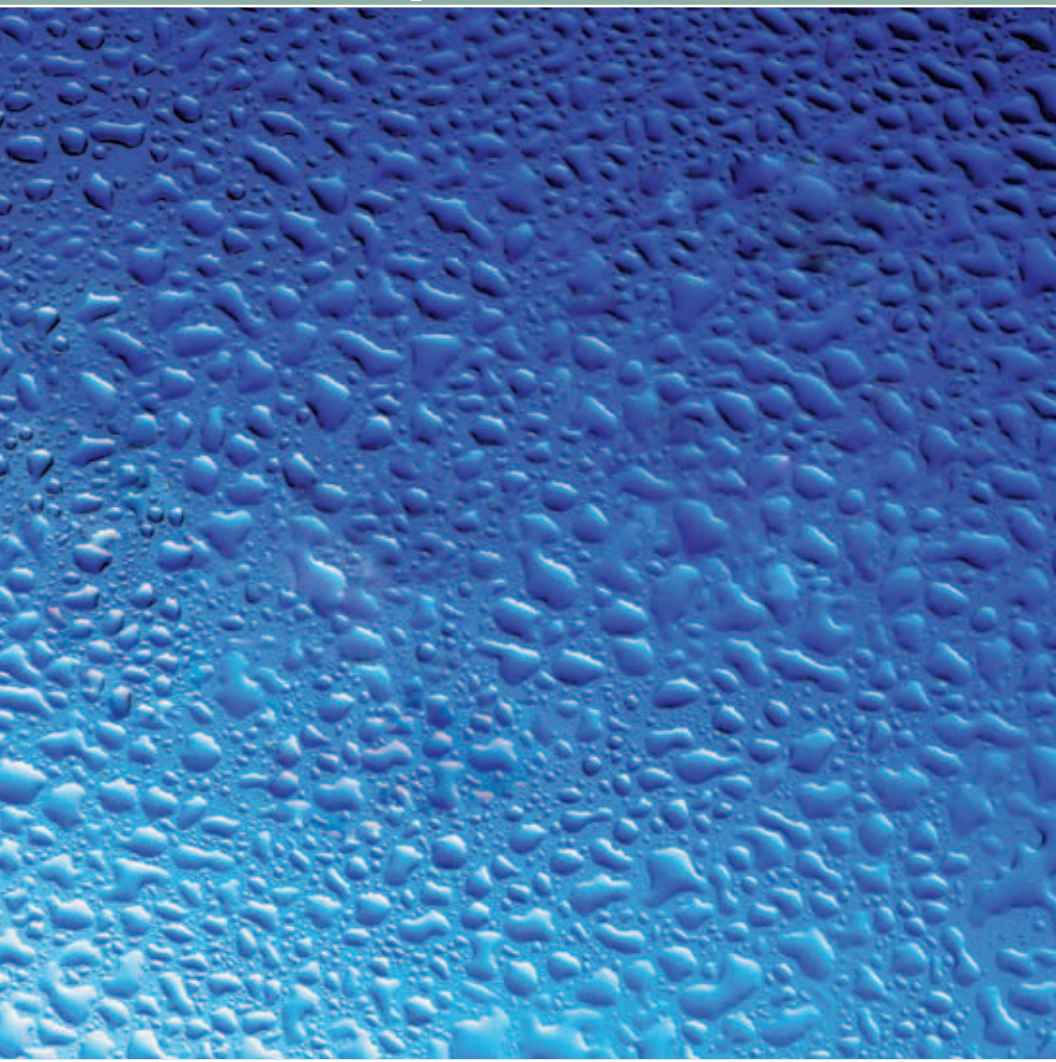
Condensation Concerns

CO_2RE Home$avers



Take Action on Climate Change

EcoVision EDMONTON

CO_2RE
Carbon Dioxide Reduction Edmonton
Supporting EcoVision Edmonton®

THE CITY OF Edmonton

Supporting Sponsors

THE CITY OF Edmonton

Technical Support

CO_2RE Community Business Partners

About CO_2RE

Created *by* Edmontonians *for* Edmontonians…

Carbon Dioxide Reduction Edmonton (CO_2RE) is the City of Edmonton's community-based strategy to permanently reduce local greenhouse gas emissions.

The CO_2RE Strategy was developed by representatives from the residential, business, industrial, institutional sectors and not-for-profit organizations who worked with the City to develop a single, coordinated plan. The group, known as the CO_2RE Team, consulted extensively with many local groups and organizations to develop a consensus on the best approach and strategies. CO_2RE was launched to the public in 2004.

The CO_2RE mission is to work with Edmonton residents, businesses, institutions, non-profits, and industry to provide services, programs and initiatives to assist in reducing energy use, thereby reducing the levels of the GHG (greenhouse gas) emissions that are responsible for Climate Change.

The Original CO_2RE goals include:

- up to a 6% reduction in GHG emissions (from 1990 levels) by the year 2010 and
- a 20% reduction in GHG emissions (from 1990 levels) by the year 2020.

Current Status

Edmonton's GHG emissions increased from 13.9 million tonnes in 1990, to 18.2 million tonnes in 2008 (the most recent year of data), an increase of approximately 38%. Much of this increase is attributable to Edmonton's 24.3% population growth, as well as significant economic growth during this period.

On a per capita basis, GHG emissions appeared to have peaked in 2001 at 29 tonnes of CO_2 per person per year. Since then per capita emissions have continued to fall.

Do your part…

We can do many things to reduce our emissions – and that includes making our homes and lifestyles more energy efficient. The publications in this series are a first step, providing Edmontonians with specific how-to guides on improving home energy efficiency, saving money and reducing GHG emissions.

