The Glass and Glazing Federation

The Glass and Glazing Federation (GGF) is the recognized leading authority for employers and companies within the flat glass, glazing, home improvement, plastics and window film industries. GGF Members can be found in over 1,500 business locations throughout the UK.

Talk to the specialists

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For additional information about condensation see

British Standard BS 5250: 2002
"Code of Practice for Control of Condensation in Buildings"
BSI Customer Services, 389 Chiswick Road London W4 4BR, www.bsi-global.com

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Glass and Glazing Federation

Condensation

Some Causes, Some Advice

The Problem

Condensation on windows and in conservatories, and the damage it does to paintwork, curtains, wall coverings and window fittings, are problems frequently encountered in all types of building.

The increased incidence of condensation in today's buildings is the direct result of changes in modern living conditions, which have led to warmer and more comfortable rooms.

In many homes, traditional open fires have been replaced by sophisticated heating systems, ill-fitting doors and window frames have been provided with draught excluders, floors have been completely covered by fitted carpets, while ceiling heights have been lowered and the space between loft joists filled with insulating material.

These modern aids to home comfort have created rooms which are warmer but which often have less ventilation and fewer air changes. The result is that the water vapour produced by normal living activities is no longer able to escape up the chimney or through door jambs, window joints and other outlets.

In certain circumstances, all these aids to comfort combine to create ideal conditions for the formation of condensation.

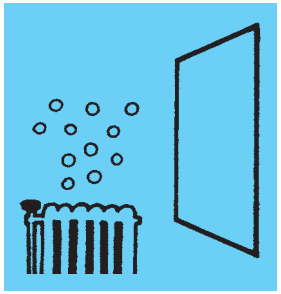
The question is how to reduce condensation without sacrificing the benefit of increased comfort. When double glazing is used in conjunction with heating and controlled ventilation, it helps solve this problem – and its effectiveness will be even greater if the elementary precautions referred to in this leaflet are adopted.

What is condensation?

Condensation is the water which results from the conversion of water vapour in the atmosphere.

The air which surrounds us in our homes always contains water vapour, which is usually invisible. A typical example is the steam cloud from a kettle, which rapidly becomes invisible – it has in fact been absorbed into the atmosphere.

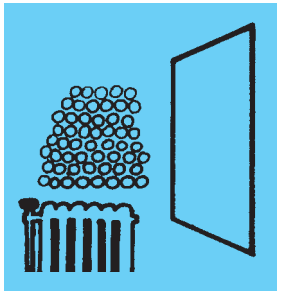
The warmer the air, the more water vapour it can hold – but there is a limit to the amount it can hold for a given temperature. When that limit is reached, the air is said to be "saturated". When saturated air comes into contact with a surface which is at a lower temperature than itself, the air is chilled at the point of contact and sheds its surplus water vapour on that surface – initially in the form of a mist and, if excessive, eventually in the form of droplets of moisture. An example of this is when a person breathes onto a mirror: condensation occurs because the exhaled air is saturated and its temperature is higher than that of the mirror (which is at room temperature).



1

NORMAL ROOM CONDITIONS

Air contains about 40% to 60% moisture.



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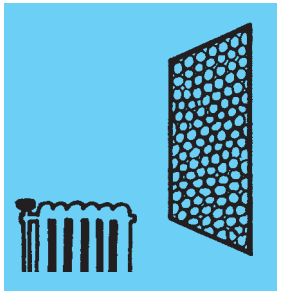
MOISTURE CONTENT INCREASES



3

OUTSIDE TEMPERATURE FALLS

Moisture condenses on cold surface.

Some examples of where the water vapour comes from

Breathing: Two sleeping adults produce 1½ pints of moisture in 8 hours, which is absorbed as water vapour into the atmosphere.

Cooking: Steam clouds can be seen near saucepans and kettles, and then seem to disappear. The clouds have been absorbed into the atmosphere.

