FACT SHEET 5

Sound Insulation for Glazed Doors

The sound insulation of glazed doors refers to the ability of a closed door to reduce noise entering your residence.

Key Issues and Considerations

When designing or modifying a glazed door, consideration should be given to reduction of outside noise and thermal considerations.

If you are concerned about noise where you live, or are planning to renovate or purchase a house or apartment, you should consider the sound insulation of glazed doors in a residence. Doors do not typically insulate against external sound as well as walls, so improving their sound insulation can help reduce external noise.

Depending on the design of a door, there will be varying levels of noise reduction. For residences in the inner city, glazed doors should include airtight seals and use either thick glass or a double/triple glazing system. By replacing standard glass doors with sealed laminated glazing, you can generally achieve effective noise reduction.

Noise and Insulation

The wide range of activities taking place in the inner city generates higher levels of external noise than in suburban areas. Noise can come from traffic, people on the street, commercial sites and waste collection. In some cases, there may be increased low frequency noise from truck engines or music. To effectively reduce external noise, a door should be well constructed and installed.

The ability of a glazed door to reduce noise is dependent on the following elements:

- frame design;
- glazing;
- composition of glass pane type;
- distance between glass panes; and
- seals.

Effect of Area: The larger the glazing area, the greater the amount of acoustic energy able to pass through it.

Effect of Distance: The more distant the noise source, the lower the noise level. If you situate your bedrooms away from a noise source, you can expect lower levels of noise.

Effect of Height: On higher floors in a building, the street noise level is expected to decrease.

The City of Melbourne recommends that an acoustic consultant be employed to conduct an assessment of the property prior to undertaking any sound insulation to ensure the proposed changes provide significant noise reduction.

Thermal Considerations

The design of glazed doors to reduce noise should be considered alongside thermal insulation requirements and the local environment. The thickness of glass, type of lamination and size of air gaps directly affects the thermal insulation properties of a door.

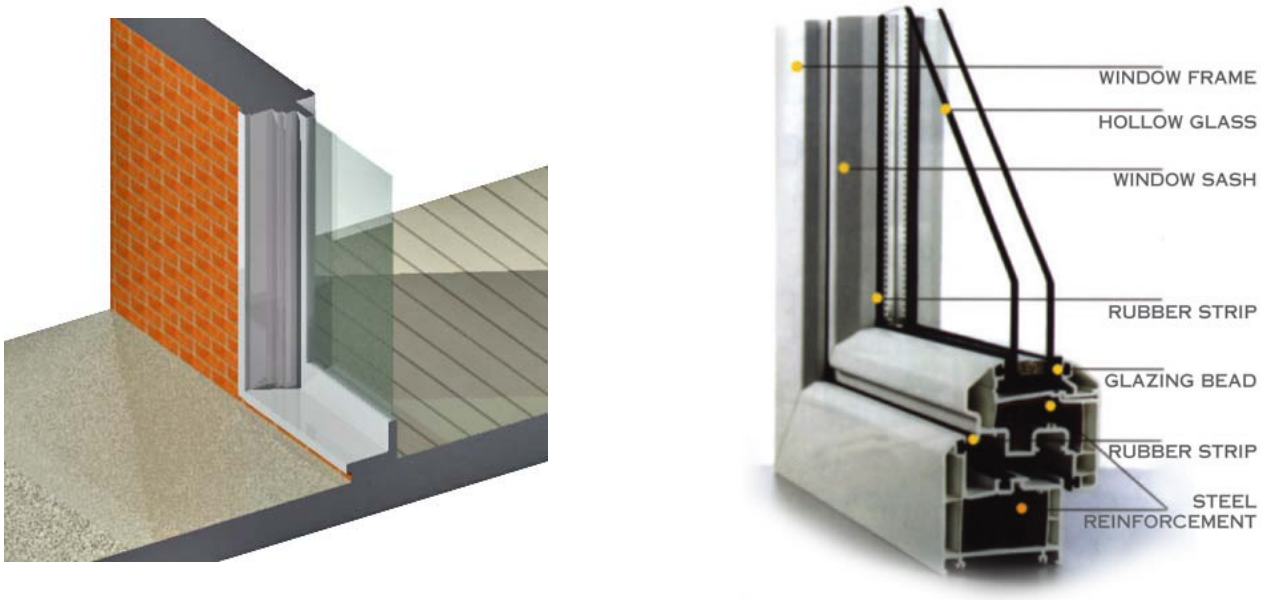
General Acoustic Design of Glazed Doors

When choosing a glazed door to reduce noise, you should consider: materials, general construction and best practice design.