For more ideas on how to become more energy efficient, log onto our website at **www.edmonton.ca/co2re!**

Free Membership

Why get a membership? Becoming a CO_2RE member is free and the more people who join us in taking action on climate change, the faster we will achieve our goals. CO_2RE is working with local companies to offer incentives on energy-efficient products and programs to further assist residents. You'll also receive a regular newsletter with new ideas and updates. Sign up today at **www.edmonton.ca/co2re.**

Organizations or individuals in the industrial, commercial, and institutional sectors can contact our commercial coordinator by calling 311.

Introduction

This booklet discusses typical condensation problems, their causes and solutions. Sudden cooling in the weather and sub-zero temperatures can result in minor short-term condensation problems. Renovations to conserve energy, such as changing the heating system, making the home more airtight or building a new energy efficient home, can sometimes result in more significant condensation concerns.

The amount of condensation and its affect on your home depends on many factors. Having a few fogged up windows on cold days is not too serious. Large ceiling stains, mould growth, ice on window frames or water running down windows and walls are serious problems and need immediate action.

Understanding Condensation

Different surfaces in the home can be at different temperatures. Surface temperatures depend on insulation, air leakage, exterior air temperature and exposure to sun and wind. The coldest surfaces are of greatest concern.

Usually the coolest interior surface temperature is on window glass and edges (Figure 1). Moist, warm interior air coming in contact with these cold surfaces is cooled to the point where condensation occurs. The amount of condensation increases as the surface temperature of interior glass gets colder or as water vapour increases inside the home due to normal daily activities.

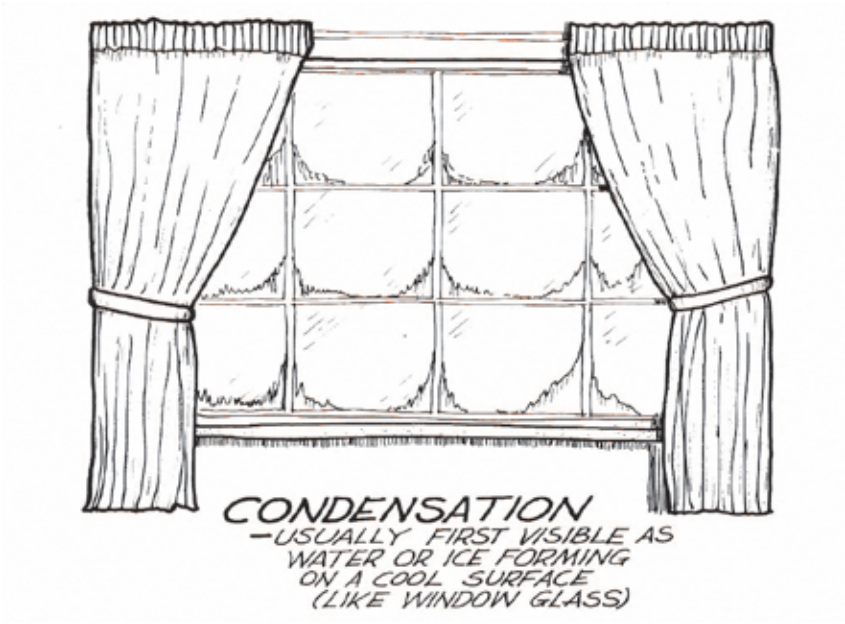


Figure 1

What is Condensation?

Condensation is the change from water vapour to liquid water or ice on a cold surface. This occurs because air holds a limited amount of water vapour at any given temperature.

When warm moist interior air comes into contact with a cool surface the temperature of the air will fall. As the air cools it has a lower ability to hold the water vapour and water will form on the cooler surface – this is condensation.

Surface Condensation

Surface condensation in winter is a visible indication of high moisture content in the interior air or of very cold interior surfaces. It is a fairly common problem in Edmonton homes and usually requires only minor actions to reduce.

Condensation usually appears on windows, inner wall surfaces, toilet tanks and cold water pipes or around exterior wall electrical outlets first. Surface condensation is not necessarily serious, but becomes a problem if it persists for many days. Ongoing build-up of condensation on interior surfaces can lead to severe staining, mould growth or finish deterioration.

Window Condensation*

Table 1

If the outside temperature is:	Then condensation will occur on the inner glass surface if the interior relative humidity rises above:	
° C (°F)	**Double Glazed Windows % of Humidity**	**Triple Glazed Windows % of Humidity**
-40 (- 40)	25	36
-34 (- 35)	28	39
-28 (- 20)	33	44
-23 (- 12)	38	48
-18 (0)	44	53
-12 (10)	50	63
-7 (20)	57	67
-1 (30)	63	72

** Room air temperature at 21°C (70°F)*

Note: Covering the window with drapes in cold weather can restrict air movement and result in a cooler glass surface which increases condensation.

As Table 1 shows, triple glazed windows (three layers of glass – see Figure 2) will allow higher interior relative humidity levels without condensation than double glazed or single pane units. The extra pane of glass and trapped air between the panes helps keep the inner surface warmer.

New energy efficient window units, such as double glazed (2 panes of glass) with Low-E (emissivity) coated glass filled with inert argon gas between the panes, performs as well as, or better than, standard triple glazed units. New window units also use insulated spacers between the panes, reducing the colder frame edges associated with older metal spacers.

Triple glazed (3 panes of glass) windows with Low-E coatings on 2 panes of glass and argon gas fill are now available offering much higher metric RSI values (or imperial R values).

Any increase in RSI value (R) of the window, allows it to perform better than a unit of lower RSI value (R). RSI value (R value) refers to the resistance to heat flow – the higher the number the better. Windows with Low-E coatings and argon gas maintain much warmer interior glass temperatures virtually eliminating window condensation (see *Home$avers – Windows*).

