



# **AIR CONDITIONING RESIDENTIAL BEST PRACTICE GUIDELINE (*Australian Capital Territory*)**

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## Foreword

The use of residential air conditioning systems in Australian homes has steadily increased over the last 10 years. Currently there are over 650,000 residential air conditioners sold in Australia annually and forward estimates indicate that this figure will continue to rise. The increase in use of residential systems has generated an increase in complaints about noisy air conditioners.

Noise is an integral part of our society today. No one can escape noise completely, but if our towns and cities are to remain liveable, it is important to manage the negative impacts of environmental noise on people within their homes.

As a supplier, installer and maintainer of residential air conditioning systems, you have a professional obligation to make sure that every practical and reasonable effort is made not to compromise our quality of life through noise related issues.

AIRAH is pleased to be involved in the development of these guidelines which are aimed at improving installation practices thereby minimising and reducing inappropriate noise from air conditioning systems.

This document represents an important step forward in coordinating Council, community and industry action in managing environmental noise. It contains fundamental guidelines to protect both yourself and your customer from actions that may result in fines and/or legal action.

Follow the basic steps outlined in this booklet and help "design out the problem".



Jennifer Pelvin  
Chief Executive  
AIRAH

## Purpose and application

The purpose of this Best Practice Guideline is to define a minimum level of service that AIRAH considers should be delivered by a Supplier\* in order to provide a quality result for a Customer. AIRAH does not monitor or control Suppliers who may use this Guideline and is not a party to any contract with which it may be used.

This Guideline is primarily intended to apply to air conditioning or heating systems for single residential dwellings, including individual apartments in a multi-residence building. It may also be used for individual small commercial systems, but does not apply to large or complicated commercial systems.

AIRAH has endeavoured to provide information that is relevant to typical residential air conditioning applications and that is correct at the time of publication. AIRAH may update this document from time to time, and will make updates available. However, it is the responsibility of the Supplier to ensure that all work is carried out in compliance with all current Legislation and the requirements of all applicable Standards, Codes and state and local Authorities.

### Intent

The intent of this Guideline is:

To enable all Suppliers to provide refrigerative air conditioning and heating systems that adequately meet the customer's needs and to minimise the risk of any Supplier bringing the industry into disrepute by:

- Using equipment that can't deliver its stated capacity.
- Offering to install equipment without accurately calculating how much cooling or heating (duty) is really needed.
- Installing equipment so that it can't meet the required duty or be properly maintained.
- Using unqualified, unskilled, unlicensed and/or inexperienced tradespersons to specify and install the equipment.

To give the Customer confidence that the selection of an air conditioning or heating system will meet their expectations of satisfactory operation and price, by:

- Noting the maximum/minimum ambient conditions at which the system will satisfy indoor temperatures.
- Ensuring alternative choices of equipment or systems are offered.
- Explaining all aspects of the price: inclusions, exclusions, maintenance work and likely additions.
- Stating what sort of service is really required and the cost of this service, indicating what has been included (and excluded) from any service agreement in the contract.

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\* The term suppliers in this document refers to: suppliers, specifiers, installers and those maintaining air conditioning equipment

## **Objectives for Suppliers**

The objectives of this Guideline are to ensure that the Supplier:

- Identifies the needs of the Customer.
- Provides professional advice and a written quotation.
- Provides a system that meets the identified needs of the Customer.
- Provides good quality equipment and installation.
- Provides professional after-sales service.

## **Meeting the objectives of this guideline**

The following items should be adhered to:

1. Educate your staff in this Best Practice Guideline.
2. Employ qualified trades people and ensure that all installation work is carried out under the supervision of a person licensed / registered for air conditioning / refrigeration work.
3. Tell your prospective customer that your firm designs systems and then selects, supplies, installs and commissions equipment, all in accordance with the AIRAH Residential Air Conditioning Best Practice Guideline.
4. Make sure that you know what your customer's real needs are, in regard to air conditioning and heating. Do they want:
  - A low price, or are they prepared to pay for the best possible air conditioning system?
  - Year-round comfort in all rooms, or just relief from outside extremes on the hottest or coldest days only?
  - Absolutely minimal noise that won't disturb the lightest sleeper, or a reasonably loud "drone"?
  - A system that makes it visually obvious that the home is air conditioned or one that is almost "invisible"?
  - Minimal running costs, or are running costs not an important issue?
  - A high efficiency unit defined by a high star rating.
5. Make sure that your customer knows what your proposal will really achieve. Does the customer:
  - know it will take time to cool-down or heat-up a home during extreme weather?
  - expect more rooms to be air conditioned than you are offering?
  - know the likely running costs per day? (or over the whole year?)
  - really know what noise level to expect from a residential air conditioning system?
  - know what it will look like, indoors and outdoors?

6. Cooling and heating load estimates must only be carried out by experienced personnel, or under the supervision of experienced personnel, and include appropriate allowances for internal loads, infiltration, fan gains and duct heat gain/loss. The Supplier shall retain calculations on file for the duration of the warranty period.
7. Design outdoor conditions should be selected from AIRAH DA09, Load Estimation & Psychrometrics 'comfort' criteria for the nearest location, adjusted if necessary for the actual local climate. Note that design conditions only a few kilometres inland may be quite different from coastal locations.
8. Equipment selection must be based on the design indoor and outdoor conditions, adjusted if necessary to account for the installed plant configuration (e.g. heat gain from surroundings, recirculation). Unit capacity must be capable of achieving both the calculated sensible and total loads.
9. Where the building occupant does not plan to operate the plant continuously, but will switch it on say, after returning home on a very hot (or very cold) day, an appropriate "cool-down/warm-up" allowance must be included in the calculated loads so the system has sufficient reserve capacity to reach comfort conditions in a reasonable time.
10. Ensure that your staff are familiar with the Australian Standards, Codes and Legislation applying to the installation and have access to appropriate reference documents. Refer to the AIRAH Residential Air Conditioning Best Practice Guideline.
11. Install systems with adequate space and access to carry out proper maintenance. Where the Customer is unwilling to provide adequate space or access, explain and confirm in writing the likely effect in terms of ongoing costs and unsatisfactory or reduced plant life.

## **Compliance**

A Supplier shall not advertise use of this Best Practice Guideline unless it is used and fully complied with on all applicable projects (except when specifically excluded by the Customer).

Compliance with this Guideline involves completion of all requirements that are relevant to the project, as initialled on the copy of this Guideline supplied with the quotation. The Supplier will indicate compliance with the Best Practice Guideline by completing the Data Form on the last pages of this booklet and leaving it with the Customer.

