

UNDERSTANDING CONDENSATION

Why Windows Do Not Cause Condensation

Under certain conditions, condensation occurs both inside and outside your home, but windows do not cause condensation. The source of condensation, or “sweating,” on windows and mirrors inside a home is humidity, or invisible water vapor, present in virtually all air. When this water vapor comes in contact with a surface, at a temperature below what is called the “dew point,” the vapor turns to visible droplets of liquid, or condenses, on the cooler surface. This often happens to bathroom mirrors and walls after someone has taken a hot shower. Condensation can also occur on windows during the winter if the inside humidity level is high enough.

When it comes to condensation outside your home, it is simply a fact of nature. Exposed to certain conditions, like a clear night sky, still air or high relative humidity, the exterior surface of the glass can radiate heat away from your home and into the night air, allowing the glass temperature to fall below the dew point of the ambient air—creating condensation. Only when the glass temperature rises above the dew point will the condensation evaporate back into the air. Common examples of this are when dew forms on grass, car hoods and roofs and in common summertime conditions, with hot, humid air on the outside and colder, conditioned air on the inside.

Condensation can form differently from window to window. Even windows that are located on the same wall of a home can experience different levels of condensation. This can happen due to varying humidity levels, elevation, landscaping near windows or different rates of exposure to the gradual warming effect of the sun.



Do Thermally Efficient Windows Prevent Condensation?

There is no such thing as a condensation-free window. Even walls will “sweat” under conditions of high humidity. Remember that windows do not cause condensation: they simply prevent the moisture from escaping to the outside and serve as a highly visible surface where condensation can be easily noticed. If inside glass surfaces on double- or triple-glazed windows show excessive condensation, you can be reasonably sure that moisture is also collecting in your walls and ceilings. When outside condensation occurs, this does not mean your insulating glass unit is defective. In fact, it shows that the unit is doing its job—insulating the building from the environment.

Balancing Humidity for Comfort and Condensation

Controlling the amount of moisture in the air, or humidity, is the most effective way to reduce condensation. The amount of moisture in the air is indicated by the “relative humidity” of the air. Relative humidity is the percentage of moisture in the air compared to the maximum amount it can hold. For instance, when it is raining or very foggy outside, the outdoor relative humidity would be 100%. Temperature also affects how much moisture air can hold. At 100% relative humidity, air at 60 degrees will hold three times as much water vapor as air at 30 degrees Fahrenheit. As temperatures drop during the winter, the air cannot hold as much moisture as before and condensation will occur unless the relative humidity level is lowered.

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The chart illustrates the maximum recommended levels of moisture in interior air for different outside temperatures. You can check the relative humidity levels in your home using a hygrometer, an electronic humidity gauge or a sling psychrometer.

Follow instructions carefully, because a reading in the middle of a room will yield a different result than a reading taken near windows. Once you've determined the humidity level in your home you can take appropriate actions.



Maximum Recommended Humidity Levels

Based on engineering studies conducted at The University of Minnesota Laboratories.

Outside Air Temperature	Inside Relative Humidity
-20°F or Below	Not Over 15%
-20°F to -10°F	Not Over 20%
-10°F to 0°F	Not Over 25%
0°F to 10°F	Not Over 30%
10°F to 20°F	Not Over 35%
20°F to 40°F	Not Over 40%

- Based on engineering studies 70°F conducted at the University Laboratories
- Relative humidity above these are not recommended at the low outside temperatures indicated, unless special provisions are taken in building construction

You can check the relative humidity levels in your home using a hygrometer.

What Can I Do to Help with Condensation?

Most everyday activities produce water vapor. A five-minute shower releases about ½ pint of water vapor, cooking dinner on a gas stove can produce 2½ pints of water vapor and the breathing and perspiration of a family of four can produce approximately ½ pint per hour.* Although it's an uphill battle, there are a few things you can do to help control moisture levels in your home.

- Use kitchen and bathroom exhaust fans.
- If you have a humidifier, set it to correct outside temperature.
- Properly vent clothes dryers, gas appliances, stoves, etc.
- Make sure attic, basement and crawl spaces are well ventilated and free from obstructions.
- Don't store firewood inside; freshly cut wood can consist of up to 45% water, while well-seasoned firewood can have a 20-25% moisture content that can be released in your home.**
- Open a window in the bathroom.
- Open curtains and blinds to allow more air circulation around windows.

* Source: Moisture Sources Associated with Potential Damage in Cold Climate Housing (1988)

** <http://www.csa.org/HomeownerResources/ChimneySafetyInfo/HowToSelectFirewood/tabid/115/Default.aspx>



When choosing windows for their energy efficiency, it is important to select a glass package that meets the performance requirements for your climate zone.