MATERIALS STOCK AND FLOWS: DOUBLE GLAZED WINDOWS

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Introduction

Glazing is an important factor to consider while selecting the type of glass windows to use. Generally, windows play an important role in determining the thermal performance of a given house. This implies that when wrong windows are used, the occupants will feel uncomfortable. This can result into increased or reduced heat entering the house through the windows. The best windows should be in a position to maintain optimum amount of heat even during winter. As a result, even the use of air conditioner will not effectively solve the problem of glazing, especially in hot areas. The right type of glazing offers solution in every scenario. Constructors are advised to use high performance glass windows during the process of building rather that trying to upgrade them later, as this may imply additional cost for the owner.

In order to fully understand the essence and types of glazing, this report will entail comparison between stocks and flows of double glazed windows and single layered regular glass.

Background Information

Today, most residential house windows are made with either double or triple glazing. This is as a result of reduced use of single-glazed windows, as they are considered old fashioned. Most of this type of glazing is now used in garages and in barns. The increased use of double or triple glazing has been associated with the fact that these types of glazing are normally insulated with glazing units (IGU’s). Notably, IGU’s are produced from combination of three layers of glass. Between the layers, there is a spacer that occupies the gap between the layers of glass, as well as sealing it, so that there is no empty space. It is also worth noting that the spacer is gas tight often filled with argon and krypton which rarely escapes, and as a result avoids any moisture from entering. The spacer also takes many forms such as super, Inex, Intercept or
Swiggle spacer (Glassfiles.com 2011). They are also able to regulate the flow of heat than it is the case with the single layer-regular glass.

Single glazing forms a very poor insulator. This necessitates the need to increase the number of panes to improve the insulating qualities of a window. Notably single pane of glass has an R-value of 1 (U-1) while double glazed has an R-value of 2 (U-0.5) which definitely implies that for triple glazing, the value will be 3 which is equivalent to U-0.33. Manufacturers can increase the value for either double or triple glazing through the use of one or two e-coatings, as well as incorporating an inert gas. A low e-coating is a thin almost invisible metallic coating that is done on a glass to reduce the emissivity of the glass (Superspacer.com 2011). The main aim of coating is to lower the U-factor of the glass window. This improves its performance as a thermal insulator. This method is cost effective and saves energy. Low e-coating can either be soft and hard coat. The differences in the two types of coating are to achieve varied formula for low SHGC. However, the U-factor and the SHGC should be in line to satisfy the buyer that they will serve the intended purpose of the window (Allen 2011, p. 156). Nevertheless, low e-coating is only used in the U.S climate and not common in Australia, although, they can be modified to have low U-factor and high SHGC to suit the Southern climate.

Relevance

This study seeks to create awareness on the advantages of using double glazed windows to single-layered regular glass. There are several situations where unsuspecting customers have been lured to buy windows that are not glazed contrary to their wish. This is so because windows are some of the most complex components to choose while building a house. On the same, windows have a much far reaching consequence on energy entering the house. This means that
the number, total area, as well as the orientation of the sun can dictate the type of window glasses that one should use for effectiveness and comfort (Southwall.com 2011).

To the majority, window frames only allow the window to close and open. However, they have additional purpose in terms of thermal performance. In addition, the type of frame used will determine the life cycle of the window (Warmedge.com 2011). Glazing, the frame and spacer are vital elements in the performance of the window. They play an important role in thermal regulation. Therefore, this paper seeks to explore the relevance of glazing, performance of the frame, as well as spacer, especially in both double glazed.

Factors to Consider While Evaluating Window’s Performance

There are three important factors that should be considered when evaluating the performance of a glass window. They include; U-factor, Solar Heat-Gain Coefficient (SHGC) and Visual Transmittance (VT). Normally, the U-factor measures the rate at which the heat flows. It is said that a low U-factor is best in all climates than a high U-factor. On the other hand, SHGC measures the amount of heat entering a building through the window in conditions when the sun is shining. However, there is no simple rule that guides one to knowing the amount of heat entering through the window. It, therefore, follows that in places where the climate is sunny, one will definitely prefer windows with low SHGC.