The following checklist should be adhered to by the Supplier.

| <b>BEST PRACTICE CHECKLIST</b> |  |
|--------------------------------|--|
| Phase                          |  |
| QUOTATION                      | Arrive at the agreed time. If an appointment cannot be kept, advise the Customer in advance and agree an alternative time.   |
|                                | Inspect the site and discuss the Customer's requirements to identify their needs.  |
|                                | Suggest alternatives if appropriate. If requested, provide indicative pricing for each.  |
|                                | Agree the system type to be used.  |
|                                | Determine required equipment capacity using an appropriate calculation method.   |
|                                | Determine Local Council requirements (if any) in relation to the works.  |
|                                | <p>Provide a detailed quotation including:</p> <ul style="list-style-type: none"> <li>• Calculated heating and cooling capacity, stating calculation method used, indoor and outdoor temperatures for Summer and Winter used for calculations and expected indoor temperature tolerances.</li> <li>• Description of the system to be provided (equipment manufacturer, heating and cooling capacity at stated indoor and outdoor conditions, noise levels, number and location of outlets, zones, controls and the like).</li> <li>• Statement on required/recommended noise levels and the extent of the Supplier's responsibility.</li> <li>• Price and payment schedule.</li> <li>• Inclusions and exclusions (Council application/fees/requirements, power supply, supports/plinth, drainage, covers for exposed piping and wiring, cleanup, rubbish removal and the like).</li> </ul> |



| <b>BEST PRACTICE CHECKLIST</b> |   |
|--------------------------------|---|
| Phase                          |   |
| QUOTATION                      | <ul style="list-style-type: none"> <li>• Warranty (length, conditions and exclusions).</li> <li>• Insurance (what is and is not covered by the Supplier's policy).</li> <li>• Details of recommended servicing frequency and exclusions. Nominate price of full service for first year.</li> <li>• A copy of this Best Practice Guideline, with initials against the requirements that will be completed.</li> <li>• Declaration by a management representative that the work will be carried out in accordance with this Best Practice Guideline.</li> </ul> |
|                                | If a contract is signed following door-to-door sales, a 10 day cooling off period applies. Otherwise, no cooling off period applies.  |
|                                | Under the Trade Practices Act 1974, an implied warranty applies on goods and services including air conditioners.   |
| INSTALLATION                   | Utilise equipment from established manufacturers capable of providing spare parts and technical backup.   |
|                                | Ensure installation is performed by, or under the supervision of qualified, licensed/registered personnel.  |
|                                | Ensure equipment, materials and installation is in accordance with all relevant legislation and Australian Standards and Best Practice Programs.  |
|                                | Commission the equipment with calibrated instruments and an established checklist, using experienced personnel. A copy of the completed checklist shall be provided to the Customer.  |
|                                | Provide the Customer with operating instructions and a (brief) schedule of recommended maintenance.   |
| AFTER SALES                    | For at least two years after installation, remind the Customer when a routine service is recommended. Service visits for the first year shall be at the fixed price nominated in the quotation.   |
|                                | Utilise a service checklist and provide a copy to the Customer after each service.  |
|                                | Promptly attend to any defects identified during the warranty period.   |

## Noise Issues

### What is Noise?

When environmental noise reaches elevated levels in our living spaces, it can have significant impacts on our health and well being by disturbing sleep and interfering with relaxation and communication.

Noise by definition is sound that is unwanted or unpleasant in some way. Due to the range of noise that can be heard by the human ear, a scale

was developed called the 'decibel scale' (dB(A)), which is used to represent how loud a particular noise is.



### How does noise affect us?

When noise becomes too loud in our living places, it can have significant impact on our health and wellbeing by disturbing and preventing sleep, relaxation and communication. Noise can also affect our performance, learning and stress levels.

The level of annoyance experienced from the noise depends on the level of the noise, type of noise, how often it occurs, how long it goes for, time of day or night and the individual's own tolerance.

### Sleep disturbance

Sleep is necessary for the basic physical and mental functioning of healthy people. Noise can interfere with sleep in a number of ways.

It can:

- prevent people from falling asleep
- cause awakenings
- interrupt quality of sleep
- affect performance and mood the next day

Research also indicates exposure to night time noises also induce secondary effects, so-called after effects. These effects that can be measured the day after the night-time disturbance and are detected while the individual is awake. The secondary effects include reduced perceived sleep quality, increased fatigue, depressed mood or well-being, and decreased performance.

Research has shown that sleep disturbance is complex and dependant on a number of factors, including the level of nuisance noise compared with the background noise, frequency of the noise and the percentage of low-range components within the nuisance noise. This combined with particular individual attributes (such as stress levels, medical conditions and level of hearing) can all lead to sleep disturbance.

## **Annoyance**

The term 'annoyance' is typically used to sum up the negative emotions people express to unwanted noise that impacts on their ability to undertake activities such as sleeping, relaxing or reading. These emotions can include anger, dissatisfaction, agitation and helplessness.

Annoyance levels are influenced by:

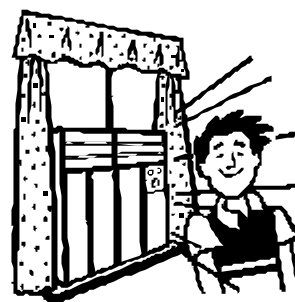
- the level of noise
- type of noise
- how often it occurs
- how long it goes for
- the time of day or night
- psycho-social factors such as the individuals ability to shut out the noise, their emotional status and disposition to the noise



Noise annoyance can result in changes in behaviour, such as closing windows, not using balconies and turning up the television volume. In some cases annoyance can be extreme and can lead to aggression.

## **Residential appliance noise**

Changing lifestyles and new technologies have seen the increased use of powered appliances. Air conditioner noise complaints made to city councils have greatly increased over the past few years and may be attributed to a number of factors including a decrease in distance between neighbours due to an increase in high density living, combined with an increase in domestic air conditioning sales.



## **Allowable Noise Levels**

The *Environment Protection Act 1997* and the *Environment Protection Regulations 2005* include noise limits for air conditioners. The Environment Protection Authority (EPA) is responsible for enforcing these limits at houses and units.

The allowable noise levels are:

| Area  | Time                | Noise level (dB(A)) |
|---|---------------------|---------------------|
| Residential Areas                           | <b>7am* to 10pm</b> | 45                  |
|   | <b>10pm to 7am*</b> | 35                  |
| Flats or townhouses in multi-unit complexes | <b>7am* to 10pm</b> | 40                  |
|   | <b>10pm to 7am*</b> | 30                  |

\*8am on Sundays and public holidays

Noise levels are measured at the boundary of the property emitting the noise. In multi-unit complexes the measurement is taken inside the neighbours' unit.

If an air conditioner exceeds these limits, the EPA can issue an Environment Protection Order, and if the order is not adhered to an on-the-spot fine may be issued.

Therefore it is important to select the quietest air conditioner possible and have it installed as far away from any surrounding dwellings / houses as possible.

## Noise Labelling

The Environment Protection Regulations 2005 require that residential air conditioners have a label clearly displayed which shows the Sound Power Level ( $L_w$ ) of the unit.

The Sound Power Level will give you an indication on how noisy the air conditioner will be outside the customer's house. The higher the number, the louder the air conditioning unit will be.

