



WORKSAFE VICTORIA

# GUIDE FOR ASSESSING AND FIXING NOISE PROBLEMS AT WORK

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WorkSafe Victoria is a division of the Victorian WorkCover Authority.

The information presented in this guide intended for general use only. It should not be viewed as a definitive guide to the law, and should be read in conjunction with the *Occupational Health and Safety Act 2004*. Whilst every effort has been made to ensure the accuracy and completeness of this guide, the advice contained herein may not apply in every circumstance. Accordingly, the Victorian WorkCover Authority cannot be held responsible, and extends no warranties as to:

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## INTRODUCTION

Hearing loss is a significant problem in many workplaces but it can be prevented. Where it occurs it can have a big effect on a business and on employees' lives.

Imagine how frustrating it would be to have to keep asking people to repeat themselves in normal conversation or not being able to hear background noises like the telephone, the doorbell or warning signals?

This guide provides information on how noise affects hearing, how to assess exposure to noise and how to fix noise problems in the workplace. There is also specific advice for purchasing quieter equipment, some information on who can conduct hearing tests and where to find further information. It also includes a summary of the legal requirements associated with exposure to noise in the workplace. However, you should refer to the Occupational Health and Safety (Noise) Regulations 2004 for specific legal requirements.

The guide provides information on managing noise problems and contributes to the state of knowledge for compliance with the 2004 Occupational Health and Safety (Noise) Regulations. The purpose of the guide is to provide interim advice until such time as a new Victorian Compliance Code for Noise is developed.

This material may also be updated from time to time prior to the development of a new code. Check with WorkSafe Victoria for the latest edition or visit the website – [www.worksafe.vic.gov.au](http://www.worksafe.vic.gov.au)

**Please note, after the commencement of the Victorian Occupational Health and Safety Act 2004 on 1 July 2005, there may be some minor references to legislation which may need to be updated. This will not affect the validity of the technical advice provided.**



## 1.0 HOW DOES NOISE AFFECT HEARING

### 1.1 What causes hearing loss?

Some people are born with reduced hearing. Others lose their hearing through disease or from taking certain medications. Most people will experience some reduction in hearing as they become older. Exposure to loud noise at work, through recreational pursuits, or from environmental factors can also result in hearing loss.

### 1.2 How does noise damage your hearing?

Most people's ears are very sensitive to noise. When sound enters the outer ear, it vibrates the eardrum. These vibrations pass into the inner ear via tiny bones where eventually delicate nerve cells like blades of grass convert the vibrations into messages which are sent to the brain. Noise can affect these nerve cells causing a temporary reduction in hearing. Most temporary hearing loss recovers within 24 hours under quiet conditions and may be accompanied by a ringing in the ear, called tinnitus.

If people's ears are exposed to loud noise continually over a period of time, the nerve cells in the inner ear may eventually die and not respond to sound. This condition is called **noise induced hearing loss** and usually occurs gradually over many years like hearing loss due to ageing. At first, people don't notice any change in their hearing. However, over the years as more and more of these nerve cells become damaged and die, the effect on hearing becomes noticeable. However, by then it is too late as the damage is not reversible. Noise induced hearing loss reduces a person's ability to hear high pitched sounds.

The degree of noise induced hearing loss that occurs is dependent on the level of noise, how long someone is exposed to it, and to some extent on individual susceptibility. Once damage to hearing occurs it cannot be repaired – only further damage can be prevented. Permanent hearing loss may also be accompanied by tinnitus or ringing in the ears.

Noise induced hearing loss may also result from exposure to sudden loud noises, such as explosions, gun shots or heavy hammering. These types of noises are commonly referred to as 'impact' noises. If loud enough, exposure to sudden noises can cause immediate permanent damage.

### 1.3 How can noise induced hearing loss affect someone's life?

Noise induced hearing loss often results in a reduced ability to perceive high pitched sounds and conversation will start to sound 'muffled'. For example, it becomes more difficult to hear high pitched letters like s,k,p and t. As a result, someone may find it difficult to understand what is being said. This is especially so when people with high pitched voices, like children, are talking.

Once hearing loss has occurred it becomes more difficult for a person to take part in normal conversation or use the telephone. They may become less confident in social and work situations, and may also lose the enjoyment of listening to TV, music and the sounds of nature. Hearing loss affects people's ability to communicate and keep in touch with the world around them, and affected people often suffer a feeling of isolation. Some people will avoid contact with others because they are embarrassed or anxious about not hearing properly. This can affect their social and work life, and may also place pressure on family life. Hearing loss may decrease their efficiency at work. In addition, accidents may occur when instructions or warning signals cannot be heard or are not understood properly. If severe enough and the result of workplace noise they may also submit a workplace injury claim.

### 1.4 Can noise induced hearing loss be cured?

Noise induced hearing loss is permanent and currently cannot be cured or repaired through medication or surgery. Hearing aids may only offer limited benefit.

## 2.0 WHAT OTHER EFFECTS ARE CAUSED BY EXCESSIVE NOISE?



There is a growing body of evidence that suggests exposure to noise is a cause of non-auditory damage in the cardio-vascular, endocrine, metabolic, gastro-intestinal and neurological systems.

Performance in reading, writing and listening tasks are also affected by noise, as is concentration. Both sudden bursts of noise and continuous noise are known to affect these activities. While some noise is unlikely to cause hearing loss it can be an annoyance and reduce the effectiveness of those exposed to it. Productivity in workplaces can be affected if there is excessive noise, especially if employees suffer from noise induced hearing loss as a result of it.



Concentration and productivity can be affected by noise



## 3.0 IS YOUR WORKPLACE TOO NOISY?

From a legal perspective, if employees in your workplace are exposed to noise that exceeds the exposure standard of 85 dB(A) averaged over an eight hour period or a peak noise level of 140 dB(C) then your workplace is too noisy. (Note: dB is the abbreviation for the decibel – the unit used for sound pressure levels on a logarithmic scale).