Interior surface condensation can occur on any cool surface – cold water pipes, toilet tanks, poorly insulated walls or floors, metal hinges or locks on exterior doors – not just on window surfaces. A high interior relative humidity with cold surface temperatures creates the most problems. This type of condensation can occur no matter how well built a home is.

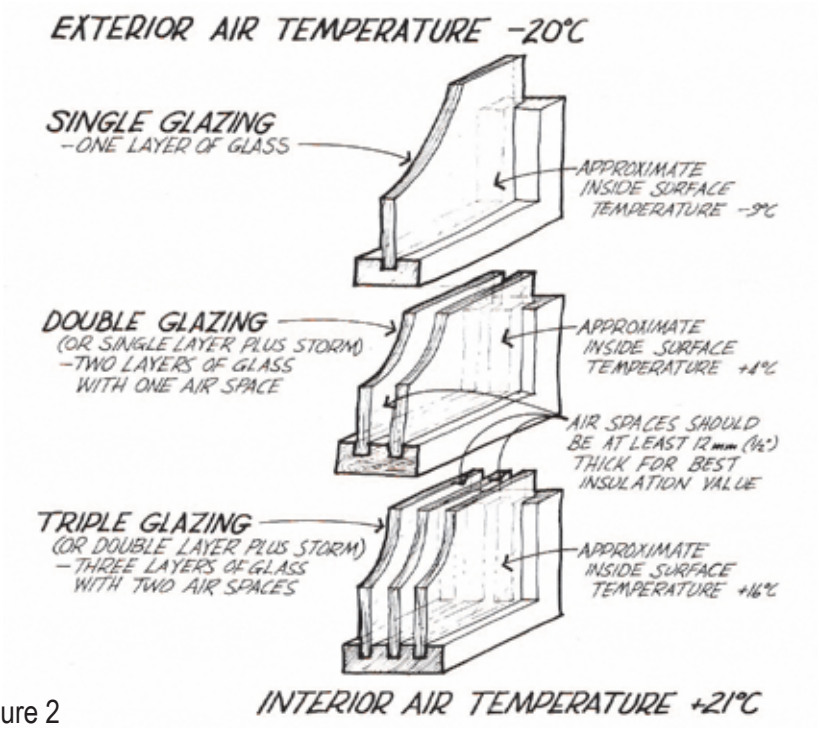


Figure 2

Concealed Condensation

Concealed condensation can occur when warm moist air goes out through cracks, gaps or holes in the building shell (walls, floors or ceilings). It may also result when water vapour diffuses (the molecular movement of water vapour through solid materials) through building materials.

If warm moist air leaks out through a gap in the building shell during cold weather, the air will, at some point, cool to where it reaches 100% relative humidity. Condensation occurs on the closest non-porous surface – often the inside face of exterior sheathing (Figure 3). If the outside temperature is quite low, water vapour may deposit directly as ice or frost.

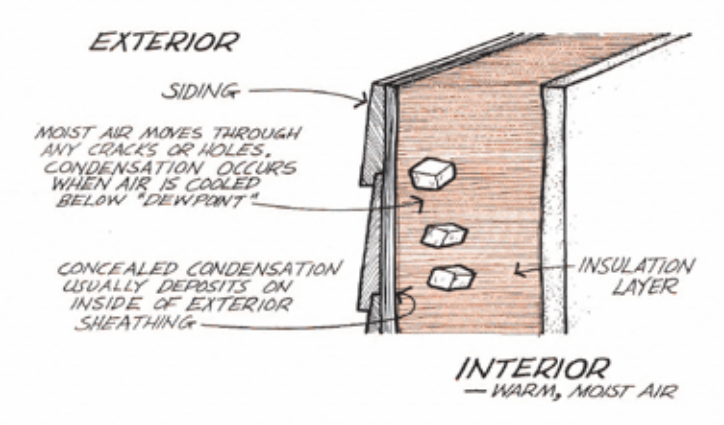


Figure 3

If the amount of moisture is small, it can change back into water vapour and be carried away by natural air movement with little damage to the structure. However, large deposits of moisture will create ice that will melt during warmer temperatures and can soak insulation, framing and sheeting materials, destroy interior or exterior finishes, or lead to structural deterioration.

Concealed condensation is not usually a problem; it is specific to individual homes. If you suspect concealed condensation is occurring (water staining, damp walls, musty odours, ceiling stains) installing an inexpensive hygrometer, available at hardware stores, can help identify if high moisture levels are causing surface condensation or if you have a concealed condensation problem.

Concealed condensation can occur anywhere: in the basement, walls and attics. On the prairies, attic condensation problems are usually more common and serious than wall condensation problems. Should you find definite signs of surface damage or staining caused by moisture build-up, you'll need to investigate for possible damage inside the walls or the attic.

If you are re-siding the exterior of your home you should seal all areas of air leakage from the inside – such as behind the baseboard and around electrical outlets – to

reduce moisture movement into the wall. Concealed condensation can result due to reduced vapour diffusion on the outside of walls after re-siding. Resulting condensation could cause deterioration of the insulation or the structure.

Condensation and Solutions – Identifying the Problem

It is important to recognize condensation problems, evaluate their seriousness and solve them. A sudden increase in humidity may indicate a basement leak, a broken water pipe or a faulty chimney – all harmful problems to be remedied immediately.

Common locations, possible causes and suggested solutions for condensation and moisture build-up are outlined in Table 2. It shows that most problems are the result of high humidity levels as well as air leakage, a cold surface or sudden temperature drop.

