Occupational noise management

NT WorkSafe

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This booklet, a Northern Territory Government funded initiative, was compiled by Brett Young, in conjunction with the Occupational Noise Management Committee of the Northern Territory. Its aim is to provide information and assist in the prevention of noise-induced hearing loss.

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NT WorkSafe, Department of Employment, Education and Training
Northern Territory Government

Northern Territory Government
Work Health Authority

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Introduction

Noise-induced hearing loss (NIHL) is a major health problem in Australia and indeed the Northern Territory. It is estimated that nearly one-third of industrial workers will experience a hearing loss to some degree as a result of working in noisy environments. You may be at risk.

Northern Territory occupational health and safety legislation dictates that it is the employer's responsibility to provide a safe place of work for all workers.

This booklet provides guidance to employers on how to manage workplace noise effectively and thereby minimise occupational noise-induced hearing impairment.

Effective noise management requires a systematic approach, referred to as an occupational noise management plan. Workplaces with noisy processes or tasks should implement a plan to reduce the risk of employees experiencing adverse health effects. This booklet provides details on how to manage noise in your workplace and a list of providers who can assist you.

What constitutes a noisy environment?

Studies have shown that noise exposure exceeding an average of 85 decibels (dB (A)) over an eight-hour period presents a high risk to a person's health and safety. Levels of noise above 140 dB(linear) can cause immediate hearing damage. This is often referred to as ‘acoustic trauma’ and can result from an event that causes very loud noise, for example a gunshot or metal punching machine.

If you have to raise your voice to speak to someone one metre away, or you are required to wear hearing protection devices, then you or your employees may be at risk.

How excessive noise damages your hearing mechanism

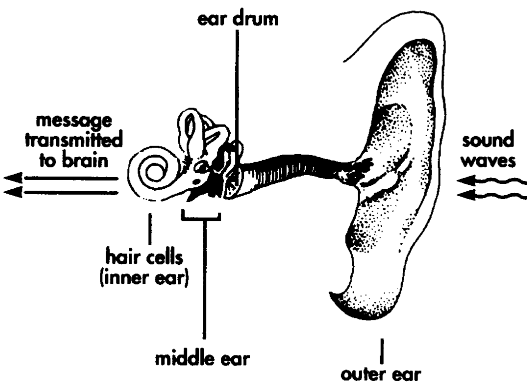
Sound stimulates tiny hair-like cells in your inner ear, which send messages to your brain. NIHL occurs because excessive noise damages the delicate hair cells.

New carpet springs back to the upright position once first walked on. However, over many years of walking up and down the same area, the pile loses its spring and is permanently bent or flattened. Similarly the hair-like cells of the inner ear are damaged by too much noise exposure.

Often, damage occurs gradually over a number of years and remains unnoticed until it is too late. The damaged cells can no longer send the messages to the brain and hearing is lost.

Extremely loud noises can cause immediate lasting damage. The sudden burst of energy in noises such as jack hammering or gunshots can cause this type of damage.

Initially the excessive noise causes a temporary hearing loss, or temporary threshold shift (TTS), and hearing recovers to normal over a period of time.



Most people can relate to this after frequenting a rock concert or a nightclub. When you go to a quiet area or get home, you realise that your ears are ringing or buzzing. This indicates that you have experienced a TTS from excessive exposure to noise. In the morning after a night's sleep, the ring subsides or goes away, giving the false impression that everything is fine, when in actual fact the delicate hearing mechanism may have been damaged.

In the workplace, if the noise exposure exceeds the equivalent or average of 85 dB(A) for eight hours, or a peak sound pressure level of 140 dB, workers may experience the same effects and a TTS may occur. Repeated exposure to excessive noise from the workplace will eventually transform the TTS into permanent threshold shift (PTS). Exposure to noise outside of work will accumulate your daily noise exposure. This is because your ears never switch off and are constantly alerting you to the environment around you. If the TTS becomes permanent, there is no medical solution. Your hearing will never come back.

