AUSTRALIAN
GLASS &
WINDOW
ASSOCIATION

TECHNICAL FACT SHEET: ACOUSTICS IN GLASS AND GLAZING

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Introduction

This fact sheet focusses on glass and glazing and looks at the different configurations available as a means to reducing sound transmission.

Sound is relative and people can perceive sound differently as sound is measured over a range (termed frequency and measured in hertz – Hz).

Unwanted sound in respect to the built environment can be considered to be a nuisance and we therefore seek methods to reduce the impact of these unwanted sound(s).

Unwanted sound can be reduced by the careful selection of building materials including glass.

Terms for sound reduction

dB—This is a measure of sound level compared to reference level of 0dB.

STC—Sound Transmission Class is a rating (ASTM E 413) of how well sound travels through a building partition.

OITC—Outdoor Indoor Transmission Class (ASTM E 132) is a standard used to indicate the rate of transmission of sound between outdoor and indoor spaces and usually related more to lower frequencies.

Rw—A weighted reduction in sound intensity compared to a standard (ISO 717).

The dB scale correlates the range of sound (which is actually a pressure) from 20 micro Pascals to 20 Pascals and 100 – 4000 Hz.

The dB scale is a logarithmic one so a dB of 40 is 10 x 20dB and a dB60 is 100 x 20dB. Our scale is 0 dB = 20 micro pascals and 140dB = 20 pascals. 140dB is the threshold of pain. Most people can only hear a difference of 3dB.

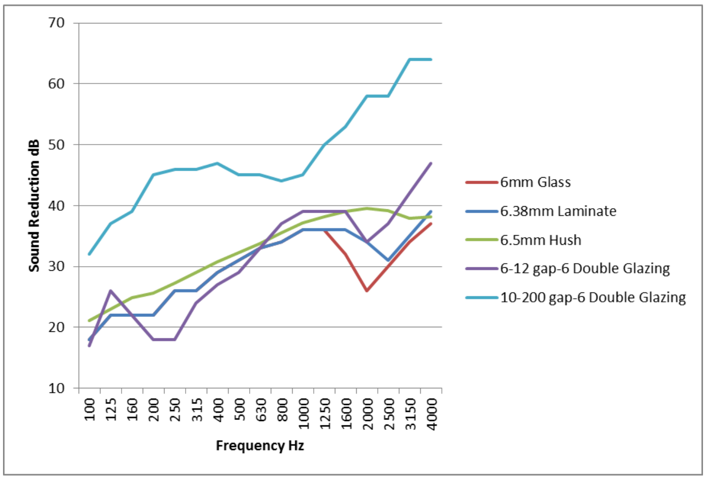
To be able to determine with some degree of accuracy how glass or glazing will reduce sound, it needs to be tested in a sound laboratory.

We are now able to consider the variations in sound reduction for our glazing materials as well as ensure we understand what a difference in dB means (because of using a log scale). If we have a 10dB reduction, that represents a 50% noise reduction. If we have a 20dB reduction then the noise is reduced by 75%.

Another aspect to consider is if the frequency of a sound source doubles, the acoustical insulation needs to increase by 6dB. For higher frequency noise we consider the use of interlayers to dampen the higher frequencies. If the mass of a wall is doubled, the acoustical insulation increases by 6dB and this is good for low frequency noise.

Monolithic glass

Figure 1 shows both the effect of glass thickness where the coincident frequency moves to the lower frequencies. It is still not as good a reduction as other glazing options.

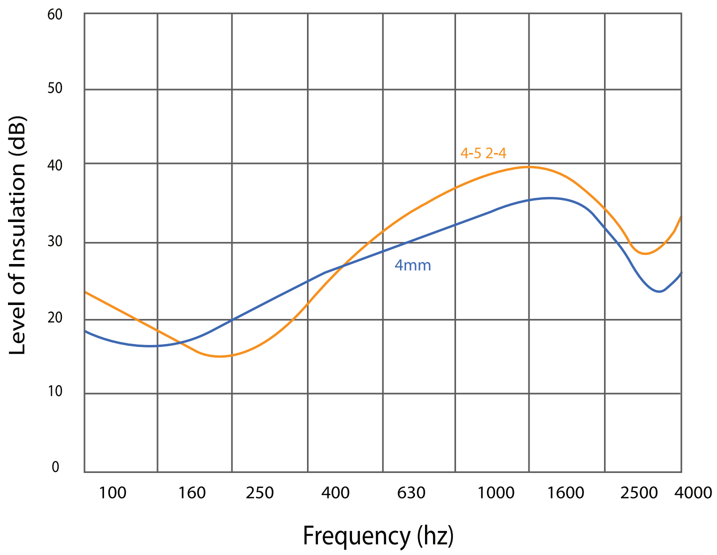


Monolithic vs Double Glazing

We can then move to evaluating mono-lithic glass and double glazing to understand the differences. The example in Figure 2 is a 4mm float and a 4-12-4 double glazed unit.