Furthermore, if any one of the following occurs:

- employees have to raise their voice to communicate at a distance of 1 metre;
- employees have a temporary reduction in hearing or ringing in the ears after leaving work for the day; or
- employees use hearing protectors during the work day,

then noise may be a problem at your workplace that requires a proper assessment. If you are not sure whether there is a noise problem, some spot noise measurements may help. The table below provides some advice on typical noise levels for common situations. Actual levels in your workplace however, may vary significantly from these figures.



Hearing protectors could indicate a workplace is too noisy



Working near a front end loader generally involves a significant amount of noise that may be above the exposure standard

## 3.0 IS YOUR WORKPLACE TOO NOISY?



### SOME COMMON NOISE SOURCES AND THEIR TYPICAL SOUND LEVELS

Effect on people's hearing	Typical sound level in dB	Sound source
	140	Jet engine, gun shot (peak noise exposure standard in Victoria) (Pain threshold)
A lot of damage	130	Rivet hammer
	120	Angle Grinding
	110	Chain saw
	100	Sheet-metal workshop
	90	(93) Lawn mowing (91) Welding
Damaging	85	Front end loader (Exposure standard in Victoria for average eight hours)
	80	Heavy traffic/lathe
	70	Loud conversation
	60	Normal conversation
	50	Low conversation
	40	Quiet radio music
	30	Whispering
	20	Quiet urban room
	10	Rustling leaves
	0	Hearing threshold

*Adapted from: Workplace Health and Safety Training Resource Kit, online version, produced by Workcover South Australia.  
For information on levels above 85 dB and how long someone can be exposed before they exceed the exposure standard refer to the next section.*



Noise from a front end loader in operation is typically 85 dB



Metal work in a foundry can generate noise levels in the low '100' decibel range



## 4.0 HOW LONG CAN SOMEONE BE EXPOSED TO NOISE?

### 4.1 Exposure standards in Victoria

In Victoria, the OHS Noise Regulations set exposure standards or 'levels' commonly referred to as 85 dB(A) Leq averaged over an eight hour period and a maximum or peak noise level of 140 dB(C).

All practicable measures should be taken to ensure these standards are not exceeded. For those requiring the more complete exposure standard definition it is as follows:

- (a) the 8 hour equivalent continuous sound pressure level of 85 dB(A) measured in A-weighted decibels referenced to 20 micropascals at an employee's ear position; or
- (b) the C-weighted peak hold sound pressure level reading of 140 dB(C) measured in decibels referenced to 20 micropascals at an employee's ear position.

### 4.2 How long can people be exposed to noise levels before the exposure standard is exceeded?

Whether you exceed the exposure standard of 85 dB(A) Leq depends on the level of noise involved and how long you are exposed to it. The peak noise level of 140 dB(C) usually relates to noise that is applied to instantaneous, impact or impulse noise such as a gun shot, plane taking off, or hammering. Any exposure above the peak is thought to create almost instant damage to hearing.

Decibels are not like normal numbers. They can't be added or subtracted in the normal way. The decibel scale is logarithmic. On this scale an increase of 3 decibels therefore represents a doubling or "twice as much" sound energy. This means if someone is exposed to 88 decibels for 8 hours their exposure would be twice that of someone exposed to 85 decibels (dB) for 8 hours. The table below demonstrates the combinations of various exposure levels and the associated length of time someone can be exposed to noise before the standard is exceeded.

TABLE OF EQUIVALENT NOISE EXPOSURES

Exposure Level dB	Exposure Time
85	8 hrs
88	4 hrs
91	2 hrs
94	1 hr
97	30 min
100	15 min
103	7.5 min
106	3.8 min
109	1.9 min
112	57 sec
115	28.5 sec
118	14.3 sec
121	7.1 sec
124	3.6 sec
127	1.8 sec
130	0.9 sec

Essentially, someone being exposed to 85 dB for 8 hours is equivalent to someone being exposed to 88 dB for 4 hours. In both cases the exposure standard is not being exceeded. Being exposed to 88 dB however for more than 4 hours means that you would exceed the standard. Similarly, if for instance you are using a grinder that generates 121 dB then you would exceed the exposure standard after only 7.5 seconds. (Please note: for the purpose of assessment you must not take into account any hearing protectors being worn.)

In assessing levels you also need to take into account if there are two or more noise sources near one another. For every two similar noise sources next to one another you generally need to add 3 decibels to obtain the real exposure level at the operator's ear. For example – if there are two machines located next to one another each producing 88 decibels, then the total decibel level at the operator's ear is actually 91 decibels. This increase must be taken into account when assessing how long someone can be exposed to noise. Instead of being exposed for 4 hours the person can actually only be exposed for 2 hours without exceeding the standard in the above example.





### 5.1 Why do a noise assessment?

A noise assessment can tell:

- who is at risk of losing their hearing;
- what is causing that risk; and
- what needs to be fixed.

It is also a legal requirement if an employee may be exposed to noise that exceeds the noise exposure standard. It is an employer's responsibility to undertake or organise an assessment.

### 5.2 When do you need to do an assessment?

You need to do a noise assessment if employees' exposure to noise may be above the exposure standard without taking into account the effect of any hearing protectors worn.

Some indicators that employees' exposure may be above the exposure standard are:

- if they have to raise their voice to talk to someone when they are 1 metre apart;
- employees notice a temporary loss in hearing or ringing in the ears after leaving work;
- employees need to use hearing protectors during the work day.

If you are not sure whether you have a noise problem at work, you could take some spot noise measurements or get someone to come in and help you.

### 5.3 Who can do a noise assessment?

A noise assessment can be done by anyone as long as they do it properly. Obviously the more complex the situation, the more knowledgeable and experienced the person needs to be. Some employers may be able to do the assessment themselves, but many will need someone like a consultant to do it for them.

An assessment should be carried out by a person who has the appropriate noise measuring instruments and, through training and experience:

- understands what is required by the Noise Regulations;
- knows how to calibrate the instruments;
- knows how to use the instruments and take the measurements properly; and
- can interpret the results of the noise measurements.

