

---

## 2 The criteria

---

### 2.1 Assessing noise impacts

Noise measurement and assessment methods are an integral part of implementing any set of noise criteria. Noise measurement procedures are described in Appendix C, together with a step-by-step methodology for assessing the noise impact from road traffic.

### 2.2 Road traffic noise criteria

#### *Road traffic noise levels*

A number of factors should be considered in setting road traffic noise levels:

- whether there is an existing road corridor and, if so, whether the road project is intended to increase traffic-carrying capacity substantially, or whether the mix of traffic would be substantially changed. Residents tend to be more sensitive to new noise sources than to existing noise sources of the same noise level. The difference in sensitivity has been identified in studies, and these are discussed in Appendix B4. Furthermore, existing road corridors generally provide less scope for reducing noise levels
- whether or not substantial changes to the alignment of a road are proposed, or whether the road is on a 'new' corridor. In cases where substantial road alignment changes are proposed or there is a new road corridor, there is maximum flexibility to select best measures to meet noise levels at the planning stage. This is a good opportunity to achieve optimum noise management through choosing a minimum impact alignment, appropriate road design, and/or appropriate management of development adjacent to an existing road
- whether the design/profile of a proposed road is to be altered substantially. In these cases, there is an opportunity to consider noise reduction options in the design phase (for example, putting a large proportion of the road in a tunnel, rather than at surface level).
- whether the criteria are being applied in relation to any redevelopment occurring adjacent to an established road. In these cases, there is an opportunity to use the orientation and/or design of the development to control or reduce noise impact.
- whether the area affected is in an urban or rural environment where existing noise levels will inevitably vary substantially, and where the response to additional noise will also vary.

All these factors have been considered in the development of the noise level criteria.

#### *Functional categories of roads*

In Table 1, roads have been classified according to the functional categories applied by the RTA. In the RTA *Road Design Guide 1996* roads are differentiated by a range of factors, including traffic volume, heavy vehicle use, through or local traffic, vehicle speeds and applicable traffic management options. The functional categories for roads consist of:

- arterial roads (including freeways), which carry predominantly through-traffic from one region to another, forming principal avenues of communication for urban traffic movements
- sub-arterial roads, which connect the arterial roads to areas of development and carry traffic from one part of a region to another. They may also relieve traffic on arterial roads in some circumstances.
- collector roads, which connect the sub-arterial roads to the local road system in developed areas
- local roads, which are the subdivisional roads within a particular developed area. These are used solely as local access roads.

It is noted that some industries (such as mines and extractive industries) are, by necessity, in locations that are often not served by arterial roads. Heavy

---

vehicles must be able to get to their bases of operation, and this may mean travelling on local roads. Good planning practice recognises that we must acknowledge this type of road use and develop ways of managing any associated adverse impacts. To this end, the concept of 'principal haulage routes' has been endorsed by the Department of Urban Affairs and Planning's North Coast Extractive Industries Standing Committee. Ways of identifying 'principal haulage routes' and managing associated adverse impacts have not yet been fully defined. Where local authorities identify a 'principal haulage route', the noise criteria for the route should match those for collector roads, recognising the intent that they carry a different level and mix of traffic to local roads.

### ***The criteria tables***

Table 1 sets out the criteria to be applied to particular types of road and land uses, including residential-, rural- and urban-zoned lands occupied by dwellings. In Table 1 arterial roads (including freeways) and sub-arterial roads are grouped together and are referred to as freeways/arterial roads.

Table 2 recognises that in some cases there will be extra noise sensitivities (for example, in hospitals

and schools) where more stringent standards are expected. For the specific land uses of schools, hospitals and places of worship and recreation, criteria have been set with regard to the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

The noise criteria in Table 2 are to be applied for assessing impact and determining mitigation measures in the following situations:

- a new road or road redevelopment
- a new noise-sensitive land use development affected by road traffic noise
- a land use with the potential to create additional traffic on local and/or collector roads.

The values presented in the tables are intended to preserve amenity appropriate to the land use. The confidence for such an outcome occurring for the specified noise levels is based on well-documented social surveys defining a dose-response relationship between noise level and annoyance. These values are also supported by the comparison with overseas criteria.