The cooker itself may be a source of water vapour; eg. an average gas cooker could produce approximately 1½ pints of moisture per hour.

Washing up: The vapour clouds given off by the hot water are rapidly absorbed into the atmosphere.

Bathing, laundry, and wet outer clothing: These are often the major sources of water vapour in the home.

Heaters: A flueless gas heater can produce up to ⅔ pint of moisture per hour. Paraffin heaters produce nine pints of moisture for every eight pints of fuel burned.

Indoor Plants: A frequently unrecognized but nevertheless significant source of water vapour.

New Property: The bricks, timber, concrete and other materials in an average 3-bedroomed house absorb about 1500 gallons of water during construction. Much of this is dissipated into the indoor atmosphere during the drying out period.

The factors governing condensation

The three main factors governing condensation are:

1. Water vapour content of the air.
2. Inside room temperature.
3. Outside temperature.

The first two factors are normally controllable.

1. Water vapour content of the air
This is produced by normal living activities such as washing, cooking, bathing, etc., and can be controlled by the use of extractor fans, cowlings, and ventilation at appropriate places.

2. Inside room temperature
This can be controlled by replacing single glazing with double glazing, thereby maintaining a higher surface temperature of the glass on the room side, and by increasing the air temperature to enable it to hold more water vapour without condensing.

3. Outside temperature
This cannot be controlled, but it can be countered when it falls by increasing the indoor heating.

How double glazing helps

Double glazing is an insulator, designed to reduce the loss of heat by conduction from the inside to the outside of a building.

Under average exposure conditions, and provided the room is heated, the room side surface temperature of the inner glass will be higher than would be the case with single glazing. The likelihood of condensation occurring when warm moist air in the room comes into contact with the surface of the glass is thereby reduced.

It must be remembered, however, that double glazing is an insulator and not a source of heat; nor does it control the amount of water vapour in the air. When rooms are inadequately heated and there is little heat to retain, double glazing cannot fulfill the purpose for which it was installed.

For example, one reason why condensation forms in, say, a bedroom not normally occupied, is that many householders, for reasons of economy, do not heat such rooms. Consequently the surface temperature of the inner glass gets very close to the outside temperature. In addition, the windows in such rooms are generally kept closed, but water vapour, generated elsewhere in the house, will find its way in and then cannot escape. Thus the two conditions necessary to produce condensation – a low glass surface temperature, and a high water vapour content in the atmosphere – are present.

The location of condensation on the glass

When attempting to reduce the degree of condensation it is important to note on which surface of the glass it forms; its location indicates the cause, and so points to the solution.

Condensation on the room side surface of the inner glass means that the temperature of the glass surface is too low given the water vapour content of the atmosphere in the room.

Condensation within the cavity of an hermetically sealed unit denotes a failure of the seal.

Where the double glazing is achieved by the installation of secondary glazing, condensation on the cavity surface of the outer glass generally (but not invariably) indicates leakage of moist air from the room into the cavity. However, the reader should note that it is not possible to hermetically seal secondary windows, therefore some migration of air from the room into the cavity is to be expected. Condensation can occur occasionally on the cavity surface of the inner glass when the sun is shining on the window. This means that something in the air space itself, such as an unsealed wooden separator or desiccant, contains moisture. It should be noted, however, that this source can also be responsible for condensation on the cavity surface of the outer glass. Condensation on the outside of the outer glass is quite natural and can be disregarded.