*Some air conditioners may also have Sound Pressure Levels ( $L_p$ ) stated on the label. This number is different from the Sound Power Level*

|  |               |
|--|---------------|
| OUTSIDE SOUND<br>POWER LEVEL   | <b>60</b> dBA |
| (LOWER LEVELS MEAN LOWER OUTSIDE NOISE)<br>THE LEVEL SHOWN ABOVE MAY BE USED TO ESTIMATE<br>WHETHER THE OUTSIDE NOISE FROM THE PROPOSED<br>INSTALLATION OF THIS UNIT WILL BE WITHIN ACCEPTABLE LIMITS<br>CONSULT YOUR SUPPLIER BEFORE INSTALLATION |               |
| (MANUFACTURER)   | (MODEL No.)   |

## Education

Noise issues associated with the use of appliances such as air conditioners are often the result of the operators being unaware that their actions are adversely affecting neighbours. Operators are also unaware that by exceeding noise levels, they are breaking the law and could be fined for such activities.

Raising people's awareness of noise nuisances and potential penalties that may apply will ensure reduction of these nuisances.

Likewise, limited advice from retailers and installers, and lack of forethought and planning by owners, retailers and installers on the location and use of air conditioners also contributes to noise impacts in the community.

Manufacturers, installers and retailers have a community obligation to provide responsible advice and service to prevent noise nuisance up-front.

Noise labelling for domestic air conditioners, providing consumers with more information in order to make informed purchasing decisions.



## Enforcement

The EPA regulates noise impacts from residential appliances using the *Environment Protection Act 1997* and the *Environment Protection Regulations 2005*. These regulations prescribe noise level restrictions and times for air conditioner use.



Initially you should try to solve the problem by discussing it with whoever is causing the noise. Alternatively, you may wish to initiate the mediation through the Conflict Resolution Services who can be contacted on 02 6295 5998. Where the noise problem cannot be resolved through these mechanisms, you may lodge a complaint with the Environment Protection Authority (EPA). A complaint regarding noise pollution will be considered by the EPA only if it is made by a person affected by the noise.

To register a complaint, you must identify the source of the noise before phoning the EPA. The first stage in investigating the complaint is for the EPA to send out a letter advising the alleged noise producer of their responsibilities under the Act and inviting them to discuss the matter. In most cases the matter can be resolved at this stage.

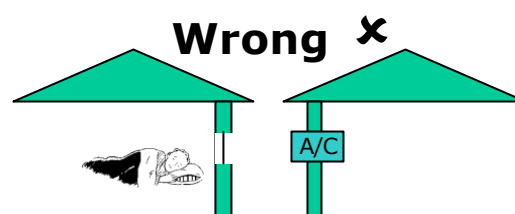
Following this, if another noise complaint is received, the complaint needs to be validated by the EPA. This involves the EPA visiting the site and taking a valid noise measurement. If validated, a warning letter or on-the-spot fine may be issued, or, depending on the circumstances, an Environment Protection Order (EPO) may be issued. A breach of an EPO is a serious offence. If the noise continues to be a problem, it could lead to prosecution in court.

# Practical steps to minimise air conditioner noise

## Where will the air conditioner be installed?

Consider where the air conditioner is likely to be installed. Some air conditioning systems are quieter than others and some have more flexibility in where they can be located.

Air conditioners should not be located adjacent to neighbours windows, bedrooms or living areas.



Split systems have more flexibility in the way they are installed and the outside unit can be located closer to the ground. This allows fences and barriers to be used to screen the noise from the unit.

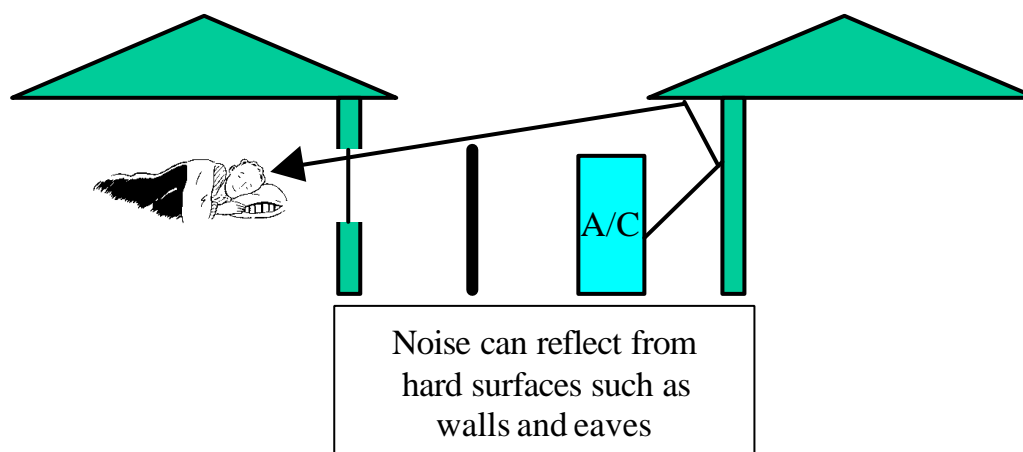
***"Discuss noise issues with your customer before the air conditioner is installed."***

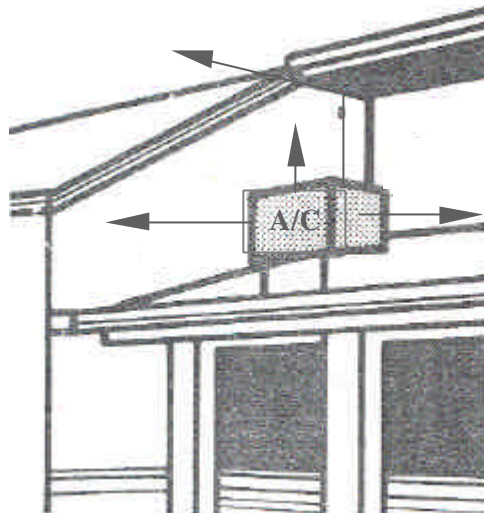
## Make use of barriers for screening

Just as light reflects from shiny surfaces, noise can be reflected from hard surfaces onto neighbour's property.

Avoid locating the air conditioner near multiple reflective surfaces such as walls and eaves.

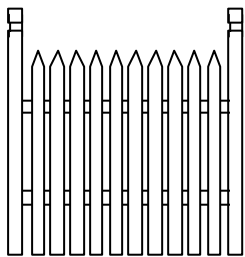
Existing barriers such as fences and garden walls can be used to effectively screen noise from neighbours. It is important to make sure that any barriers used to screen neighbours from noise blocks the line of sight of the air conditioner and does not contain any holes or gaps.



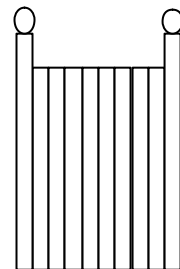


Try and avoid multiple reflective surfaces when air conditioner is facing neighbours

A solid fence, which completely blocks line-of-sight of the air conditioner and contains no gaps, may help you to reduce your air conditioner noise to acceptable limits.