**Table 1. Road traffic noise criteria for proposed road or residential land use developments**

For an explanation of the terms used here, see the sections 'Guide to terms used in the tables' and 'Technical notes to the tables' immediately following the tables.

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7 am-10 pm) dB(A)	NIGHT (10 pm-7 am) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
1. New freeway or arterial road corridor	$L_{Aeq(12h)}$ 55	$L_{Aeq(12h)}$ 50	The new road should be designed so as not to increase existing noise levels by more than 0.5 dB.  Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In some instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.
2. New residential land use developments affected by freeway/arterial traffic noise	$L_{Aeq(12h)}$ 55	$L_{Aeq(12h)}$ 50	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development.  Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
3. Redevelopment of existing freeway/arterial road	$L_{Aeq(12h)}$ 60	$L_{Aeq(12h)}$ 55	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.  Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7 am– 10 pm) dB(A)	NIGHT (10 pm– 7 am) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
4. New collector road corridor	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	The new road should be designed so as not to increase existing noise levels by more than 0.5 dB.  Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In some instances this may only be achievable through long-term strategies, such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.
5. New residential developments affected by collector traffic noise	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development.  Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
6. Redevelopment of existing collector road	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.  Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies, such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.
7. Land use developments with potential to create additional traffic on existing freeways/arterials	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.  In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Environmental criteria for road traffic noise

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7 am– 10 pm) dB(A)	NIGHT (10 pm– 7 am) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
4. New collector road corridor	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	<p>The new road should be designed so as not to increase existing noise levels by more than 0.5 dB.</p> <p>Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In some instances this may only be achievable through long-term strategies, such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.</p>
5. New residential developments affected by collector traffic noise	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	<p>Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development.</p> <p>Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.</p>
6. Redevelopment of existing collector road	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	<p>In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.</p> <p>Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies, such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage.</p>
7. Land use developments with potential to create additional traffic on existing freeways/arterials	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	<p>Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.</p> <p>In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.</p>

Environmental criteria for road traffic noise

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7 am–10 pm) dB(A)	NIGHT (10 pm–7 am) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
12. Redevelopment of existing local roads	$L_{Aeq(2hr)}$ 55	$L_{Aeq(1hr)}$ 50	<p>In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.</p> <p>Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through medium-term and long-term strategies, such as regulation of exhaust noise from in-service vehicles; limitations on exhaust brake use; restricted access for sensitive areas or during sensitive times to low-noise vehicles; improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards; and alternative methods of freight haulage.</p>
13. Land use developments with potential to create additional traffic on local roads	$L_{Aeq(2hr)}$ 55	$L_{Aeq(1hr)}$ 50	<p>Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.</p> <p>In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.</p>

Table 2. Road traffic noise criteria for sensitive land uses

For an explanation of terms used here see the sections 'Guide to terms used in the tables' and 'Technical notes to the tables' immediately following the tables.

SENSITIVE LAND USE	CRITERIA		
	DAY 7 am-10 pm dB(A)	NIGHT 10 pm-7 am dB(A)	NOISE MITIGATION MEASURES
1. Proposed school classrooms (For existing schools see Technical Note x)	$L_{Aeq(1h)}$ 40 (internal)	-	<p>To achieve internal noise criteria in the short term, the most practicable mitigation measures are often related to building or façade treatments.</p> <p>In the medium to longer term, strategies such as regulation of exhaust noise from in-service vehicles, limitations on exhaust brake use, and restricting access for sensitive areas or during sensitive times to low noise vehicles can be applied to mitigate noise impacts across the road system. Other measures include improved planning, design and construction of sensitive land use developments; reduced new vehicle emission standards; greater use of public transport; and alternative methods of freight haulage. These medium- to long-term strategies apply equally to mitigating internal and external noise levels.</p> <p>Where existing levels of traffic noise exceed the criteria, all feasible and reasonable noise control measures should be evaluated and applied. Where this has been done and the internal or external criteria (as appropriate) cannot be achieved, the proposed road or land use development should be designed so as not to increase existing road traffic noise levels by more than 0.5 dB(A) for new roads and 2 dB(A) for redeveloped roads or land use development with potential to create additional traffic.</p>
2. Hospital wards	$L_{Aeq(1h)}$ 35 (internal)	$L_{Aeq(1h)}$ 35 (internal)	
3. Places of worship	$L_{Aeq(1h)}$ 40 (internal)	$L_{Aeq(1h)}$ 40 (internal)	
4. Active recreation (for example, golf courses)	Collector and local roads: $L_{Aeq(1h)}$ 60  Freeway / arterial roads: $L_{Aeq(12h)}$ 60	-	
5. Passive recreation and school playgrounds	Collector and local roads: $L_{Aeq(1h)}$ 55  Freeway / arterial roads: $L_{Aeq(12h)}$ 55	-	

