

# SESLHD GUIDELINE COVER SHEET

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<b>KEY TERMS</b>	WHS risk management, noise management, health surveillance
<b>SUMMARY</b>	This procedure provides managers and workers with guidance on managing risks associated with noise in the workplace

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## Introduction

The aim of this handbook is to provide information to employees about the issue of noise management within the workplace. It is a companion to [SESLHDPR/394 Work Health and Safety - Noise Management Procedure](#).

It is not intended to replace proper safe work instruction. If you are in doubt about any aspect of [SESLHDPR/394 Work Health and Safety - Noise Management Procedure](#), speak with your manager.

A copy of this handbook should be given to all workers who work in high-risk noise areas.

## Definitions

This list of definitions is provided to help worker understand some of the terminology used in this guide. A more comprehensive list is included [SESLHDPR/394 Work Health and Safety - Noise Management Procedure](#).

**A-weighting dB(A)** - refers to a standardised frequency response used in sound measuring instruments. It corresponds approximately to the human ear response at low sound levels. Sound pressure levels measured using this response, which is specified in Australian Standard AS 1259.11, are expressed in units of dB(A).

**C-weighting dB(C)** - refers to a standardised frequency response used in sound measuring instruments. It corresponds approximately to the human ear response at high sound levels. Sound pressure levels measured using this response, which is specified in Australian Standard AS 1259.11, are expressed in units of dB(C).

**Decibel (dB)** is the unit used to indicate the relative magnitude of sound pressure level and other acoustical quantities. The range of sound pressures commonly encountered is very large so a logarithmic scale is used. The decibel is the unit used on this scale and is abbreviated to 'dB'. On the decibel scale, the threshold of hearing occurs at a sound pressure level of about 0dB and the threshold of pain occurs at about 120dB. As the decibel is also used to describe the level of other quantities, such as sound power and vibration acceleration, it is always necessary to refer to the specific quantity being measured, for example, LAeq,8h or Lpeak.

**LAeq,8h** (eight hour equivalent continuous A-weighted sound pressure level in dB(A) referenced to 20 micropascals) means that steady noise level which would, in the course of an eight hour period, cause the same A-weighted sound energy as that due to the actual noise over an actual working day. LAeq,8h is to be determined in accordance with Australian Standard AS 12693.

**LC,peak (peak noise level)** means C-weighted peak hold sound pressure level in decibels, referenced to 20 micropascals, determined in accordance with Australian Standard AS/NZS 1269.1. It usually relates to noise that is loud and sudden, such as impact or explosive noise, and can cause immediate hearing loss.

**Sound pressure** means the alternating component of the pressure at a point in a sound field.

## Noise and hearing

### What is Noise?

Noise is any unwanted or damaging sound in the environment.

Noise varies from nuisance noise to loud industrial noise. It can be continuous or intermittent. Both types can be damaging to the human ear depending on the level of noise and the length of time someone is exposed to it.

### How does the ear work?

The outer ear consists of the pinna, ear canal and eardrum. The pinna collects sounds which pass through the ear canal channels to the ear drum. The sound causes sound waves that make the eardrums vibrate. These vibrations are carried across the middle ear to the inner ear by the lever action of 3 tiny bones called the hammer, anvil and stirrup.

The inner ear consists of the cochlea and semicircular canals, where fine hair-like structures of cells are located. The travelling sound causes the hair-like structures to vibrate according to the frequency and loudness of the sound. The vibration of the sensory hairs causes nerve impulses to be sent to the brain via the auditory nerve. The brain then transforms the nerve impulses into meaningful sounds.

### How does noise damage hearing?

In the short term, exposure to high levels of noise causes fatigue of the hair cells in the cochlea and this leads to short term hearing loss. It may last for a few minutes, hours or even days after being exposed to excessive noise. It generally occurs when a person is exposed to noise levels that they are not used to and is essentially a reversible adaptation of the hair cells to an unwanted excess of sound energy.

In the longer term, permanent noise induced hearing loss (deafness) occurs if exposure to high levels of noise continues. The hair cells of the inner ear are eventually killed by the continuous high intensity of noise. Hair cells cannot repair themselves or regenerate. This is why hearing loss is permanent and irreversible.