A PTS, accompanied by ringing in the ears or tinnitus, is extremely distressing and causes other problems such as stress and difficulty in sleeping.

The extent of the noise-induced hearing loss depends on the intensity of the noise, its duration and its frequency or pitch. Put simply, the more time ears are exposed to any particular excessive noise level, the greater the degree of hearing loss. More time equals more acoustic energy and hence more damage.

NIHL is progressive and permanent, but preventable with appropriate noise control options.

Occupational noise management

To provide a safe workplace, irrespective of size, employers need to have carefully designed safety management systems. Noisy workplaces, such as panel beaters' and metal fabricators' premises and construction sites must implement an occupational noise management plan and incorporate this into their safety management system.

The plan should aim to:

- identify noise hazards in the workplace
- minimise noise-induced hearing loss and tinnitus by using engineering control measures and purchasing quieter equipment/plant
- inform workers of the harmful effects of noise through training and information sharing
- use a systematic approach to the management of exposure to excessive noise
- promote consultation with workers, external providers, and management.

This is not merely a set of procedures designed to lower the volume of noise in the workplace in an ad hoc manner, it is a fully integrated plan of action to target noise and to educate management and staff about the hazards associated with excessive noise levels. Developing a noise management plan is not hard. By working through the general principles of safety management, a plan can be tailored for your individual workplace.

Noise management plan

The occupational noise management plan should include procedures for:

- identifying noise hazards in the workplace
- assessing the risk of the noise exposure
- identifying control measures to reduce the risk of noise exposure
- implementing the control measures
- establishing a hearing protection program
- hearing assessment or auditory assessment
- program evaluation.

What employers must do

By law, employers must:

- identify, from the level of noise in the workplace, any risk of hearing loss to an employee
- assess whether an employee's exposure to workplace noise is likely to exceed the exposure standard.

These requirements are stipulated by the Work Health (Occupational Health and Safety) Regulations 1996, specifically under Regulation 38.

The exposure standard

Regulation 56 stipulates that a worker shall not be exposed to noise exceeding an average of 85 dB(A) over an eight-hour day—commonly referred to as $L_{Aeq,8h}$ 85 dB(A)—or a peak noise of 140 dB(linear). This may damage hearing and must be **identified** and **assessed**.

Noise identification

Noise identification involves identifying noise and determining the risk. This enables the employer to:

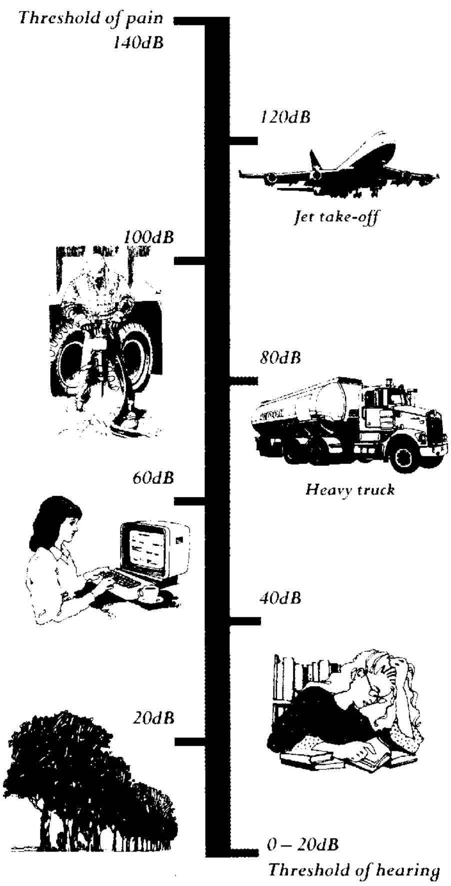
- identify employees whose exposure may exceed the exposure standard
- identify employees whose exposure needs to be assessed
- recognise noisy areas, tasks, and processes
- recognise situations where immediate solutions, such as a quick fix, are possible or where hearing protection may be used as an interim measure
- provide information for anyone carrying out a noise assessment.