---

### **Guide to terms used in the tables**

**Freeway/arterial** includes sub-arterial roads and refers to roads handling through-traffic, with characteristically heavy and continuous traffic flows during peak periods. Through-traffic is traffic passing through a locality bound for another locality.

**New freeway/arterial** refers to a freeway, arterial or sub-arterial road that is proposed on a 'corridor' that has not previously been a freeway, arterial or sub-arterial road; or an existing freeway, arterial or sub-arterial that is being substantially realigned.

**Redevelop existing freeway/arterial** refers to an existing freeway, arterial or sub-arterial corridor where it is proposed to increase traffic-carrying capacity, change the traffic mix or change the road alignment through design or engineering changes. Redevelopment does not cover minor road works designed to improve safety, such as straightening curves, installing traffic control devices or making minor road alignments.

**Collector road** refers to a road situated in a built-up area that collects local traffic leaving a locality and connects to a sub-arterial road.

**Redevelop existing collector road** refers to changes to a collector road corridor where it is proposed to increase the traffic-carrying capacity, change the traffic mix or change the road alignment through design or engineering changes. Redevelopment does not cover minor road works designed to improve safety, such as straightening curves, installing traffic control devices or making minor road alignments.

**Local road—metropolitan** refers to a road situated in built-up areas and handling local traffic. These roads characteristically have intermittent traffic flows. Metropolitan refers to the built-up area of a city or town, and includes both the urban zone of the CBD and adjacent localities, and the suburban zone situated between the urban and rural zones.

**Local road—rural** refers to a road situated in rural areas and handling local traffic with characteristically intermittent traffic flows.

**Redevelop existing local road** refers to changes to a local road corridor where it is proposed to increase the traffic-carrying capacity, change the traffic mix or change the road alignment through

design or engineering changes. Redevelopment does not cover minor road works designed to improve safety, such as straightening curves, installing traffic control devices or making minor road alignments.

**Land use development with potential to create additional traffic on existing roads** implies increases to the magnitude of the traffic flow and/or changes to the traffic mix brought about by new land use developments or significant alterations to existing land use developments, which may not involve any construction to the road. This category does not cover minor changes that are not subject to either development consent or amendment to an EPA licence.

**New residential development affected by traffic noise** addresses the acceptable level of road traffic noise impact for new residential developments.

### **Technical notes to the tables**

Details of the approaches to take when measuring and predicting noise are set out in Appendix C, but it is worthwhile to note here the key points in interpreting the specified noise levels from a technical perspective.

- i Specified noise values refer to noise from traffic on roads, road bridges and freeways, and do not include ambient noise from other sources. However, they rely on all traffic noise at the receiver location—not only noise due to the project under consideration.
- ii  $L_{Aeq(1hr)}$  represents the highest tenth percentile hourly A-weighted  $L_{eq}$  during the period 7 am to 10 pm or the period 10 pm to 7 am (whichever is relevant). If this cannot be defined accurately, use the highest hourly A-weighted  $L_{eq}$  noise level. More information on  $L_{Aeq}$  is in Appendix C.
  - $L_{Aeq(15hr)}$  represents the  $L_{eq}$  noise level for the period 7 am to 10 pm.
  - $L_{Aeq(9hr)}$  represents the  $L_{eq}$  noise level for the period 10 pm to 7 am.
  - The 'A' weighted  $L_{eq}$  noise level descriptor has been chosen for use with the criteria, and is designed to measure a level of annoyance reaction caused by road traffic noise. As explained in Appendix B, social surveys have shown that for



