Hambleside Danelaw
Rooflights

TECHNICAL MANUAL
Sound Transmission

ZENON

LOW CARBON DAYLIGHT SOLUTIONS

ISSUE 2

Sound transmission

Acoustic or sound transmission considerations in building design cover the methods by which sound can be transferred from one part of a building to another, or from inside to out and vice versa. Sound transfer can be created by air pressure waves which induce vibration on one side of a building element causing the other face of the element to also vibrate, transmitting the sound.

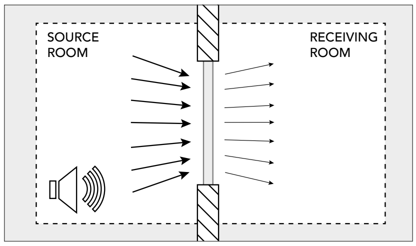
The interest in building acoustic performance has seen an increase in recent times, and particularly in respect of amendments to Building Regulations and Part E. Because this has been driven mainly by the requirements for improved sound proofing between dwellings and residential spaces, the regulations focus on reducing the sound transmission through walls and floors. There are no specific requirements for roofs or rooflights.

Part E4 covers the requirements for schools. Compliance is considered to be achieved if the values for sound insulation, reverberation time and ambient noise, given in Building Bulletin 93 'Acoustic design of schools: performance standards', are met.

Sound transmission testing

Hambleside Danelaw have carried out independent laboratory testing of airborne sound transmission through in-plane glass reinforced polyester (GRP) rooflight panels in accordance with BS EN ISO 140-3:1995, BS 2750-3:1995.

The airborne sound transmission through the rooflight panel samples was determined by measuring the corrected difference in sound pressure between two reverberant rooms, the 'source room' and the 'receiving room'. Noise levels over a wide range of frequencies were originated in the source room and then measured on both sides of the sample. From these measurements the Sound Reduction Index can be calculated. This kind of laboratory testing is the only method that can measure the performance of a construction element accurately. Once materials are installed and in use in a building, other areas and attributes of the building can influence the actual sound transmission performance and create false results.



Typical arrangement for airborne sound transmission testing

As different frequencies may be transmitted at different levels depending upon the type of construction and materials used, a standard procedure is used to determine a single decibel (dB) number to rate the effectiveness of the overall sound transmission reduction of the material or assembly. This is known as the Weighted Sound Reduction Index or Rw value. Increasing the Rw by 1 equates to a reduction of approximately 1dB in noise level transmission; the higher the Rw number, the better a sound insulator it will be.

Insulated rooflights

Improving the sound insulation performance of rooflights by introducing materials into the cavity is relatively difficult to achieve given that the primary purpose of the rooflight is to permit light entry into a building. Sound attenuating materials, by their very nature, tend to be higher in density and invariably, introducing these into rooflight cavities will restrict light transmission.

For reasons of cost and practicality, the simplest and most widely adopted insulation method for rooflights is the inclusion of multiple layers of materials with high transparency within the cavity. This approach is reasonably effective for uses where only moderately improved U-values are required. A common technique would be to use multi-wall or structured polycarbonate sheet, but for each layer that is added, there is a penalty in terms of light transmission due to the cumulative effect of the reflectance of light at each and every layer.

A further issue associated with this method is that, although increasing the number of layers - and therefore the mass of material in the rooflight - does improve the sound reduction, the increased mass within the rooflight cavity absorbs more heat energy. This heat energy is subsequently re-radiated into the building from the rooflight as a secondary component of solar gain.

Air tightness is another important sound transmission control technique. However, this is relatively easy to achieve for in-plane rooflights used in metal cladding systems and needs no further comment within this section.

Zenon Insulator

To overcome the problem of achieving environmentally friendly, low U-value rooflights without significantly compromising the light transmission, Zenon Insulator was developed to provide much improved U-values without the penalties of creating multiple layers within the rooflight. This is achieved by trapping and containing air in small pockets within the rooflight cavity, which significantly improves the thermal performance of the rooflight. Reduction in the levels of sound transmitted through the rooflights can be achieved using Hambleside Danelaw's unique Zenon Insulator core.

An additional benefit of Insulator is that it gives a significantly lower level of embodied carbon than the polycarbonate alternatives.

Factory Assembled Insulated Rooflight (FAIR) using Zenon Insulator 80 insulation layer core

Sound transmission values

Tested rooflight assemblies	Rw value (dB)
Zenon Pro 24 outer, Pro 18 liner, triple skin GRP	24
Zenon Pro 24 outer, Pro 18 liner, Insulator 20 core	23
Zenon Pro 24 outer, Pro 18 liner, Insulator 80 core	26
Zenon Evolution LC2 outer, Pro 18 liner, Insulator 80 core	28

Source: Physical testing by Sound Research Laboratories

Zenon, a comprehensive range of low carbon rooflights for the metal building envelope from Hambleside Danelaw

Hambleside Danelaw
Rooflights

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