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INFLUENCE OF MICROCLIMATE ON WINDOWS AND DOORS

Beatrice-Cristina PACEA (ANTON)
Faculty of Product Design and Environment, Transilvania University, Brasov, Romania

Abstract: *Maintaining the needed air temperature is, probably, the most difficult thing while forming the microclimate in the building. Optimal air temperature in various rooms of the building differs from the point of view of persons well-being, economic reasons and functions of the building. Doors and windows, also walls, floor and ceiling (roof) cause the greatest heat losses. Particularly great heat losses are caused by frames of windows of low quality and improper adjustment of glass. That is why you should pay special attention to windows so that maintaining proper temperature in the building does not take a lot of time, nerves and money. Condensation happens when moisture in the air suddenly cools and condenses on a cold window. Although it is difficult to prevent this on the outside of a window, by installing well insulated double glazing window (Low E), condensation problems on the room-side can be greatly reduced.*

Keywords: *window, microclimate, condensation, optimal, super spacer*

1. INTRODUCTION

It is impossible to imagine comfortable and functional housing without particular conditions of air - temperature, humidity and serenity , which influence not only our physiological state and as a result our health, but also physical and hygienic state of the building. There is no need in saying that people (especially children) who live a building with unfavorable humidity and temperature are more subject to illnesses; dirty air immediately makes a person feel unwell, causes sleep disorders and problems with metabolism. Maintaining the needed air temperature is, probably, the most difficult thing while forming the microclimate in the building. Optimal air temperature in various rooms of the building differs from the point of view of persons well-being, economic reasons and functions of the building. Temperature in the living room, study, dining room and nursery should be about 21-24 degrees; in bedroom, kitchen and toilet -20, bathroom - 24 degrees. It is commonly considered that optimal average temperature for a building should be 20 degrees, and the difference between the temperatures in different rooms, to avoid discomfort while going from one room into the other, should not be more than 3 degrees. Air temperatures higher than the norm make a person less stable to diseases. Approximately such temperatures are used while projecting central heating systems in houses. Unfortunately, the saying theory and practice differ describes the real regime of work of heating devices in the conditions of thermal isolation of a particular room in the house or a flat. In most cases designers do not take into consideration the needed difference in heating of

different rooms, depending on their placement according to the parts of the world or wind directions during cold seasons. For calculations they use average scales of heat loses through doors and windows of the building and average temperature of the coldest month. Definitely, they can not forecast personal sensitivity of people to temperatures while projecting impersonal housing.

Heat retention lagging of the building is an important factor, in other words its protection from heat losses. Doors and windows, also walls, floor and ceiling (roof) cause the greatest heat losses. Particularly great heat losses are caused by frames of windows of low quality and improper adjustment of glass. That is why you should pay special attention to windows so that maintaining proper temperature in the building does not take a lot of time, nerves and money. The ways to winterize windows are well-known: putting wool between frames of the window and then sticking paper tape on it, putting special jointing material on the clasps. The first way, ancient one, is more practical but then the window does not look esthetic; the second is not so time-consuming but not always effective: jointing materials can cause defects of window frames, their locks, the glue destroys the paint and does not always sticks firmly the jointing material. The jointing materials themselves are not always stable enough to frost and humidity, that is why the structure of the material, necessary for proper sealing, is quickly ruined. This disadvantage is particularly common for rubber sealers, sometimes after only one cold and humid winter they fall to pieces.

Multiple glazing consists of frames with two (or more) inbuilt glasses, which are connected with a shoulder along the perimeter. The space between the glasses is filled with dry air, which prevents the glass from weeping and formation of condensate. Vacuum multiple glazing is a more modern way of preventing heat losses. There is no air between the glasses at all and that does not let heat exchange between outside and inside glasses. It should be mentioned though that multiple glazing like usual windows has joints on sash, which may need additional sealing. Effectiveness of window sealing also depends on the adjusted of latches and bolts on the window frame. They should close with noticeable but not abnormal effort, because if the frame is pressed to the sash too hard it can cause obliquity and early wear of the sealer.

The temperature in the room is also influenced by the material of walls, floor and ceiling (roof), and by the material and its quality of the outside and inside joinery. [3]

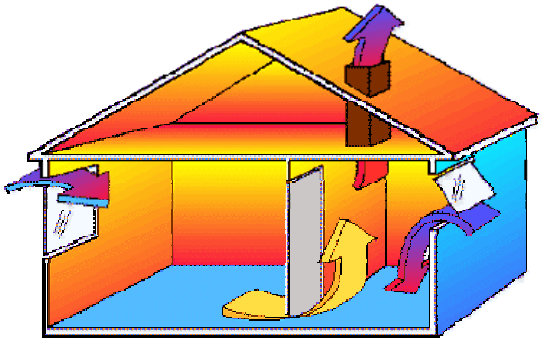

Fig.1.1. Circulation of air in a room

2. CONDENSATION

Condensation happens when moisture in the air suddenly cools and condenses on a cold window. Although it is difficult to prevent this on the outside of a window, by installing well insulated double glazing window (Low E), condensation problems on the room-side can be greatly reduced. As the room facing pane of an insulated double glazing window stays warmer, the air that comes into contact with it does not cool and condense.