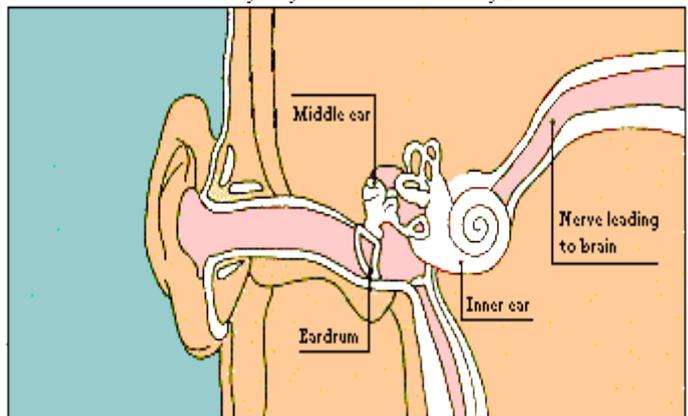
Noise not only damages hearing sensitivity but can also cause tinnitus; a disturbing ringing in the ear. Tinnitus is the increasing reverberation of the hair cells response to sound and is best described as an echo of the hearing mechanism.

With advancing age the auditory sensitivity diminishes, especially at the higher frequency end of the spectrum. This phenomenon occurs irrespective of exposure to noise; however noise exposure can dramatically increase the rate of deterioration of auditory sensitivity.

Very loud impact noises cause acoustic trauma. The burst of energy accompanying the impulse noise can not only kill the hair cells of the inner ear but damage the ear drum. The ear drum can normally repair itself over time but the hair cells cannot.

#### *Inside your ear*

Sound is transmitted by your eardrum and three tiny bones to fluid in the inner ear. This movement is picked up by tiny hair cells and a signal is passed to the brain. It is these cells that are damaged by excessive noise causing deafness.



## Where is Noise found?

Noise is found in:

- plant and machinery, tools, compressed air and steam processes
- workplaces located next to, above or below noisy machinery or work activities
- workplaces where low-level nuisance noise occurs, eg there are a lot of people talking, phones ringing, banging of equipment.

## Health and Safety Risks of Noise

Exposure to continuous noise at low levels can cause fatigue and stress. It can make communication difficult and/or interfere with concentration. This can impact on an individual's ability to work effectively and can lower job satisfaction and morale.

Continuous and high-intensity exposure to noise can lead to deafness.

For the individual who suffers from noise-induced hearing loss, it can impact on their quality of life by:

- making verbal communication difficult which can impact on relationships and may make the individual feel isolated
- reducing enjoyment of music and other aural entertainment by not being able to hear it clearly
- impairing the ability to hear warning signals, for example a car horn, or a smoke alarm

Noise-induced hearing loss results from repeated exposure to excessive noise levels for a period of time. This type of hearing loss is permanent.

## Safety Risks

At work, noise-induced hearing loss can lead to an inability to:

- hear warning and safety signals, which could put the employee at risk of being hurt
- correctly hear verbal instructions which may lead to misinterpretation of information.

## What are the noise control laws?

Under the *NSW WHS Act 2011* and *NSW WHS Regulation 2017*, managers are legally required to identify, assess and control noise sources so that no worker or other person is exposed to noise levels greater than the legal maximum levels.

The maximum legally-acceptable levels of exposure to noise in the workplace are:

- no more than the equivalent of eight hours exposure to steady sound pressure levels of 85 dB(A) per day, or
- peak sound pressure levels of 140 dB(A).

Workers need to be made aware that exposure to noisy activities outside their work hours will also impact on their overall noise exposure in a 24 hour period, eg loud music through earphones, loud music at a concert, using a bandsaw or wood chipper.

The [SafeWork NSW Managing Noise and Preventing Hearing Loss at Work Code of Practice 2016](#) provides guidance on managing exposure to noise at work and minimising the associated health risks in compliance with the Regulation.

## Management of noise

A risk management approach should be used to manage risks associated with noise in the workplace.