Persons who may be competent to do a noise assessment are listed in directories such as the Yellow Pages under "Occupational Health and Safety Consultants", "Acoustical Consultants and "Hearing Conservation Consultants and/or Services". Suitable consultants such as Occupational Hygienists and acoustic engineers may also be found by searching the VWA Consultants Database.

### 5.4 How should a noise assessment be done?

A noise assessment may be simple or complex, depending on what's causing the noise and how the job is done. The noise assessment should be done during a typical workday and must determine:

- the level of noise; and
- how long employees are exposed.

An assessment must take into account:

- plant and other sources of noise in operation;
- how the job is done (ie the systems of work); and
- any other relevant factors.



A forestry worker exposed to two noise sources at the same time – a chainsaw and a front end loader in operation

Where employees' exposure to noise varies quite a bit from day to day, the assessment should take that into account. As a general rule, the worst case scenario should also be taken into account. Measurements must be taken at the employee's ear position using suitable equipment that has been calibrated. The measurements need to be taken for a period of time that is representative of the process, activity or work pattern being assessed. The period should take into account significant variations in the level and duration of the exposure and may require measurements to be taken over a full shift.



## 5.0 ASSESSING EMPLOYEES' EXPOSURE TO NOISE

### 5.5 Does a separate assessment need to be done for each and every employee?

If there are employees who are exposed to identical sources of noise and their exposure is likely to be the same, then a separate assessment for each and every employee is not required. A "representative" assessment can be done for one or more of the employees and this would apply to the rest of the employees.

### 5.6 Does a record have to be kept of the assessment?

A written record of the assessment needs to be kept as long as it applies to the workplace. The record needs to be accessible to the employees assessed and their health and safety representative. The record needs to contain the results of the assessment and enough information to show that it was done properly and the appropriate factors were taken into account. For more information on what should be recorded, refer to the section – "What to look for in a noise assessment report".

### 5.7 Does an assessment need to be reviewed or revised?

A noise assessment must be reviewed, and if necessary revised:

1. if the assessment is no longer applicable;
2. when reasonably requested by an OHS representative; and
3. at least every five years.

The assessment would no longer apply if there have been changes in the sources of the noise such as new equipment introduced or changes in how the job was done such as different time of day or location, or changes in the length of time a machine is on or being used. In this case, the assessment must be revised.

### 5.8 Who should be consulted on noise assessments?

When doing a noise assessment, or reviewing or revising an assessment, an employer must consult with the health and safety representative of the designated workgroup if practicable to do so. If there is no designated health and safety representative then the employer, if practicable, must consult with affected employees or a representative, if any, nominated by the affected employees.

## 6.0 WHAT TO LOOK FOR IN A NOISE ASSESSMENT REPORT



### 6.1 What information should you expect to find in a noise assessment report?

The assessment report needs to have the results and enough information to show that the assessment was done properly and that the appropriate factors (such as level, duration, sources of noise, systems of work and other relevant factors) were taken into account.

A good assessment report should contain the details shown in the checklist below.

### 6.2 How is all the information in a report useful?

A noise level result on its' own doesn't mean anything without any supporting details about what actually happened during the measurement, and how the measurements were done. To be useful, a report needs to include information on what is causing the noise, how the job is done and how long employees are exposed to the noise. Details on the type of equipment used to do the measurements, whether it was calibrated, where the measurements were taken (eg at the operators position or area measurement) and over what period of time are also important in making sense of the results. This information is important in interpreting the results and showing that the assessment was done properly and the right factors were taken into account.

The information recorded is also useful when it is time to review the assessment as required by the Noise Regulations. It would be difficult to work out if the assessment still applies if people can't remember what happened during an assessment that was done many years ago. No one is likely to remember these details if they have not been recorded. For example: Was that other noisy machine on at the time of the assessment or not? What were you doing? Such as, if you were cutting, what was the material or object being cut? What was the actual equipment used to do the job? Did you use the small grinder/saw or the big one? How did you do the job? Is it done the same way now? Was the level of production the same as it is now? Also, the people that worked in that area may not be there anymore to check the details with. If you can't review the assessment then you can't determine if the assessment is still valid or not.

You need to remember, that if an assessment is reviewed, it does not have to be repeated as long as it can be shown that it is still valid and applies to what's being done now. To be able to do this there needs to be sufficient detail in the original report. If it can't be demonstrated that the assessment still applies, then it would have to be repeated.



A noise level metre used for measuring noise exposure



## 6.0 WHAT TO LOOK FOR IN A NOISE ASSESSMENT REPORT

CHECKLIST ON WHAT SHOULD BE INCLUDED IN A NOISE ASSESSMENT REPORT	✓ IF PRESENT
<b>WHEN</b>	<input type="checkbox"/>
Date of assessment	<input type="checkbox"/>
<b>WHO</b>	<input type="checkbox"/>
Name of assessor	<input type="checkbox"/>
Information (background/qualifications) of assessor	<input type="checkbox"/>
<b>EQUIPMENT USED</b>	<input type="checkbox"/>
Type of equipment used to take measurements	<input type="checkbox"/>
Calibration details (if, when and how) for equipment used	<input type="checkbox"/>
<b>HOW THE NOISE MEASUREMENTS WERE TAKEN</b>	<input type="checkbox"/>
Where measurements were taken (general area or operator ear position)	<input type="checkbox"/>
Period of time over which the measurements were taken	<input type="checkbox"/>
<b>WHAT WAS ASSESSED</b>	<input type="checkbox"/>
The area, plant, process, activity and employees that were assessed	<input type="checkbox"/>
<b>SOURCES OF NOISE</b>	<input type="checkbox"/>
The sources (plant/processes/jobs) of the noise	<input type="checkbox"/>
Whether all the noise sources that may be operating at the same time were taken into account	<input type="checkbox"/>
Whether there were any significant noise sources that were not operating during the assessment	<input type="checkbox"/>
<b>SYSTEMS OF WORK</b>	<input type="checkbox"/>
Brief description of the job (how it's done; plant/process /activity/operating conditions/duration of process etc)	<input type="checkbox"/>
Hours of work (eg 8 hour or 12 hour shift?)	<input type="checkbox"/>
Whether assessment is for a normal/typical day or for a worse case scenario	<input type="checkbox"/>
<b>RESULTS</b>	<input type="checkbox"/>
The results of the measurements in terms of the levels and duration	<input type="checkbox"/>
Interpretation of the results, (i.e. compared to exposure standard; what do the results mean etc; any action required?)	<input type="checkbox"/>
<b>ANY OTHER RELEVANT FACTORS</b>	<input type="checkbox"/>
Information on any specific safety measures in place during the assessment (eg hearing protectors used)	<input type="checkbox"/>
Where relevant, information about the environment (type of walls, surfaces, buildings etc.	<input type="checkbox"/>