	<p>existing noise, a level of <math>L_{Aeq} 55</math> dB(A) equates to about 10% of a population exposed to this noise level being highly annoyed.</p> <p>—Freeways and arterial roads handle high volumes of through-traffic over extended periods of time; hence the need for a noise descriptor that measures noise exposure for the full day and night periods. Local roads in metropolitan areas, by contrast, handle only intermittent local traffic and require a shorter measurement period.</p>
<p>iii</p>	<p>In assessing noise levels at residences, the noise level is to be measured at 1 m from the facade that is the most exposed to traffic noise, and at a height of 1.5 m from the floor level. The residential noise level criterion includes an allowance for noise reflected from the facade ('facade correction'). If reflection during measurement is unlikely (as, for instance, when measuring on open land before a residence is built), add an appropriate correction—generally 2.5 dB(A)—to the measured value.</p>
<p>iv</p>	<p>Where internal noise levels are specified, they refer to the noise level at the centre of the habitable room that is most exposed to the traffic noise.</p>
<p>v</p>	<p>In the case of multi-level residential buildings, the external point of reference for measurement for the criteria is the two floors of the building that are most exposed to traffic noise (generally the ground and first floors). On other floors, the guideline is that the internal noise level should not exceed a value 10 dB below the relevant external noise level on the basis of operable windows being opened sufficiently to provide adequate ventilation (Refer to Building Code of Australia for additional information.) For most residences this equates to a minimum of 20% of the window area left open.</p>
<p>vi</p>	<p>For all road developments, the criteria should apply on the basis of the traffic volumes projected for 10 years' time. The noise criteria should also apply immediately after the road opens. In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Aus-</p>
	<p>tralian Standard 2107 <i>Acoustics—Recommended design sound levels and reverberation times for building interiors</i>.</p> <p>vii For commercial and industrial developments, information on desirable noise levels is contained in Australian Standard 2107 <i>Acoustics—Recommended design sound levels and reverberation times for building interiors</i>.</p> <p>viii In Table 1, for categories 3, 6 and 12 (redevelopment of existing roads) and 7, 8 and 13 (land use developments with the potential to create additional traffic), where the existing road traffic noise levels lie within 2 dB of the noise criteria, the 2 dB allowance can be applied where all feasible and reasonable mitigation measures have been used. The same approach applies to categories 1, 4, 9 and 10 (new road corridors) in Table 1, where a 0.5 dB allowance is assigned.</p> <p>ix If the existing noise level is below the criteria but within 2 dB of the criteria, then the 2dB allowance may be applied to the existing noise level.</p> <p>x In cases where existing schools are affected by noise from proposed roads, the daytime criterion is <math>L_{Aeq(0h)} 45</math>dB(A) (internal).</p>
	<p><b>Maximum noise levels</b></p> <p>Unlike <math>L_{Aeq}</math> levels and annoyance reactions, the relationship between maximum noise levels and sleep disturbance is not currently well defined. (See Appendix B.) In addition, the effects of sleep disturbance on health are not clear. While research indicates that noise at low levels can cause autonomic reactions (including changes in gastrointestinal activity and cardiovascular responses), there is no clear indication of what, if any, impact these reactions may have on health.</p> <p>Based on a review of the relevant research (see Appendix B), the following conclusions have been drawn.</p> <ul style="list-style-type: none"> <li>• Sleep disturbance occurs through two mechanisms: changes in sleep state and awakenings.</li> <li>• Awakenings are better correlated to subjective assessments of sleep quality than are changes in sleep state.</li> </ul>

- Factors (other than noise) that contribute significantly to awakening reactions include sleep state and subject age.
- The maximum noise level, the extent that noise exceeds the ambient noise level, and the number of noise events, all contribute to sleep disturbance.

There are some unresolved points regarding sleep disturbance and maximum noise levels. Even where noise is not a factor, awakenings may still occur. Typically this level of awakening is 1 to 1.5 per night. Thus, some level of sleep disturbance through awakenings that are not related to noise incidents is quite usual. Further, the number of additional awakenings that would have a significant effect on health and wellbeing is yet to be demonstrated. Similarly, the extent to which sleep state and other sleep disturbance indicators affect health is still to be determined.

