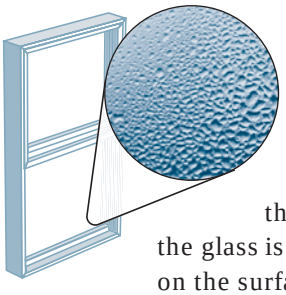
Questions about Windows and Condensation?

NFRC Has the Answers

In today's market, architects, builders, and consumers have the opportunity to choose among many different windows. In colder climates that have a heating season, many home and building owners may have concerns regarding the formation of condensation on the inside of their windows. Condensation on window surfaces can reduce visibility, obscure the view through the window, and, in some cases, damage curtains, walls, carpets, and even the window itself.

What is Condensation?

Condensation, which can appear as a light coating of water, water droplets, frost, ice, or some combination of the four, forms on any surface when the temperature (°F) of that surface is less than its dew point temperature. For example, if the temperature of the glass in a window is 50°F and the dew point temperature for the glass is 55°F, condensation will form on the surface of the glass.



The dew point temperature of any surface is directly related to the amount of moisture that is in the air, which is called the relative humidity. It is also related to the temperature of the air in the room, which is known as ambient air temperature. As the relative humidity in a room increases, the dew point temperature also increases, which means that a surface is more likely to show moisture even at warmer temperatures. As the relative humidity starts reaching levels near 100%, moisture will form on almost any surface, no matter what the temperature of that surface. For example, bathroom and kitchen areas typically have higher humidity conditions at certain times of the day. On the other hand, surfaces in living or working areas where the relative humidity is low have lower chances for the formation of condensation.

How To Stop Condensation on Windows

To increase the resistance of windows to the formation of condensation, it is important to maintain the surface temperature of the window above the dew point. To accomplish this, manufacturers must reduce the amount of heat that transfers through a window, which is called the thermal transmittance or U-factor of the overall window product. The higher the U-factor of a window, the higher the potential that condensation will form on a surface of the window unit.

NFRC recognizes three parts to a window: the center-of-glazing; the edge-of-glazing; and the frame. Heat from inside the house will conduct its way through the parts of the window that are the least energy efficient, causing those parts to have lower indoor surface temperatures. To reduce the potential for condensation, each component of the window should be thermally efficient.

You can reduce the potential for condensation on each window component by looking for the following improvements:

Center-of-Glazing – Going from single-glazed (one lite of glass) windows to multiple-glazed windows or insulating glass units reduces the potential for condensation. Choosing energy-efficient, low-e coatings in multiple-glazed or insulating glass units further reduces the potential for condensation.

NFRC administers an independent, uniform rating and labeling system for the energy performance of fenestration products, including windows, curtain walls, doors, and skylights. For more information on NFRC, please visit our Web site at www.nfrc.org or contact NFRC directly at 301-589-1776.

Edge-of-Glazing – Similar to the center-of-glazing, going from single-glazed to dual-glazed or insulating glass units reduces the potential for condensation on the edge-of-glazing surface, and using high-performance glass further reduces the chance for condensation. A third step for reducing the potential for condensation is the use of warm edge spacer systems that reduce conductivity through the edge.

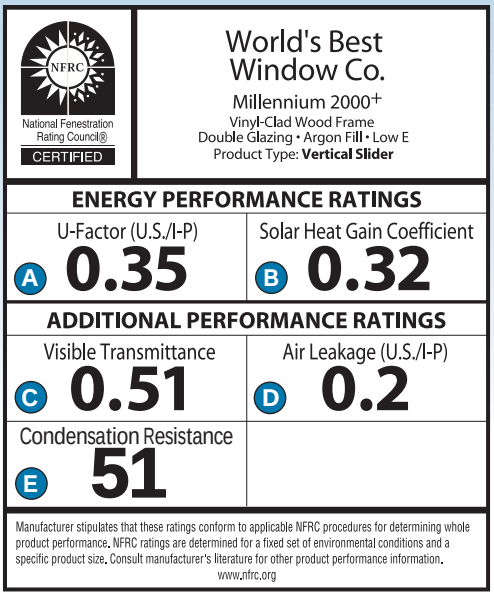
Frame – Going from highly conductive metal framing systems to thermally broken metal frames or thermally improved framing materials (like wood or vinyl) reduces the chance for condensation formation.

Determining Condensation Resistance With NFRC 500

NFRC has developed a standardized methodology for determining the potential formation of condensation on a window – called Condensation Resistance. Condensation Resistance is reported on a scale of 1 to 100. The higher the number, the better a product is at resisting condensation. The results are based on a set of standardized conditions (O°F outside temperature, 70°F inside temperature) and three levels of relative humidity – 30%, 50%, and 70%. Surface temperatures for the window are normalized and recorded for the three window areas (center-of-glass, edge-of-glass, and frame). The Condensation Resistance of the window is then determined by the lowest rating obtained from the three component areas of the window.

It should be noted that NFRC 500 only reports condensation formation on the inside surfaces of windows, and that in the real world, environmental conditions vary from the standardized environmental conditions used to determine Condensation Resistance. This standard (NFRC 500) is not meant to predict condensation; rather it is meant to be a tool for rating and comparing window products and their potential for condensation formation.

NFRC has additional information for selecting energy efficient windows on its Web site www.nfrc.org. Of special interest, see the NFRC *Certified Products Directory*, which lists hundreds of manufacturers and thousands of products authorized for certification by NFRC. If you need further information, contact our offices in Maryland (301-589-1776) or Kansas (785-862-1890).



A ***U-Factor*** *measures how well a product prevents heat from escaping a home or building. U-Factor ratings generally fall between 0.20 and 1.20. The lower the U-Factor, the better a product is at keeping heat in. U-Factor is particularly important during the winter heating season. This label displays U-Factor in U.S. units. Labels on products sold in markets outside the United States may display U-Factor in metric units.*

B ***Solar Heat Gain Coefficient*** *(SHGC) measures how well a product blocks heat from the sun. SHGC is expressed as a number between 0 and 1. The lower the SHGC, the better a product is at blocking unwanted heat gain. Blocking solar heat gain is particularly important during the summer cooling season.*

C ***Visible Transmittance*** *(VT) measures how much light comes through a product. VT is expressed as a number between 0 and 1. The higher the VT, the higher the potential for daylighting.*

D ***Air Leakage*** *(AL) measures how much outside air comes into a home or building through a product. AL rates typically fall in a range between 0.1 and 0.3. The lower the AL, the better a product is at keeping air out. AL is an optional rating, and manufacturers can choose not to include it on their labels. This label displays AL in U.S. units. Labels on products sold in markets outside the United States may display AL in metric units.*

E ***Condensation Resistance*** *(CR) measures how well a product resists the formation of condensation. CR is expressed as a number between 1 and 100. The higher the number, the better a product is able to resist condensation. CR is an optional rating, and manufacturers can choose not to include it on their NFRC labels.*