### 6.3 Are spot noise measurements of machines or equipment sufficient as an assessment?

A spot measurement is a quick or brief measurement taken at a particular spot that gives an indication of the sort of noise levels present. This type of measurement taken next to a particular machine, may provide some useful information about the machine but on its own it is usually not sufficient as an assessment because often it does not represent employees' actual exposure. You need further information with the result. Does anyone work next to the machine where the measurement was taken? If so, does the employee work there all day or only for a short time? What other noisy jobs does that employee do? How often is the machine used? What was actually being done or processed when the measurement was taken? The type of object or material being cut by a saw can make a big difference to the level of noise generated. Are there any instant impact type noises such as those from a nail gun etc? What other equipment was operating or not operating at the time of measurement?

As you can see, a number (noise level value) for a machine provides very little useful information on its own. Because most employees don't spend all day in one fixed position, the measurement at the machine would not be regarded as the employee's actual exposure for the whole day. Therefore you can't compare the result with the exposure standard which applies to the noise exposure at the employee's ear usually averaged over the day.

### 6.4 Are noise contour maps sufficient as an assessment?

Noise contour maps are maps that show the different noise levels in various areas of the workplace. Sometimes they look like weather maps. This information is often used to mark out areas on the factory floor to show where hearing protectors need to be worn.

While this type of information is useful in showing where hearing protection is required to be worn, it does not represent actual employee exposure. Therefore it is not considered to be a proper assessment under the Noise Regulations. Employees' actual exposure depends on how much time they spend in a particular area and what they do. Employees usually don't spend all day in one fixed position. They move around and are exposed to various sources of noise throughout the day. Noise levels in a particular area also change throughout the day depending on what is happening and so a contour map is only an indication of the type of noise levels that may be present in a particular area. Noise contour maps are just a tool to help manage noise problems.



## 7.0 FIXING YOUR NOISE PROBLEMS

### 7.1 What level of noise exposure is acceptable?

The Noise Regulations require employers to make sure that the noise exposure of any employee does not exceed the exposure standard specified.

The noise exposure limits or standards are an 8 hour 'average' level of 85 decibels (dB(A)) and a peak noise level (L<sub>p</sub>) of 140 dB(C) at the employee's ear position. If exposure to noise is above either of these exposure standards then control measures need to be put in place.



Remote control device that allows an operator to work at a distance away from a noise source

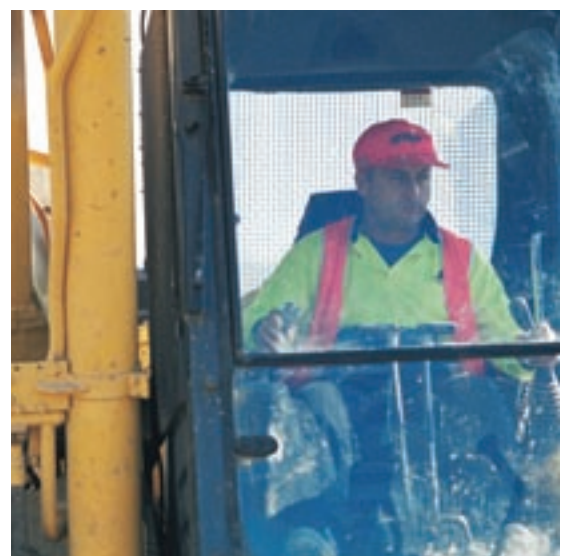
### 7.2 What measures have to be considered and applied when fixing a noise problem?

The Noise Regulations set out a hierarchy or order of controls that must be applied when fixing noise problems. These are:

1. elimination of noise sources
2. substitution of quieter plant or processes or use of engineering measures
3. administrative measures
4. hearing protectors.

This hierarchy has changed from the previous regulations. There is now more emphasis on controlling noise at the source. The hierarchy means employers have to consider and apply each safety measure as much as practicable before considering the one below it. If you are an employer you need to work your way down the hierarchy until employees' exposure does not exceed the exposure standard. This means that you can't just give employees hearing protectors without trying to fix the problem using 'high level' measures. However, hearing protectors may need to be used as an interim measure until you can control the noise problem properly. Often you will need to use a combination of measures to effectively control noise problems.

It is worth noting that if noise can be controlled without relying on hearing protectors, then hearing tests don't have to be provided. Hearing tests must be provided where hearing protectors are required to make sure that employees' exposure does not exceed the noise standard.



Enclosed cabin to protect operator from noise sources



### 7.3 How do you get rid of the cause of the noise?

While noise sources can be difficult to eliminate there are some things that can be done such as:

- getting rid of noisy plant that is not needed;
- eliminating noisy processes that are no longer needed or do not add value;
- outsourcing noisy processes; and
- using better or more precise methods of construction or manufacture so that you don't have to use noisy processes (eg trimming, cutting or grinding of excess material) later.

