



Condensation On Windows

Window condensation is a combination of the moisture content and the temperature of the indoor air in your home.

Window condensation is caused because the humid air inside your home gets cooled by a colder surface such as your window glass. Cold air has less capacity to hold water vapour than warm air. The excess water vapour that is in the cooled interior air condenses on the colder glass surface.

In climates similar to Southeastern Ontario and Northern New York State, either too little or too much condensation on the inside of windows can be a sign of less than ideal conditions. Most of the year, good windows well-installed in a well-built building should be condensation-free. During cold winter weather, some interior condensation is a sign that your windows are air-tight and working well.

The old way to eliminate excessive indoor humidity:

Old houses leaked air. The windows were draughty. Air leaked in around electrical boxes in exterior walls. The joints between the foundation and the house framing were not caulked. Et cetera. All winter long, houses tended to “breathe” to the exterior. Warm moist interior air leaked out, and was replaced with cool dry exterior air that leaked in. As a result, indoor humidity levels tended to remain fairly low – low enough that it was not uncommon for people to install humidifiers for winter use.

What Has Changed:

Commencing in the mid-1980's, and increasing regularly since then, we have paid more attention to sealing a home by doing such things as

- wrapping electrical boxes on exterior walls with vapour barrier or using special air-tight boxes,
- caulking or using gaskets on the joints between sill plates and foundations,
- sealing new windows to the structure using blown-in-place closed cell foam,
- increasing the weatherstripping on windows and doors, making them more airtight,
- Taping or caulking all the joints in vapour barriers.

Common sources of interior humidity:

- Seasonal high outdoor humidity (a significant contributing factor to window condensation in late fall when the overnight temperatures first drop) = 30,000ml - 120,000ml/day
- Ground moisture migration (through basement floor and foundation walls) = 0 – 50,000ml/day
- Evaporation from materials, seasonal and new construction = 3000ml - 8000ml/day
- Drying clothes (non-vented) = 2000ml - 3000ml per load
- Humidifiers = 1000ml/hour on average

- Cooking dinner for a family of 4 = 575ml + 750ml for gas
- 5-7 house plants = 400ml - 450ml per day
- Washing dinner dishes = 325ml
- Cooking lunch for a family of 4 = 250ml + 325ml for gas
- Showering = 250ml every 5 minutes
- Respiration and perspiration (family of 4) = 200ml/hour
- Each gas range pilot light = 175ml or less per day
- Cooking breakfast for a family of 4 = 150ml + 275ml for gas
- Washing breakfast dishes = 100ml
- Washing lunch dishes = 75ml
- Floor mopping = 15ml/sq.foot
- Bathing = 6 ml

The Result:

It is now fairly common for homeowners to discover, upon replacing their windows, that interior condensation has increased on the glass surface.

In general, this can be a good sign. It means that the new windows are airtight and well-sealed to the frame of the building. Less heated moist interior air is escaping, and it is not being replaced with dry cold exterior air.

A problem is created if the interior condensation is great enough that it causes deterioration in the sill of the window or to the surrounding interior room finish.

The issue then becomes – how do you control the now higher interior humidity level in your home? You do not want to fully eliminate interior humidity. For comfort and long-term health of items like your wood furniture, you should maintain an interior humidity level such that, during cold snaps, you have some condensation on your windows. Just not enough to do any damage to the windows. Typically this can mean reducing interior relative humidity levels to 15% to 20% in the winter, depending on how cool the nights are.

Remove Excess Humidity From Your Home

i) Dehumidifiers

A dehumidifier is not the answer. Most dehumidifiers will only lower relative humidity to somewhere in the 40% range. This is fine to control mildew in a basement in the summer, but is not low enough to control window condensation in the winter.

A dehumidifier is helpful if your interior relative humidity levels are above 40% – typically during the first winter or two after the home is built or major renovations completed. During this period relative humidity is typically very high due to the drying of concrete, drywall, wood framing, paint, and such sources of humidity that result from construction activity.

ii) Install and Use a Heat Recovery Ventilator (HRV)

If you are building a new home or doing a major renovation of an existing home, install an HRV. These are by far the best way to control indoor humidity levels. They have humidistats built into

their controls – if you see excessive humidity on your windows, you simply set the HRV to a lower relative humidity setting until the outside temperature rises again.