We can see the coincident dip for both examples at the higher frequency end but also a dip for the double glazed unit at the lower frequency. The coincident dip is the frequency at which the glass resonates and the outcome from a sound transmission perspective is that the 4 mm float has an Rw = 32, whilst the double glazed unit has an Rw = 30.

The way to mitigate this is to use asymmetrical glass thickness and as a general rule of thumb you need at least a 2mm difference in thickness for the two lites.



Monolithic vs Laminated Glass

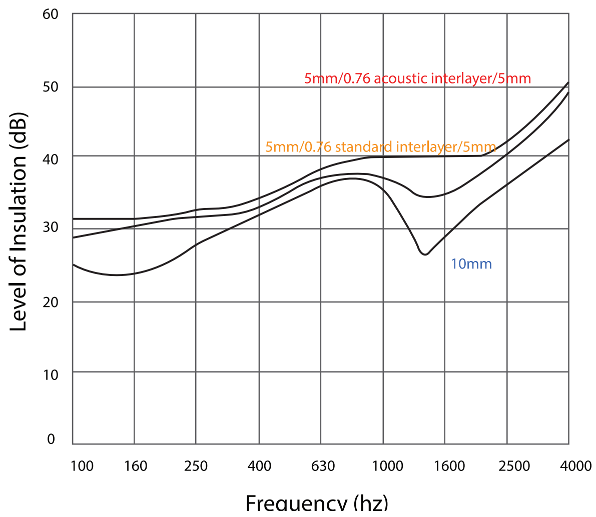
The next evaluation is between monolithic glass and laminated glass in order to understand how laminated glass can contribute to improved sound dampening.

Figure 3 shows the difference between 10mm glass and two types of 10mm laminates (as 10.76).

The first laminate incorporates a standard interlayer (10.76), whereas the second laminate incorporates an acoustic interlayer.

The effect is to dampen the sound at the higher frequency range. This is a positive contribution to the overall rating of the three different configurations and this gives results of Rw from 35 to 36 to 38.

Figure 3 Monolithic vs Laminated Glass



Double Glazing vs Double Glazing With Laminated Components

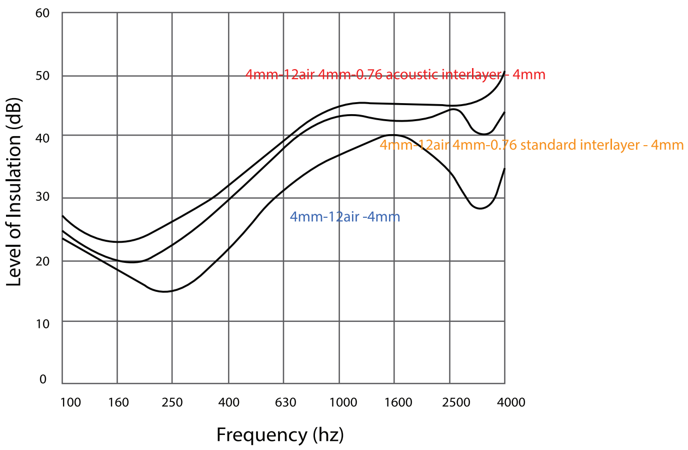
The final comparison in this summary is the differences between double glazing and double glazing with laminated components.

Again we see improving sound reduction effectiveness at the higher frequency range, as well as lower frequency range, from the combination in increase mass (more glass) and addition of a standard 0.76 clear inter-layer and then the use of a 0.76 acoustic trilayer interlayer.

Again the interlayer assists with the sound dampening at the higher frequencies and takes account of the co-incident frequency of the double glazed unit. This is also the case with the dip at the lower frequency area where glass resonates, as the two lites used are the same thickness. A more elegant solution is to use lites of different thicknesses. The Rw numbers will range from Rw of 38 to 40 and Rw 42.

Figure 4

Double Glazing vs Double Glazing with Laminated components



The information provided in this document is done so in good faith and for information purposes only and does not purport to be a guarantee of glass or glazing performance. There is no express or implied guarantee or warranty on the numbers shown in the document or that these numbers will be achieved in actual application. For any determination of acoustic performance please consult an Acoustics Engineer.

The AGWA thanks Eastman Chemical Co. for use of information regarding their performance interlayers.

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