### 7.4 How do you substitute quieter plant or processes to reduce noise?

One of the most effective long-term ways of reducing noise at work is to introduce a purchasing policy to choose the quietest plant for the job. This can be done by obtaining noise information (sound power level data) from the manufacturer, importer or supplier of plant and comparing it to determine the quietest plant. Refer to Attachment 2 – 'Buy Quiet' Guide for purchasing quieter equipment. Legally, a plant's sound power level must be considered when proposing to acquire it for use at a workplace. This is to ensure as far as practicable, that employees will not be exposed to noise that exceeds the exposure standard.

Sometimes a different way of doing the job might avoid the need for a noisy operation. For example, the use of welded instead of riveted construction in large-scale fabrications is quieter. Another example is bending a piece of steel with a hydraulic process instead of hammering it into shape. As a general rule, welding is quieter than riveting, gluing is quieter than hammering, clipping is quieter than stapling, and placing objects in a position is quieter than throwing them or letting them fall via gravity.

Changing the material being processed may also reduce noise if practicable. Processing or attaching metal is generally noisier than processing or attaching plastic or wood.

### 7.5 What engineering controls can be used to reduce noise?

A good understanding of the operation of the plant or process is necessary to determine the best possible way of minimising or controlling the noise at its source.

Some engineering measures that should be considered include:

- elimination of impacts between hard objects or surfaces;
- minimising the drop height of objects or the angle that they fall onto hard surfaces;
- using absorbent lining on surfaces to cushion the fall or impact of objects;
- fitting of exhaust mufflers on internal combustion engines;
- fitting silencers to compressed air exhausts;
- isolating (using rubber mounts and flexible connections) a vibrating noise source to separate it from the surface on which it is mounted;
- ensuring gears mesh together better;
- fixing damping materials (such as rubber) or stiffening to panels to reduce their tendency to vibrate;
- building enclosures or sound proof covers around noise sources;
- fitting sound absorbing materials to hard reflective surfaces;
- turning down volume controls;
- changing fan speeds or the speeds of particular components;
- changing the material the equipment or its parts are made of (example change from metal components to plastic components);
- undertaking regular maintenance on equipment.

For more detailed information on some of the noise control measures listed above (including illustrations) refer to the publication "Noise Control" produced by the National Occupational Health and Safety Commission, WorkSafe Australia, 1991. Information is available online at [www.nohsc.gov.au/OHSInformation/OHSSolutions/noise/contents.htm](http://www.nohsc.gov.au/OHSInformation/OHSSolutions/noise/contents.htm)



## 7.0 FIXING YOUR NOISE PROBLEMS

### 7.6 What administrative measures can be used to reduce noise?

Administrative measures are the way work is organised to reduce either the number of employees affected, the level of noise or the length of time that employees are exposed to excessive noise.

Some administrative measures include:

- increasing the distance between noise sources and employees;
- doing noisy work out of normal working hours;
- minimising the number of employees working in noisy areas;
- rotation of employees between noisy and quiet jobs.

### 7.7 When should hearing protectors be used?

Hearing protectors (such as earmuffs or earplugs) must be used when higher level safety measures (such as substitution or engineering measures) have been put in place, as far as practicable, and employees are still exposed to noise above the exposure standard. It is important to ensure that the hearing protector chosen is worn at all times in noisy areas and provides adequate protection without overprotecting. Overprotection makes useful sounds such as warning signals hard to hear and can put an employee's personal safety at risk.



Sign indicating hearing protection is required to be worn



Worker using a chainsaw wearing hearing protection





### 7.8 When is a written action plan required?

A written plan is required where the employer proposes to implement a higher order control but it is not practicable to do so within 6 months of the assessment. If the employer has, after considering higher order controls, determined that hearing protection or admin measures are the only methods to control exposure, a written plan is not required.

The written plan needs to describe the actions needed to implement safety measures and the time frames for those actions. An example where this situation might apply is where an employer intends to import quieter new plant but it will take longer than 6 months to do so. A written plan may also be needed when it is intended to engineer out a noise problem but it would take some time (more than 6 months) to properly evaluate the process and try some different engineering controls.

### 7.9 Who should be consulted when trying to fix a noise problem?

An employer who is trying to control a noise problem by implementing measures, preparing a written action plan or reviewing and revising a safety measure, must consult with the health and safety representative of the designated work group if practicable to do so. If there is no health and safety representative then the employer must consult if practicable with affected employees themselves or a representative, if any, nominated by the employees.

### 7.10 What else needs to be considered when fixing noise problems?

Obviously you need to look at other hazards that may be introduced if you change a process, material or equipment and only implement changes that reduce the risk of injury and illness overall. When considering what measures to implement, all of the things that may go wrong and result in someone being hurt need to be considered and how likely it is that these will occur. For instance if you want to introduce new equipment that is quieter but the new equipment is more likely to result in a higher number of manual handling or equipment related injuries, then either different noise reduction measures should be considered, or else additional preventative measures that stop or reduce the risk of manual handling or equipment related injuries factored in. Information, instruction and training of staff also need to be factored in when considering fixing a noise problem. Employees must know how to use equipment safely and it should not be assumed they will know how to do this without adequate information, instruction and training from an employer.



## ATTACHMENT 1

### SUMMARY OF OCCUPATIONAL HEALTH & SAFETY (NOISE) REGULATIONS 2004

The purpose of these Regulations is to reduce the incidence and severity of noise-induced hearing loss by ensuring that employees are not exposed to noise above the exposure standard.

The noise exposure limits imposed by the Regulations are an 8 hour average of 85 dB(A) Leq and a peak noise level of 140 dB(C) at the employee's ear position.

