Assessing external noise impacts for apartments

Planning Practice Note 83

AUGUST 2017

This practice note gives guidance about the operation of Clause 55.07-6 (Noise impacts) and Clause 58.04-3 (Noise impacts) for apartment developments.

Noise

New apartment development in Victoria is typically found in areas with high levels of accessibility to facilities and services such as transport nodes and corridors and activity centres. The impact of noise from external sources in these locations can affect the wellbeing of occupants and liveability of the apartments.

Clause 55.07-6 (Noise impacts) and Clause 58.04-3 (Noise impacts) specify noise levels that should be met for an apartment development within a noise influence area specified in Table 1 below.

An apartment development in these noise influence areas should be designed to achieve the following noise levels:

- Not greater than 35dB(A) for bedrooms, assessed as an LAeq,8h from 10pm to 6am.
- Not greater than 40dB(A) for living areas, assessed LAeq,16h from 6am to 10pm.

Table 1: Standard D3 and B6

Noise influence area

Noise source	Noise influence area
Zone interface	
Industry	300 metres from the Industrial 1, 2 and 3 zone boundary
Roads	
Freeways, tollways and other roads carrying 40,000 Annual Average Daily Traffic Volume	300m from the nearest trafficable lane
Railways	
Railway servicing passengers in Victoria	80m from the center of the nearest track
Railway servicing freight outside Metropolitan Victoria	80m from the center of the nearest track
Railway servicing freight in Metropolitan Melbourne	135m from the center of the nearest track

Note: The noise influence area should be measured from the closest part of the building to the noise source.

VICTORIA State Government | Environment, Land, Water and Planning

How are the specified noise levels met?

The specified noise levels can be met by:

- Undertaking an assessment of the impact of external noise through an acoustic report prepared by a suitably qualified consultant; or
- Applying a standard design treatment for noise.

An acoustic report is a detailed acoustic assessment incorporating external noise exposure measurements or modelling of the proposed building design to demonstrate suitable design responses can achieve the specified noise levels. In some instances, an acoustic report is not required if a standard design treatment is available and used.

The acoustic report must be prepared by an experienced, professional acoustic engineering consultant who should either be a member of, or have the qualifications to become a member of the Australian Acoustic Society (AAS) or the Association of Australian Acoustical Consultants (AAAC).

Compliance verification to support the acoustic report assessment route can be addressed by the responsible authority through permit conditions. Permit conditions normally specify that recommendations of the endorsed acoustic report (including verification of the sound insulation performance of the development) must be implemented and complied with to the satisfaction of the responsible authority before the use and/or development commences.

Technical requirements for measuring noise

When performing measurements inside the building, measure at the expected occupancy position(s) in the space relevant to the noise of interest. The preferred positions are at least 1m from the walls or other major reflecting surface, 1.2m to 1.5m above the floor and about 1.5m from windows. Measurements at the centre of a room should be avoided as far as possible.

Internal noise level measurements should be correlated to simultaneous external noise level measurements undertaken outside the considered facade in front of the same noise sensitive room. When performing measurements outside the building, locate the microphone at the level of the centre of the window for the considered habitable room, with the microphone oriented towards the source of noise, 1 m from the external facade.

Outdoor measurements should locate an external microphone at the level of the centre of the window for the considered habitable room, with the microphone oriented towards the source of noise at a distance of 1 m from the facade.

Measurements should be conducted following the general provisions of the following reference standards:

- Road traffic noise intrusion: AS 3671
- For internal noise measurements: AS/NZS 2107 (Clause 6)
- For measurement of road traffic noise: AS 2702
- For measurement of railway noise: AS 2377
- General environmental noise measurement: AS 1055.

Verification of the sound insulation performance is based on short term measurements to determine whether the building achieves the design intent noise reduction (i.e. there is effective noise attenuation as assessed through the difference between exterior and interior noise levels). To check on progress toward achieving compliance with the noise objectives, it is advisable to undertake sound insulation progress testing at various stages of construction.