**✗ Wrong**  
Too many holes and gaps



**✓ Right**  
Solid fence with no gaps

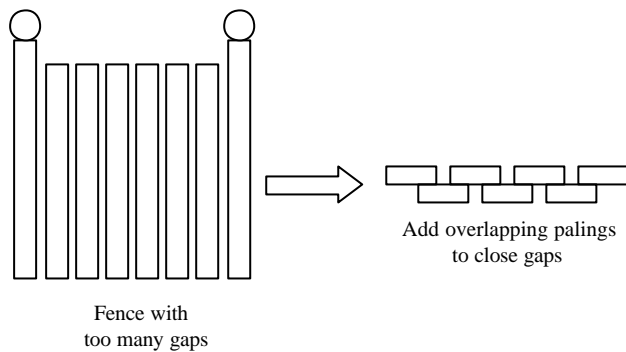
### Acoustic Barriers

If the air conditioner is well maintained and operating properly, but is still causing excessive noise, consider the use of acoustic barriers.

Fences and garden walls can be used effectively to screen neighbours from noise, however to be effective, any fences or walls must block the line of sight of the air conditioner, be of solid construction and contain no gaps or holes.

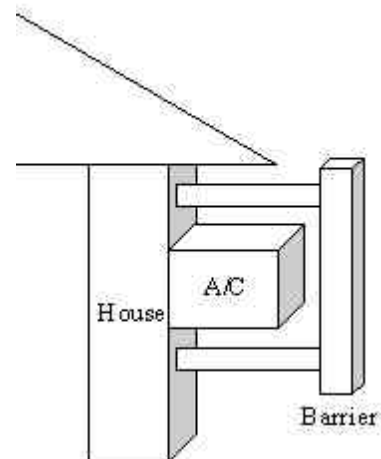
If a dividing fence is located between the air conditioner and the neighbour, it may be constructed of standard wooden palings with gaps between the palings. The fitting of additional overlapping palings could make an existing fence an effective noise barrier.





If room permits, an air conditioning barrier could be a cost effective option. In order for this to be effective, the barrier must block line of sight to the affected neighbours and the air conditioner must be located away from multiple reflective surfaces, such as corners and eaves, which could reflect noise and decrease the effectiveness of the barrier.

Air conditioning outdoor units require ventilation to operate. Any barriers must be constructed in accordance with manufacturer specifications for ventilation to avoid damage to the outdoor unit.



### Air Conditioning Enclosures

There are a number of companies that market full noise enclosures for air conditioning units.

Also check with the manufacturer of your air conditioner to see whether they have any after market sales of noise enclosures.

***"Always make sure when enclosing air conditioning units that you check the manufacturers' specifications for ventilation, to avoid damage to the outdoor unit and voiding of the warranty."***

### Estimating the Noise Impact on Neighbouring Properties

The following pages give simple methods to estimate the likely noise impact of an air conditioner installation on neighbouring properties. If you want to determine the suitable "Sound Power Level" for a given installation then follow the steps for - *Determining a Suitable Sound Power Level*.

If you have already selected a unit and know the "Sound Power Level" and want to know how close to a neighbouring property or fence it can be located, follow the steps for - *Determining Distance to Boundary*.

## Determining a Suitable Sound Power Level

Follow **Steps 1- 4** carefully and it will guide you to decide which air conditioner is suitable by considering the distance between the intended site and property boundary, as well as noise barriers such as fences.

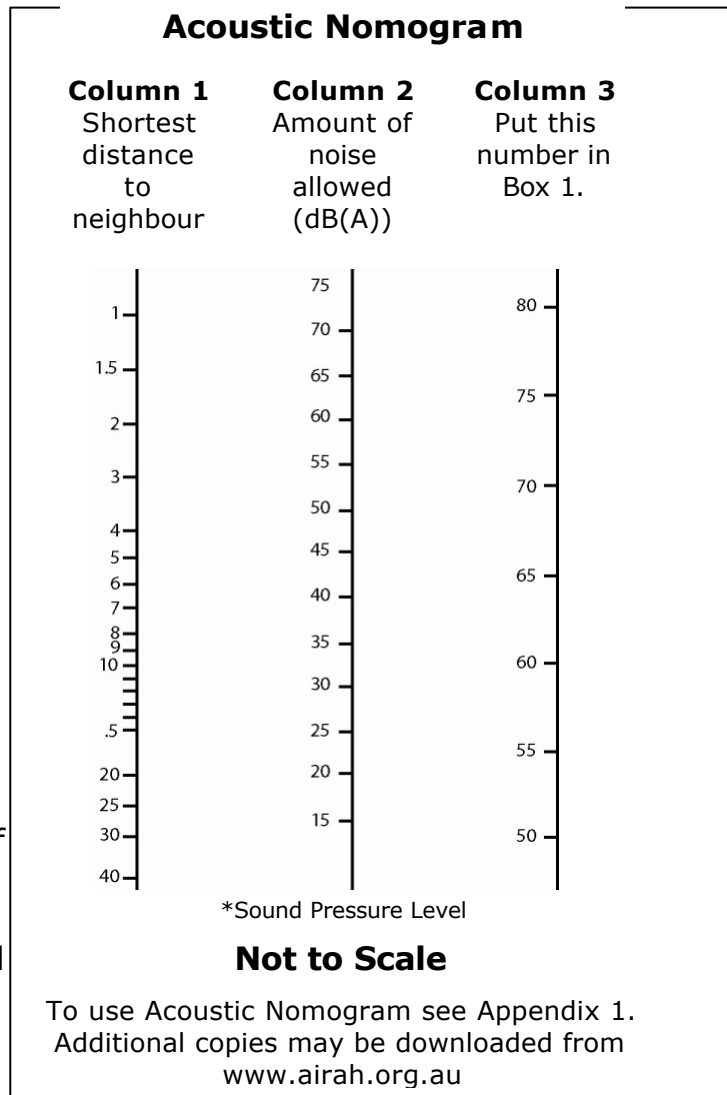
### Step 1 Distance Factor

The closer the air conditioner is to the neighbour the quieter it will need to be. Follow the steps below and put your answer in **Box 1**.

a) Measure the shortest distance, in metres, between where you want to put the air conditioner and the boundary of the owner's property. Mark the distance with an X in Column 1 - Acoustic Nomogram.

b) Bear in mind that to reduce noise, air conditioners are best placed in a location that provides the greatest distance between the air conditioner and neighbours. This could, for example, mean mounting the air conditioner facing the back fence or front street (check Town Planning constraints first).

c) For the majority of residential properties the assigned level will be the base value of 35dB(A) sound pressure level for the overnight period from 10pm until 7am the following morning on weekdays and Saturdays. Assigned noise levels are calculated at the



property boundary rather than on the property emitting the noise. In multi-unit complexes, the measurements are taken inside the neighbour's unit. Before relying on an assigned level for this calculation you will need to consider tonality.