Materials

Frame

Several materials are commonly used as door frames: wood, clad wood, aluminium, vinyl and fibreglass. The type of material usually does not have a significant influence on noise reduction properties, but the effect of seals is a critical issue in door frames. Frames should be well sealed internally and externally to provide acoustic, thermal and moisture protection.



Door glazing – an example of single and double glazed frames
(Image on right courtesy of Titane pty ltd)

Hinged doors are preferred to sliding doors as they are able to achieve a positive compression seal. There are proprietary framing systems that provide improved acoustic performance.

Glazed doors – an example of sliding and hinged type glazed frames

Glazing

There are a number of glazing options available for the reduction of noise:

- **Single glazing** is the use of single panes of glass in a door;
- **Double glazing** is the use of two panes of glass in a door separated with a spacer, and
- **Triple glazed** doors have three layers of glass separated with spacers.

As each residence and situation is different, there is no single best method for door noise insulation. For example, the heritage status of a property or body corporate requirements may limit changes you can make to the external facade, restricting your glazing options. By checking these factors and employing an acoustic consultant you will be guided to the best solution for your residence.

Glass Pane Type

Glass thickness is the major factor influencing the passage of sound. Typically, thicker glass offers better sound insulation than thinner glass, particularly when the major problem is low frequency noise such as truck engine noise. Toughened, coated, wired and patterned glass types behave acoustically the same as standard float glass.

Laminated glass performs slightly better than other types of glass when the major problem is high frequency noise such as tram wheel squeals or freeway traffic noise. However, it offers little improvement over other glass of the same thickness when the main problem is low frequency noise. The improvement is due to a PVB (polyvinyl butyral) interlayer that helps to reduce the passage of sound at high frequencies. This layer is sandwiched between two panes of glass.

Laminated glass can also offer a thermal protection layer that can significantly improve energy efficiency. Thick PVB laminated glass in conjunction with tight seals and a well manufactured and installed frame system ensures a good level of sound insulation.

General Construction

Distance Between Glass Panes in Double or Secondary Glazing Systems

In most cases, the larger the air cavity, the more noise the door system can reduce. All air gaps must be sealed to ensure a door achieves maximum noise reduction.

Small air gaps between panes of glass can provide good thermal insulation properties but may offer minimal acoustic insulation. Thermal double glazed systems have an air gap of about 12mm between each pane of glass, while acoustical double glazing has an air gap of between 50 and 150mm. It is important to distinguish between thermal and acoustic insulation as some glazing suppliers may not specialise in both areas.

Seals

As with all building structures, cracks enable sound to enter a building. These noise *flanking paths* can defeat noise reduction techniques. This is of particular concern for doors. Even doors with good weather stripping can have compromised noise reduction due to air leakage. Brush type seals have poor acoustic insulation properties. A tight rubber seal offers better results. Hinged doors are preferred to sliding doors as they are able to achieve a positive compression seal.

Most glazed doors require full acoustic seals around the head, jamb and foot to limit flanking. Note that acoustic seals only provide suitable performance if they are properly adjusted. Seals should be selected on their performance and simplicity of use. They should also be low maintenance and have a long life.

Test Your Existing Window and Door Seals

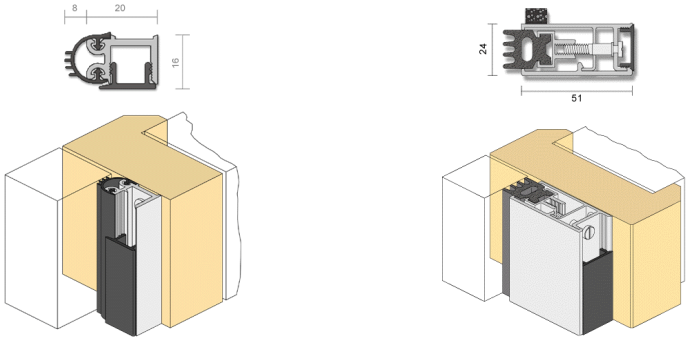
Before you purchase new glazing, consider fixing or installing seals on your existing windows and doors. This could achieve the noise reduction you want.

Seal gaps between window and door frames with plasticine, or an equivalent malleable, but weighty substance.

Consider the improvements for several days and nights.

If improvements are sufficient, sealing devices can be fitted which will allow doors to open, whilst maximising noise reduction when closed.

The tighter a door closes the better the noise reduction.



Sealing door frames for noise reduction – Examples of rubber seals
(Images courtesy of Raven pty ltd)

Installation

Correct installation is an important aspect of door treatment. Consult a reputable trades person when arranging installation.

Best Practice

Frames should be well sealed internally and externally to provide acoustic, thermal and moisture protection. Hinged doors are preferred to sliding doors as they are able to achieve a positive compression seal. Consider the kind of noise you are trying to reduce when choosing a glazing system. There are several proprietary framing systems that provide improved acoustic performance.