Condensation Problems, Causes and Solutions

Table 2

Indication	Possible Causes	Suggested Solutions
Windows Condensation on most inside surfaces of inner pane	Abnormally high humidity	Control humidity source (Table 5). Add layer of glass or plastic on inside (Table 1) to increase interior surface temperature (Figure 2).
	Lower thermostat setting at night	Condensation should disappear as house warms up (adjust thermostat slightly higher if condensation is severe).
	Sudden change to colder weather	Ventilate home to lower humidity level; control sources of moisture (humidifier, showers, etc.).
	Poor air circulation	Improve circulation by opening drapes, moving furniture or objects blocking heat registers, consider running furnace fan continuously.
Condensation on upper storey windows only	Warm moist interior air leaking out upper level windows	Improve caulking and window weatherstripping to reduce air leakage (see *Home$avers – Caulking and Weatherstripping);* ensure there are adequate fresh and combustion air supplies (Figure 5). Lower humidity levels.
	Poor windows (single pane, aluminum sliders)	Upgrade to better windows. Install exterior storm windows (see *Home$avers – Windows*).

Indication	Possible Causes	Suggested Solutions
Windows Condensation on north windows only	Inner surfaces cooler than south windows (in daylight or wind cooling)	Open drapes and improve circulation; add layer of glazing on inside, exterior storms or upgrade to better windows.
Condensation on windows on one side of house only	Cold air in on windward side, warm air out on downwind side	Improve caulking and weatherstripping to reduce cold air infiltration (see *Home$avers – Caulking and Weatherstripping*).
Condensation on windows, 1-2 rooms	Room(s) cooler than rest of house High humidity rooms: laundry, rooms with a humidifier	Improve circulation by opening drapes; leaving room door(s) open; run furnace fan continuously. Exhaust dryer to outside. Shut off humidifier.
Condensation between layers of glazing.	Air leakage from inside into space between glazing Outer storm window sealed Broken seal	Seal inner pane between glass layers with caulking or replace weatherstripping between sliding units (see *Home$avers – Caulking and Weatherstripping*). Seal inner unit; allow outer unit to breathe to exterior. Replace window with good new sealed unit capable of withstanding relatively higher humidity levels.
Condensation on window frame	Air leakage: rough opening space, poor weatherstripping Air leakage: frame, sash, meeting rails Poor quality metal or plastic frames	Seal between frame and rough opening space; improve caulking and weatherstripping. Install sealed interior plastic or Plexiglas storm window or shutter. Replace with good quality units with a thermal break.

Indication	Possible Causes	Suggested Solutions
Doors Condensation on doors	Un-insulated door	Replace with insulated door; storm door. Lower interior humidity levels.
Condensation on door frame/threshold	Air leakage around door	Replace, adjust weatherstripping, threshold; add storm door (see *Home$avers – Caulking and Weatherstripping*).
Condensation on lock, knob, hinges	Air infiltration due to negative pressure inside	Replace weatherstripping; add fresh air duct to heating system, add exterior storm door. Lower interior humidity levels.

Indication	Possible Causes	Suggested Solutions
Walls Condensation on closet walls	Poor air circulation around clothes	Improve air circulation; open doors; add louvers, grilles; undercut doors; leave space by outside wall.
Condensation and staining below windows	Melted window condensation Window in high humidity area Insulation missing	Improve window as above or upgrade to new windows. Eliminate window unit, insulate opening. Add insulation to wall cavity.
Condensation on many walls	Abnormally high humidity Poor air circulation Missing insulation	Control humidity sources (Table 5). Run furnace fan continuously. Add insulation to wall cavities.
Condensation in corners	Cold air leaking in or warm air out Thermal bridging, missing insulation Poor air circulation	Caulk siding corners, window brick moulds, siding-parging joint, etc. to exterior (see *Home$avers – Caulking and Weatherstripping*). Air seal interior and add insulation in wall or on outside. Aid circulation; move furniture/objects blocking registers; run furnace fan continuously.
Mould on wall	Abnormally high humidity levels Poor ventilation Poor air circulation	Control humidity sources (Table 5). Use fans; add mechanical ventilation. Aid circulation; move furniture/objects blocking registers; run furnace fan continuously.
Frost on basement wall	Air leakage at sill plate, un-insulated walls High humidity	Air seal and insulate basement walls, floor joist header area (see *Home$avers –Basement Insulation* and *Caulking and Weatherstripping)*. Use a dehumidifier to lower humidity levels.
Condensation around electrical outlets	Incoming cold air	Seal under plates (see *Home$avers – Caulking and Weatherstripping*).
Water on basement floor or walls.	External sources like runoff, rain or ground water	Seal wall; install weeping tile; direct gutter drains away from wall; maintain ground slope away from wall; check that existing weeping tiles are open.

Indication	Possible Causes	Suggested Solutions
Ceiling/Attic Large isolated frost deposit in attic	Indicates large volume of warm and moist air leaking into attic space. Inadequate attic space ventilation.	Identify moisture source; caulk or seal leak at ceiling level (large amounts usually occur around stacks or from poorly sealed exhaust ducts – vent all exhausts to exterior. Add attic vents (see *Home$avers – Attic Insulation*).

Stains on ceiling	Frost build-up melting in attic when weather warms Leaking roof	Seal air leaks into attic space from below (see *Home$avers – Attic Insulation).* Add vents to overcome inadequate attic ventilation. Repair roof leak.
Frost on exposed nails in attic	Small amount of warm air leaking into attic space.	Occurs normally during cold weather in most homes (check for adequate ventilation see *Home$avers – Attic Insulation*).
Other Condensation on cold surfaces such as pipes, toilet tank, etc	Abnormally high humidity level Cold water supply	Control humidity sources (Table 5). Insulate pipes or toilet tank.
Exterior paint peeling	Lack of air/vapour barrier Rain penetration behind siding	Add air/vapour barrier to interior or paint with vapour barrier paint on interior surfaces; seal around electrical outlets and all wall penetrations. Identify and caulk any leaks or gaps on exterior; repair flashing.
Structural damage to studs, joists or rafters	Bacterial action due to warm, moist and dark environment	Identify cause of leakage (external or concealed condensation); replace damaged members; seal wall, floor or ceiling assembly to prevent recurrence.

