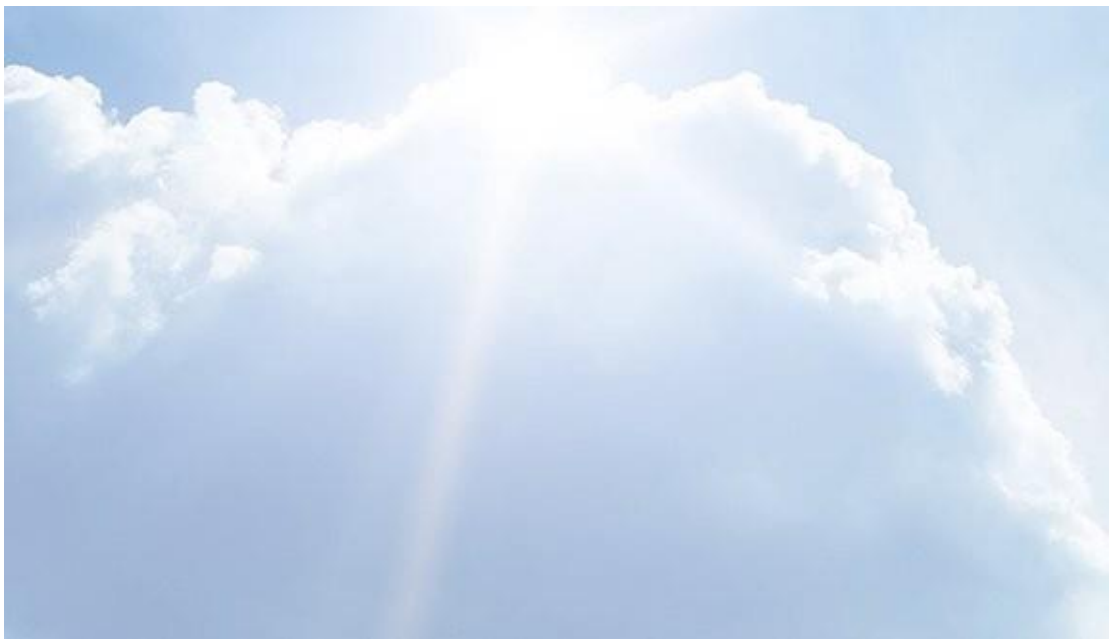
The Building Envelope Authority

LIGHT TRANSMISSION – FIVE FACTORS YOU SHOULD CONSIDER



Rooflights can provide up to three times more light than vertical glazing and can provide more even and useable distribution of natural light into a building, particularly in large structures where light is required deep into the building or in enclosed areas that cannot be lit through an external wall.

But it is not just as simple as installing some rooflights and the job is done. There are some important factors to consider for an effective daylighting plan.

1 Direct Light v's Diffused Light

Direct Light

Light that enters a building through transparent materials, such as glass and polycarbonate, provides a strong and direct light path that can create high localised levels of illumination and provide clear vision to the outside of the building, but in periods of strong sunlight it can create strong contrasts between light and dark, producing undesirable shadows and glare.

Diffused Light

Light 'spreads out' as it passes through translucent diffusing materials such as GRP. This makes more efficient use of the available light by spreading it over a far greater area, significantly reducing the difference between light and shade, minimising shadows thereby creating a more consistently, evenly lit space.

2 Levels of light transmission

Different rooflight and insulant materials provide very different levels of light transmission, and it is important that all elements of the rooflight assembly are taken into consideration, particularly with 'multiple layer' rooflights for improved insulation. Even transparent elements like glass or polycarbonate can suffer from significant reflectance light losses.

Remember the problems with the 'Walkie Talkie' building in London? The more 'plane elements' in a rooflight assembly, no matter how transparent that element, the greater this reflectance loss can be. So, whilst multi-walled polycarbonate insulation will improve the thermal performance of a rooflight, it will also reflect away more of the daylight, reducing the effectiveness of that rooflight.

Critically, many building owners ignore the financial value of scheduled maintenance; cleaning the rooflights regularly will ensure that dirt retention does not reduce light transmission. Too many people grasp the importance of this simple rule too late.

3 Intended building use

Where possible, designers need to consider the intended building use and possible future changes to the use or internal layout of the building.

Windows and wall lights become ineffective at distances over 6m into the building and daylighting through rooflights becomes the most effective method. When they're combined with an efficient automated light control system, those efficiencies can be optimised for the best possible lighting energy consumption reductions and the savings that go with them.

4 Energy saving

In newer buildings, excellent thermal performance is now being achieved. This means that some of the most significant savings in operational energy can be gained by using the free resource of natural daylight. Anything that minimises the need to switch on internal artificial lighting, however efficient that internal lighting may be, can only be a good thing.

In newer, well insulated buildings, the lighting cost per unit can be as much as FOUR TIMES the heating cost losses, making free, natural daylighting a simple, cost effective way to save on fossil fuel usage and building running costs.

5 G-Value (Solar Gain)

But this is not to say that the ideal scenario is to simply bring as much daylight into the building as possible. There has to be a limit. For any building, there is an optimum light level which will give optimum energy savings and daylighting benefits.

This formed part of a study conducted by DeMontfort University, which concluded that the optimum rooflight percentage can typically be as much as 18% – 20%.

Beyond that point, the heat – or total solar gain – which naturally accompanies daylight into a building can begin to create overheating problems without an adequate ventilation strategy. This is a key reason for the need to understand the relationship between light transmission and g-value.

Building designers often specify a rooflight with a high light transmission, but with a low g-value, not realising that the two are inextricably linked. It is not possible, at least with standard polycarbonate or GRP rooflights, to have high light transmission with low g-value, since the majority of transmitted heat is mainly at the visible range of the solar spectrum.

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