Field tests should be conducted in an exposed, noise sensitive room for a short period (e.g. at least 30min) during which the character and frequency spectrum of the measured sound is representative of the noise impacting the building over the 16h (or 8h) period.

The assessment for verification purposes should normally be based on a sample of two of the most noise exposed unfurnished units (with finished floor consistent with submitted design).

Where a development is exposed to both road and train noise, the highest assessed noise exposure category based on the tables provided should be applied, and noise measurements should be conducted during a worst case combined exposure peak period.

A standard design treatment for noise is a prescribed building construction method based on the known performance of the construction materials adopted including documentation, plans and product certification specifying the level of sound attenuation performance of the materials used for the relevant level of noise exposure. (See Appendix.)

The application should be accompanied by a design response outlining how the standard will be achieved. The selection of materials must be supported by evidence of their acoustic performance. A product performance specification certificate from a National Association of Testing Authorities (NATA) accredited laboratory (or international equivalent) is considered sufficient evidence.

Where a standard design treatment is not available, a detailed acoustic assessment will be required to demonstrate that the specified noise levels can be met.

How do standard design treatments for noise work?

As the Noise Exposure Category increases, so does the level of acoustic performance of the prescribed standard design treatment package. This is shown on shown on Charts 1 and 2 (Road noise) and Table 3 (Rail noise), where Noise Exposure Categories range from A (low) to E (high).

Glazing typically represents a key source of external sound ingress. As represented in Table 4 in the Appendix, the standard design treatments nominate different glazing types for each Noise Exposure Category and further define glazing by the percentage area giving developers a greater range of potential solutions. For example, where a design adopts large windows and door areas (as a percentage of floor area), increased acoustic performance is necessary. Including large window areas in the higher noise exposure locations will go beyond the capacity of standard design treatments listed in the Appendix to meet the specified noise levels and require an acoustic report to justify a particular response.

When is an apartment development exempt from meeting the specified noise levels?

An apartment development screened from a noise source can claim a partial or full 'line of sight' shielding under the standard and not need to meet the specified noise levels for those portions of the development that are effectively shielded.

Documentation should be provided at the time of application showing the location and dimensioned distances from any designated noise sources with details of any solid, permanent structure such as a noise barrier, earth mound or existing building that obscures or partially obscures the proposed building and natural ground levels where topography of the land attenuates noise sources.

Care should be taken to avoid sound reflection between buildings through orientation and use of physical barriers.

When assessing the adequacy of 'line of sight' shielding from new or pre-existing noise barrier walls, to claim full or partial exemption from meeting the specified noise levels, an applicant needs to provide evidence from a qualified acoustic consultant of the adequacy of these structures.

For road and rail noise this can be achieved through appropriate non-porous constructions with no gaps and a surface mass of no less than 40 kg/m^2 of face area; or a construction achieving an airborne sound insulation rating Rw+Ctr of at least 25 dB when determined in accordance with AS/NZS ISO 717-1 using results of appropriate airborne sound insulation tests (AS 1191; ISO 10140-2 or ISO 140-3) conducted in a NATA accredited laboratory.

For other types of noise, the adequacy of the design of the barrier can be substantiated by a report from a qualified acoustic consultant that gives due consideration to the characteristics of the noise, in particular, its frequency spectrum. For existing barriers, the report should include an assessment of the materials and the construction method used following a site inspection.

Which method is applicable within a Noise Influence Area?

- **Industry Noise Influence Area** – an acoustic report is required to meet the specified noise levels. The standard design treatment option is not available due to the highly inconsistent character of industrial noise sources.
- **Roads Noise Influence Area** – an acoustic report or a standard design treatment for noise can be used to meet the specified noise levels depending upon the type of road, traffic volume, speed limit and distance of road kerb.
- **Railways Noise Influence Area** – an acoustic report or a standard design treatment can be used to meet the specified noise levels depending upon the type of railway line and distance from the railway line.

INDUSTRY NOISE INFLUENCE AREA

Selecting an appropriate method

The application of a standard design treatment for noise is not available for an apartment development located in an Industry Noise Influence Area. An acoustic report must be provided.