Condensation Sources

Table 3 – Moisture Sources

Type	Moisture Source	Litres (Gallons) Added Per Week to Interior Air
Continuous	Occupants (4)	30-40 (7-9)
	Showers (8/wk.)	18-29 (3-5)
	Drying clothes	12 (2-6)
	Cooking (steam)	9 (2)
	Gas cook stove	9 (2)
	Refrigerator (Frost Free)	9 (2)
	Dishwashing (sink)	3 (0.7)
	Large house plant	3 (0.7)
	Bathing (8/wk.)	3 (0.7)
	Laundry	2 (0.4)
Seasonal	Summer moisture	40 (9)
	Damp basement or crawlspace	14 (3)*

** If your basement has moisture problems, it can greatly increase the release of moisture into the entire house.*

Normal Home Operations

In an average home there are many sources and causes of humidity – some are evaporating periodically, some constantly, others are adding moisture directly to the air.

Most Edmonton area homes quickly eliminate the extra moisture in their interior atmosphere through cold air leakage and condensation is not a problem. Many have such low relative humidity in winter that humidifiers are used to add water vapour to the air. A comfortable and healthy level of relative humidity in the air would be between 40 and 50% but that would cause severe window condensation in winter. Try to maintain an interior humidity level of 30 to 35% in winter.

Figure 4 (top image) shows that air leakage and the effect of the chimney continually exhausting warm air results in cold outside air being drawn in. Regardless of its initial relative humidity, when that cold air is heated to room temperature it is quite dry and readily absorbs the normal moisture production of the home.

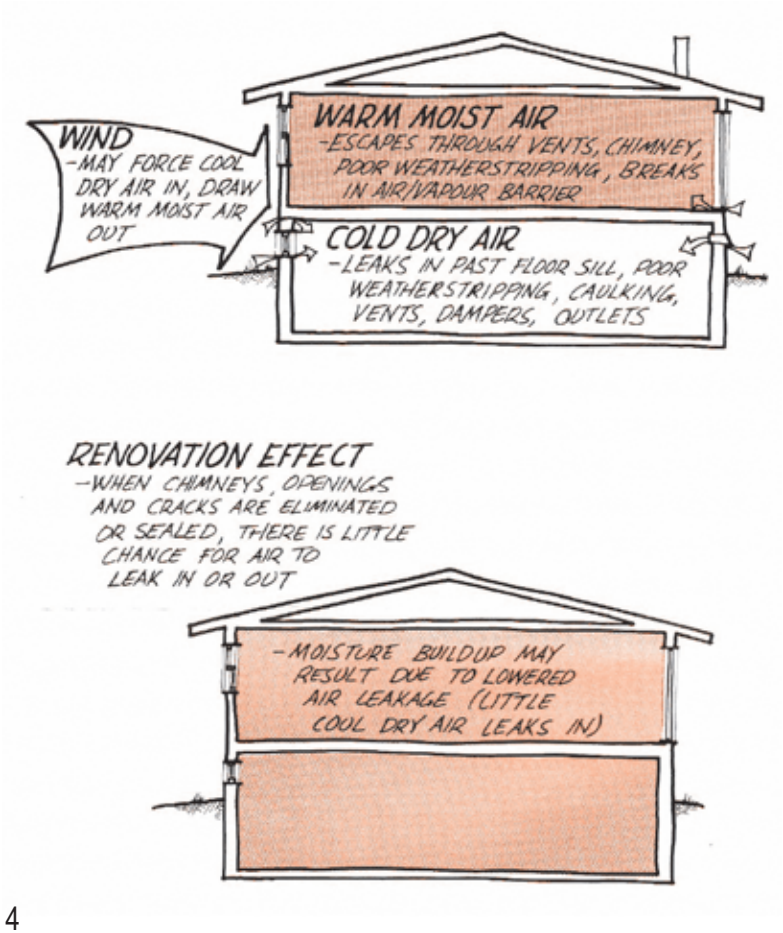


Figure 4

There may be situations when water vapour production is greater than loss. Increased caulking and weatherstripping to reduce air leakage, the installation of a chimneyless furnace, a serious water leak or a blocked chimney are a few of the things that can change the moisture balance. Cold air being continually drawn in (a negative pressure) can result in warm air being forced out (a positive pressure) – shown in Figure 4.

Changes to Normal House Operations

Excessive humidity and surface condensation become problems when previous routes for moisture are closed or when more moisture is produced than can escape. The average home needs about 55 litres per second (115 cubic feet per minute) of fresh ventilation air to control humidity and maintain air quality.

Table 4 – Unusual Causes and Sources of High Humidity

Cause	Comments
Faulty or plugged chimney serving any fuel-fired appliance (furnace, hot water heater, etc.)	Water vapour is a major by-product of combustion so unusually high moisture levels can be an indication of a plugged or leaking chimney vent and **must be corrected immediately**. Have a heating contractor or utility company test the system.
New home or large addition	As much as 36 litres (8 gallons) of moisture a week are released from building and finishing materials during the first 18 months.
New energy-efficient home	Low air leakage rate and moisture from building materials means ventilation (Figures 5 and 6) must be used to prevent the build-up of moisture from day-to-day activities.
Extensive renovation for energy efficiency	Plugging air leaks means moisture that formerly leaked out (Figure 4) must now be ventilated.
Installation of a high-efficiency (chimneyless) furnace	Eliminating the chimney stops a major source of air leakage. Additional ventilation may be needed.
Flooded basement	A major water source such as a broken water pipe, spring run-off or a high water table can bring up to 900 litres (200 gallons) of moisture into the home each week – proper ground slope, weeping tile and gutters directed away from basement walls are essential for controlling water movement.
Minor leaks and water sources	Leaking roofs, water pipe leaks, badly dripping taps, carpet steam cleaning, mopping floors or storage of green wood can introduce a lot of moisture – recognize and control the source.
Other	Operating an indoor hot tub or pool, maintaining a tropical atmosphere for plants or throwing a large party can overload the home with moisture.

