GANZ

Published February 2013

SOUND CONTROL (ACOUSTICS)

Introduction

Sound control is becoming a significant factor in glazing selection as the noise level in the environment rises. The correct choice of acoustic glass can make a significant difference to the level of transmitted noise and ensure a peaceful living or working environment.

However, when seeking to reduce noise, glass is only part of the solution and good acoustic building performance is complex. In addition, for truly effective sound control, you also need to consider the type of noise (frequency) and the means by which unwanted noise can enter the building.

Key Points

The key points to consider are:

1. The type of noise and its critical frequency – glass types perform differently over the total noise frequency range.
2. Construction and sound insulation of the building envelope components - using higher rated glazing may be a futile exercise.
3. Wall and ceiling vents – uncovered vents are a significant source of unwanted noise.
4. Gaps in the wall, floors or around window frames, sashes and doors will undo many of the benefits of sound control glass.
5. Flanking paths – noise can travel around barriers e.g. over walls and through common suspended ceilings.

Addressing these key areas , together with the using right glass, can be the answer to your noise problem.

Measurement and Rating Indices

Worldwide, building materials , including glass, are commonly rated by several different indices depending on the test method, standard and country of origin.

The most common are as follows:

STC	The Sound Transmission Class (STC) is a rating system for the acoustic performance of building materials in internal walls. It is a weighted index of noise reduction performance over a frequency range of 125 – 4000Hz encompassing noise generated internally in a building by human speech.
OITC	The Outdoor-Indoor Transmission Class produces an index similar to the STC rating but is designed for frequencies generated by aircraft, truck and rail noise.
STL_{Avg}	Simple average of the Sound Transmission Loss (STL) measurements in dB over the frequency range, from 100Hz to 5000Hz.
R or R_m	Mean Sound Reduction Index measured over the frequency range, measured in dB.
R_w	Weighted Sound Reduction Index. Similar to R_m but corrected for the ear's response, measured in dB. This usually produces a similar number result to the STC method.
R_{tr}	The Traffic Noise Reduction Index is calculated based on a typical spectrum of road traffic noise in city centres, measured in dBA.
C	A-weighted pink noise (speech and music).
C_{tr}	A-weighted urban traffic noise.
PSR	Perceived Sound Reduction – A ratio of the Rw compared to 3mm glass.

Because noise comes from many different sources it can have a different pitch or frequency range. Therefore, it is important to choose the most appropriate measurement for the type of noise to be controlled, as different glass types and combinations often perform differently depending on the frequency. While some of the rating methods may produce similar results any comparison of glass types must be compared using the same rating system.

Sometimes the indices are combined, like $R_w + C_{tr}$ for traffic noise and $R_w + C$ for aircraft noise.

GANZ

Published February 2013

SOUND CONTROL (ACOUSTICS)

- Typical Sounds and Noise Levels

The following tables give a guide to the sound pressure levels of typical sound and the recommended noise levels inside typical buildings.

Typical Sounds	Sound Pressure Level (dB)
Thunder Clap	120
Subway	100
Loud Street/Vacuum Cleaner	90
Noisy Office	80
Average Street	70
Average Office	60
Average Conversation	50
Quiet Office	40
Average Auditorium	30
Whisper	20

Recommended Maximum Noise Levels	(dB)
Dwellings:	
Bedroom	30 – 40
Living Rooms	40 – 45
Offices:	
Private Offices/Small Conference Rooms	40 – 45
Large Offices	45 – 50
Education:	
Classrooms	35
Library	35-40
Music Practise Room	30

GANZ

Published February 2013

SOUND CONTROL (ACOUSTICS)

Human Ear Response to Changes in Sound Levels

As decibels (dB) are measured on a logarithmic scale a difference in a performance of 1-2 (dB) will be insignificant, while an increase in noise from e.g. 20 to 30 dB will be heard as twice as loud, with 30 to 40 dB a further doubling of perceived noise level.

Change in Sound Level	Change in Apparent Loudness
1 -2 dB	Not detected
3 dB	Just perceptible
5 - 7dB	Clearly noticeable
10dB	Twice (or half) as loud
20dB	Much louder (or quieter)

How to Select

1. Identify the noise source and establish the sound pressure level (ie 70 dB for a average street).
2. Establish the maximum noise level required (ie 40dB for a living room).
3. Determine the reduction required by deducting the required noise level from the noise source (ie 70-40=30dB).
4. Using the appropriate rating indices , select a glass type with the reduction required. (ie 30dB).

OR

Request the required performance data from the designer or acoustic engineer and select the appropriate glass type or types.

