16 noise control

Glass is just one component in the window and door system. Suppliers of these complete products should have accredited testing to determine noise reduction ratings for the complete window assembly, not just glass!

noise

The definition of **noise** is 'an unpleasant, disturbing or unwanted sound'. Noise sources vary greatly from traffic noise to busy office environments. Noise is a form of pollution which can impact adversely on people's mental and physical health.

sound insulation

This section provides an introductory guide to control of noise using glass. It is important to note that laboratory sound reduction results as shown, may differ from actual site conditions and results. Careful consideration should also be given to the frequency and intensity of the sound, framing types and construction, window surrounding/building material construction and any specialised acoustic requirements.

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 **Loudness** of a sound is of most concern to people. The loudness of a sound is rated as **Decibels** or 'dB'.

Tables 16a and **16b** list general sound information and sound reduction information using glass. When referring to these tables, the following points should be considered:

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.

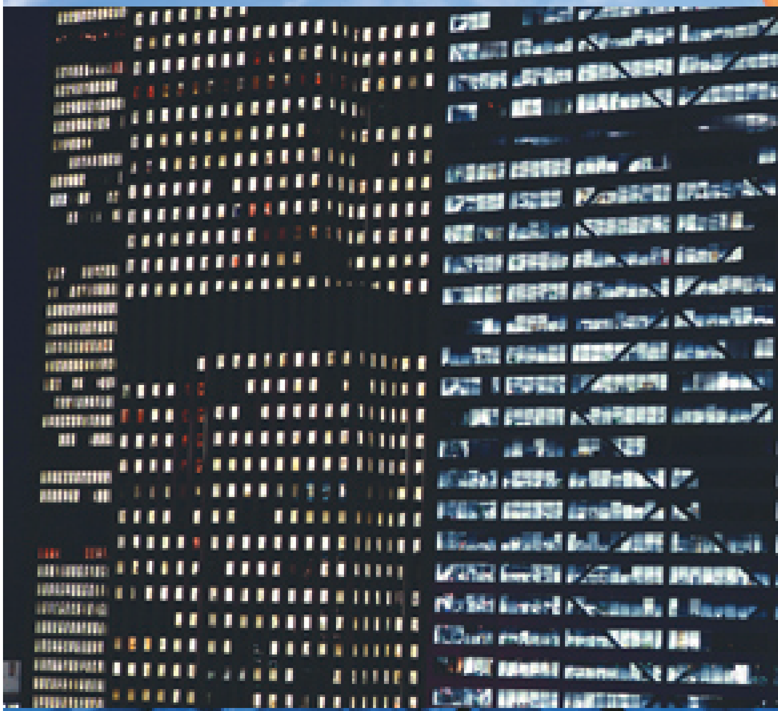
general sound information

table 16a: sound pressure level

Noise level (dB)	Example of Noise
110	Nearby riveter
90	Noisy factory/loud street noise
70	Average street noise
60	Average office noise
50	Average conversation
40	Quiet radio/private office
30	Average auditorium

table 16b: noise reduction compared to 3mm float (in STL)

Glass thickness (mm)	Reduction (dB)
6.0	3 – Barely noticeable
6.38	5 – Clearly noticeable
6.76	7 – Clearly noticeable
10.38	11 – Halving of original noise



sound reduction ratings

There are two fundamental considerations that come into play when measuring the reduction of sound through windows and selecting a glass for sound insulation:

- **Sound Transmission Loss** (STL) – indicates the effectiveness of a window or wall in reducing exterior sounds. In determining the ability of a window or wall in reducing outdoor sounds such as traffic noises, engineers usually figure STL in the frequency ranges of 100–3150Hz (UK) or 125–4000Hz (USA). The STL is measured in decibels (dB) and thus the greater the STL value the better the glazing is for reducing sound;
- **Sound Transmission Class** (STC) – indicates the reduction of sound provided by an interior wall. This rating applies to interior partitions, walls, ceilings and floors, but not to exterior walls. In terms of glass this means office partitions, viewing windows for radio/TV stations and similar applications. The STC value is a number rating that is designed to correlate the effectiveness of sound insulation of elements against sounds normally sourced inside buildings (i.e. speech, typewriters).

Before exploring the sound reduction capabilities of glass it is important to establish the fact that the best sound reducing glass cannot do its job if air leaks or cracks allow sound to travel around the glass.

Acknowledgement: Text adapted from "Glass – The 'See Through' Barrier" by P.R. Shaw, Glass Digest Magazine, Issue Nov 15, 1982.

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 laminated glass due to the vibration dampening effect of the PVB interlayer. Laminated glass is particularly effective for interior partitions as it reduces the 'coincidence dip' attributed to monolithic glass in the 1000–2000Hz range, a range attributed to the human voice. The optimum PVB interlayer thickness for sound reducing laminated glass is 1.14mm but 0.38mm will generally suffice. Multi-laminates combine the mass effect of solid glass with the dampening effect of the interlayer for superior sound reduction;
- **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. The optimum airspace is about 300mm, but for practical purposes 200mm is more acceptable.

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.

sound reduction using glass

table 16c: sound reduction with annealed glass

	125–4000Hz (dB)	
Nominal thickness (mm)	Exterior Average STL	Interior STC Rating
3.0	24	26
4.0	25	28
5.0	26	29
6.0	27	31
8.0	29	33
10.0	30	34
12.0	32	36
15.0	34	38
19.0	35	39

table 16d: sound reduction with laminated glass

	125–4000Hz (dB)	
Nominal thickness (mm)	Exterior Average STL	Interior STC Rating
6.38	29	34
6.76	31	34
8.38	33	35
10.38	35	36
12.38	36	39

table 16e: sound reduction with IGU's

		125–4000Hz (dB)	
Nominal thickness (mm)	Make-up (mm)	Exterior Average STL	Interior STC Rating
20.0	4.0/12.0 air space/4.0	27	30
22.0	5.0/12.0 air space/5.0	27	31
24.0	6.0/12.0 air space/6.0	29	31
24.38	6.38/12.0 air space/6.0	34	39

table 16f: sound reduction with double windows (secondary sashes)

		125–4000Hz (dB)	
Nominal thickness (mm)	Make-up (mm)	Exterior Average STL	Interior STC Rating
110.0	6.0/100.0 gap/4.0	44	46
160.0	6.0/150.0 gap/4.0	45	47
216.0	10.0/200.0 gap/6.0	49	49

table 16g: sound reduction with glass blocks

	125–4000Hz (dB)	
Construction (mm)	Exterior Average STL	Interior STC Rating
190.0 x 190.0 x 80.0	40	42