How to reduce the condensation

A) When formed on the room side surface of the inner glass

i) Provide natural ventilation through an opening section of the window, or through a proprietary ventilating unit, or through an airbrick.

ii) Where there is no open fire, or where existing flues have been blocked off (and cannot be unblocked), ensure that wall vents are fitted and kept clear.

iii) Open at least one window in each room for some part of the day to permit a change of air.

iv) Ensure ventilation of all rooms where gas or oil heaters are used.

v) Fix hoods over cookers and other equipment producing steam, and ventilate them to the outside air.

vi) Ensure that bathrooms and kitchens are ventilated in accordance with National Standards.

vii) Draught proof internal doors and keep them closed, to prevent transfer of air with a high water vapour content from the main moisture producing rooms – kitchens, bathrooms, and drying rooms. It should be borne in mind that water vapour does not remain in the room where it is first generated, but tends to migrate all over the house because:

a) the water vapour pressure in the original room may be higher than elsewhere, and so the moist air will be forced out into rooms with a lower pressure, and

b) convection currents will carry it through the house.

viii) Increase slightly the air temperature within the house.

ix) In cold weather, keep some form of heating on permanently in the house.

x) Wherever practicable, fix radiators under windows to maintain the temperature of the inner glass at a reasonable level.

xi) Condensation can be caused by isolating the inner glass from the warm room air with heavy curtains when drawn. To allow free passage of warm air to the glass, position curtains 15cm to 20cm away from the window, and ensure there are sufficient gaps at the top and bottom to permit continuous circulation. (Holes should be drilled along the top of any box pelmet used).

Condensation will not form on the inside of a correctly functioning sealed unit. For secondary sash systems this phenomenon could occur.

B) When formed on the cavity side surface of the outer glass

i) Make the seal of the secondary frame, and the sealing of the secondary glass to this frame, as near airtight as possible. Particular attention should be paid to all joints.

ii) Drill breather holes through the primary frame to connect the air cavity to the drier air outside the home. Holes should have a diameter of 10mm. If the frame is made of wood it is better to drill a hole large enough to accommodate a metal tube of 10mm internal diameter. Two holes about 50cm apart should be sufficient for windows up to 1m wide; more should be drilled for larger windows. A simple filter, such as glass wool, should be inserted to exclude dirt and insects.

C) When formed in the cavity when the sun shines

i) Remove the secondary glass pane.

ii) Remove and discard any desiccant.

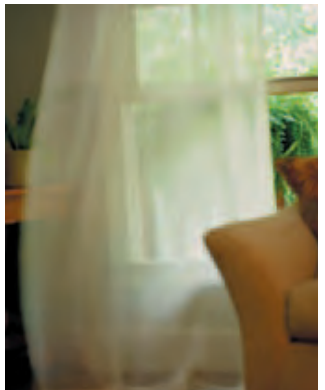
iii) Drill holes to connect the cavity to the outside as described in paragraph B(ii) above.

iv) Dry out the frame area. Care must be taken not to apply concentrated heat close to the original glass.

v) Seal up any holes or cracks with compound or wood filler.

vi) Seal completely all wooden surfaces in the cavity with a proprietary wood sealer.

vii) Replace the secondary pane, taking care to make the seal and all joints as near airtight as possible.



Summary

Condensation is a ventilation problem and cannot be caused purely by the installation of double glazing. By acting as a heat barrier and providing an inner pane which is considerably warmer than the outer pane, condensation may be reduced.

Modern buildings are designed to eliminate draughts and do not have the natural ventilation that some older houses have with their chimneys and ill-fitting doors and windows. Houses which have been completely sealed by the installation of cavity wall insulation, loft insulation, double glazing, and draught proofing throughout are likely to become moisture traps. In such cases, condensation is a ventilation problem. Provided the rooms are heated normally, the solution will probably be found by providing controlled ventilation.

When lack of ventilation is suspected, the householder should consult a heating and ventilation engineer.

In the case of the older, "unsealed" buildings, the dominant factor is likely to be the indoor temperature, and additional heat, or the introduction of localised heat near the windows, will probably provide the answer.