Reduce Sources of Humidity

Reduce or eliminate as many sources of indoor humidity as you can. For example:

i) Basement and Crawl Space Insulation and Vapour Barrier

Ensure your basement and crawl space insulation fits properly and check for symptoms of excessive moisture (eg. discoloured insulation). Ensure your basement walls have good vapour barriers installed. If re-doing a basement floor, install a vapour barrier to prevent ground humidity from entering the home.

ii) Humidifiers

Do not use humidifiers. Common in houses in the mid-20th century, new and recently renovated homes brought up to modern air-tightness standards do not need humidifiers. In fact, humidifiers can do more harm by increasing indoor humidity to unhealthy levels. Moisture given off by showers, laundry equipment, cooking, and by the occupants themselves puts more humidity into the air than is needed.

iii) Firewood

Do not store firewood in your house for prolonged periods of time, i.e. more than a couple days, as it releases a large amount of moisture.

iv) Vent Appliances

Install and use direct-vent appliances and furnaces in your home. Do not use a heat saver to direct the air from a clothes dryer into your house. Install an outside vent for the dryer instead.

v) Use Bathroom and Kitchen Exhaust Fans Longer Than Usual

Bathing and cooking are both major sources of humidity. Make sure your kitchen exhaust fan vents to the exterior, as opposed to being just a recirculating type.

Warm the Interior Glass Surface

As well as lowering indoor humidity levels, it also helps to keep the interior glass surface of the window as warm as practical.

i) Use Low E + Argon Insulated Glass Units.

This glass is now the industry standard in Canada, and typically has twice the insulating value of regular insulated glass units.

ii) Use a Warm Edge Spacer Bar

With insulated glass units, the coldest portion of the glass is around the perimeter where the spacer bar that separates the two pieces of glass is located. Typically, this spacer bar was tubular aluminum. In Canada, most insulated glass units are now made with some sort of “Warm Edge Technology” – spacer bars of a material other than un-thermally broken aluminum.

iii) **Remove Interior Window Screens in the Winter**

Casement and awning windows have insect screens mounted on the interior side of the window. Remove them for the winter. There are no bugs to stop. The screens typically eliminate 20% of your light, so your home will be brighter and more cheerful. Most important – they inhibit interior air flow over the glass. If they are removed, your glass will stay warmer and you will have less condensation.

iv) **Open Drapes, Blinds, and Interior Shutters**

On cold nights, leave your drapes, blinds, and interior shutters open so that warm room air can circulate across the glass surface, keeping it warmer.

v) **Avoid Deflectors**

Do not use deflectors on forced air heat vents that deflect air flow along the floor rather than up towards the windows.

vi) **Use Fans**

If you have forced air heat, leave the furnace fan on “circulate” so that the air keeps moving over the windows. Especially if you have a bay or bow window that projects from the house, consider using a small room fan pointed at the window to keep warm room air circulating across the glass. If you have a skylight at the top of a shaft, try to ensure that a ceiling fan “overlaps” the shaft and leave the fan on in the winter.

vii) **Insulate Heads and Seats**

With bay and bow windows that project from the home, ensure that the heads and seats are well insulated. These windows were very popular in the 1970's, but the heads and seats were often either poorly insulated or not insulated at all.

Ensure the Windows Can Withstand Some Condensation

If you use wood windows where the interior wood is up against the glass, after completing the interior painting install a needle bead of neutral cure clear silicone between the glass and wood joint, and extending an inch or so up each side.



Neutral cure silicone has superior adhesion characteristics relative to the silicone typically sold at “big box” type building materials stores. It is a few dollars more per tube than most “big box

store silicone”. It will be sold at independent glass shops that cater to the commercial market, or at some specialty building material stores that cater to contractors. The more expensive neutral cure silicone is well worth the \$3 or so per tube extra. One tube will likely do all the windows in your home, and it can extend the life of your windows by decades.

Special Consideration

In some cases special measures are warranted.

New construction and remodeling

Increase ventilation and circulation throughout your home during construction and for two years following construction.

Crack Open a Window

If indoor humidity is particularly high and you do not have an HRV, consider opening a window for awhile to readily moist interior air to escape and be replaced with dry exterior air.

Maintain Negative Pressure

Try to maintain the pressure inside your house so that it is slightly lower than the outside pressure. This prevents moist air from migrating into the walls, soaking insulation, and causing damage. This can be done by leaving on bathroom or kitchen exhaust fans for longer than you normally would, or by cracking open a window on the leeward (downwind) side of the house.