On the contrary, when in cold climate, where the heating bills are high, one will go for windows with high SHGC. In conditions where the sun is moderate, one will chose windows that will favor both forms of climate (Allen 2011, p. 156). This means that windows should be able to orient according to the changes in the sunshine. The positioning of the windows also matters a lot in determining the amount of sunshine that enters the house. For example, for the south facing windows, they should have high SHGC glazing, while in the north ones they should have low
SGHC glazing (Sup spacer.com 2011). Visual Transmittance (VT) is another factor to consider while choosing the type of glazing. VT refers to the fraction of visible light that passes through a window glass. The higher the fraction, the higher the amount of visible light energy will be entering the room. VT can be maximized through combining the U-factor and SHGC. Therefore, VT, SGHC and U-factor are important properties that help in evaluation of the performance of a glass window.

Differences between Double Glazed and Single Regular Glass Windows

One major difference between the double glazed windows and single regular glazed window is that double glazed windows have both argon and krypton gases, while single glazed windows contain only air. These gases improve the performance of these types of windows.

Secondly, double glazed windows have a space between the two planes of glass which is filled with gases, unlike in case of single glazed windows that are made of one layer of glass, thus, hard to leave a space between. The space between the glass layers is occupied by gases. For argon, it occupies 1/2 of inch while Krypton occupies 3/8 of an inch.

Development of Double Glazed Windows

Double glazing is made up of two glasses which have been spaced apart. They are then sealed to form a single glazed unit. There is air between the two glass panes. They are made of IGU glass, whose main role is to enhance the thermal performance of glass in its architectural use. When two panes of glass are placed on each other with space between them, they result in what is called double glazing units. In other instances, there are triple glazings that are much preferred in extremely cold climates (Warmedge.com 2011). In case of double or triple glazing, the air between the layers of the glass acts as the insulating material. Thus, inert gases, such as argon or Krypton are used to fill these spaces, as they also have the insulating qualities.
However, there are instances where the IGU glass is made of insulated glass that in itself acts as the insulating material to serve the purpose of thermal insulation.

Although the space between the two glasses is filled with gases, there is a spacer that contains the desiccant meant to prevent condensation, as well as improve the rate of insulation. This raises the performance of the entire window based on its properties. Basically, desiccant is a hygroscopic substance that has capacity to induce and at the same time sustain dryness (Allen 2011, p. 156). This is achieved through the removal of air from the region, leaving a vacuum area. Consecutively, this reduces the amount of heat being transferred through the process of convection and conduction (Glassfiles.com 2011). This method is popularly known as evacuated glazing. Sometimes, the gap between the glazed sheets determines the amount of heat being transferred. Moreover, the insulating qualities of the material placed between the glazed glasses determines to what extent the heat is likely to be transferred (Southwall.com 2011). It is recommended that the air gap between the glazed sheets should be 8mm to 22 mm thick. As earlier stated, the thickness between the glazed sheets has a significant impact on the insulating properties of the final product.

Performance Requirements of Double Glazed Windows

There are number of performance requirements that define the double glazed windows which are not the case in the single glazed windows. Some of these requirements include the following: firstly, thermal insulation, which serves the main purpose of IGUs, involves the reduction of thermal heat which enters the house from the outside. It is true to argue that the performance of thermal insulation depends on the dryness of the air placed inside the IGUs, as well as the quality of the seal used. This is simply because of the fact that IGU works on the principle of thermal reduction through conduction and convection (Warmedge.com 2011). Thus,
the amount of heat transferred through the unit is determined by the IGU used and its composition. Scientifically, dry air is a poor conduction of heat. On the same, the air gap established between the glasses, which follows that before the conducted reaches the second glass, is reduced significantly.

The second performance requirement of double glazed windows which is also different with single gazed windows is the structural strength of the IGUs used. This is because IGUs are structurally made strong. When an IGU of 2m by 1m is used, its resultant weight is approximately 60kg. Moreover, in some building applications, IGU is used as one of the structural members to support the building (Warmedge.com 2011). Therefore, it is advisable that the strength of IGU should be maintained at all times. The quality is maintained through the use of primary spacers, number of joints and type of spacers used as well as the use of high quality and adequate quantity of the secondary sealant.

