Humidity and Condensation in the Home: A Basic Guide to Reduce and Control Household Humidity

What is Condensation?

Stained ceilings, water streaming from windows and mold on trim and walls are all the common results of excessive water vapour in the air.

If we could only see the water vapour in our homes we would have a better chance of controlling it. We can't see water vapour, but we can see its effects. The most common is condensation on the inside surface of your new windows. The fog, or in severe cases, the frost that forms on the glass or edge of door is a sure tell tale sign that the humidity levels in your house are too high.

Condensation problems arise because air can hold onto limited amount of water vapour at any given temperature. Cold air can 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 relative humidity level of 100%. If it contains only half the water vapour it can hold at the temperature, then the relative humidity is 50%. If the temperature changes but no water vapour is added or removed, then the relative humidity will also change. It will increase as the temperature falls and decrease as the temperature rises. Relative humidity will rise as the temperature falls until "DEW POINT" is reached, that is, the temperature at which the air can hold no more water vapour. Any further decrease in temperature will cause some of the vapour to condense as fog when the temperature is above freezing or as frost when it is below freezing.

It should be pointed out that a little fogging at the lower corners of the insulating glass units is nothing to be concerned about. Heavy fogging or worse, ice formation on the glass surfaces is a cause for concern. It is symptomatic of invisible moisture damage that could be happening in other parts of your home. Household humidity is a modern problem. More and more of us are living in "air tight" homes, they are more economical to heat and cool and easier to keep clean but we have created another problem and that is lack of air exchange and moisture traps.

Sources of Moisture

The principal sources of water vapour in today's homes vary with lifestyles but the following is just a small list of normal daily activities and the water vapour they introduce per day.

Cooking (3 meals per day)	3-4 lbs.
Dishwashing	1-2 lbs.
Shower or Bath	1-2 lbs.
Weekly Laundry	30 lbs.
Occupancy	12-15 lbs.

How Much is Enough?

As stated before, we need some humidity in our homes to be comfortable. A house that is too dry is just as bad as a house that is too humid. Symptoms of a dry house are sore throats, itchy eyes, nosebleeds and dry skin to name a few. Other, not so obvious symptoms are static electricity, cracked and dried out furniture and constant feeling that the house is colder than it really is. Your new windows are a great barometer of just where your humidity level should be.
Not enough to fog the glass but just enough to feel comfortable.

There are naturally more sophisticated means to check the humidity levels in your home from simple, inexpensive hygrometers to more complicated "wet and dry" bulb hygrometers. There are even inexpensive digital units that will measure temperature and humidity levels available at most hardware stores.

In the following chart are the recommended safe humidity levels based on outside temperatures for an interior household temperature of 70 degrees F.

Outside Air Temp. Max. Indoor Relative Humidity

-20 DEG F OR BELOW	NOT OVER 15%
-20 DEG F TO -10	NOT OVER 20%
-10 DEG F TO 10	NOT OVER 25%
0 DEG F TO 10	NOT OVER 30%
10 DEG F TO 20	NOT OVER 35%
20 DEG F TO 40	NOT OVER 40%

Practical Steps to Reduce Surface Condensation on Windows

If your furnace is equipped with a humidifier or you run a separate humidifier unit, turn it off until the amount of condensation is reduced. Make sure that the humidifier and the setting switch are really working.
Run kitchen and bathroom exhaust fans longer than you normally would.
Make sure your clothes dryer is vented to the outside.
Avoid hanging wet clothes inside to dry if you have a fireplace, open the damper.
The free circulation of air around windows is important. Leave drapes and blinds open as much as possible.
Leave the furnace fan running than set in automatic.

If Condensation Still is a Problem

Remember that windows don't cause condensation but high humidity levels can. If the above 7 simple steps don't solve the problem you might have to call in an expert. Ask your heating contractor to check the airflow in the house and your humidifier.

You might also want to inquire about installing outside air vents or larger and more exhaust fans. The most important thing to remember is you cannot afford to let high humidity levels go unresolved.

Exterior Condensation on S.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 outside relative humidity
high performance glazing systems (eg. Low"E"/Argon units)
early morning
unobstructed exposure to a clear sky to the North, West or South - no wind

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The cause of condensation in general is due to the temperature of a surface being lower than the dew point of the surrounding area. 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 temperatures, 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 (eg. 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 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 the window. When this temperature happens to be below 0 degrees Celsius, then frost, rather than condensation forms on the glass.

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 lose 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 of a similar temperature to it (eg. a person or objects in a home) there is no net change in the objects temperature, since the surrounding objects are radiating towards it at the same rate it is radiating towards them. But when an object is surrounded by other objects which are at a lower temperature than it is, it will cool down as it loses its heat through radiation.

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. There is.

As explained, 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). Since the sky is at a very cold temperature (close to absolute zero), it will not radiate back towards the window to any significant extent. As a result, the exterior glass surface cools down. As this is happening, the trees, the grass and the 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 temperature quite quickly. It does not occur on eastern exposures because the sun will warm the window pane as the sun rises. It does not occur on "dry" days because the dew point temperature 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 prevents the outer pane from cooling down.

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 the 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 and is working.

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