#### Duties of employers

The principal duty on employers is to ensure employees' exposure to noise does not exceed the exposure standard. Other duties are as follows:

- Where practicable, consult the designated health and safety representative (HSR) when conducting noise assessment and risk control activities. If no HSR or designated work group is present, then consult directly with employees or an employee representative if there is one.
- Assess employee exposure to noise where exposure may exceed the exposure standard (NB: do not take into account the need for hearing protectors in determining if an assessment is required). In the assessment, determine the level and duration of noise and take into account the plant or sources of noise, the systems of work and any other relevant factors. The assessment itself must not take into account the effect of any hearing protectors the employee may be using. If several employees are being exposed to noise, a representative assessment is allowed where the source of noise is identical and employee exposure is likely to be the same. The assessment must be documented.
- Review and where necessary revise a noise assessment if circumstances change, when reasonably requested by a health and safety representative or in any event at least every 5 years.
- Employers must ensure employees' exposure to noise does not exceed the exposure standard. To achieve this, the following measures should be implemented in the order listed:
  1. eliminate the source of the noise;
  2. substitute quieter plant or processes or use engineering controls;
  3. use administrative controls; and
  4. provide hearing protectors (NB: if these are required under the Regulations, then there must be signs, labelling of plant or other appropriate means that clearly identify when and where the hearing protectors are to be worn).

*NB: The employer must apply each measure above as far as practicable before proceeding to the next type of control listed until employees' exposure does not exceed the standard.*

- Prepare a written record for the actions necessary to implement a control measure under the following circumstance. That circumstance is, where it is proposed to eliminate the source of noise or substitute quieter plant or processes or use engineering measures, and it is not practicable to introduce the measure within 6 months after the most recent assessment.
- When acquiring plant, have regard to the sound power level of the plant to ensure so far as practicable that employees will not be exposed to noise that exceeds the exposure standard.
- Provide information, instruction and training to employees in relation to the effects of noise, the control of noise (including the use of hearing protectors), and the purpose of hearing tests (audiometric) and audiological examinations.
- Provide and pay for hearing tests for employees if they are required to use hearing protectors under the Regulations.
- Provide and pay for audiological examinations to employees if hearing tests indicate a reduction in hearing levels equal to or greater than 15 dB at 3000 Hz, 4000 Hz or 6000 Hz.
- Review and revise control measures if an audiological examination shows an employee has suffered hearing loss that is likely to be due to noise exposure.
- Ensure copies of audiometric test results and audiological examination reports are kept confidential, kept for as long as applicable and are provided to relevant employees.
- On request, provide health and safety representatives with aggregate results of the most recent hearing tests related to their designated work group.



## Other persons with duties

### **Designers**

A person who designs plant for use at a workplace must ensure, by taking into account noise emission and exposure, that the plant is designed so that its sound power level is as low as practicable.

### **Manufacturers**

A person who manufactures plant for use at a workplace must:

- by taking noise emission and exposure into account, ensure that the plant is constructed so that its sound power level is as low as practicable;
- if the proper use of the plant may cause an employee's exposure to exceed the exposure standard, determine the plant's sound power level and ensure that a record stating the sound power level accompanies the plant when it is supplied to another person.

### **Suppliers**

A person (including an importer) who supplies plant for use in a workplace must:

- provide with the plant any record received that states the sound power level of the plant
- take action as is reasonably necessary to obtain the record that states the sound power level of plant from the person whom the plant was acquired.

### **Employees**

- If an employee has been given information, instruction and training in how to use noise control measures (for example, wearing hearing protectors) he or she must use the measures in accordance with the information, instruction and training provided.

## Further information

- view the Acts and Regulations online at: [www.dms.dpc.vic.gov.au](http://www.dms.dpc.vic.gov.au)

*Please note: The above is only a summary of the key OHS legislative requirements relating to Noise. This summary does not replace the need to consult the actual Regulations.*



## ATTACHMENT 2

### **'BUY QUIET' GUIDE FOR PURCHASING QUIETER EQUIPMENT**

#### **Purpose**

The purpose of this guide is to provide advice to employers on what to consider when buying quieter equipment for your workplace.

The advice should be used particularly when buying equipment or parts such as compressed air nozzles, compressors, generators, motors, saw blades, grinders, fans, vehicles, purpose built process plant, presses, power tools, and various types of pneumatic tools and equipment for use in workplaces.



Always check sound power levels when purchasing noisy equipment, eg chainsaws

#### **Why buy quieter equipment?**

Buying quieter equipment is one of the most effective ways of reducing noise. Even equipment that is 3 decibels quieter might not seem like a big difference but can reduce noise exposure levels by half.

Buying quieter equipment is generally cheaper than buying noisier equipment when all factors are considered. Noisier equipment usually needs to be modified later in some way because it's too loud. Hearing protection often needs to be provided also with the use of noisy equipment which means hearing tests need to be performed regularly. Such subsequent measures can often be quite costly so any alternatives that potentially avoid them are usually more cost effective. While it is not always possible to buy 'quiet' equipment it is always possible to buy the 'quietest' equipment available.

#### **Before buying new equipment**

Before looking at purchasing quieter equipment, it is worth looking at the job carefully and seeing if the job needs to be done at all or whether there is a quieter way of doing it. For example, if you are bending metal bars you should use a hydraulic process rather than a large hammer to bend them into shape. Alternatively make improvements in the production process to avoid the need to have to grind off any rough bits. These alternatives may prove to be a more cost effective option both in terms of expense and the level of noise reduction achieved. That is, in some cases the quietest equipment available may still be very noisy.

#### **Getting noise information on plant/equipment**

By law, you must ask manufacturers or suppliers of equipment for sound power level data when considering buying equipment, if the equipment will be used in a work environment. The 'sound power level' is a measure (in decibels) of the sound energy of the equipment. Think of sound power as a bit like the power or capacity of an engine.

In Victoria, manufacturers of equipment that may cause employees' exposure to exceed the noise exposure standard when it is properly used, are required to test that equipment and provide a record of the sound power level. Suppliers (including importers) of that equipment must then provide the 'sound power level' information from the manufacturer.



### Questions to ask suppliers or manufacturers when buying equipment

- Ask potential suppliers/manufacturers for noise emission data (sound power levels) and compare the options.
- If plant is to be supplied through a tender process, specify a maximum acceptable noise level. Refer to boxed section one page 21 for advice on “What to include in a noise specification”.