The last performance quality of double glazed windows is its fogging IGUs. These types of IGU are used because they provide better protection against any form of fog in comparison with the single pane glass. Nevertheless, when IGU is not made of the right quality control, desiccant fillings, insufficient quantities, as well as thermal heat seal, the structure will still be prone to fogging, just as it is the case with the single glazed windows.

Factors to Consider While Developing Double Glazed Windows

Firstly, the use of the correct quantity and type of desiccant, as it is responsible for absorbing moisture and maintaining the air inside the IGU dry. Therefore, the right type and quantity of desiccant will determine the effectiveness of the glass, something that glass processors should put into consideration while developing the double glazed windows.
Secondly, the type and quality of the desiccant should be appropriate. This helps to minimize a condition where the drying agent may come into contact with the air during the process of filling it in the spacer. If such a condition happens, then, the moisture absorbed will result into reduced performance of the drying agent. Thirdly, the spacer should not have jointed to ensure it is strong. As a result, this increases the performance of the glass window. Indeed, when the corner joints are used in spacers, it results into reduced structural performance of the IGU.

The fourth factor to consider is the environment to which the IGUs are being made. It is recommendable that IGU should be made in enclosed and conditioned environment, preferably at humidity of less than 62% and at a temperature of less than 24 C. This is important as it helps to reduce excess moisture that could be absorbed by the IGU as it is being produced. It also significantly reduces chances of moisture entering into the units (Beckett & Godfrey 1974, p.25).

The quality of the secondary sealant is another factor to consider. Normally, the rigidity of the structure is determined by the secondary sealant and the spacer. The amount of the secondary sealant used is determined by the gap between the spacer and the glass panes (Warmedge.com 2011). This follows that the space should be appropriate in order to fit the correct amount of insulated glass. On the same, the equipments to make IGU should be in line with the manufacturing requirements. When an IGU is made manually, it will not perform effectively for the required lifecycle (Allen 2011, p. 156). The spacer thickness should also be appropriate. It should be in accordance with the local requirements. In addition, it should be per the customer expectations. The common thickness of spacer includes 6, 8, 10, 12, 15, 18 and 24 mm.

Factors to Consider While Choosing Windows
It may be difficult for one to specify the appropriate type of glazing. However, there are important principles which can guide one while choosing the type of glazing. First of all, it is worth noting that irrespective of the type of climate, low U-factor is more appropriate than high U-factor (Southwall.com 2011). Therefore, one should consider the U-factor and ensure that it is low. This implies that one should use double glazed windows. Some builders opt for improving the performance of U-factor by the use of triple glazed windows.

It is also important to note that different windows will require different walls. Orientation of the window is also an important factor to consider, just as it is the case with the climate of the region. For instance, designers suggest that South facing windows need high glazing, while West-facing windows should have low solar glazing. The SHGC of North windows does not matter a lot when it entails the orientation. For the East windows, climate plays a major role in determining the nature of glazing to be used. Thus, windows are used depending on whether it is cold or warm.

When low SHGC window is chosen for warmer areas particularly in the East and the West windows, the air-conditioning in the room will be lowered. This follows that high solar gain glass should be used in warm regions to favor the air-conditioning in the room. On the other hand, cold climate builders should use insulated glazing that has warm edged spacers. As stated earlier, glazing helps in maintaining the distance between the glass panes, as well as provides the edge seal. It is also advisable that aluminum spacers should not be used as they have weak thermal link. Instead, bayform, Edgetech, super spacer, PPG should be used as they are more technologically advanced. In general, an individual who is wishing to order windows, should be able to verify the type of glazing spacer used (Allen 2011, p. 156). This can be done by consulting the representative of the manufacturing company or the glazing supplier.
Conclusion

From the above analysis, it is evident that the double glazed windows are suitable in any type of climate in comparison with single-layered regular glass. Indeed, single regular glass is nowadays rarely used in windows, as it does not effectively serve the intended purpose of regulating heat in the house. On the contrary, double glazed windows are mostly preferred in most cases, not only due to its ability to maintain the optimum heating into the house but also to absorb heat. This is achieved through placing of spacer that contains inert gases that absorb moisture. Any user should also understand some of the important factors to consider before buying any glass window, as it may turn out to be ineffective according to the intended purpose.
Reference List


Edgetech, IG, Does the spacer really matter? Superspacer.com.


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