### 1. Identifying Noise Hazards

The first step in noise management is to identify if there are noise hazards. As an informal guide, there is likely to be a noise problem if:

- it is necessary to raise your voice to have a conversation with someone up to a metre away
- worker complain of noise affecting their concentration and ability to do their work
- worker are experiencing headaches, ringing in their ears or changes in the quality of hearing due to exposure
- the level of noise is similar to heavy city traffic.

Manager and worker are required to at a minimum conduct an annual Noise Hazard Identification Checklist from the [SESLHDPR/394 Work Health and Safety - Noise Management Procedure](#).

Information on noise levels of existing plant and equipment can usually be sourced through manufacturer operational manual or indicator markings (see examples below).

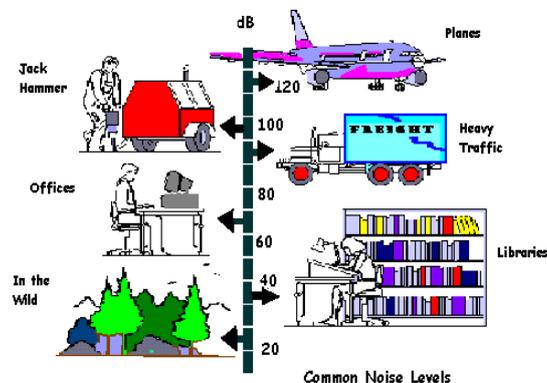


### 2. Assessing Noise Hazards

Where a noise hazard is identified the [local WHS&IM unit](#) will assist in arranging an external noise assessment.

#### How much noise is too much?

The risk of hearing loss depends on exposure. Exposure means *how loud* the sound is and *how long* a person is exposed to it.



## How do you measure noise?

Sound waves travel through the air creating minute fluctuations of pressure called sound pressure. The amount of sound pressure is interpreted by the ear as a level of sound. Sound is defined by strength, frequency (pitch) and duration.

## Sound pressure levels

Decibel (dB) is the unit used to measure a sound's strength. The decibel scale is not linear but logarithmic. This means that noise levels cannot be added directly like other numbers. For example, a compressor and lawn mower might each produce 90dB but would have a combined output of 93dB, not 180dB. In other words, sound intensity doubles every 3dB.

The human ear can detect a large range of sound pressure levels ranging from 0 dB, which is the threshold of hearing, to 140 dB, which is the threshold of pain. Noise pressure levels over 140 dB can cause immediate and permanent damage to a person's hearing.

## Noise fluctuations

Noise levels rarely remain constant and can fluctuate depending on the type of machinery/equipment used and work activities being carried out in the workplace. This can make it difficult to assess the total dose of noise delivered to the ear over an average working day. This can be measured by using an integrated sound level meter or sound exposure meter that can calculate equivalent continuous noise level (Leq).

## Daily noise dose

Daily noise dose is a term used to describe a person's daily exposure to noise. It is determined by the noise level (dB) and the equivalent continuous noise level (Leq).

A daily noise dose of 1 is defined as the equivalent of being exposed to 85 dB(A) of noise over an 8 hour period. This is the maximum dose of noise exposure by law to which a person may be exposed.

## 3. Controlling Noise Hazards

Where a noise assessment reveals that noise in the workplace exceeds safe exposure levels, then the exposure must be controlled. Control measures should be implemented in accordance with the WorkCover Hierarchy of Control.

### Elimination

- Use equipment that does not emit noise.

### Engineering

- Modify, redesign or replace the noise-emitting object.
- Modify the noise transmission path, eg isolate the object in an enclosure, enclose the operator in a soundproof booth, acoustically treat the area.

## Administration

- Consider job rotation, job redesign to reduce the amount of time people are exposed to the noise, safe work practices.

## Personal Hearing Protection

- When other controls do not reduce exposure to noise to below safe exposure levels, then worker should be supplied with appropriate and effective personal hearing protection (PHP).
- Workers are to be provided with information, instruction and training in its use and maintenance of PHP before being given, or asked to use the equipment for the task.
- PHP that complies with *Occupational Noise Management AS/NZS 1269* is rated to assist with reducing the risk to, or below, the 85dB LAeq,8h.
- When choosing PHP there are two major considerations:
  - what style best suits the individual user, ie foam, moulded earplugs or earmuffs
  - the level of protection required by the PHP to reduce the noise level to or below 85dB LAeq,8h. **The table below must be used for this selection process as the attenuation of PHP is in dBC, not dBA.**

### Personal hearing protector selection

**Step 1:** Identify the average noise level of the equipment or process of concern in  $L_{Aeq,8h}$  dB(A) from Column 1 in the table below.

