



# Questions about Windows and Condensation?

## NFRC Has the Answers

In today's market, there are so many window products to choose from it can be overwhelming. Fortunately, the National Fenestration Rating Council (NFRC) has developed a rating system and label that allow consumers to understand how the product performs in several areas and provides a fair, uniform method for comparing products. In addition to ratings for U-factor, Solar Heat Gain Coefficient (SHGC), Visible Transmittance (VT), and Air Leakage ([AL] -- see [www.WindowRatings.org](http://www.WindowRatings.org) for more information on these ratings), NFRC also has an optional rating for Condensation Resistance. In 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 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 or frost, forms on any surface when the temperature 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 (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 lower the U-factor of a window, the better the window is at keeping heat inside the room and the lower 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



Condensation on a window can obscure the view and excess moisture can damage curtains, the wall, surrounding woodwork, and even the window itself.

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 purchasing multiple-glazing or insulated glass units,
- by purchasing windows with low-e coating,
- by purchasing products that have “thermally broken” (the “breaks” limit heat transfer along the frame material), or
- by purchasing products with thermally-improved frames.

**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 (0°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-glazing, edge-of-glazing, 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 the “NFRC 500: Procedure for Determining Fenestration Product Condensation Resistance Values” procedure only reports condensation formation on the inside surface of windows, and that in the real world, environmental conditions vary from the standardized environmental conditions used to determine Condensation Resistance. The NFRC 500 standard 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.

**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.

**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.

**Condensation Resistance** measures the potential formation of condensation on the inside of a window. It is reported on a scale from 1 - 100. The higher the number, the better a product is at resisting condensation.

<div><div><b>NFRC</b> National Fenestration Rating Council® <b>CERTIFIED</b></div></div> <div><b>World's Best Window Co.</b> Series "2000" Casement Vinyl Clad Wood Frame Double Glazing • Argon Fill • Low E ABC-X-1-00001-00001</div>	
<b>ENERGY PERFORMANCE RATINGS</b>	
U-Factor (U.S. / I-P)	Solar Heat Gain Coefficient
<b>0.35</b>	<b>0.32</b>
<b>ADDITIONAL PERFORMANCE RATINGS</b>	
Visible Transmittance	Air Leakage (U.S. / I-P)
<b>0.51</b>	<b>0.2</b>
Condensation Resistance	
<b>51</b>	<b>—</b>
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

**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.

**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.

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 Website at [www.nfrc.org](http://www.nfrc.org) or contact NFRC directly at 301.589.1776.