Controlling Moisture

Table 5 outlines steps that can be taken to lower home humidity levels. The initial steps are simple and may provide easy solutions. Working further through the chart leads to more complex and detailed solutions, but in most cases of high humidity and low air leakage, these are not required. **Always try the simplest steps first. If they do not work, use the more complex solutions.**

Use the information to help identify the sources of moisture so specific ones can be controlled. Some information in Table 5 will require a fair amount of work and expertise to carry out. The information following the table provides details on suggested techniques.

Table 5 – Controlling Humidity

Action Required	Comments
Personal actions	Cover cooking pots (eliminates steam, conserves energy). Hang wet clothes to dry outside whenever possible. Take shorter showers.
Turn humidifiers down (or off)	May require shutting off water supply to furnace humidifier. Use individual room humidifiers sparingly.
Check that clothes dryer is vented to exterior	Electric and gas dryers **must be vented to exterior**. (Electric dryer may have been vented indoors as a heat saving measure.)
Operate venting fans	Use individually to control humidity from showers, cooking, etc. (Bathroom fans should be run for a minimum of 15 minutes after you turn the water off.)
Operate furnace fan continuously	Set switch for summer operation (fan runs constantly). Use two-speed fan (runs continually at low speed, switches to high speed for heating cycle). Improved circulation will help reduce localized condensation.
Isolate moisture-producing areas	Close windows and doors to greenhouses, indoor pools and hot tub spaces. Do not draw air into the heating system from humid areas. Add separate exhaust venting system.
Cover exposed earth in basement/crawlspace	Must have a ground cover like heavy polyethylene or roll roofing overlapped by 10 cm (4 inches) and weighed down or protected by a sand layer, (ventilate space in summer according to Alberta Building Code).
Increase outside air supply to heating system	Fresh air duct with variable damper allows a controlled amount of dry outside air into the home during winter (Figure 5).
Add mechanical venting	Install exhaust fans in moisture-producing areas: bathrooms, laundry areas and kitchen. Install a central fan controlled by a humidistat (operates only when the humidity is above preset level – Figure 6).
Install air-to-air heat exchanger into venting system	Can recapture part of the heat from the outgoing air (Figure 7). Expensive to install (costs and benefits must be considered).

Note: The installation of a dehumidifier is not a solution to overall home humidity problems because it is only capable of lowering the relative humidity down to 50 or 60% and is not suitable for colder basements.

Increasing the Fresh Air Supply

One method that may be required to control humidity build-up is to install a controlled source of fresh air. An insulated duct is installed from outside to the return air plenum of the forced-air heating system (Figure 5). Although required as a make-up air duct by the building code in new homes and when installing a new furnace, a controlled fresh air supply source is often lacking in older homes. Installing a duct introduces a new source of dry outside air in homes renovated to cut down air leakage heat loss. For correct operation, a damper is installed and then opened or closed as necessary to control humidity levels and fresh air supply as the outside temperature varies.

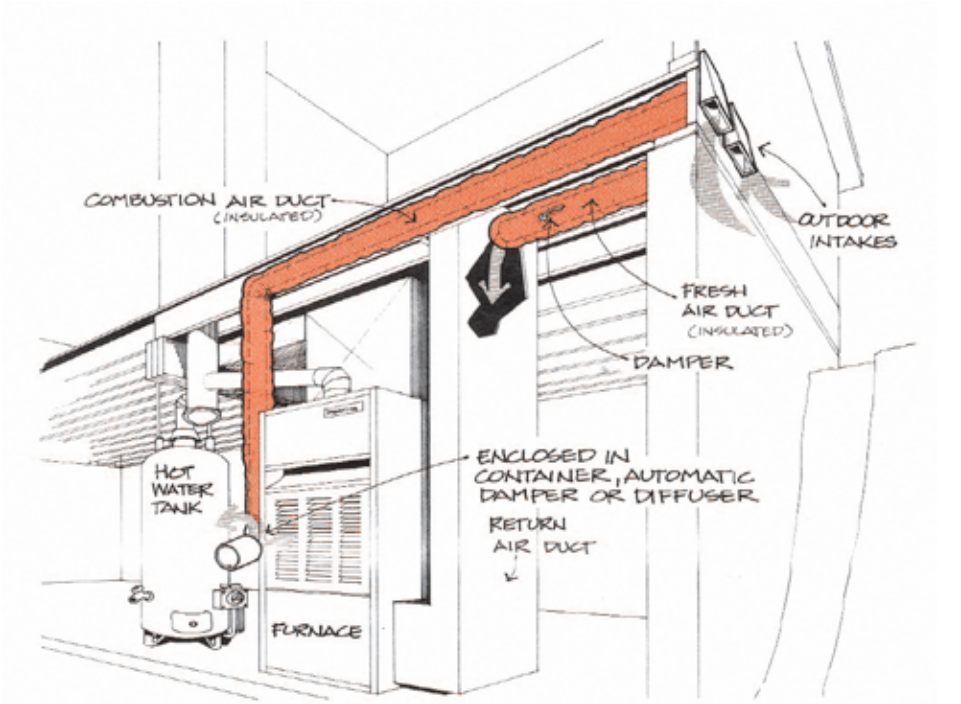


Figure 5

This duct provides fresh air for humidity control; a separate duct needs to be installed to supply combustion air for fuel-burning appliances like the furnace, hot water heater or boiler (Figure 5). The combustion air duct should not have a manual damper. Approved automatic dampers, which automatically open and close according to the requirements of the heating unit, are available.

