Noise

Insulating glass units were originally introduced to reduce heat loss through windows. However, by judicious design, it is possible also to achieve moderately high acoustic insulation. The main principles to employ are the use of thick glass, and ensuring that the component glasses differ in thickness by at least 30 percent (e.g. 10mm + 6mm or 6mm + 4mm) in order to offset individual resonances (suppress sympathetic resonances).

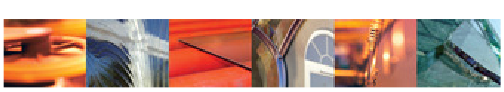
The lamination of one pane produces a further small improvement, and this is achieved regardless of which glass is laminated.

Effect of the cavity width

Over the usual cavity width range of 6mm to 20mm for insulating units, there is little variation in acoustic performance although there is a more significant change in thermal insulation. This acoustic performance plateau is due to the relatively strong coupling of the glass component glasses.

The associated data presented in the table below relates specifically to insulating units with standard 12mm air filled cavities, but negligible error is introduced if these values are adopted for all cavities within the above range.

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)											
	4/12/4		6/12/6		6/12/6.4		10/12/4		10/12/6		10/12/6.4	
100	25		17		19		23		27		27	
125	24	24	26	20	24	21	28	25	27	26	28	27
160	23		22		21		26		24		26	
200	21		18		19		19		24		26	
250	21	20	18	19	19	20	23	22	29	27	30	29
315	19		24		24		26		31		32	
400	22		27		28		31		33		34	
500	25	25	29	29	32	31	33	33	34	34	36	36
630	30		33		34		36		37		40	
800	33		37		38		39		39		41	
1000	36	35	39	38	40	39	41	40	41	40	42	41
1250	38		39		40		41		41		41	
1600	40		39		39		41		39		41	
2000	41	38	34	36	35	37	45	43	37	38	42	42
2500	35		37		39		45		40		44	
3150	31		42		44		42		43		49	
4000	40	35	47	45	49	47	44	44	47	46	53	52
Rm (dB)	**29**		**30**		**31**		**34**		**34**		**36**	
Rw (dB)	**31**		**33**		**34**		**36**		**38**		**40**	
Rtra (dBA)	**25**		**26**		**27**		**29**		**32**		**34**	



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Noise

Acoustic Indices

Rm - Mean Reduction
The complete way of specifying the acoustic performance of glazing, (or any other building element), is to establish its sound insulation over a wide range of frequency range is
100-3150 Hz in which case the corresponding sound insulation value, (or Sound Reduction Index, SRI), should be determined at all the 16 thirdoctavebands between 100-3150 Hz.

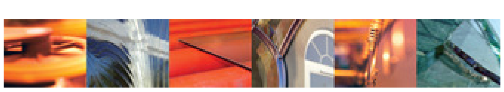
The arithmetic mean, or average, of these insulation values is a simple indicator of performance, designate Rm, or Mean Sound Reduction Index, and is measured in dB.

Rw - Weighted Reduction
Rm is now less used since the publication of BS 5821: 1984, in which the index, Rw (weighted reduction) is defined, which incorporates a correction for the ear's response. It is derived from comparing the window sound insulation/frequency curve with a family of reference curves and selecting one to obtain the 'best fit' so that its average adverse deviation over the 16 thirdoctavebands between 100-3150 Hz is only 2dB. The corresponding sound insulation of this reference at 500 Hz then defines the Rw index of the window

Numerically, it may be up to 5dB higher than the corresponding Rm value for the same window data. Hence, it is more important to differentiate between these indices.

Rtra - Traffic Noise Reduction
Neither Rm or Rw can be used directly to estimate interior noise levels because of their independence of the spectrum of the actual noise climate. By adopting an idealised, but typical, spectrum of road traffic noise in town and city centres, the index Rtra (reduction of road traffic noise) can be derived, by processing this with the basic sound insulation of the window, frequency-by-frequency. This represents the attenuation, in dBA, which the window can achieve in mitigating road traffic noise and gives a very useful guide to in-service performance.

STC - Sound Transmission Class
Occasionally, requirements may be stated, in terms of Sound Transmission Class (STC) values, which is the American Standard ASTM E413. Its dervation is similar to the Rw index, except that the relevant frequency is range is 125-4000 Hz)i.e. shifted upwards by 1/3 octave from the British Standard). For this reason STC is, typically, around 1dB higher then its equivalent, owing to panel materials (including glass) being generally better performance at high frequencies.



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Noise

Recommended Interior Noise Levels
The table below is compiled from typical values contained in BS 8233: 1987.
The original document should be consulted for guidance on less common noise exposures.

Location	**Recommended Maximum Laeq Levels (dBA)**
Dwellings:	
Bedroom	30-40
Living Room	40-45
Offices:	
Private Offices/ Small Conference Rooms	40-45
Large Offices	45-50
Educational:	
Classrooms (15-35 people)/ Small Lecture Rooms	40
Classrooms (35+ people)/ Large Lecture Rooms/ Language Laboratories	35
Music and Drama Spaces	30
Health and Welfare:	
General Wards	55
Small Consulting Rooms	50
Diagnosis Rooms	45