How to conduct noise identification

One way to conduct noise identification is to carry out a walkthrough of the workplace, identifying noisy processes or tasks. Other information may be gathered from manufacturers' records such as the sound power or sound pressure levels. A risk identification checklist is provided on pages 18 and 19 as a guide for identifying noise.

When conducting a walkthrough survey, divide your workplace into separate areas. Include exposure to employees who do not work in fixed locations, such as maintenance personnel, cleaners, and contractors. Include noise from portable equipment such as hand-held drills and whipper snippers, as this will add to the overall daily noise exposure.

Who can conduct noise identification?



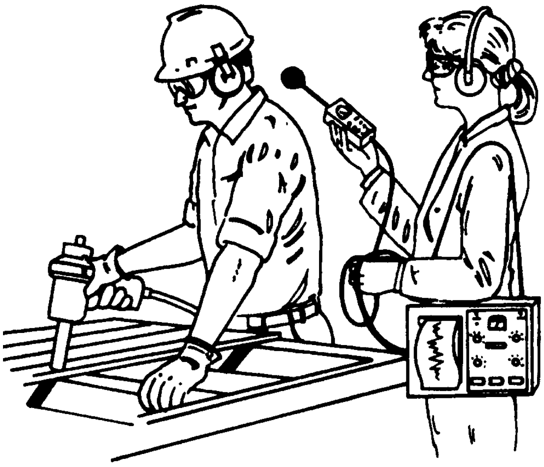
No special skills are needed to conduct noise identification. The employer or a nominee can do this in consultation with those who understand the work processes. They can then consult with affected employees and any health or safety representatives.

Use the decibel levels of common sounds as a guide for determining if your workplace carries out noisy processes.

When a noise assessment is necessary

If the level of noise to which an employee is exposed is likely to exceed the exposure standard, it must be assessed.

This involves measuring the noise levels in the workplace with a sound level meter and, where appropriate, a personal sound exposure meter or dosimeter. The worker wears the dosimeter throughout the normal working day and it records the worker's noise exposure for the entire shift.



An assessment is required:

- within three months of a workplace being set up
- after a change to the workplace that is likely to affect the level of noise
- when requested by a health and safety representative, if reasonable
- when requested by an NT WorkSafe officer
- at least every five years.

What noise assessment does

Assessment enables employers to:

- accurately measure the noise to which employees are exposed, to assess the risk of hearing loss in $L_{Aeq,8h}$ and peak levels
- recognise the sources of noise and develop methods of reducing it
- check the effectiveness of the control methods.

Who can conduct a noise assessment?

A competent, experienced person, such as an acoustic engineer or occupational hygienist, should conduct the assessment. Affected employees and relevant NT WorkSafe representatives must be consulted. How and why the monitoring is being conducted should be explained to workers.

How to conduct a noise assessment

Measurements should be taken during an employee's typical working day, taking into account any marked variability in an employee's exposure. If noise levels at the employee's ear level fluctuate more than 6-8 dB, measurements will need to be conducted over an entire work shift, using a personal sound exposure meter or dosimeter. Details about measuring equipment are provided in the Australian Standard AS/NZS 1269 series.

The subsequent report should identify employees likely to be exposed to noise levels above the exposure standard. Results must be made available to affected employees and their health and safety representatives. This data must be kept at the premises and maintained for at least 30 years.

What to do next

If the results show that an employee's exposure has exceeded the noise standard, the employer must:

- reduce the noise immediately
- prepare a written noise control plan.

Noise control

The most effective and reliable method for reducing noise exposure is to engineer out the noise at the source and develop procedures for purchasing quieter equipment in the future.

Administrative controls, such as job rotation and modified work schedules, reduce the time or extent of exposure and when implemented are effective control options.