ROADS NOISE INFLUENCE AREA

Selecting an appropriate method

Depending upon the type of road, traffic volume, speed limit and distance of road kerb the specified noise levels can be met by:

- An acoustic report
- A standard design treatment for noise
- Normal construction method.

The following charts can be used to determine the appropriate method.

Chart 1: Roads with speed limits between 50-80 km/h

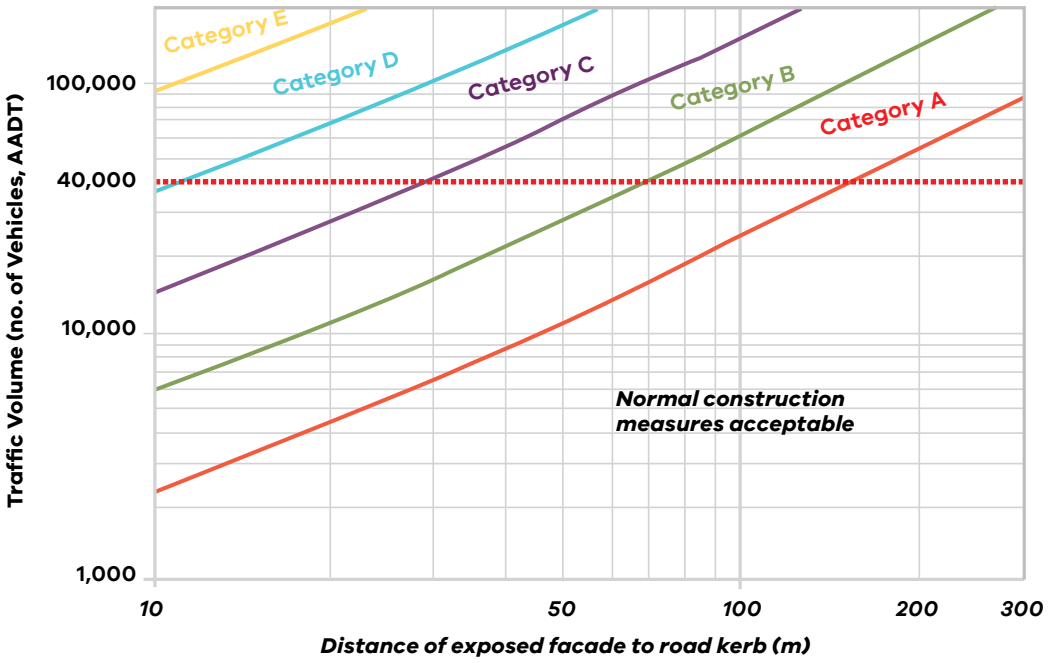
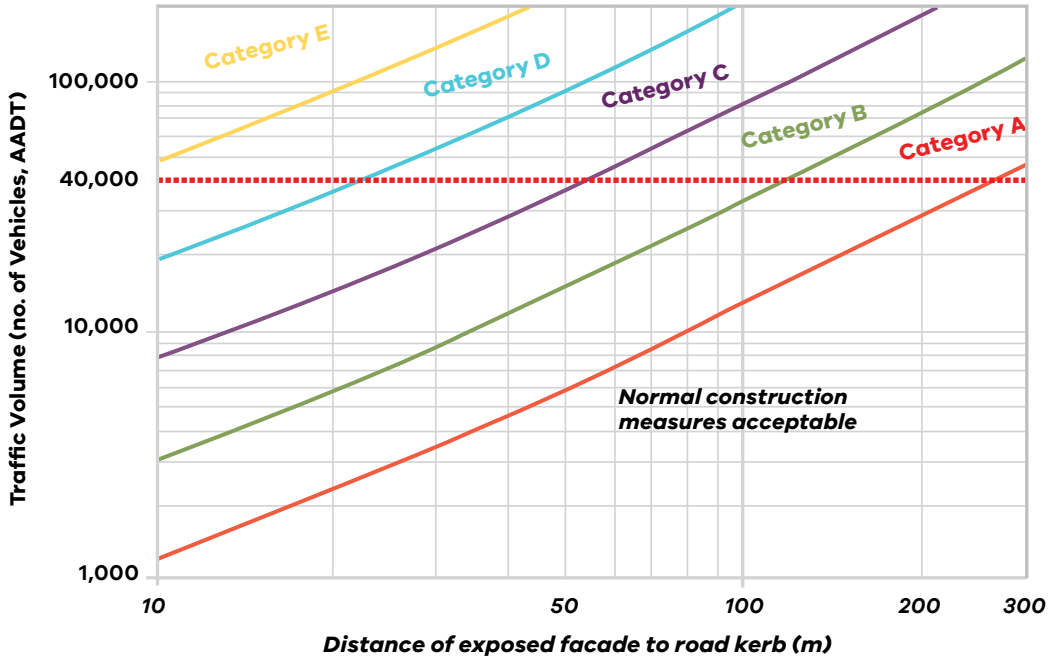