- d) Tonality can be simply described as a characteristic whine or drone. Experience has shown that many air conditioners are tonal when assessed under Regulations. If the tone cannot be reasonably and practicably removed from the noise, the installer will need to compensate for this in the calculation. This can be achieved by subtracting 5dB from the assigned level, prior to doing any calculations.
- e) If the highest allowable level is 35dB(A) sound pressure level, and you believe a unit is tonal and you cannot reasonably or practicably remove the tones, you will need to consider lowering the assigned allowable level to 30dB(A) sound pressure level.
- f) Once you have considered whether an adjustment for tonality is required, mark the amount of noise allowed in the area with an X in Column 2 - Acoustic Nomogram.
- g) Draw a straight line from the X in Column 1 through the X in Column 2 to cut through Column 3 - Acoustic Nomogram.
- h) Read the number from Column 3 - Acoustic Nomogram, where the line you have just drawn crosses, and write this in **Box 1**.

#### **Distance Factor**

|              |   |
|--------------|---|
| <b>BOX 1</b> |   |
| í            | ý |

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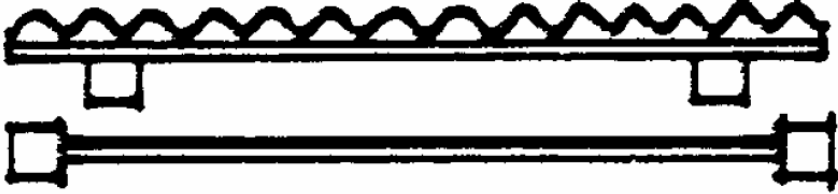

**Step 2      Barrier Factor**

If there is a fence or wall between the neighbouring properties the noise may be reduced. Check this below and put your answer in **Box 2**.

A fence or barrier can reduce the level of air conditioner noise heard in neighbouring premises. To do this a fence or barrier will need to be continuous or solid. It should contain very few gaps, particularly where the fence meets the ground. The fence or barrier must also prevent the air conditioner being seen from noise sensitive locations on neighbouring premises. Noise sensitive locations include windows of bedrooms and living rooms (including those of multi storey dwellings) and outdoor entertaining and relaxing areas.

Carefully read through the fence/barrier descriptions below starting at **a)**. Select a value that corresponds to the fence/ barrier description applicable to your situation. Put this value in **Box 2**.

|           |  |          |
|-----------|--|----------|
| <b>a)</b> | The fence/barrier does not prevent the air conditioner being seen from between the air conditioner and noise sensitive locations on the neighbouring premises.   | <b>0</b> |
| <b>b)</b> | The fence/barrier only just blocks the "line of sight" and it is made of material having gaps, such as a standard picket fence or a brick fence with fancy iron inserts.   | <b>0</b> |
| <b>c)</b> | The fence/barrier only just blocks "line of sight" and is made of solid material.  | <b>5</b> |
| <b>d)</b> | Fence/barrier with gaps e.g. <ul style="list-style-type: none"><li>• Hedges/bushes/trees</li><li>• Tea tree/brush</li><li>• Picket Fence</li><li>• Fence in disrepair with holes or missing planks</li><li>• Wire mesh fence</li><li>• Masonry fence with decorative open inserts.</li></ul> | <b>0</b> |

|    |   |    |
|----|---|----|
| e) | <p>The fence/barrier completely blocks "line of sight" of the air conditioner from noise sensitive locations.</p> <p><i>Typical paling fence e.g.</i><br/>Planks overlapped by 25mm planks, 13mm thick.<br/>Air gaps between palings due to warping etc.</p>  | 6  |
| f) | <p><i>Solid fence with no gaps and flush to the ground e.g.</i><br/>Galvanised iron<br/>Fibre cement sheeting<br/>20mm Pine planking with 35mm overlap</p>    | 10 |
| g) | <p><i>Concrete block / masonry / brick</i></p>    | 10 |

**Note:**

- If in doubt about your fence type, select a low value.
- For roof mounted refrigerated units, place "0" in Box 2 – Barrier Factor.

**Barrier Factor**

|              |   |
|--------------|---|
| <b>BOX 2</b> |   |
| í            | ý |

---

### Step 3 Reflection Factor

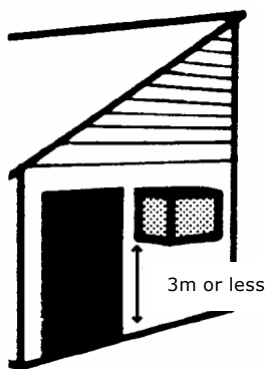
Noise can reflect off walls and make the air conditioner appear louder. From the examples below, determine the best fit for your situation and put your answer in **Box 3**.

Just as light reflects from mirrored surfaces, sound will reflect from walls, carports, roofs and the like. Find a diagram below which best corresponds to the placement of the air conditioner. Put the corresponding value in **Box 3**.

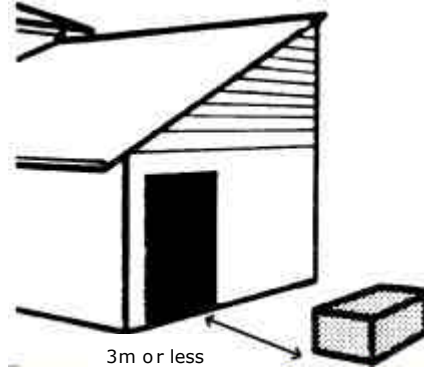
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#### One Reflective Surface

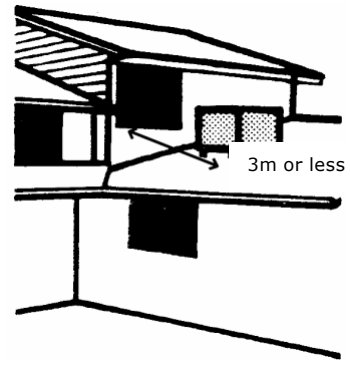
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on side of building = 3



on ground = 3

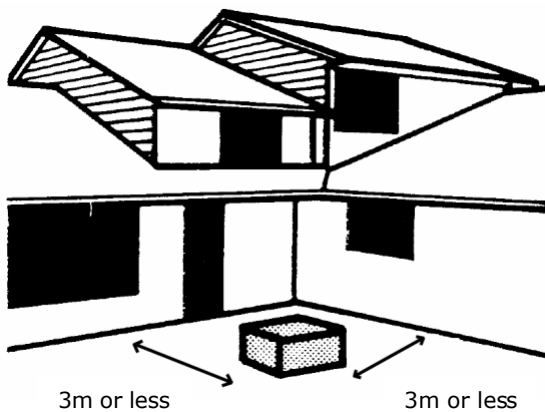


on roof = 3

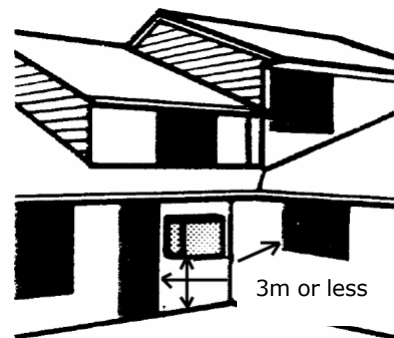
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#### Two Reflective Surfaces

