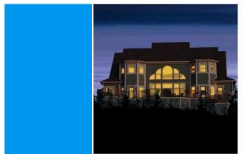
Interior, Exterior Condensation & Air Convection Information

Kohltech
Windows & Entrance Systems



Everyday indoor condensation is no cause for concern

Congratulations on your purchase of high quality vinyl windows. With these advanced windows installed in your home, you can now look forward to many years of beauty, ease of operation, and thermal efficiency. People who are not accustomed to the superior efficiency of vinyl windows sometimes express concern about condensation – the fog or moisture that can appear on your windows. This does not indicate a problem with either the construction or installation of your windows. Quite the contrary, it indicates that your vinyl windows are performing well. Any other type of window – wood or aluminum – is much more like to cause condensation problems. You're holding in the precious warm air like never before. But you're holding in humidity like never before as well. And that's really what this sheet is about – controlling the humidity in your home.

Condensation is caused by household humidity

Basically, condensation occurs when humid air comes into contact with a surface that is cooler than the air itself. This happens most often in winter, when your doors and windows are kept closed, holding in the moisture-filled air. Condensation may appear as a thin film of dew or frost on your windows. This is normal, and will not damage your new vinyl windows or any other part of your home. However, if you see excessive amounts of condensation, such as beads of water flowing down your windows or walls, it's the sign of a problem- excessive household humidity.

There are many sources of household humidity

The humidity that leads to condensation is a normal product of everyday life. According to studies, a family of four can release up to nine kilograms (20lbs) of moisture – nine and a half litres or water – into the air every day, just through the daily routines of cooking, showering, cleaning and breathing. Therefore, the more activity in your home, the more likely you are to see condensation. Other major contributors to household humidity include: humidifiers, water pans on radiators or wood stoves, kerosene heaters, drying laundry, and

house plants. The construction of your home – the kind and amount of ventilation, the presence or absence of a basement – even the soil type and drainage patterns of the land on which it is built can add humidity as well. In many cases, you can reduce humidity simply by being aware of the sources and reducing your daily use – for example, boil less and bake more when cooking and take shorter showers.

Kohler uses warm edge technology on all windows and doors, creating an insulated air space between the glass units. Warm edge spacers also keep the edges of your window glass warmer, reducing condensation.

Here's what you can do to reduce the humidity that causes condensation...

- **Fan it out**: When using your bathrooms, kitchen, or laundry room turn on any built-on fans. It may also be a good idea to install an exhaust fan in your attic to draw moist air out of your house.
- **Dry it out**: Use a dehumidifier to remove excessive moisture from the air. Also, discontinue the use of any humidifiers, or the placement of water pans on your radiators or wood stove.
- **Air it out:** Every day, open a door or window for a few minutes to air out your home. Opening fireplace dampers and basement or attic louvers will also allow moist air to escape.
- **Move it out:** In cold weather, move your house plants to the sunroom or other seldom used room.
- **Seal It out:** Waterproof your basement floors and walls using a moisture sealing paint, available at most hardware stores.

Some problems may require professional assistance.

If your home still contains excessive humidity after you've tried the above steps, you may have a more serious problem. Solutions vary sometimes, because so many different activities and conditions can

contribute to humidity. Therefore, you may wish to seek professional assistance. Start with your architect or heating contractor. They are familiar with such problems, and may be able to offer further advice and suggest inexpensive solutions.

Enjoy the comfort and saving of your new windows

By installing energy-efficient vinyl windows, you have done your home and your family a tremendous favour; one that will result in greater comfort and significant energy savings. As with most home improvements, you may need to makes some adjustments in order to enjoy the full benefits of your vinyl windows. In the case of ordinary condensation, that simply means reducing the sources of excess humidity in your home, particularly during the colder seasons.

Exterior Condensation on I.G Units

A relatively recent phenomenon occurring in high performance windows is that of exterior condensation on insulating glass units. While occasionally a source of concern for the customer, this condition is normal given certain combinations of glazing systems and environmental conditions.

Exterior condensation is usually observed under the following conditions:

- High relative humidity i.e. outside temperature new the dew point
- High performance glazing system e.g. double glazed i.g with Low E glass or better
- Early morning
- Unobstructed exposure to a clear sky to the North, West or South
- No wind

The cause of condensation in general is due to the temperature of a surface being lower than the dew point of the surrounding air. The dew point is the temperature at which a given volume of air with a

given water-vapour content is completely saturated. Since air can hold an increased amount of water-vapour with increased temperature, and vice-versa, lowering the temperature of air below the dew point will cause condensation to occur. This can happen when the air comes into contact with a cooler surface (the side of a cool beverage glass) or simply through cooling of the air itself, which is how rain and snow form.