There are three main ways to improve thermal insulation, and thus reduce condensation, in a double glazing window :
- By using Low-E glass;
- By upgrading from an aluminium edge spacer to a warm edge spacer bar;
- By substituting a dehydrated air cavity filling with an inert gas, such as argon.

In a properly sealed double glazing window there should be relatively little condensation in the window's inner cavity as dehydrated air and desiccants are used. If there is condensation in the double glazing window's cavity, this is probably due to a seal failure.

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.

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. 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 double glazing window containing an enhanced thermal insulation glass. Windows manufactured using an energy efficient low-emissivity (or low-E) glass actually restricts 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 will reduce the risk of condensation at the edges.

Condensation forms on the outdoor surface of glass when its temperature drops below the outdoor dew point temperature. Again, windows manufactured with a double-glazing window containing energy efficient low-emissivity glass, 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 efficient

thermal insulation glass. 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 double glazing window are actively reducing heat loss through the glass. This form of condensation can be counteracted through the use of a hydrophilic coating such as traditional self-cleaning glass. Traditionally a self-cleaning glass attracts water across the surface in a "sheeting" effect allowing clear vision through glass that is susceptible to external condensation.

The formation of condensation on the inner faces of the double glazing window is an indication that the air or gas cavity is no longer completely sealed. The desiccant will rapidly become saturated and any damp air penetrating via the seal around the perimeter will reduce visibility by forming condensation on faces 2 and 3. The double glazing window must therefore be replaced as this cannot be reversed. This double glazing window must be replaced in accordance with the terms and conditions of the warranty. [1,2,5,6]

3. VINYL WINDOWS - 100% PVC

Our windows are made from an exclusive, 100% PVC powder compound that is entirely lead-free. This special compound gives the system better resistance to impact and discoloration. The windows are maintenance-free and will not crack, blister or warp. These windows have the highest number of internal air chambers, giving them outstanding insulation and sound abatement qualities, as well as thermal efficiency and increased sturdiness. Fusion welding Corners provide attractive appearance & eliminate the need for adhesive and sealants. There are no imperfections on the completely watertight and airtight surface. Internal walls are also welded for increased overall structural strength A choice of maintenancefree PVC jamb extensions, frame moldings and corner blocks are available to enhance inside finishing.

Many of today's energy efficient windows offer glass packages with "Warm Edge Technology". The problem is that highly conductive metalbased insulating glass spacers are often used in these new windows. A new window can lose up to 50% of its overall stated R-value with a metal-based spacer at the edge of the glass. R stands for the "resistance" of the transfer of heat or cold through a solid object. So, a higher R-value means better insulation against heating and cooling loss. The edge of the insulating glass is the most vulnerable to heating and cooling loss. This usually leads to condensation. It's a problem that looks unsightly, and over time, it will stain wood, peel paint and rot frames. Not only that, but window condensation can

contribute to mold growth, a sinister presence hidden from sight deep inside window and wall openings. In fact, visible mold can often be found in poorly insulated or installed windows. Mold is more and more being linked to child asthma plus increases in general respiratory illness, allergies and outbreaks of fungal diseases. [2,4,6]

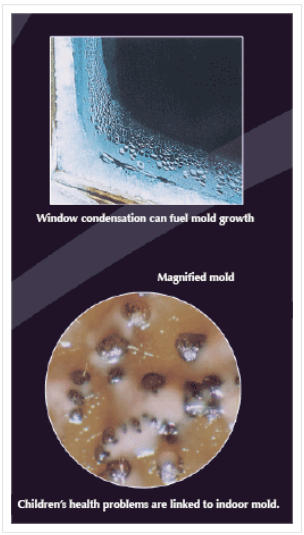

Fig.3.1. Mold effects

4. SOLUTION

Keep moisture off the glass with the warmest inside surface temperatures possible. The primary window condensation culprit is its insulating glass spacer. Traditional metal spacers can conduct heat and cold - causing condensation at the edge of the glass. Convection currents further concentrate cold air along the bottom edge of glass making that area the most vulnerable. Only a warmer edge all the way around will strike at the heart of the problem.

The only edge occurs with super spacer, an insulating foam spacer whose usage helps reduce condensation and allows for comfortable household humidity levels. [5]

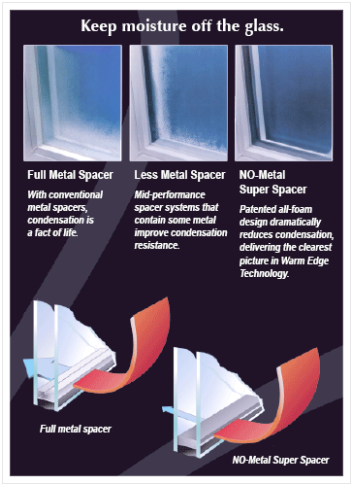

Fig.4.1. Use of super spacer

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