Adding Mechanical Ventilation

Older homes often do not have exhaust fans in moisture-producing areas like bathrooms, laundry rooms or kitchens. If a fan is required to control humidity, it is best to install it as shown in Figure 6 – on an interior wall, venting down the wall cavity and out through the joist space. This eliminates potential problems in the attic. Ensure exhaust fans are powerful enough to move the air the required distance.

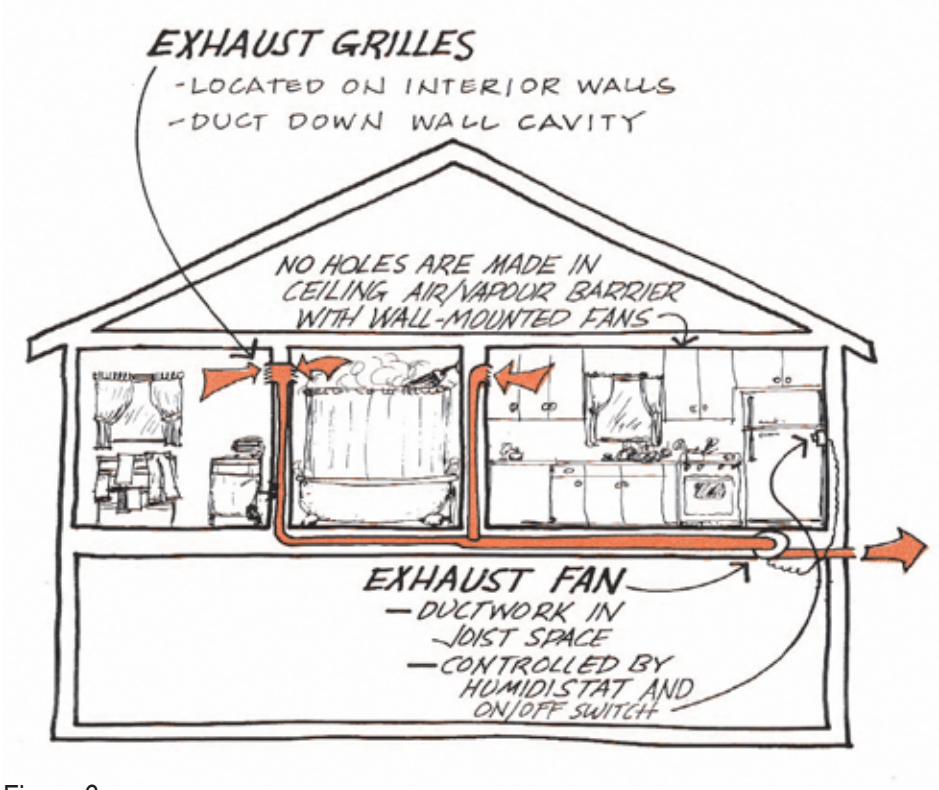


Figure 6

If vents must be installed through the attic and roof or soffit, be sure that they have automatically closing dampers. They must be sealed and insulated so that warm, moist air cannot leak into the attic space and water vapour will not freeze inside the duct and leak back into the home (see *Home$avers – Attic Insulation*).

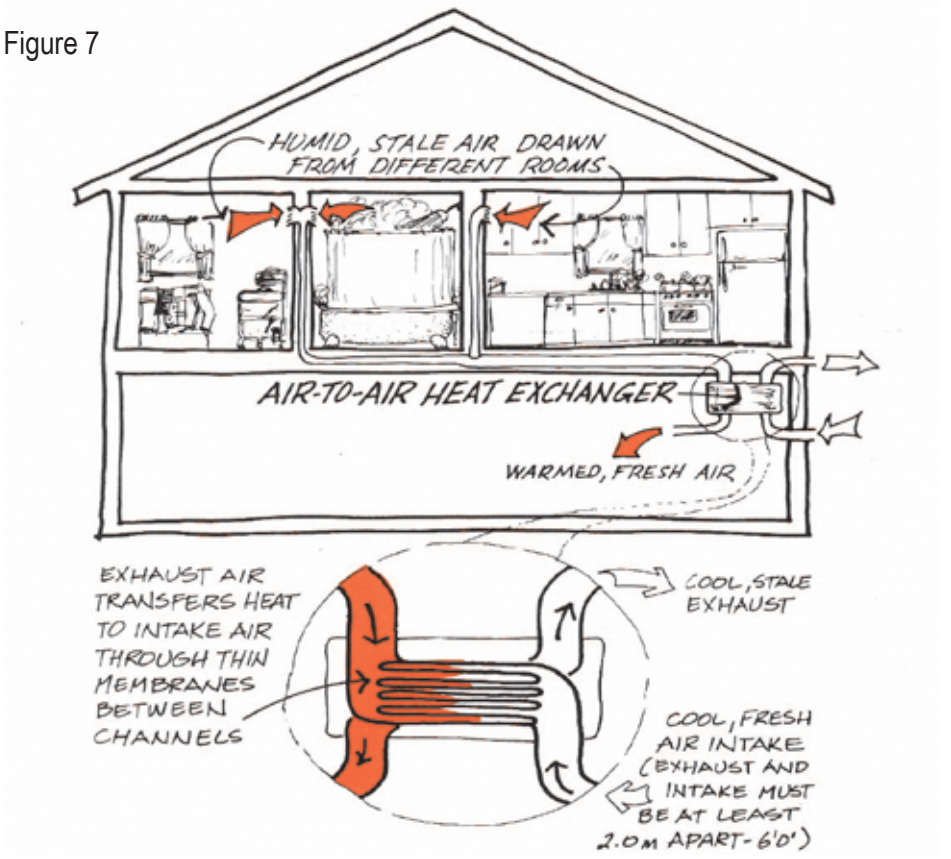
If two or three exhaust locations are required, they can be joined and operated with a single, large variable-speed fan (Figure 6). Controlling the single exhaust fan with a dehumidistat control allows the resident to set the desired humidity level. The fan can be operated as needed; at high speed when someone is showering or many people are in the home, at a slower speed during normal activities or shut off at night when little moisture is being produced.