---



on ground = 6

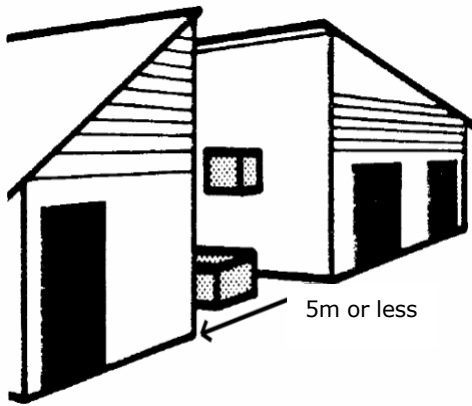


on side of building = 6

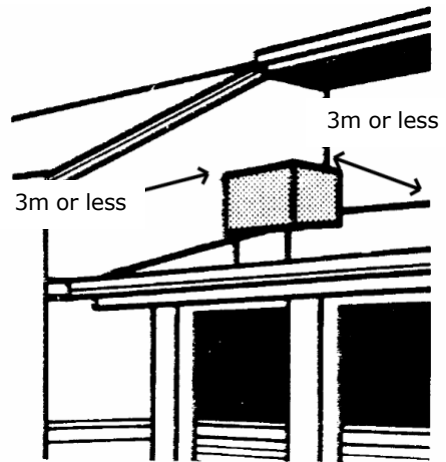
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## Two Reflective Surfaces

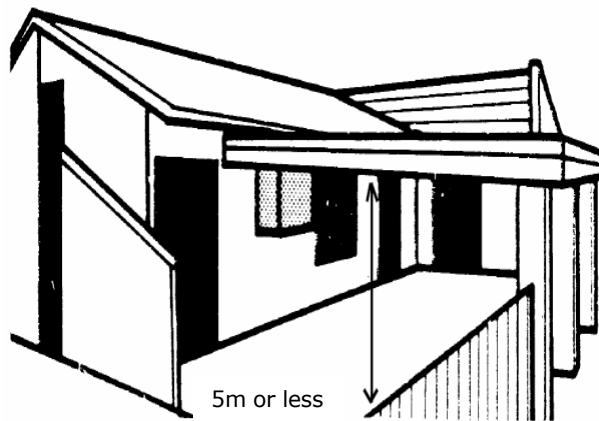
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between two walls = 6

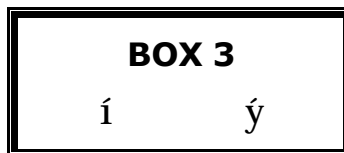


on roof = 6



under carport = 6

### Reflection Factor



---

**Step 4      Sound Power Level dB(A)**

(= Answer)      Add the numbers in **Box 1** and **Box 2**, then subtract the number in **Box 3**.

**Transfer all your Answers here and complete the equation.**

|                            |          |                           |          |                              |          |  |
|----------------------------|----------|---------------------------|----------|------------------------------|----------|--|
| <b>Distance<br/>Factor</b> | <b>+</b> | <b>Barrier<br/>Factor</b> | <b>-</b> | <b>Reflection<br/>Factor</b> | <b>=</b> | <b>Sound<br/>Power Level<br/>dB(A)</b> |
| <b>BOX 1</b><br>í      ý   |          | <b>BOX 2</b><br>í      ý  |          | <b>BOX 3</b><br>í      ý     |          | <b>ANSWER</b><br>í      ý              |

The answer is the Maximum Sound Power Level (expressed in dB(A)) that can be installed in the position you are considering.

Refrigerated domestic air conditioners must be labelled with their outside sound power level.

***"As a Supplier you will need to know the sound power level of any air conditioning unit you intend to install."***

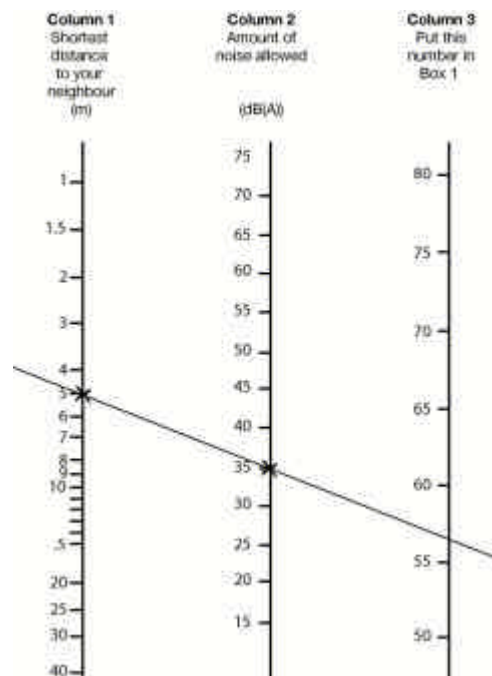


# EXAMPLE

## Determining a Suitable Sound Power Level

### Step 1

You plan to locate the air conditioner 5 metres from the neighbour's fence so you put a mark at 5 in Column 1. The assigned level at the property boundary should not exceed 35dB(A) and you are satisfied that the unit is not tonal so you put a mark at 35 in Column 2 of the Acoustic Nomogram. Joining these two points with a straight line through column 3 of the Acoustic Nomogram gives a value of 57.



### Step 2

The fence between the air conditioner and neighbours would block the "line of sight" and is made of wooden overlapped planks. Put 6 in Box 2.

### Step 3

The air conditioner will be located on the ground against the house wall and more than 3 metres from any other wall surface. Put 3 in Box 3.

| Distance Factor       | + | Barrier Factor       | - | Reflection Factor    | = | Sound Power Level dB(A)      |
|-----------------------|---|----------------------|---|----------------------|---|------------------------------|
| <b>BOX 1</b><br>í 57ý |   | <b>BOX 2</b><br>í 6ý |   | <b>BOX 3</b><br>í 3ý |   | <b>ANSWER</b><br>í 60 dB(A)ý |

You have determined that the Sound Power Level for an air conditioner to be installed at this particular location should not exceed 60 dB(A). It may be possible to locate a unit with a higher Sound Power Level at this location if an appropriately designed acoustic enclosure is built around it. This should only be considered under the advice of a suitably qualified person otherwise damage to the unit or a fire hazard may result.

If it is estimated or anticipated that noise levels will exceed allowable limits, Suppliers must raise potential issues and solutions with the Customer before a location is finalised.

## Determining Distance to Boundary

Determining the distance to the boundary for a known air conditioner is simple. This time the known values are Sound Power Level (from the unit), Barrier Factor and Reflection Factor.