Personal hearing protection is the least preferred control option and should be used only as a interim measure, for example, during the planning and budgeting phase, where more permanent engineering and systematic methods are identified for the reduction of employee exposure.

What do you control first?

When prioritising the control of noise sources, consider:

- magnitude of $L_{Aeq,8h}$ and peak noise level
- number of exposed employees who will benefit
- results of any engineering appraisal
- working conditions that make hearing protection unsuitable
- the remaining serviceable life of the equipment and any noisy equipment or machinery.

The employer should also review any previous noise assessments for information on the above factors.

By engineering out noise at the source, the need for additional control measures is eliminated, for example administrative controls and hearing protection.

How to plan engineering controls

Preparation is essential for effective implementation of engineering controls in the workplace. You also need to consult with employees, particularly:

- those exposed to the noise
- their health and safety representatives, if any
- maintenance and engineering staff.

The assistance of an acoustic engineer and an occupational hygienist may be required.

Some common sources of noise

Sources of noise present in any plant or process include:

- the nature of the process, e.g. grinding
- moving parts, e.g. belts
- parts that wear or loosen, e.g. bearings
- reflections from hard sources, e.g. metal panels
- air turbulence, e.g. through ducts
- transmission through structures such as floors, walls and machine panels.

Where you control noise

Methods can be used to control noise at the:

- source
- path—along which the noise is transmitted
- receiver—the employee who is exposed.

Control at source

The most effective way to control noise is at the source. This should be given the highest priority.

Eliminate or substitute it

If eliminating noisy plant/processes is not possible, substitution is the next step.

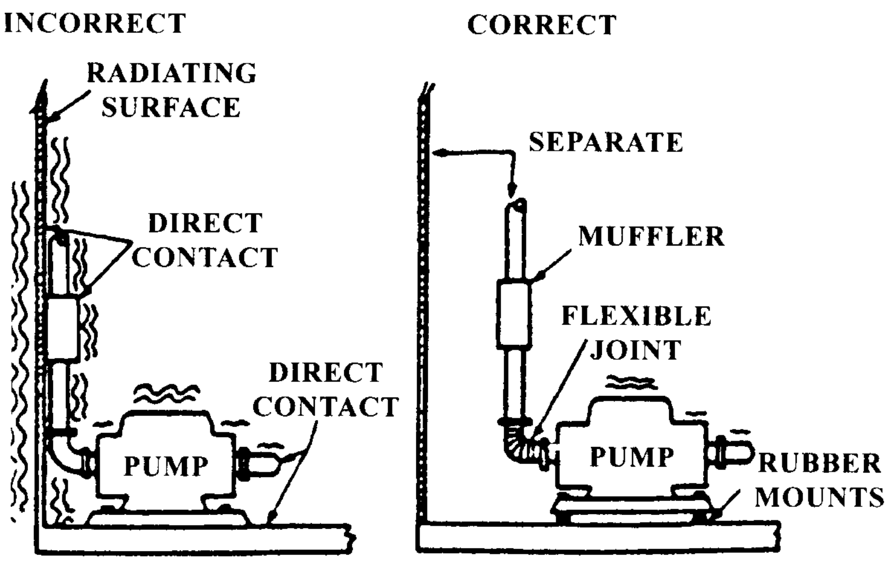
This includes:

- substituting metal parts with plastic/non-metal parts, e.g. pneumatic wheels on carts
- reducing sound produced by fluid flow, e.g. low turbulence fan blades
- avoiding metal-to-metal impact by changing work practices
- substituting machines, e.g. presses for hammers.

Engineer it out

Solutions could include:

- dampening of panels, e.g. increasing stiffness or using rubber/plastic bumpers/cushions
- isolating vibrating machinery to prevent structure-borne noise, e.g. reducing sound transmission through solids or installing flexible mountings
- fitting silencers or mufflers, e.g. low-noise nozzles for blow guns
- altering work practices, e.g. drop heights.



Control at path

Where noise can't be controlled at the source, the transmission of noise should be prevented.