You should operate the exhaust system at a minimal rate because it exhausts heated air. The exhausted air must be replaced and reheated. If the house is airtight, air leakage might not provide enough make-up air and replacement air will be required through a fresh air vent (make-up air) as shown in Figure 5. The ease of installation of a fresh air vent depends on the accessibility to walls and the basement ceiling. The benefits in terms of efficiency and controlled ventilation far outweigh those of standard ceiling fan units.

Incorporating a Heat Recovery Ventilator

As mentioned, operating exhaust systems can control the build-up of excessive humidity but remember, the exhaust is also removing heated air – air that you have paid to heat! If only a little air needs to be exhausted to control humidity, nothing can be done to recapture the heat. However, if large volumes of air are continually being exhausted, then a heat recovery ventilator can be installed to recapture a portion of the heat from the outgoing air. Heat recovery ventilators are devices in which warm air is exhausted past incoming cold air. The two air streams are separated by a thin membrane, which allows heat, but not odours, to be transferred (Figure 7).

Figure 7



Although expensive, these devices recapture a good portion of the heat from exhaust air while greatly improving indoor air quality. They must be installed into a ventilation system from a centralized exhaust point (Figure 6). To date, Heat Recovery Ventilators (HRV) or Air-to-Air Heat Exchangers have been generally considered economically justifiable only in airtight energy-efficient homes. Considering the health benefits associated with a constant fresh air supply and increased heating costs, more residents are beginning to install HRV's.

Summary

If there are signs that the humidity level in your home is too high, try the following steps:

Note the type of problem.

- A light fog on windows.
- Dampness or frost on walls.
- Stains on the ceiling.

Establish whether the problem is isolated or widespread.

- Just a few windows fogged or a small stain on the ceiling.
- Many windows or walls with condensation.
- Only one or two areas of the home affected.

Determine the problem (use Table 2).

- Is the humidity level too high?
- Has there been a change to colder weather?
- Is there a water leak or other new source of moisture?
- Is your home new or has a large addition been constructed?
- Have there been any equipment changes?
- Has the chimney been checked recently for leaks or blockages?
- Have you taken measures to stop air leakage?

Take action to rectify the situation.

- Control the sources of humidity first.
- If condensation is isolated, remedy the problem area (air leak, water leak, missing insulation, etc.)

The tables, diagrams and other information in this booklet provide a background on relative humidity and how to gain control of any condensation problems in your home.

Additional Information Sources

Natural Resources Canada – Office of Energy Efficiency

www.oee.nrcan.gc.ca – The Office of Energy Efficiency offers a wide range of free publications, programs and services to help Canadians save energy and reduce the greenhouse gas emissions that contribute to climate change.

Recommended Reading: *Keeping the Heat In* is a comprehensive source of energy efficiency how-to information for residents. This free publication is available from Natural Resources Canada. Call toll free at **1-800-635-7943** or download it from **http://publications.gc.ca/pub?id=259273&sl=0**.

Canada Mortgage and Housing Corp.

www.cmhc.ca – CMHC is a valuable resource for information. The CMHC Order Desk is a one-stop shop for all free and priced publications, fact sheets, reports, videos and other CMHC resources. You can order online, or through their call centre at **1-800-668-2642**.

EPCOR

www.epcor.ca – The website contains information on energy and water efficiency with calculators, tools and downloadable publications to assist you in reducing your energy and water consumption.

Tools include a ***Home Energy Audit***, a do-it-yourself home audit with a library of resources; ***EPCOR House***, an animated tour of a typical home with efficiency information; and calculators for most major appliances, plus a ***simple electricity calculator*** and ***water audit tool***. Tools are located in the EPCOR-Customer Service drop down menus.

Environment Canada

www.ec.gc.ca – Environment Canada's website provides weather and environmental information to help connect Canadians, exchange information and share knowledge or environmental decision making.

Climate Change Central

www.climatechangecentral.com - Climate Change Central has information and resources to help Albertans save energy and reduce the greenhouse gas emissions that contribute to climate change.

Notes:

Notes:

Become A CO_2RE Member

We all contribute to the problem of Climate Change and each of us can contribute to the solutions. Become a CO_2RE Member. Membership is free and you can sign up on the CO_2RE website at www.edmonton.ca/co2re.

CO_2RE

Carbon Dioxide Reduction Edmonton

Publications Currently Available

- Attic Insulation
- Basement Insulation
- Caulking and Weatherstripping
- Condensation Concerns
- Conserving Electricity
- General CO_2RE Brochure
- Heating Systems
- Renewable Energy
- Ventilating Your Home
- Water Conservation
- Windows
- Eco-Landscaping Brochure

THE CITY OF Edmonton

Deputy City Manager's Office
Office of Environment

Suite 750, Tower I Scotia Place

10060 Jasper Avenue NW, Edmonton, Alberta T5J 3R8

Phone: 311 (in Edmonton) / 780-442-5311 (outside Edmonton)

Website: www.edmonton.ca/co2re