Acoustic Technical Information

As a general rule, increasing mass will improve sound insulation. Brick and concrete walls have stronger sound insulating values because they are of greater mass when compared to glass. But because we need glass to see through, to provide natural daylight and to enhance a buildings look and appeal, the need for greater sound control when using glass becomes more important.

Sound originates from something that vibrates which generates changes in air pressure. Frequency is used to refer to the number of vibrations or changes in air pressure per second. The value given is usually expressed as hertz (Hz) (i.e. 750Hz). Different sounds produce different frequencies. Traffic noise as an example, produces sounds most intensely in the lower frequency range. The intensity or volume of a sound is of most concern to people. The volume of a sound is rated as Decibels or 'dB'.

Where there is a noise problem to solve, three areas have to examined:

1. Determine and/or measure the external noise;
2. Sound insulation rating of the window system/glazing and;
3. The resultant noise level in the room.

Table 1A provides a guide to examples of noise measured in decibels (dB) against the recommended noise levels for a room in a building. Table 1B shows the sound reduction values expressed as Rw (dB) of many different types of glass, including float, laminated, Acousta™ Laminated and IGU's. Having determined the noise source level rating and the desired internal noise level for a given room, the next step is to find a glass product from Table 1B which meets or exceeds the recommended interior noise level.

FOR EXAMPLE:

- Noise source level – Busy traffic 75dB
- Bed Room recommended noise level – 40dB

75dB – 40dB = 35dB rating required for window/glazing system

- From Table 1B select 6.5mm Acousta™

Rw - SOUND REDUCTION INDEX

Table 1B data is measured as a single-number (dB) sound reduction rating called Rw. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.

GLASS ONLY VALUES

Sound reduction Rw data shown are for glass only test values. Adding a frame typically reduces the performance by 3 or more Rw (dB) points. Most window system suppliers have total system (frame and glass) tested values.

TABLE 1A:

Noise source levels	dB
Threshold of hearing	0
Conversational speech	65
Average traffic (kerbside)	70
Busy traffic	75
Loud traffic	80
Live band (20 metres)	105
Recommended interior noise levels	**dB**
Bedroom	30-40
Classroom	35-40
Living room	40-45
Private office	40-45
Open office	45-50

DID YOU KNOW?

- Sound reduction will improve with increased glass thickness due to the greater mass involved;
- Sound reduction will decrease somewhat with increasingly larger glass areas but not enough to make much difference in the majority of architectural glass sizes;
- Sound reduction will improve with the use of Acousta™ laminated glass due to the vibration dampening effect of the interlayer. It's particularly effective for interior partitions as it reduces the 'coincidence dip' attributed to monolithic glass in the 1000–3000Hz range, a range attributed to the human voice;
- Structural or sometimes referred to as 'stiff' interlayers including DG41 and SGP do not perform as well as PVB or Acoustic layers;
- Sound reduction will improve with the use of glass/ airspace combinations, but the performance is critically dependent upon the width of the airspace. An airspace of 100mm is generally regarded as a minimum for reasonable benefits at medium to high frequencies.

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TABLE 1B: GLASS SOUND REDUCTION RATINGS Rw (dB)

Float mm	Rw (dB)
3 , 4	30
5 , 6	31
8	34
10	35
12	37
19	39
Duo Plus™ IGU with Float mm	**Rw (dB)**
4/12/4	32
5/12/5	33
6/12/6	34
Single Laminated PVB mm	**Rw (dB)**
6.38	32
6.76	33
8.38	34
8.76 , 9.52 , 10.38	35
11.52 , 12.38	36
12.76 , 13.52	37
16.76 , 17.52	39
20.76	40
Duo Plus™ IGU with Laminated PVB mm	**Rw (dB)**
6/12/6.38	36
6/12/8.38	40
Single Laminated Acousta™ mm	**Rw (dB)**
6.5	35
8.5	37
10.5	38
12.5	40
16.76	41
20.76	42

Duo Plus™ IGU with Laminated Acousta™ mm	Rw (dB)
6/12/6.76	41
6/12/8.76	41
6/12/10.76	42
6/12/12.76	43
6/12/13.52	44
8/12/6.5	42
8/12/8.5	44
8/12/12.5	46
8/20/8.5	46
8/20/12.5	47
10/12/6.5	42
10/12/8.5	44
10/12/12.5	46
10/20/10.76	46
Duo Plus™ IGU with 2 Laminated Acousta™ panels mm	**Rw (dB)**
6.5/12/6.76	42
6.76/12/6.76	43
6.76/18/6.76	44
6.76/12/16.76	47
12.76/20/8.76	49

NOTES:

- All values shown are glass only. Check with your framing system supplier for total window values.
- The higher the Rw value the better the acoustic performance.
- As a guide when frames are included, the Rw values shown will decline. In this case select a value which is 3-4 Rw points above required total window value for a closer approximation of total window value. Consult with your framing supplier for further advice.
- Stock sheets of clear Acousta 6 to 12 use 0.50mm thick QS sound reduction interlayer.
- Custom laminated panels use a 0.76mm thick QS sound reduction interlayer.

