

## Understanding Condensation & Humidity

Condensation on interior surfaces of windows and doors occurs because of a combination of high humidity and insufficient air exchange inside the building. In many windows built using older technologies, there were gaps in the windows where a significant draft could be felt and where air would flow. This exchange of air, in many cases, was sufficient enough to prevent condensation from forming. The high-performance windows of today are designed to be as air tight as possible to reduce heat loss. By doing this, it reduces air flow, and in humid conditions, will allow for condensation to form on windows. This is not a window defect. Recommended maximum humidity levels to prevent condensation on all parts of the window are listed below taking into account various window framing materials and glazing types. These are the recommended humidity levels, and may not be applicable for every household. Differences in glass types (low-e vs. clear) will allow for variances in humidity levels.

### Recommended Maximum Humidity Levels (Based on interior temperature of 70° F)

Outdoor Temp.	Maximum Indoor Humidity
20° F to 40° F	not over 40%
10° F to 20° F	not over 35%
0° F to 10° F	not over 30%
-10° F to 0° F	not over 25%
-20° F to -10° F	not over 20%
-20° F or below	not over 15%

\* Based on engineering studies conducted at the University of Minnesota Laboratories.

## How Do You Stop Condensation On Your Windows?

The condensation on your windows comes from an interaction of temperature, humidity, and a lack of air movement. You must isolate each factor and analyze it to properly establish the source, and eventual solution to the condensation on your windows. If replacing windows, invest in Low-E and inert gas fill technology. These windows keep the glass surface temperatures higher, reducing the chances of condensation. Keep the humidity levels indoor lower than 30% during winter. If the indoor humidity level is above 30% there is a stronger probability of condensation forming on your windows, even if they are a low-e insulated product. Keep sufficient air circulation in your home. This can be accomplished by:

- Vent clothes dryers, gas burners, etc. to the outdoors.
- Insure all ventilation equipment is properly adjusted.
- Use exhaust fans in your kitchen and bathroom. By simply opening a window and airing out your kitchen, bath, and laundry rooms a few minutes will help to reduce condensation.
- Inspect your attic louvers to ensure they remain open year around, also make sure there is proper ventilation in your crawl spaces. If you are not sure there is adequate ventilation, consult with a local heating and ventilating contractor.

## Condensation Can Be Controlled

To reduce the likelihood of condensation formation at the areas in question there are a few basic techniques utilized in the building industry.

- Decrease the relative humidity
- Increase the interior ambient temperature - warmer air can hold more moisture
- Increasing the interior window surface temperatures - circulate air, open blinds ect.
- Or a combination of each of these

Increasing the interior room air temperature would inherently accomplish heating up the frame temperatures, as long as the air within the room is able to circulate freely to the window surface. Window blinds or drapes will increase the possibility of condensation as they restrict the flow of warmer room air to the surface of the window, therefore creating a cool pocket of air immediately in front of the window. This keeps the window frame from warming, allowing the frame temperatures to possibly drop below the dew point temperature of the room air and increase the chances for condensation. Increasing air circulation at the window surface will reduce the chances of the air next to the window to cool therefore reducing the likelihood of condensation formation. This can be accomplished by keeping the blinds open during colder temperatures or moving them further away from the window creating space for air circulation. Running fans in the winter is also a good strategy used to help keep temperature and humidity levels more uniform in a room.

**Dual Windows**

Graham Architectural Products manufactures several types of dual window and dual glazed systems. Some of these types of windows can be more susceptible to condensation formation since the air space is not a sealed insulating glass unit. These windows are desired for various purposes such as between-glass blinds and acoustic performance. Because most modern-day commercial building construction includes HVAC systems and sometimes humidification systems, pressurization exists inside the building. In other words, the warmer moist air is pushing outwards. This means that if the relative humidity is not maintained at lower levels during cold weather; the warm moist air in the room will migrate into the airspace between the two window layers. Once the moist air is in this space, the moisture can condense out onto the interior surfaces (See Figure # 1 and # 2 below). The potential for condensation on the # 2 or # 3 surfaces depends on the building HVAC systems and should be evaluated by the building design professional as it may be recommended to add insulated glass to the exterior unit to raise the dew point temperatures of the glass surfaces.