Chart 2: Roads with speed limits between 90-110 km/h



Source: Adapted for Victorian conditions from NSW (2008) Development near rail corridors and busy roads – interim guideline.

Refer to VicRoads (http://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/) or the Responsible Authority for traffic volume, vehicle mix data and expected traffic growth rate. The design response should allow for noise exposure from future road and rail traffic volumes using a design period of 10 years after the planned date of occupancy. Volume are based on the Two-way total of the Annual Average Daily Traffic Volume.

Freeways and tollways

Where the traffic mix for a road characterised by an Annual Average Daily Traffic Volume (AADT) of least 40,000 is greater than 20% heavy vehicles, the only method available to meet the specified noise levels for an apartment development is an acoustic report.

Where an apartment development is located within Noise Exposure Category E on Charts 1 and 2, an acoustic report is the only method available to meet the specified noise levels.

Where an apartment development is located within Noise Exposure Categories A-D on Charts 1 and 2 and the road has a AADT of at least 40,000 vehicles, an acoustic report or a standard design treatment for noise can be used to meet the specified noise levels.

The Appendix outlines the acceptable standard design treatments for noise for different building elements for each Noise Exposure Category. If a building element does not meet the requirements set out in the relevant Noise Exposure Category in the Appendix, an acoustic report will be required for that building element.

Where an apartment development is located on a road with a AADT less than 40,000 vehicles, normal construction methods are considered to meet the specified noise levels for an apartment development.

Other roads with an annual average daily traffic volume of 40,000 vehicles

Where the traffic mix for road carrying at least 40,000 vehicles is above 20% for heavy vehicles, the only method available to meet the specified noise levels an apartment development is an acoustic report.

Where an apartment development is located within Noise Exposure Category E on Charts 1 and 2 and the road is carrying at least 40,000 vehicles an acoustic report is the only method available to meet the specified noise levels.

Where an apartment development is located within Noise Exposure Categories A-D on Charts 1 and 2 and the road is carrying at least 40,000 vehicles an acoustic report or a standard design treatment for noise can be used to meet the specified noise levels.

The Appendix outlines the acceptable standard design treatments for noise for different building elements for each Noise Exposure Category. If a building element does not meet the requirements set out in the relevant Noise Exposure Category in the Appendix an acoustic report will be required for that building element.

Where an apartment development is located on a road carrying less than 40,000 vehicles normal construction methods are considered to meet the specified noise levels for an apartment development.

RAILWAYS NOISE INFLUENCE AREA

Selecting an appropriate method

Depending upon the type of railway line and distance from the railway track (summarised in Table 2), the specified noise levels can be met by:

- An acoustic report
- A standard design treatment for noise
- Normal construction method.

Table 2: Rail noise exposure

Type of Rail Service	Rail Noise Screening Distances (measured in metres (m) from the centre of the nearest track to the proposed apartment development			
	<10m	10-80m	80-135m	135m>
Passenger rail lines and all **non-metropolitan rail lines**	**Noise assessment required**		Normal construction method acceptable	
Metropolitan Freight – railway servicing freight in metropolitan Melbourne	**Noise assessment required**			Normal construction method acceptable

The following table can be used to determine the appropriate method.