Eliminate or substitute it

Eliminate noise by rearranging the work area to place sources of noise as far away as possible from employees or by moving machines outside work areas.

Engineer it out

Some solutions are:

- building enclosures around noisy equipment
- insulating walls/panels to prevent noise transmission through walls and panels
- using sound-absorbing material or baffles to prevent reflection of noise.

In some cases it may be more practical to erect booths or control rooms that employees can work from. This is particularly useful where the entire workplace is noisy.

Control at receiver

Personal hearing devices

If the assessment determines that employees are being exposed to excessive noise, appropriate hearing protectors must be issued to, and worn by, the affected people. This is an interim measure while engineering and administrative noise-control options are being examined.

It is imperative that the hearing protectors selected will provide wearers with reliable and adequate protection, but you don't want to overprotect the worker. That is, workers shouldn't be protected to the point that they can't hear alarms, or they feel isolated. The most important factor is comfort. If the protector is not comfortable, workers will not wear it. Tight-fighting protectors often cause headaches and feelings of fatigue. Removing the protector, even for a brief period, can dramatically reduce its overall effectiveness.

There are several recommended methods for selecting the correct protectors. Advice should be sought from your supplier or from a competent person such as an occupational hygienist. In addition to providing adequate attenuation, the selected protector must be compatible with other personal protective equipment.

Employees must be given training in their selection, fitting, use, care and maintenance. This instruction must be repeated at regular intervals.

In regard to a personal protection program, the employer should develop standard operating procedures incorporating the following:

- documentation showing the reasons why the hearing protectors selected were considered the most suitable
- a training program in which personnel can become familiar with hearing protectors, including selection and proper fitting
- provision for assigning a suitable range of protectors to people for their exclusive use
- a record of which types of protectors have been issued to which person
- provision for adequate supplies of protectors at accessible locations
- provision for regular cleaning
- continued education and motivation programs designed to promote correct wearing and to maintain a positive attitude towards hearing preservation
- provision of ongoing auditory assessment if appropriate.

In identified noisy areas, hearing protection must be worn at all times. In high noise levels, removing the hearing protection for even very short periods can drastically reduce the overall protection received.

The enormous diversity of hearing protectors—both in attenuation and their correct use and fitting—necessitates close attention to the fitting instruction, supervision, motivation and evaluation under workplace conditions. Remember uncomfortable equipment will not be worn.

Auditory assessment

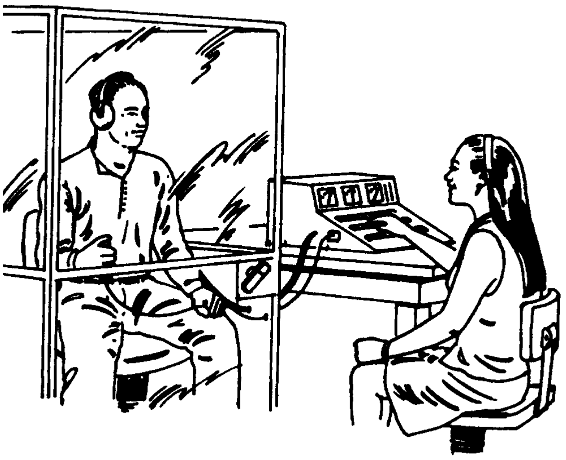
Measurements should be taken during an employer's typical auditory testing of workers. It must be emphasised that auditory assessment is not a control measure, but an effective tool to determine if the control measures are suitable and are protecting the hearing of workers.

Workers required to wear personnel hearing devices during their daily work activities, should be enrolled in the operation's auditory program.

The initial test—or reference test—requires a 16-hour quiet period before testing. A full audiometric and impedance audiometry evaluation should be carried out before an employee begins work. This test can be used as a reference test to determine if hearing loss has occurred before employment.