A common example of this process in the window industry is condensation on the inside of the windows. This occurs when the indoor humidity in a house is such that the dew point temperature is higher than the temperature of the glass at the bottom of a window. When this temperatures happen to be below zero Celsius frost, rather than condensation forms.

But how can an exterior object become cooler than the surrounding air? This is what must occur in order for condensation to form on an exterior surface. The answer is that all objects naturally loose heat in the form of radiation. Everyday objects radiate energy at a rate proportional to the temperature they are at. In other words, a hot object will radiate more than a cool object. When an object is surrounded by other objects which are at similar temperatures to it there is no net change in the object's temperature, since the surrounding objects are radiating towards it at the same rate it is radiating towards them.

As a result of developments in insulating glass technology over the last number of years interior condensation occurs somewhat less frequently. Improvements in the insulating value of glazing systems have resulted in higher inside glass temperatures when it is cold outside. The onset of incidences of exterior condensation in recent years suggests that there may be a link between these two developments.

As explained earlier, when an object is surrounded by other objects

which are cooler than itself, it will lose heat. When the exterior glass surface of a window is exposed to a clear sky, it will radiate towards it (as well as towards other surrounding objects). The sky is at a very cold temperature (close to absolute zero), it will not radiate back towards the window to a significant extent. As a result, the exterior glass surface cools down. As this is happening, the trees, grass, and surrounding buildings also lose heat and the air typically cools down as well. However, when the sun rises, the surrounding objects are typically warmed. If a particular object, such as a window surface is not warmed by the sun during that period, it may remain cooler than the surrounding air. If the surrounding air temperature is just above the dew point and the glass surface temperature remains just below, condensation will form on the glass surface.

The phenomenon does not occur on windy days because air movement past the outer pane of glass will warm it to the outside air temperature quite quickly. It does not occur on eastern exposure because the sun will warm the window pane on that side as it rises. It does not occur on 'dry' days because the dew point temperature on dry days is significantly lower than the outside air temperature. It does not occur on windows which do not have a clear exposure to the sky because whatever obstructs the exposure (e.g. tress or clouds) prevents the outer pane from cooling down significantly.

It should be noted that the condition can occur in winter when frost, rather than condensation may occur.

Exterior condensation has only recently become an issue. Why has this not been seen until now? With less insulative glazing systems, heat flows from the inside of the house, through the interior pane, to the exterior pane of glass, raising its temperature to a point somewhat above that of the outside air. This process ensures that condensation will not occur as the exterior glass temperature is almost always above the dew point. It is the high insulation value of recently available glazing systems, preventing heat from escaping to the outer glass

surface which allows exterior condensation to form.

In fact, exterior condensation is seldom seen, even on very high performance glazing systems. This is because the above conditions do not coincide very frequently in most locations. When it is seen, it is evidence that a high performance glazing system has been installed.

**Drafts vs. Convection: there is a difference

Drafty windows

Windows can draft for a variety of reasons such as cracked caulk, improper window locking, interlocks that are not lined up to seal properly, damaged or missing weather stripping, and poor insulation within the interior walls. These types of problems are easy to remedy.

Convection

However, windows may seem 'drafty' for another reason: namely a process known in physics as convection. Convection can lead you to believe that your windows are drafty. Convection occurs when air gives up its heat to the cooler glass and sinks towards the floor. This movement sucks new, warmer air toward the glass that is in turn cooled, creating a draft. What you are actually experiencing is the process of warm air forcing colder air to move due to differing density properties. Heated air circulates through the home. When it reaches window glass it effectively pushes the existing cold air off of the glass.

This is an easy experiment and example of how convection works: Fill a glass with ice and water. Let is stand for about 10 minutes. When you return, place your hands around (but not touching) the glass you will feel cold air on your hands as warm air pushes it away from the glass surface.

Convection is actually proof that your new windows are working well and energy efficient.

Tips to reduce Convection

Leave your blinds or window treatments open about ¼" so heated air can reach the glass.

Make sure heat register exchanges are not obstructed by couches or other furnishings.

**Hansoms.com /window-convection.htm