Acoustic Technical Information

THE HUMAN EAR

- Under typical field conditions the ear cannot detect a change of 1–2dB;
- The ear will not pick up a change of 3dB if there is a time lapse between the two sounds and they are of moderate or low intensity;
- A change of 5–7dB can always be detected;
- For every 10dB increase/decrease in intensity we perceive the sound as being a doubling/halving of the noise level.

TABLE 1C: PERCEIVED NOISE REDUCTION

Sound pressure level (dB) reduction	Perceived Noise Reduction	
1	Cannot be heard	
3	18%	Just audible
6	34%	Clearly audible
10	50%	Noise reduced by half
20	75%	Noise reduced by 3/4
30	87%	-
42	95%	-
51	97%	-
54	98%	-

IGU VS SINGLE ACOUSTA™ LAMINATED

A common misconception is that standard IGU's are better at noise reduction. This is not always the case. Where IGU's are not specifically required, single Acousta™ laminated glass is better than standard float IGU's. If IGU's are required, the better option is to include an Acousta™ laminated panel. Depending on product selection, noise levels can be reduced by half when compared to the base example of single 4mm thick float glass. Table 1D compares the perceived noise reduction between 4mm glass with other products.

TABLE 1D: PERCEIVED NOISE REDUCTION COMPARISONS

Type	dB Reduction Rw	Perceived Noise Reduction
4mm float	30	-
5mm float	31	Cannot be heard
4mm float/12mm/4mm float IGU	32	Cannot be heard
5mm float/12mm/5mm float IGU	33	Just audible
6.5mm Acousta™	35	Clearly audible
12.5mm Acousta™	40	Noise reduced by half
6mm/12mm/6.76mm Acousta™ IGU	41	Noise reduced by half

Ctr VALUES

The Rw is a simplified average rating across all frequencies. However noise produces different intensities at different frequencies. In certain situations, the Rw does not account for all noises generated. This is especially the case for low frequency noises such as traffic rumble or hi-fi system bass sounds. The Ctr value adjusts for these low frequency noises (Rw + Ctr) and is always a negative number. Smaller negatives are better than larger negative values.

COINCIDENCE DIP

This occurs where the panel vibrates in unison with the frequency of the sound. The result is that the sound insulation values of the glass panel are reduced at that specific frequency. The frequency at which the 'dip' occurs varies with the thickness and the stiffness of the glass. The thicker and stiffer the glass, the lower the frequency at which the 'dip' occurs. Where specific frequencies are targeted for noise reduction, an analysis of where the frequency 'dip' occurs for the glass type under consideration is important.

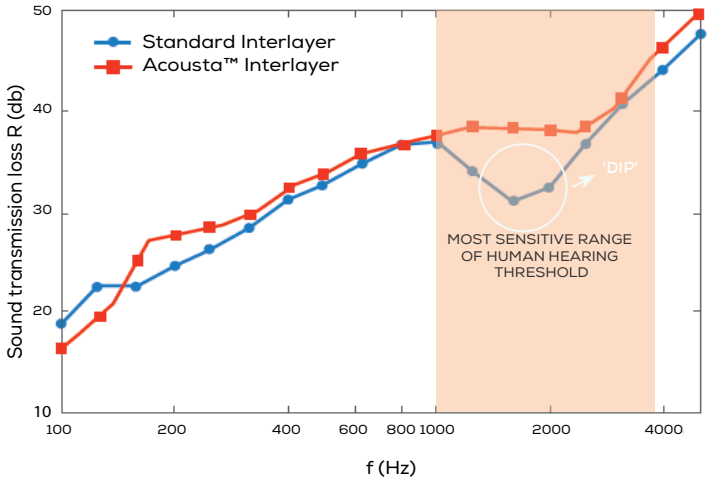
PRODUCT SELECTION

ACOUSTA™ LAMINATED

Acousta™ is a Grade A safety glass that uses a specially developed interlayer which dampens noise more effectively than ordinary single glass. Utilising an advanced, three layer system designed to decouple and disseminate sound waves for superior sound damping performance. This patented system targets sounds in the 1000 – 3000 Hz range which is the "most sensitive range of human hearing" that allows the most irritating of sounds to penetrate windows.

Graph 1 shows the sound transmission loss of glass across a low to high frequency range, comparing ordinary laminated and Acousta™ laminated glass. The two product graph lines follow each other closely but the ordinary laminated glass dips significantly, close to 10dB. This 'dip' means more noise is let through at these frequencies whereas the Acousta™ continues to perform. A 10dB increase in sound is perceived as a doubling of the sound level to the human ear. The frequencies at which the 'dip' occur are at the most sensitive range of human hearing.

GRAPH 1: SOUND TRANSMISSION LOSS - COINCIDENCE DIP



Sound Transmission Loss of Laminated Glass with Saflex Q series acoustic interlayer and Saflex R series interlayer. Configuration 8mm Laminated.