Table 3: Rail Noise exposure categories

Exposure Category	Separation distance between external noise source and new apartment	
	Passenger rail lines and all non-Melbourne metro rail lines	Freight line (Metro Melbourne)
A	50<80m	80<135m
B	25<50m	50<80m
C	10<25m	25<50m
D	<10m	10<25m
E	NA	<10m

Where an apartment development is located within the Noise Exposure Category D in Table 3 for a passenger rail line and all non-Metropolitan rail lines, an acoustic report is the only method available to meet the specified noise levels.

Where an apartment development is located within Noise Exposure Category E in Table 3 for a Metropolitan freight rail line, an acoustic report is the only method available to meet the specified noise levels.

Where an apartment development is located within Noise Exposure Categories A-C in Table 3 for a passenger rail line and all non Metropolitan rail lines, an acoustic report or a standard design treatment for noise can be used to meet the specified noise levels.

Where an apartment development is located within Noise Exposure Category D in Table 3 for a Metropolitan freight rail line, an acoustic report or a standard design treatment for noise can be used to meet the specified noise levels.

The Appendix outlines the acceptable standard design treatments for noise for different building elements for each Noise Exposure Category. If a building element does not meet the requirements set out in the relevant Noise Exposure Category in the Appendix an acoustic report will be required for that building element.

Where an apartment development is located further than the distance for Noise Exposure Category A in Tables 2 and 3, normal construction methods are considered to meet the specified noise levels for an apartment development.

Appendix 1

STANDARD DESIGN TREATMENTS FOR NOISE

Façade design and window considerations

These standard façade treatments are based on the principle that where a higher percentage of glazing forms part of the external envelope, higher performing glass is required to meet the acoustic requirements.

When applying standard design treatments all external windows and doors should be fitted with suitable proprietary acoustic seals supported by manufacturer's performance certification from a NATA accredited laboratory (or international equivalent).

All external doors should be fitted with suitable proprietary acoustic seals supported by manufacturer's performance certification from a NATA accredited laboratory (or international equivalent).

Table 4: Specified Rw+Ctr values for façade features in different noise exposure categories

Façade type	Total window area as % of floor area	Exposure Category				
		A	B	C	D	E
Wall	N/A	45	50	50	50	
Floor	N/A	45	50	50	50	
Roof	N/A	45	45	45	45	
Door (non-glazed)	N/A	30	35	35	40	
Bedroom Windows	< 20%	28	31	34	37	
	≥20% but <40%	31	34	37	40	
	≥40% but <60%	34	37	40		
	≥60% but <80%	37	40			
	≥80% but <100%	40			**Note 1**	
	≥100% but <120%					
	≥120%					
Living Zone Windows	< 20%	25	28	31	34	
	≥20% but <40%	28	31	34	37	
	≥40% but <60%	31	34	37	40	
	≥60% but <80%	34	37	40		
	≥80% but <100%	37	40			
	≥100% but <120%	40			**Note 1**	
	≥120% but <140%					
	≥140%					

Note 1: A standard design treatment for noise is not available. A design must demonstrate compliance with the specified noise levels set out in the standard through an acoustic report.