It may also be useful to ask suppliers the following questions:

1. Are there quieter models of the same machine?
2. Does the quieter equipment have any additional safety features? If so, what are they?
3. Are there any specific maintenance and service requirements?
4. Are there any optional extras that can be purchased to further reduce noise?
5. What costs are involved?

Even though quieter equipment generally tends to be more expensive to purchase, the equipment is usually better built and has noise reducing features included.

Features to look for are:

- higher manufacturing tolerances;
- insulation or damping material included;
- gears that mesh together better;
- fans that are quieter;
- better mountings;
- more secure parts to reduce vibration;
- less reverberation within the unit itself;
- tolerance for greater loads;
- less impact noises produced in operation;
- the use of quieter processes (eg hydraulic processes that often dampen noise);
- sound enclosures for noisy parts or operators;
- parts or attachments constructed of noise absorbing material (eg rubber or polyethylene); and
- remote controls that allow operators to remain a safe distance from the source of the noise.

### What if the information is not available?

The information may not be available where the supplier is dealing with an overseas or interstate manufacturer that has not determined the sound power level and refuses to do so.

If the plant or equipment to be purchased is manufactured by a Victorian manufacturer, it should be brought to their attention that they are legally required to provide the information. That is, if the use of their plant or equipment is likely to cause employees to exceed the noise exposure standard when the plant or equipment is used properly. If there is no success in obtaining such information then the matter may be referred to WorkSafe Victoria.

If a supplier cannot provide noise information because it is not available from an overseas or interstate manufacturer, you may be able to arrange for noise measurements to be made on the same machine being used elsewhere or at the supplier’s premises. The supplier may have already done such measurements. If not, you could ask the supplier to meet or share the costs of getting the measurements as the information may be useful for other potential purchasers and for promotional purposes. Whether you need to go to this length will depend on the cost of the machine, how many you intend to buy and whether the machine is likely to be a major noise source.

Alternatively, if you know someone else that is using the machine that you are interested in, you could ask them if they could provide you with any noise information they may have. You could also ask them if you can arrange for noise measurements to be taken.

If a supplier or manufacturer is not providing you with the information required, you could also look at the same or similar equipment from other suppliers or manufacturers.



## ATTACHMENT 2

### How can information on noise (sound power levels) be used?

#### *Comparing different brands of equipment or plant*

Sound power level data can be used to compare different brands of machines to enable you to buy the quietest machine as long as other safety aspects are at least equivalent. However, you need to have the right information so that you know you are comparing “apples with apples”.

- What standard (if any) was it tested against? For some types of equipment there may be specific International or Australian Standards that specify a particular test procedure for certain types of plant/equipment]. Testing in different ways may give different results which cannot be compared.
- Are the levels sound power levels or sound pressure levels at some distance away or at the operator position?
- What work was being undertaken during the testing (including materials handled etc)?
- Test conditions (inc. whether free running or under load)?

#### *Estimating noise levels in the workplace*

When introducing new machines, you need to consider the impact they will have in your workplace. To be able to determine this impact you need to take into account such things as;

- the number of machines to be introduced;
- where the machine(s) is to be used;
- how it is to be used (eg, operating speed, what is to be processed or cut etc);
- how long it is to be used for;
- whether employees work close to the plant or some distance away;
- the number of employees likely to be affected;
- whether employees are exposed to it for a few minutes a day or 8 hours a day; and
- existing background noise levels.

This may become complex and expert advice may be required.

The sound power level can be used to predict or estimate the noise levels likely to be generated in a particular environment. In some circumstances, the sound power level may give you a rough estimate of the noise level when the machine is used in your workplace. However, as a general rule, you probably need to add approximately 6 decibels to get an estimate of what the noise levels may be in your workplace. When two equally loud noise sources are positioned near each other, it normally causes an increase of 3 decibels. For example, two machines producing 88 dB(A) each would be expected to produce a combined noise level of 91 dB(A). The resulting noise levels will be even higher if there are more than two machines operating next to each other or there are other noise sources in the vicinity that produce similar noise levels.

The distance of employees to the machine can make quite a difference to their noise exposure. Obviously the closer employees are to the machine generating the noise, the higher their exposure. As a rough guide, there will be an increase of 6 decibels as you halve the distance between the person and the noise source. For example: if the noise level (sound pressure level) is 91 dB(A) 4 metres from the machine, then the noise level is likely to be 97 dB(A) at 2 metres from the machine.

Even if new plant will produce noise levels above the exposure standard when used in your workplace, the plant is still worth considering if it is the quietest available.



If cutting with a circular saw is required, the material being cut will determine the amount of noise produced



### WHAT SHOULD BE INCLUDED IN A NOISE SPECIFICATION

The following is a guide to assist you in putting together noise specifications when purchasing equipment through a tender process. This process can become complex and expertise may be required to assist you in:

- determining the actual specifications;
- providing guidance on what is available and what is technically possible; and
- assisting in interpreting any data received.

#### Noise levels:

Tenders should:

- specify the acceptable sound power level;
- specify noise levels (sound pressure levels (dB(A)) at a particular position(s) measured over an appropriate number of operating cycles;
- specify peak noise levels Lp(C) if appropriate (eg for impulse or impact type noise generated by such devices as pneumatic tools, explosive-powered tools and impact devices such as presses). The Victorian Occupational Health and Safety (Noise) Regulations specify a peak sound pressure level of 140 dB(C).

#### Position of measurements:

The position usually specified for noise measurements is the operator's position. However, for some machines (such as a machine for which there is no fixed operator position or a machine with a built-in operator's enclosure) it may be important to know the noise levels at other points around the machine so that exposure of the operator, and the effects on others in the workplace, can be properly assessed. In these cases, specify that noise should be measured at points around the machine at a height of 1.5 metres above the floor and/or access platform(s) and 1.0 metre from the machine itself, ignoring small projections.

#### Operating conditions:

The operating conditions to be specified depend on the nature of the machine and its intended use and include such factors as speed, load, tooling, material being processed and feed rate. Specify whatever conditions are likely to result in the highest noise emission. If it is not known what these might be, specify a range of typical operating conditions and base decisions on the highest level.

