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Condensation

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Condensation

This information is intended for use by window fabricators, glaziers, and their customers, to gain a better understanding of the cause and how to prevent condensation. Addressing the circumstances will improve the energy efficiency of windows and the longevity of window systems that may be adversely effected by continued build-ups of internal moisture.

What is condensation?

Condensation is the process of water vapour changing back into a liquid form. Where the temperature of an object e.g. grass, metal or glass falls below what is known as the dew point temperature, water vapour from the atmosphere condenses into water droplets on its surface. The dew point varies according to the amount of water in the atmosphere, which is known as humidity. In humid conditions, condensation occurs at higher temperatures. In cold conditions, condensation still occurs despite relatively low humidity.

When does condensation occur on a glazed panel?

Condensation forms quite differently depending on whether it is on the inside or the outside of the building. It will appear on the surface of a glazed panel if the temperature on this face is significantly lower than the adjacent air temperature and if the dew point of the adjacent air is higher than the temperature of the glass.

This is influenced by 3 factors:

1. The heat flow from the interior passing through the glass
2. The heat exchange by convection with the external air (relevant for single glazing)
3. Heat loss by radiation mainly to the sky or open air

Condensation on the external face

Surface #1 is defined as the outside face of a glazed panel, refer to diagram 1.

The coldest point on the external face is generally in the centre with the edges likely to be warmer if placed in conductive frames.

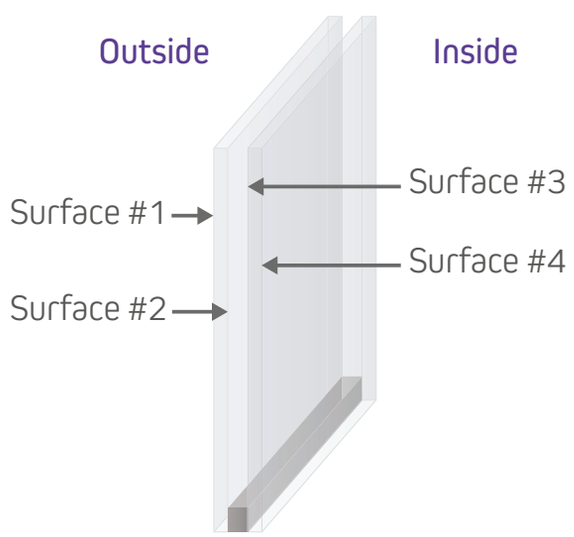
The surface temperature of single glazing is rarely lower than the external air temperature, so condensation rarely occurs on the external face. However, improved thermal insulation by introducing double glazing reduces the heat transfer to the external surface, making it cooler and increasing the risk of some external condensation.

This is generally seen in combinations of colder nights, well-insulated glazing systems and clear cloudless weather without wind. It is important that this phenomenon is not considered to represent poor quality glazing, but rather proof of good thermal insulating window products.

Heat exchange by radiation is relatively limited in overcast weather. However, without cloud cover at night, there are significant heat losses to the open sky.

To illustrate the effect of increased radiant heat loss, consider a car parked outdoors at night in clear cloudless weather. In the early hours of the morning, some parts of its outer surface are wet or frosted without any evidence of rain. However, when the car is parked with protection alongside a solid fence or structure, the windows on the protected side are dry, because the building significantly reduces this radiant heat exchange between the car windows and the open sky.

Diagram 1. IGU Surface Numbering



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Condensation on the inner faces of an IGU

Surface #2 and #3 are defined as the inner faces of a glazed panel, refer to diagram 1.

When condensation forms on the inner faces of a double glazed unit it is an indication that the air or gas cavity is no longer completely sealed. The moisture absorbing desiccant is likely to have become saturated, and any damp air penetrating through the seal will form condensation on the internal faces #2 and #3. The double glazed unit must therefore be replaced as this cannot be reversed.

This issue will either be a consequence of poor manufacture or poor glazing techniques and is most commonly caused by moisture entering the glazing cavity and not being allowed to adequately drain away. This is common in timber windows and other non-drained glazing systems.

Replacement will be in accordance with the terms and conditions of the product warranty.

Condensation on the indoor face

Surface #2 for single glazed and surface #4 for double glazed are defined as the indoor faces of a glazed panel, refer to diagram 1.

Condensation that forms on the inside of a building is due to a combination of high internal humidity levels and colder outside temperatures. This combination cools the inside surface to below the dew point.

The condensation will commonly form in the corners mainly due to frame effects of more conductive frame types e.g. aluminium, steel or even metallic spacers if incorporated within an IGU.

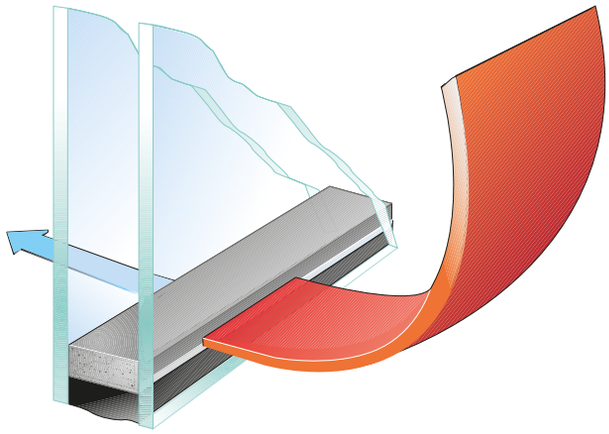
In addition, certain internal areas where humidity levels are high such as bathrooms and kitchens will be particularly susceptible to condensation.

In order to control this form of condensation, consideration should be given to improving the heating and ventilation, including exhaust fans for showers and cooktops.

However, an effective way to reduce the problem throughout the building is to use double glazed units, especially those containing a Low E coating.

The double glazed unit reduces the rate of heat exchange across the airspace. This will enable the inner pane of glass to stay warmer therefore reducing the circumstances for condensation to form.

Diagram 2. OptEseal™ Warm Edge Spacer



Other contributing factors

There are other contributing factors that increase the risk of condensation, including but not limited to the following:

Firstly, throughout the building and construction phase, large amounts of water are used when installing building materials such as concrete, plaster, grouting and tiles. As these materials dry, damp climates are temporarily created inside the building. During this time the risk of condensation may be abnormally high.

Secondly, localised humid spaces can be created where there is a confined space i.e. between a window covering and the glazing. In these instances, the risk of condensation is increased.