The distance value is determined as follows:

$$\text{Column 3} = \text{Sound Power Level dB(A)} + \text{Reflection Factor} - \text{Barrier Factor}$$

|                           |          |          |          |
|---------------------------|----------|----------|----------|
| <b>Answer</b><br>í      ý | í      ý | í      ý | í      ý |
|---------------------------|----------|----------|----------|

The value from the above answer box is marked in Column 3 of the Acoustic Nomogram. Draw a straight line through this mark and a similar mark in Column 2 representing the noise level allowed in the area (typically 35dB(A) at night, or 30dB(A) if the noise is tonal).

This straight line is extended through Column 1 to find the minimum distance in metres that the unit should be set back from the nearest boundary.

It may be possible to locate the unit closer to the boundary if an appropriately designed acoustic enclosure is built around it. This should only be considered under the advice of a suitably qualified person otherwise damage to the unit or a fire hazard may result.

If it is estimated or anticipated that noise levels will exceed allowable limits, Suppliers should raise potential issues and solutions with the Customer before a location is finalised.

## Load Estimation

The Supplier will determine the required equipment capacity using an appropriate method and means of calculation, using their best professional judgement and provide the details of the basis of this determination to the customer. Load estimation shall be performed only by personnel experienced in doing these calculations or under the supervision of other experienced personnel.



## **Legislation, Regulations, Standards and Reference Material**

Current legislation, regulations, standards and reference material is correct at the time of publication. It is the responsibility of the Supplier to ensure that all work is carried out in compliance with all current Legislation and the requirements of applicable Standards, Codes and Authorities.

### **ACT Legislation**

- Fair Trading Act 1992
- Electricity Safety Act 1971
- Occupational Health & Safety Act 1998
- Sale of Goods Act 1974
- Trade Practices Act 1974
- Environment Protection Policy 1998 (Noise)
- Environment Protection Policy 2000 (Hazardous Materials)
- Environment Protection Act 1997
- Environment Protection Regulations 2005

### **Commonwealth Legislation**

- Trade Practices Act 1974

### **Codes**

- Building Code of Australia
- SAA HB40: The Australian Refrigeration and Air conditioning Code of Good Practice - Reduction of emissions of fluorocarbons

## Australian Standards

The Supplier shall comply with all relevant requirements of any Standards that are called up by Legislation, Codes or Authorities. Even if not mandated in legislation, AIRAH recommends compliance with the latest edition of the following Standards including, but not limited to:

|             |  |
|-------------|--|
| AS1055:     | Acoustics - Description and measurement of environment noise   |
| AS1668.2:   | The use of mechanical ventilation and air conditioning in buildings - Mechanical ventilation for acceptable indoor air quality |
| AS1677:     | Refrigerating systems  |
| AS2107:     | Acoustics - Recommended design sound levels and reverberation times for building interiors                                     |
| AS2913:     | Evaporative air conditioning equipment   |
| AS3000:     | SAA Wiring Rules   |
| AS 3102:    | Approval and test specification for electric duct heaters  |
| AS/NZS3018: | Electrical installations - Domestic installations  |
| AS/NZS3350: | Safety of household and similar electrical appliances, Part 2.40 - Electrical heat pumps air conditioners and dehumidifiers    |
| AS3823:     | Performance of electrical appliances - Air conditioners and heat pumps   |
| AS4254:     | Ductwork for air-handling systems in buildings   |
| AS4269:     | Complaints handling  |
| AS4426:     | Thermal insulation of pipework, ductwork and equipment - Selection, installation and finish                                    |

## AIRAH Reference Material

AIRAH recommends reference to the following documents:

- DA 02: Noise Control
- DA 03: Duct Design
- DA 08: Introduction to HVAC&R
- DA 09: Load Estimation & Psychrometrics
- DA 19: HVAC&R Maintenance
- DA 20: Humid Tropical Air Conditioning
- RS1: Refrigerant Selection Guide 2003

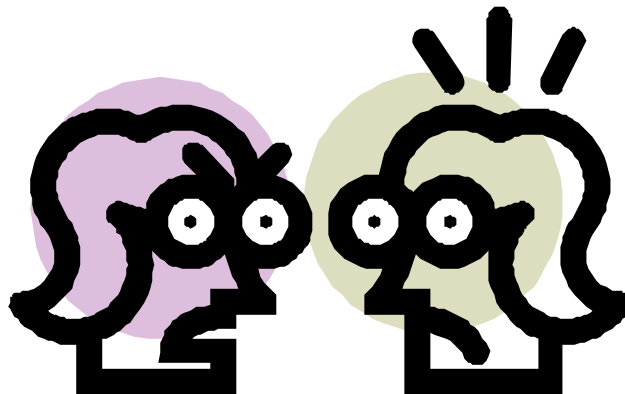
## Dispute Resolution

If a Customer is not satisfied with an air conditioning or heating installation carried out in accordance with the AIRAH Residential Air Conditioning Best Practice Guideline, a management representative of the Supplier shall investigate the complaint in a timely manner.

In the event of an omission or failure to comply with the relevant requirements of the Guideline, the quotation, any formal contract entered into for the works or to any other matter which the Supplier has a common law obligation to address, the Supplier shall promptly rectify the omission or failure.

If the Supplier determines that no such omission or failure has occurred and that the complaint is not justified, the management representative shall provide a written response to the Customer outlining the reasons why, and suggesting the informal or formal dispute resolution procedures that may be employed if the Customer is still not satisfied.

It is recommended that the dispute resolution procedures are included in the quotation or any formal contract entered into for the works. The Supplier should specify the relevant authorities and agencies appropriate for handling disputes in their State or Territory.



## Where to get more help

### **Department of Environment and Heritage**

**Phone** (02) 6274 1888

**Website** [www.greenhouse.gov.au](http://www.greenhouse.gov.au)

**Look for** Your Home - information to help control your indoor living environment while reducing energy consumption. Energy rating – information on buying energy efficient appliances.