#### Acoustical conditions:

The acoustical conditions may be specified in three ways:

- 1) The first option is to specify that the noise of the machine is to be measured under agreed conditions in an environment similar to the proposed installation site. In practice, the manufacturer's or supplier's workplace will often meet this requirement.
- 2) A second option, appropriate for major purchases by tender, is to specify that the maximum acceptable noise level is not to be exceeded when the machine is installed and operating in your workplace. This puts the onus on the manufacturer to take the acoustical characteristics of your workplace into account when responding to the tender invitation. In order to do this, the tenderer should inspect the installation site. If unable to do so, the tenderer would need to ask for relevant details such as the dimensions of the installation site, the size and placement of nearby machines, benches and other fittings and the nature of floor, wall and ceiling materials. If a tenderer neither inspects nor requests details, treat the tender with caution.
- 3) A third option is to specify that the noise of the machine is to be measured in a standard acoustical environment, such as one of those defined in a relevant Australian, New Zealand or International Standard for machine noise measurement.

### Acknowledgements

This 'Buy Quiet' Guide has been adapted from the following sources:

1. WorkSafe Western Australia's 'Buying Quiet 1' module, and
2. New Zealand's, Occupational Health and Safety, Department of Labour, 'Module 8: Buy quiet'.



## ATTACHMENT 3

### WHO CAN CONDUCT AUDIOMETRIC TESTING?

Under the Occupational Health and Safety (Noise) Regulations 2004 where hearing protection such as ear muffs and ear plugs are required to control noise exposure, employers must provide and pay for audiometric testing (commonly referred to as hearing tests) for employees at specified times. The Victorian WorkCover Authority however, no longer approves persons to carry out audiometric testing.

Employers who are required to provide “screening” audiometric testing should ensure that it is performed by a competent person who has the appropriate training or qualifications and has relevant experience. Persons who perform audiometric testing should also have a sound knowledge of the Occupational Health and Safety (Noise) Regulations 2004. Persons who may meet these criteria include:

- those who were approved to conduct audiometric testing under the old Occupational Health and Safety (Noise) Regulations 1992 and who have maintained their knowledge and skills;
- ear, nose and throat specialists;
- audiologists; and
- persons who have successfully completed an appropriate industrial screening audiometry course.

Equipment (audiometers) used by persons doing hearing tests should comply with and be calibrated in accordance with any relevant standards such as Australian Standard AS 2586: Audiometers.

Guidance on the acoustical environment (‘background noise level’) in which the audiometric testing is performed and the audiometric test procedures is provided in AS/NZS 1269.4 Occupational Noise Management Part 4: Auditory assessment.





## OTHER NOISE INFORMATION

### Web-based

The following website links are to various other sites interstate and overseas that contain information and training relating to noise. Legislative requirements referred to on these sites may differ from Victorian requirements. Those seeking further information should consult the Victorian Occupational Health and Safety (Noise) Regulations 2004 to see if there are any differences before utilising any advice or information from these sites.

### Sites within Australia

- [www.whs.qld.gov.au/subject/noise.htm](http://www.whs.qld.gov.au/subject/noise.htm) – This site contains brochures and various industry specific guides on noise.
- [www.workcover.com/learning/information/noise.asp](http://www.workcover.com/learning/information/noise.asp) – This site contains training materials and guidelines for the control of workplace noise.
- [www.safetyline.wa.gov.au/sub30.htm](http://www.safetyline.wa.gov.au/sub30.htm) – This site contains a variety of general and industry specific material on noise as well as training resources. Also includes a set of Buy Quiet Guidelines.

### Overseas sites

- [www.hse.gov.uk/pubns/noisindx.htm](http://www.hse.gov.uk/pubns/noisindx.htm) – This UK site has a significant number of information leaflets on noise for employers and employees including a variety of industry specific information.
- [www.osha.gov/SLTC/noisehearingconservation/index.html](http://www.osha.gov/SLTC/noisehearingconservation/index.html) – This American site contains a substantial amount of information on noise including links to reference material and a hearing conservation program evaluation checklist.
- [www.ccohs.ca/oshanswers/phys\\_agents/](http://www.ccohs.ca/oshanswers/phys_agents/) – This site in Canada has basic information on noise and some information on the auditory and non-auditory effects of noise.

### Examples of Online Training Resources

- WA Noise and Vibration Assessment and Control Training Module – This training module produced by WorkSafe Western Australia is part of a comprehensive training resource kit for tertiary students on health and safety. It covers both general and technical issues and is an approved ANTA module to obtain National Qualifications in Health and Safety.

- SA WHS Training Resource Kit – Workcover South Australia has produced a publication titled “Workplace Health and Safety Training Resource Kit” of which one module is on noise. The module is fairly basic aimed primarily at students however may be useful for some workplaces and trainees. Topics covered in the module include: what is sound, how the ear works, measuring sound, what happens if noise levels are too high, and a case study and activities. (PDF, 1.98MB)

*Please note: WorkSafe Victoria does not control information on the above sites and therefore cannot endorse the information in any way.*

### Further Information Sources

Further information is provided in the Occupational Health and Safety (Noise) Regulations 2004.

Copies of the Regulations can be obtained from Information Victoria, 356 Collins Street, Melbourne 3000 Tel 1300 366 356 or viewed at: [www.dms.dpc.vic.gov.au](http://www.dms.dpc.vic.gov.au)

For other information on noise contact WorkSafe Victoria’s Advisory Service on Tel (03) 9641 1444 or 1800 136 089, or go to the website – [www.worksafe.vic.gov.au](http://www.worksafe.vic.gov.au)

Your industry association, professional association or union may also be able to provide advice concerning noise related issues.



## NOTES



## VICTORIAN WORKCOVER AUTHORITY

WorkSafe Victoria offers a complete range of health and safety services.

- Emergency response
- Advice, information and education
- Inspections and audits
- Licensing and certification
- Publications

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