Table 5: Construction responses for solid façades

Façade type	Acceptable construction responses for solid façades				
	A	B	C	D	E
Wall	**Cement**				
	125mm concrete panel. Or 100mm concrete panel with 13mm cement render or 13mm plasterboard to each face.	100mm concrete panel with 70mm timber studs or 64mm metal studs) spaced 25mm from the concrete panel with 50mm glass/rock wool insulation of 11kg/m^3 and two layers of 13mm plasterboard. Or 125mm concrete panel with 70mm timber studs or 64mm metal studs) spaced 25mm from the concrete panel with 50mm glass/ rock wool insulation of 11kg/m^3 and 13mm plasterboard. Or 150mm (or thicker) concrete panel.			**Note 1**
	Brick				
	1 x 150 single brick wall with at least 13mm render or plasterboard to each face. Or 2 x 110mm double brick wall with 50mm cavity and resilient wall ties.	1 x 90mm single brick wall with 70mm timber studs spaced 25mm from the brick wall, 75mm glass/rock wool insulation of 11kg/m^3 or 75mm polyester insulation of 14kg/m^3 with 10mm plasterboard. Or 1 x 110mm single brick wall with 70mm timber studs spaced 20mm from the brick wall (or 64mm metal studs), 50mm glass/rock wool insulation of 11kg/m^3 and 13mm plasterboard. Or 1 x 110mm single brick wall with 13mm thick render on the outside face with 70mm timber studs (or 64mm metal studs) spaced 20mm from the brick wall, 50mm glass/rock wool insulation of 11 kg/m^3 and 13mm plasterboard to the inside face. Or 2 x 110mm double brick wall with 50mm cavity, resilient wall ties and at least 13mm thick render or plasterboard to each face. Or 2 x 110mm double brick wall with 50mm cavity, resilient wall ties and 50mm of glass/rock wool insulation of 11kg/m^3 or 50mm of polyester insulation of 20kg/m^3. Or 2 x 110mm brick wall with 50mm cavity with resilient wall ties and 50mm of glass/rock wool insulation of 11kg/m^3 in the wall cavity; and with 50mm batten and 13mm plasterboard to the inside face of the brick wall.			**Note 1**
	Lightweight				
	9.5mm hardboard, or 9mm fibre cement sheeting, or 11mm fibre cement weatherboard cladding with resilient steel channels on 90mm timber studs, 75mm glass/rock wool insulation of 11kg/m^3 or 75mm polyester insulation of 14kg/ m^3 and two layers of 16mm fire rated plasterboard.	75mm autoclaved aerated concrete panel with 9mm fibre cement sheet to the outside face, 70mm metal studs (or 64mm metal studs) spaced 20mm from the concrete with 75mm glass/ rock wool insulation of 11kg/m^3 and 13mm fire rated plasterboard.			**Note 1**

<table>
<tr><th rowspan="2">Façade type</th><th colspan="5">Acceptable construction responses for solid façades</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><td>Floor</td><td>100mm dense suspended concrete slab
Or
19mm tongue and groove boards with:
• Timber joists not less than 175mm x 50mm;
• 75mm of glass/ rock wool insulation of 11kg/m³ between joists, laid on 10mm plasterboard;
• 25mm glass/rock wool insulation of 11kg/m³ laid over entire floor (including top of joists) and secured to battens (75mm x 50mm); and
• Assembled flooring laid over the joists but not fixed to then, with battens laying between the joists.</td><td colspan="3">Concrete slab directly on ground.
Or
150mm (or thicker) dense suspended concrete slab.</td><td>Note 1</td></tr>
<tr><td>Roof</td><td colspan="4">150mm (or thicker) suspended concrete slab with 28mm metal furring channels, 30mm glass/rock wool insulation of 11kg/m³ (or 30mm polyester insulation of 14kg/m³) and 10mm plasterboard.
Or
Metal deck roof with 165-210mm glass/rock wool insulation of 7kg/m³ (or 185-210mm polyester insulation of 10kg/m³) with two layers of 13mm fire rated plasterboard fixed to furring channels.</td><td>Note 1</td></tr>
<tr><td>Door (non-glazed)</td><td>40mm solid core door with full perimeter acoustic seals.
Or
40-45mm solid core door with 6.38 laminated glass inserts and full perimeter acoustic seals.</td><td colspan="2">45mm solid core door with full perimeter acoustic seals.</td><td>50mm solid core door with full perimeter acoustic seals.</td><td>Note 1</td></tr>
</table>

Note 1: A standard design treatment for noise is not available. A design must demonstrate compliance with the specified noise levels set out in the standard through an acoustic report.