Key Points in Glass Selection

1. The thicker the glass the better the sound insulation.
2. Laminated glass improves sound insulation, and special acoustic laminates are even better.
3. IGU's improve sound insulation but are dependent on glass and airspace combinations, and panes of different type and thickness help.
4. Larger air spaces in secondary glazing systems (100-300mm) make significant improvements in sound insulation.
5. For specialised applications, panes of different glass types or thickness, sloping one or both panes, sound absorbent reveals, or gas filling IGU's with specialist gas mixtures may be helpful. In these instances an acoustic engineer should be consulted for advice.

Indicative Sound Control Performance Data

Typical Rw/STC sound control performance data for various glass types is shown in the tables on the following page.
The data is based on a range of published data from glass suppliers and testing laboratories and averaging the results to give a **guide** only.
For projects that require a fully tested & certified sound performance data to achieve compliance with relevant building codes, GANZ recommends contacting your glass supplier for confirmation of product types and performance data.

Note that Rw and STC results are not always the same but are normally very similar. Where limited data is available, or the results are out of balance some smoothing has occurred to show a realistic guide.

Typical International Standards Used for Sound Measurement and Ratings:

ASTM E90, ASTM E413, ASTM E1332
BS 5821,
AS/NZS 2107
DIN 52210
ISO 140, ISO 717

GANZ

Published February 2013

SOUND CONTROL (ACOUSTICS)

Indicative Sound Control Performance Data

This page should be read in conjunction with the first three pages of this data sheet.

MONOLITHIC	Rw/STC
3mm float	28
4mm float	29
5mm float	30
6mm float	31
8mm float	33
10mm float	35
12mm float	36
15mm float	38
19mm float	40

LAMINATED GLASS	MAKE-UP	Rw/STC
6.38mm PVB laminated	3/0.38/3	33
6.76mm PVB laminated	3/0.76/3	34
7.52mm PVB laminated	3/1.52/3	35
8.38mm PVB laminated	4/0.38/4	34
8.76mm PVB laminated	4/0.76/4	35
10.38mm PVB laminated	5/0.38/5	35
10.76mm PVB laminated	5/0.76/5	36
10.52mm PVB laminated	3/1.52/6	37
12.38mm PVB laminated	6/0.38/6	37
12.76mm PVB laminated	6/0.76/6	38
13.52mm PVB laminated	6/1.52/6	39

INSULATING GLASS UNITS	MAKE-UP	Rw/STC
14mm IGU	4/6as*/4	29
18mm IGU	6/6as/6	31
20mm IGU	4/12as/4	30
21mm IGU	4/12as/5	31
22mm IGU	5/12as/5	32
24mm IGU	6/12 as/6	34
26mm IGU	6/16as/4	35
31mm IGU	6/19as/6	37
28mm IGU	6/12as/10	38

LAMINATED IGU	MAKE-UP	Rw/STC
16.38mm IGU	6.38/6 as/4	34
23.76mm IGU	5/12as/6.76	37
24.38mm IGU	6.38/12 as/6	35
24.76mm IGU	8.76/12/4	36
24.76mm IGU	6/12as/6.76	37
25.52mm IGU	6/12as/7.52	38
28.76mm IGU	6/12as/10.76	39

ACOUSTIC LAMINATED	MAKE-UP	Rw/STC
7mm CIP	3/1A/3	36
9mm CIP	4/1A/4	37
11mm CIP	5/1A/5	38
13mm CIP	8/1A/4	39
17mm CIP	10/1A/6	41
6.76mm Acoustic PVB	3/.76A/3	36
8.76mm Acoustic PVB	4/.76A/4	37
10.76mm Acoustic PVB	5/.76A/5	39
12.76mm Acoustic PVB	6/.76A/6	40

ACOUSTIC LAMINATED IGU	MAKE-UP	Rw/STC
24.76mm Acoustic IGU	6/12as/6.76A	38
26.76mm Acoustic IGU	6/12as/8.76A	39
28.76mm Acosutic IGU	8/12as/8.76A	41
28.76mm Acosutic IGU	8.76A/16as/4	38
30.76mm Acoustic IGU	8.76A/16as/6	40
30.76mm Acoustic IGU	10/12as/8.76A	42
30.76mm Acoustic IGU	6/12as/12.76A	42

Key
as = airspace
A= Acoustic
IGU = Insulating Glass Unit
PVB = Poly Vinyl Butyral

The above data is based on a range of published data from glass suppliers and testing laboratories and averaging the results to give a **guide** only. For projects that require a fully tested & certified sound performance data to achieve compliance with relevant building codes, GANZ recommends contacting your glass supplier for confirmation of product types and performance data.

GANZ is an association within the Window Association of New Zealand Inc.
GANZ—Glass Association of New Zealand
PO Box 11-464 Wellington 6142 www.ganz.co.nz