Therefore, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance.

This does not mean that we should avoid considering maximum noise levels. It does mean that we should start to consider these levels broadly, and that we should start more rigorous assessment and research on the sleep disturbance effects of traffic noise.

At our present level of understanding, it is important that all of the noise characteristics of road traffic noise known to affect sleep are assessed.

This means that we should assess the likely maximum noise levels from road traffic, the extent to which these maximum noise levels exceed the ambient noise level, and the likely number of noise events from road traffic during the night.

Because the relationship between noise, sleep disturbance and health is not fully understood at this stage, it is not possible to define fully how the different noise characteristics of road traffic should be measured to best estimate effects on sleep.

The intention is to refine the definition of the important noise characteristics of road traffic noise as understanding improves.

Maximum noise levels during each hour of the night-time period should be assessed and reported to give an indication of the likelihood of awakening reactions.

#### ***Where noise levels are already exceeded***

The fourth column in the tables shows the preferred approach where existing noise levels already exceed the noise criteria.

In areas where the criteria are exceeded by high existing levels of road traffic noise, the capacity to employ noise reduction measures will depend on current circumstances and on whether any change to the road and/or adjoining development is also proposed. The most stringent criteria apply to the development category with the most noise reduction options, and the least stringent criteria apply where there is little potential for noise control. This is discussed more fully below.

As a general principle, where reduction of existing noise levels is possible, a reduction in noise levels in line with the noise criteria is desirable. The best combination of short-term and long-term measures should be applied. In some instances it is expected that reduction in traffic noise levels will be practicable only over time. Long-term measures, such as reducing vehicle noise emissions through new Australian Design Rules (ADRs), considering existing noise levels in planning decisions, and developing alternative methods of transport, are examples of applicable long-term strategies.

New road development in greenfield sites is likely to present a wide range of potential noise control measures and would not be expected to add to existing noise levels from road traffic noise by more than 0.5 dB.

The redevelopment of existing corridors offers a more limited range of noise control measures because of likely limitations to using corridor route adjustment, proximity of residents to the road and limited road re-design options. Construction activity may, however, provide some potential at least to contain noise increases as a result of the development. Measures should be formulated with a view to achieving the noise criteria. However, where this is demonstrated not to be feasible, it is expected that strategies be implemented to contain

---

any increases to 2 dB above the prevailing noise level before re-development begins.

Upgrading of roads not designed to increase road traffic inherently should not create significant noise impacts.

New industrial, commercial or residential developments that generate additional traffic on existing roads are likely to provide limited potential for noise control, because such developments are not usually linked to road improvements. The criteria recognise the difficulties in these cases by specifying that any road traffic noise increase should be limited to 2 dB above existing levels before the development takes place, where it is shown that meeting the criteria is not feasible and reasonable.

Where there is new residential development that can be affected by noise from existing roads, it is expected that developers will be able to use a number of noise control options to mitigate traffic noise. These options include designing developments so that sensitive land uses are protected from excessive noise through the use of options such as optimum location and orientation on the site, well-planned internal layouts, noise insulating building materials and construction methods that facilitate noise control.

Similarly, these principles can be applied to schools, hospitals, places of worship and the location of recreational areas.

Opportunities are more limited for existing land uses affected by existing roads, but where opportunities such as building improvements arise, noise control measures should be applied as far as practicable.

In the longer term, for all development and existing use categories, strategies should be developed for overall reductions in road traffic noise using the criteria as the target.

#### *Internal noise levels*

It is preferable for internal noise level criteria to be set by the relevant planning or building authority. The internal levels that are set may vary depending on the type of development the planning authority wants to encourage for an area. The Hornsby Shire and Sydney City councils have codes for internal noise level criteria in place. Sleeping areas are usually the most sensitive to noise impact, so in the absence of any local codes internal levels of 35–40 dBA at night are recommended. As a guide for other living areas, internal noise levels 10 dB below external levels are recommended on the basis of openable windows being opened sufficiently to provide adequate ventilation (refer to Building Code of Australia for additional information). For most residences this equates to a minimum of 20% of the window area left open.