Table 6: Acceptable construction responses for glazed façades

	Total window area as % of floor area	Acceptable Construction Responses for glazed façades				
		A	B	C	D	E
Bedroom windows	< 20%	4-6mm single glazing. Or 6mm/12mm air/6mm double glazing.	6.38-10.38mm laminated single glazing. Or 10mm/ 12mm air/ 4mm double glazing.	10.5mm acoustic laminated glazing (e.g. Vlam Hush or equivalent). Or 10mm/12mm air/ 6mm double glazing.	5mm/100mm air/5mm double glazing.	Note 1
	≥20% but <40%	6.38-10.38mm laminated single glazing. Or 10mm/ 12mm air/ 4mm double glazing.	10.5mm acoustic laminated glazing. Or 10mm/ 12mm air/ 6mm double glazing.	5mm/ 100mm air/ 5mm double glazing.	5mm/100mm air/ 5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).	
	≥40% but <60%	10.5mm acoustic laminated glazing. Or 10mm/12mm air/6mm double glazing.	5mm/100mm air/ 5mm double glazing.	5mm/100mm air/ 5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).		
	≥60% but <80%	5mm/100mm air/ 5mm double glazing.	5mm/100mm air/ 5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).			
	≥80% but <100%	5mm/100mm air/5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).				
	≥100% but <120%					

	Total window area as % of floor area	Acceptable Construction Responses for glazed façades				
		A	B	C	D	E
Living zone windows	< 20%	4-6mm single glazing.	4-6mm single glazing. Or 6mm/12mm air/6mm double glazing.	6.38-10.38mm laminated single glazing. Or 10mm/12mm air/4mm double glazing.	10.5mm acoustic laminated glazing. Or 10mm/12mm air/6mm double glazing.	
	≥20% but <40%	4-6mm single glazing. Or 6mm/12mm air/6mm double glazing.	6.38-10.38mm laminated single glazing. Or 10mm/12mm air/4mm double glazing.	10.5mm acoustic laminated glazing. Or 10mm/12mm air/6mm double glazing.	5mm/100mm air/5mm double glazing.	
	≥40% but <60%	6.38-10.38mm laminated single glazing. Or 10mm/12mm air/4mm double glazing.	10.5mm acousting laminated glazing. Or 10mm/12mm air/6mm double glazing.	5mm/100mm air/5mm double glazing.	5mm/100mm air/5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).	
	≥60% but <80%	10.5mm laminated acoustic glazing. Or 10mm/12mm air/6mm double glazing.	5mm/100mm air/5mm double glazing.	5mm/100mm air/5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).		
	≥80% but <100%	5mm/100mm air/5mm double glazing.	5mm/100mm air/5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing).			
	≥100% but <120%	5mm/100mm air/5mm double glazing (or alternatives, e.g. 8.5mmHush/ 16mm air/ 12.5mmHush double glazing.				
	≥120% but <140%					

Note 1

Note 1: A standard design treatment for noise is not available. A design must demonstrate compliance with the specified noise levels set out in the standard through an acoustic report

As construction methods and materials can become out of date and in some cases building responses require different dimensions, alternative materials can be applied. However, these variants should be supported by evidence of the acoustic performance of the material. Normally this is through supply of a product performance specification certificate from a National Association of Testing Authorities (NATA) accredited laboratory (or international equivalent).

Acknowledgement: *DELWP would like to thank the NSW Department of Planning and Environment for permission to adapt the screen test diagrams used in the Guidelines from the 'Development Near Rail Corridors and Busy Roads – Interim Guideline'.*

© The State of Victoria Department of Environment, Land, Water & Planning 2017

This work is licensed under a Creative Commons Attribution 4.0 International licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the Department of Environment, Land, Water and Planning (DELWP) logo. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/

ISBN XXX-XXX-XXXXXX-XXX (pdf/online)

Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186, email customer.service@delwp.vic.gov.au (or relevant address), or via the National Relay Service on 133 677 www.relayservice.com.au. This document is also available on the internet at www.planning.vic.gov.au

Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.