### **Australian Institute of Refrigeration, Air Conditioning & Heating (AIRAH)**

**Phone** (03) 8623 3000

**Website** [www.airah.org.au](http://www.airah.org.au)

**Look for** Reference material

### **Australian Refrigeration Council (ARC)**

**Phone** 1300 884 483

**Website** [www.arctick.org](http://www.arctick.org)

**Look for** Authorised Organisations

### **Yellow Pages**

**Website** [www.yellowpages.com.au](http://www.yellowpages.com.au)

**Look for** See “Acoustical Consultants”

### **State Government**

**Website** [www.act.gov.au](http://www.act.gov.au)

**Look for** Legislation. Also Acts, Regulations and Policies associated with environmental issues

### **Environment Protection and Compliance / Environment Protection Authority**

**Phone** 132281

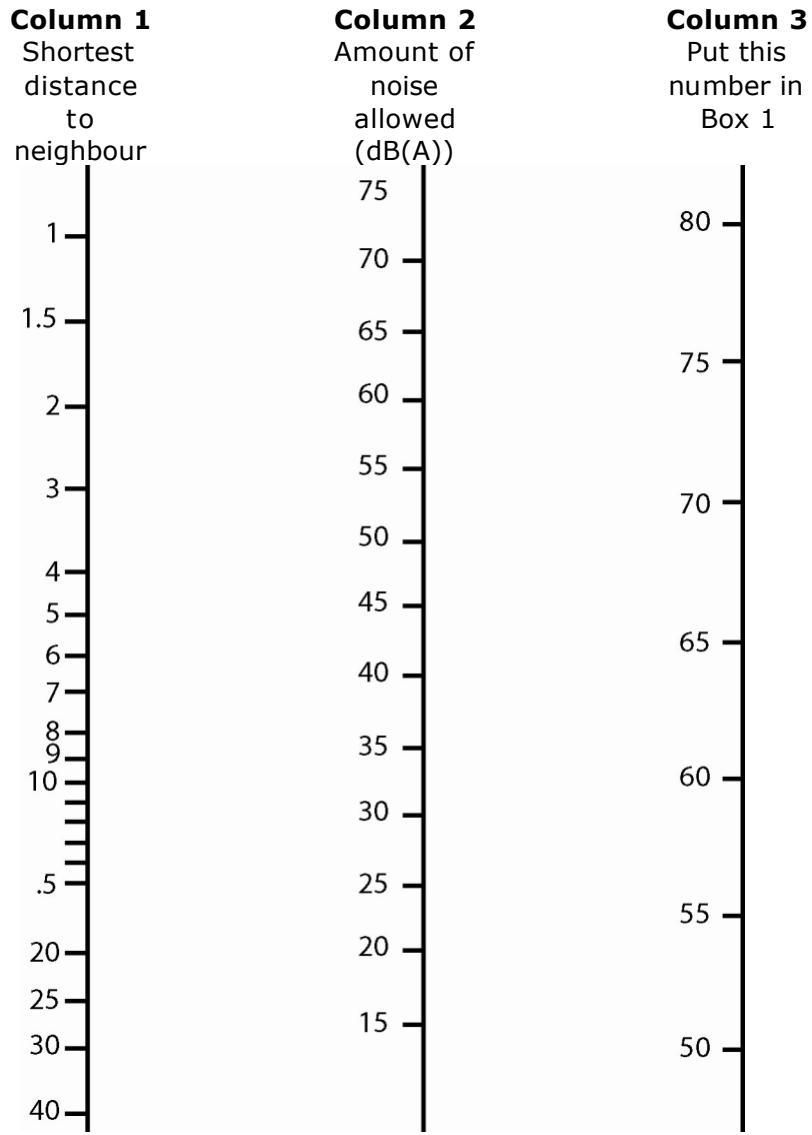
**Website** [www.environment.act.gov.au](http://www.environment.act.gov.au)

### **ACT Office of Fair Trading**

**Phone** (02) 6207 0400

**Website** [www.fairtrading.act.gov.au](http://www.fairtrading.act.gov.au)

# Appendix 1 – Acoustic Nomogram



$$\begin{array}{ccccccc}
 \text{Distance} & & \text{Barrier} & & \text{Reflection} & & \text{Sound} \\
 \text{Factor} & + & \text{Factor} & - & \text{Factor} & = & \text{Power Level} \\
 & & & & & & \text{dB(A)} \\
 \boxed{\text{BOX 1}} & & \boxed{\text{BOX 2}} & & \boxed{\text{BOX 3}} & & \boxed{\text{ANSWER}} \\
 \text{í} & & \text{í} & & \text{í} & & \text{í} \\
 \text{ý} & & \text{ý} & & \text{ý} & & \text{ý}
 \end{array}$$





## Appendix 2 - Data Form

This Data Form is intended to record the basis for calculations used by the Supplier to estimate the air conditioner capacity for a particular customer. It should be used with the AIRAH Residential Air Conditioning Best Practice Guideline and it should be left with the customer on completion of the installation.

✂ detach here and leave with Customer

|                            |  |                      |                                |
|----------------------------|--|----------------------|--------------------------------|
| <b>Customer Details</b>    | Name   |                      |                                |
|                            | Address  |                      |                                |
|                            | Address of Installation  |                      |                                |
|                            | Contact Details:   | Phone:               | Email:                         |
|                            | Date of Installation   |                      |                                |
|                            | Type of building<br>(eg Weatherboard, Brick etc.)              |                      |                                |
| <b>Design Basis</b>        | Internal design temperatures                                   | Summer °CDB °CWB     | Winter °CDB                    |
|                            | External design temperatures                                   | Summer °CDB °CWB     | Winter °CDB                    |
|                            | Method used to calculate cooling load                          |                      |                                |
|                            | Calculated cooling load  | GTH (kW) TSH (kW)    | Air Flow (l/s)                 |
|                            | Calculated heating load  | GTH (kW)             | Air Flow (l/s)                 |
|                            | Estimated system size  |                      |                                |
| <b>Equipment Selection</b> | System selection (make & model) at nominated design conditions | GTH (kW)<br>TSH (kW) | Heating (kW)<br>Air Flow (l/s) |
|                            | (Other Comments)   |                      |                                |
|                            | Outside Unit Sound Power Rating:                               | dB(A)                |                                |
|                            | Calculated Outside Sound Pressure Level :                      | dB(A)                |                                |

(Scissors icon) detach here and leave with Customer)

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 1 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 2 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 3 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 4 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

✂ detach here and leave with Customer

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 5 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

|                    |   |  |
|--------------------|---|--|
| Details of Room(s) | Room 6 & Name                             |  |
|                    | Size of room (eg 10m <sup>2</sup> )       |  |
|                    | Insulation (eg batts)                     |  |
|                    | Primary aspect (eg North)                 |  |
|                    | People & Equipment<br>(eg 3 people, 1 kW) |  |
|                    | External shading (eg none)                |  |
|                    | Windows A x B                             |  |
|                    | Internal shading eg blinds                |  |

Noise Calculation:

|                            |          |                           |          |                              |          |  |
|----------------------------|----------|---------------------------|----------|------------------------------|----------|--|
| <b>Distance<br/>Factor</b> | <b>+</b> | <b>Barrier<br/>Factor</b> | <b>-</b> | <b>Reflection<br/>Factor</b> | <b>=</b> | <b>Sound<br/>Power Level<br/>dB(A)</b> |
| <b>BOX 1</b>               |          | <b>BOX 2</b>              |          | <b>BOX 3</b>                 |          | <b>ANSWER</b>                          |
| í      ý                   |          | í      ý                  |          | í      ý                     |          | í      ý                               |

Company Contact: .....

Address: .....

.....Postcode: .....

Phone: .....Fax: .....

Installer Name:.....

Address: .....Postcode: .....

Phone: .....Fax: .....

Licence Number (if applicable):.....

*(Attach card or stamp)*