**Step 2:** Using the level identified in **Step 1** look across the row to identify the **Class** in column 2 and the **SLC<sub>80</sub> rating** in column 3.

**Step 3:** When Purchasing PHP quote the **Class** and **SLC<sub>80</sub>** established in Steps 1 and 2.

**Note:** **SLC<sub>80</sub> rating** is how many decibels (in dBC) the noise is reduced by the PHP. **All PHP will have this SLC<sub>80</sub> rating written on the packaging when you purchase it.**

1	2	3	4
$L_{Aeq,8h}$ dB(A)	Class	SLC <sub>80</sub> rating	Example of Equipment dB levels
Less than 90	1	10 to 13	Using a vacuum cleaner or hand saw
90 to less than 95	2	14 to 17	Operating Tractor, Hair Dryer
95 to less than 100	3	18 to 21	Operating Electric Drill
100 to less than 105	4	22 to 25	Operating electric Saw or line trimmer
105 to less than 110	5	26 or greater	Operating an impact drill or chain saw

**Example** - A lawn mower rated at 95  $L_{Aeq,8h}$  dB(A) would mean using Class 3 PHP or PHP rated between 18 to 21 SLC<sub>80</sub>.

## Hearing Protection Areas and Signage

Areas where people may be exposed to excessive noise should be sign-posted as Hearing Protection Areas. Where sign-posting is not practicable, other arrangements should be made, eg attach warning signs to tools and equipment indicating hearing protection must be worn.

## Audiometric Testing

One of the biggest changes around noise management within the WHS Act 2011 and WHS Regulation 2017 is the minimum requirements for audiometric testing.

Audiometric testing will be arranged through the Facility Executive for identified workers exposed to noise. This will include all workers who are required to frequently use personal hearing protectors as a control measure for noise that exceeds the exposure standard. New workers will undergo their first audiometric test within three months of their start date. For all current workers, audiometric assessments will be carried out every two years.

Hearing is also to be monitored with audiometric testing in situations where:

- exposure to ototoxic substances where airborne exposure is greater than 50% of the national exposure standard for the substance, regardless of noise level
- exposure to ototoxic substances at any noise level where LAeq,8h is greater than 80 dB(A) or LC Peak is greater than 135 dB(C)
- hand-arm vibration at any level and noise where LAeq,8h is greater than 80 dB(A) or LC Peak is greater than 135 dB(C).

Workers are to be given the results of audiometric testing accompanied by a written explanation of the meaning and implications. Only with the consent of the worker should their results be provided to other parties. Unidentifiable individual results and group data can be made available through the Facility Executive.

## Exposure to ototoxic substances and hand-arm vibration

Studies have indicated that there is a greater risk to workers, when exposures to noise combined with other known risks such as hand-arm vibration and some chemicals.

Workers who use equipment such as chainsaws that subject them to both hand-arm vibrations and to noise may be more likely to suffer from hearing loss.

Exposure to some chemicals known as ototoxic substances, may increase the risk if the worker is exposed to both noise and ototoxic substances than if exposure is just to noise or ototoxic substances alone. There are three major classes of ototoxic substances: solvents, heavy metals and asphyxiates.

Audiometric testing for workers that may be exposed to these additional combined risks is included in the Noise Management Policy.

## References

- [Work Health and Safety Act 2011](#)
- [Work Health and Safety Regulation 2017](#)
- [SafeWork NSW Managing Noise and Preventing Hearing Loss at Work Code of Practice 2016](#)
- [SESLHDPR/394 Work Health and Safety - Noise Management Procedure](#)

## Revision and Approval History

Date	Revision no	Author and approval
2014	1	
August 2018	2	Desktop review, links updated – Catherine Johnson, WHS Consultant Endorsed by Executive Sponsor