Living rooms

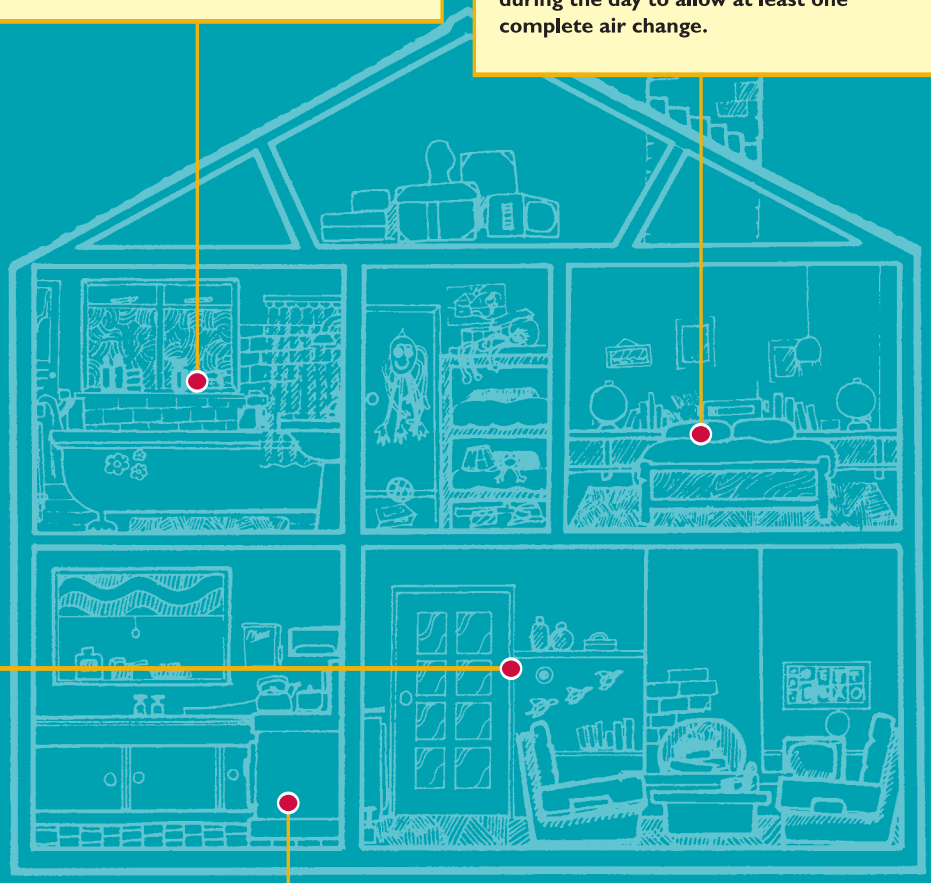
- Allow the room's warmth to reach the windows. Position heaters under the windows, and use fittings which hold the curtains at least 15cm to 20cm away from the glass to allow free movement of warm air.
- Open windows for at least a few minutes each day to permit air changes.
- Where open fires are not provided, or existing flues are blocked off, see that wall vents are fitted and kept clear. When a gas fire has been installed in an open fire aperture, the back plate should have vent holes below the fire, unless this is provided for in the fire design.
- Where possible, avoid glazed or non-absorbent wall coatings, as these can promote condensation on walls.

Bathroom

- Stop water vapour finding its way into the rest of the house, particularly during and after bathing.
- After a bath or shower, close the door and open a window for a few minutes. Position a radiator, or heated towel rail, under the window.
- Consider installing an extractor fan.

Bedrooms

- Check points under "Living Rooms", particularly with respect to the position of curtains and the provision of vents.
- If possible extend the central heating programme to compensate for the night time drop in external temperature, and the increase in water vapour caused by the occupants' breathing.
- Bedroom windows should be opened during the day to allow at least one complete air change.



Kitchens, Laundries

- Close internal doors and keep a window open. Alternatively, install extractor fans or cooker hoods, ventilated to the outside air.

Conservatories

- Consider crossflow ventilation with the use of vents in walls and roofs especially if the conservatory is south facing.
- Trickle ventilation in the wall, eaves and ridge zone can also help.