If you have a noise problem, achieving a useful improvement in sound insulation requires a decrease of at least five decibels (dB), preferably 10 to 15dB. An improvement of less than 5dB is normally not worth the additional expense.

If you are comparing quotations for sound insulation, look at the noise reduction performance of different options. Remember that most products perform better in laboratory conditions than in final installation. Ensure the specified noise reduction of the treatment is presented in decibels or a suitable acoustic measurement. Noise reduction figures presented as percentages can be misleading.

Examples of Design

This section provides examples of different acoustic treatments and door types. They are provided as examples only and are by no means exhaustive. The City of Melbourne recommends consultation with an acoustician to ensure correct design for your project.

Standard Treatment

Standard single glazing:

- 6mm float glass set in a non-sealed timber frame.

Due to poor sealing and the use of thin, standard glass, standard doors generally do not have particularly good airborne sound insulation (Rw 15-20 dB). Improved performance can be gained by installing better seals.

Improved Treatment

Acoustic rated single glazing:

- 12.38mm PVB Laminated glass set in a sealed metal frame.

Laminated glass performs slightly better than ordinary glass due to a PVB interlayer that helps reduce the passage of sound, but only at high frequencies. In most cases, thick, laminated glass in conjunction with tight seals and a well manufactured and installed frame system ensures a good level of sound insulation (Rw 30-34 dB). Hinged doors are preferred as they are able to achieve a positive compression seal on closure. The quality of the seals is the most important component of a glazed door.

Challenges

Low Frequency Noise

Low frequency noise is usually generated by music or heavy vehicles. Standard double glazing is often ineffective at reducing low frequency noise. The reduction of low frequency noise depends on the glass thickness and the gap between panes. With low frequency noise, the overall design of the door may need to be evaluated by an acoustic consultant as standard glazing may not achieve the quality of noise insulation expected. A single, thick (10.38 mm) pane of glass may be more effective in reducing low frequency noise than standard double glazing systems. For low frequency noise, laminated glass is no better than float or toughened glass.

TITANE WINDOWS & DOORS (TAS)

Image on page 2 courtesy of Titane pty ltd

RAVEN

Images on page 4 courtesy of Raven pty ltd

Acoustic Consultant

The City of Melbourne recommends an acoustic consultant be employed to conduct an assessment of the property prior to undertaking any sound insulation to ensure the proposed changes provide significant noise reduction and value for money.

You should engage reputable, appropriately qualified, experienced/competent acoustic engineers or consultants to do this work. There is a listing for Acoustical Consultants in the Yellow Pages. The Association of Australian Acoustical Consultants (www.aaac.org.au) and the Australian Acoustical Society (www.acoustics.asn.au) are also available to assist you in deciding the appropriate person or company to engage.

Other Fact Sheets

A number of other fact sheets complement the information in this document. These can be downloaded from:

The City of Melbourne website: www.melbourne.vic.gov.au/noise or
City Sounds 2 – Acoustic Design Resource website: http://sound.sial.rmit.edu.au/ADR

Fact Sheet 1: Acoustic Terminology
Fact Sheet 2: Sound Insulation Guidelines
Fact Sheet 3: Room Overviews and Planning
Fact Sheet 4: Sound Insulation for Windows
Fact Sheet 5: Sound Insulation for Glazed Doors
Fact Sheet 6: Sound Insulation for Standard Doors
Fact Sheet 7: Sound Insulation for Exterior Walls and Façade Systems
Fact Sheet 8: Sound Insulation for Interior / Party Walls
Fact Sheet 9: Sound Insulation for Floors
Fact Sheet 10: Sound Insulation for Ceilings
Fact Sheet 11: Sound Insulation for Building Elements and Services
Fact Sheet 12: Air Conditioners
Fact Sheet 13: Audio Equipment
Fact Sheet 14: Sound in the City

Australian Building Codes Board

The Acoustic Design Resource fact sheets contain content sourced from the Building Code of Australia and Guideline on Sound Insulation, published by the Australian Building Codes Board (ABCB). These documents can be purchased from the ABCB website: www.abcb.gov.au

References

This project has been developed by the City of Melbourne in partnership with the Spatial Information Architecture Laboratory (SIAL) of RMIT University.

For more information visit
www.sial.rmit.edu.au

Spatial Information Architecture Laboratory

Contact Us

This fact sheet is part of CitySounds2 - Acoustic Design Resource. To experience CitySounds2 go to:
www.melbourne.vic.gov.au/noise or http://sound.sial.rmit.edu.au/ADR

For further information call the City of Melbourne Hotline on (03) 9658-9658
email: enquiries@melbourne.vic.gov.au or visit www.melbourne.vic.gov.au

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