Technical Datasheet

Condensation on glass

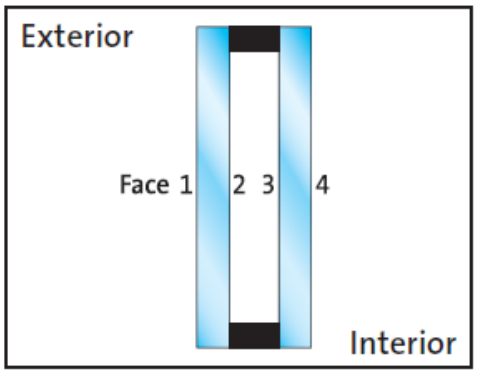
What is condensation?

Condensation is defined as the physical process by which a gas or vapour changes into a liquid. If the temperature of an object (e.g. grass, metal, glass) falls below what is known as the 'Dew Point' temperature for a given relative humidity of the surrounding air, water vapour from the atmosphere condenses into water droplets on its surface. This "dew point" varies according to the amount of water in the atmosphere (known as humidity). In humid conditions condensation occurs at higher temperatures. In cold conditions condensation occurs despite relatively low humidity.

Condensation on glass

Condensation on the external surfaces of a double-glazed unit can form in a wide variety of circumstances and on either the inside or the outside of a building. The phenomenon of surface condensation on double-glazed units occurs in three forms:

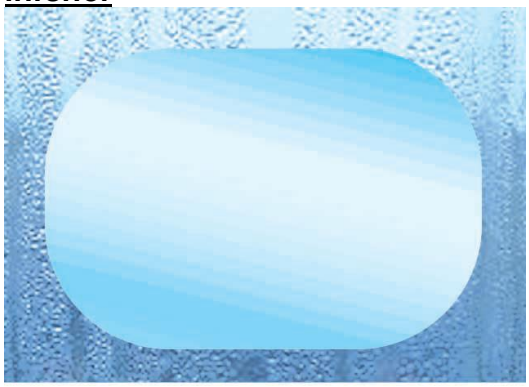
- On the external face (face 1)
- On the inner surfaces 2 and 3 of the double-glazed unit
- On the internal face (face 4)



Indoor condensation

The principal cause of condensation on glass on the inside of a building is a high internal humidity level coupled with a low outside temperature which cools the inside surface to below the dew point, particularly around the edges. Bathrooms, kitchens and other areas where humidity levels are high are particularly susceptible to this problem.

Interior

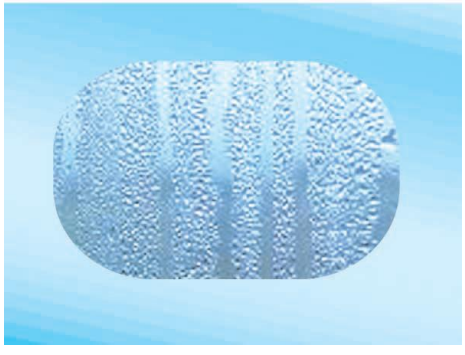


In order to control this form of condensation, consideration should be given to improving the heating and ventilation in these areas. However, another way to reduce the problem is to use high performance windows containing an enhanced thermally insulating glass. Windows manufactured using an energy efficient low-emissivity (or low-E) glass such as SGG PLANITHERM TOTAL, actually restrict heat exchange across the air space between the two panes of glass. This keeps the inner pane of glass warmer thus reducing the instances when condensation can form. In addition, the use of a "Warm-edge" spacer bar made of insulating material, such as SGG SWISSPACER, will reduce the risk of condensation at the edges.

Outdoor condensation

Condensation forms on the outdoor surface of glass when its temperature drops below the outdoor dew point temperature. Again, windows manufactured with a double-glazed unit containing energy efficient low-emissivity glass such as SGG PLANITHERM TOTAL, have enhanced thermal insulation properties thanks to a high performance transparent coating that reflects heat from radiators or fires back into the room. As a result the outer pane of glass does not get warmed by heat escaping from inside the building through the glass and remains cooler in comparison to less thermally efficient windows.

Exterior



External condensation only occurs in certain climatic conditions with high humidity levels and/or particularly cold weather. It is possible that external condensation will appear on some windows but not on others. This is due to localised atmospheric conditions such as shelter from nearby trees or buildings, variable air currents and wind speeds and varying

levels of nearby vegetation. Condensation on the outdoor surface of such high performance windows is in no way an indication of a defective unit. Indeed, this can be seen as a positive indication that the enhanced thermally insulating units are actively reducing heat loss through the glass.

<u>This table shows that:</u>
- The surface temperature of single-glazing is almost never lower than the external air temperature, so condensation rarely occurs on the external face
- Improving the thermal insulation (lower U-value) reduces the transfer of heat to the external surface: the external glazed surface is therefore colder, increasing the risk of condensation.
- When there is a high wind speed, the temperature of the glass tends to be similar to that of the external air
- The cooler the external air, the less likely the glazing is to have a significantly lower temperature than that of the external air.

Wind (m/s)	T (°C)	Position	Single-glazing (U-value = 5.8 W/m²K)		Standard double-glazing (U-value = 2.9 W/m²K)		Thermally insulating double-glazing (U-value = 1.3 W/m²K)	
			Tglass (°C)	Condensation	Tglass (°C)	Condensation	Tglass (°C)	Condensation
0	10	vertical	12.4	none	9.3	95%	7.2	83%
0	0	vertical	7.3	none	2.2	none	-1.3	90%
0	-10	vertical	2.2	none	-4.9	none	-9.9	99%
0	10	horizontal	9.8	99%	5.8	75%	2.9	61%
0	0	horizontal	4.7	none	-1.3	90%	-5.6	63 %
0	-10	horizontal	-0.3	none	-8.4	none	-14.1	69 %
4	10	vertical	11.2	none	9.7	99%	9.0	93 %
4	10	horizontal	9.9	99 %	8.3	89%	7.4	84 %
10	10	vertical	10.7	none	9.9	99%	9.5	97 %