Monitoring tests are then carried out within three months and then 12 months of the reference test. Thereafter, monitoring is performed 12 monthly unless employees are exposed to high-level noise, e.g. > 100 dB(A). For these cases, more frequent evaluations may be required.

Monitoring audiometry should be scheduled well into the work shift, or after work, so that a comparison with the reference test can be performed. This will indicate if the working environment has caused a temporary shift or effect to the employee's hearing mechanism.



Records of all tests should be kept and maintained for at least 30 years. Results of the audiometric examination, and the possibility of subsequent hearing damage, should be discussed with each employee.

Employees with a significant depreciation in hearing ability should be counselled and advised of their options. The employer will then be advised that there is a significant risk to employees conducting a particular task(s).

Employees should be encouraged to bring their personal hearing devices with them so that the use and care of this equipment can also be monitored.

Audiometric testing also provides a unique opportunity for employee education. The individual assessment usually leads to greater interest and concern for hearing and provides the opportunity to answer individual concerns about noise control and hearing conservation precautions.

Consultation and education

Education has an important role in alerting people to the danger of noise. Hearing loss happens slowly over a number of years and is usually only recognised too late, when the damage has already been done. All levels of employers and employees must be involved in implementing the noise management plan, so all need to be included in educational sessions. The consultative process will play an important role in achieving a workable strategy.

Occupational noise management is a concept that is viable, but it must be vigorously supported by senior management, and couched in a holistic framework that includes education, motivation and enforcement.

Program evaluation

Evaluation is the careful appraisal of the planning, implementation, impact and outcomes of a program against its goals and objectives. The evaluation process should ask key questions such as 'Is the program meeting the organisation's targets, goals and objectives?', 'Are resources being effectively allocated, and is there a need for possible changes in direction of the program?' and 'Are workers informed of the hazards associated with noise?'

To be effective, an occupational noise management program must be continually reviewed. Machinery must be maintained, maximum noise levels should be specified for new machinery and building extensions and alterations should be planned taking noise into account. Also, to preserve their effectiveness, noise control measures should be monitored and maintained.

Noise identification checklist

Description of work location ______________________________

____

Task at workstation ______________________________

____

Assessed by ______________________________

Health and safety representative ______________________________

Date ____ / ____ / ____

A 'Yes' to any of the following key risk factors indicates the need for assessment.

Key risk factor	**Yes**	**No**
Is there difficulty in communication between two employees at one-metre distance? Difficulty means that the speaker has to raise their voice or that the listener may not understand what is said.	❑	❑
Do employees in the area notice a reduction in hearing over the course of the day? This reduction might not be noticed until after work.	❑	❑
Do employees experience any of the following?		
Ringing in the ears—tinnitus	❑	❑
The same sound having a different tone in each ear—diplacusis	❑	❑
Blurred hearing	❑	❑
Are any long-term employees hard of hearing?	❑	❑
Are hearing protection devices provided?	❑	❑
Are signs, indicating that hearing protective devices should be worn, posted at the entrance of the work area?	❑	❑
Do results of past noise measurements or surveys indicate noise levels equal to or greater than any of the following?		
85 dB(A) slow or fast	❑	❑
85dB (A) Laeq	❑	❑
140 dB(lin) peak noise	❑	❑
Daily noise dose of greater than 1, i.e. LAeq,8h 85 d(A)	❑	❑
Have there been any industrial deafness claims?	❑	❑

Does any equipment have noise information—including labels—that indicate noise levels equal to or greater than any of the following?

80dB(A) LAeq	❑	❑
130 dB(lin) peak noise	❑	❑
80 dB(A) sound power	❑	❑

Note: The levels may be several decibels below the standard

Do the results of audiometry indicate that past or present employees have hearing loss?	❑	❑
Does the noise in any part of the workplace sound as loud or louder than 85 decibels using the scale—decibel levels of common sounds on page 9.	❑	❑

Note: The LAeq or dB(lin) measurement supplied may, for a variety of responses, underestimate noise.

Sound power is not a noise level. Under circumstances, equipment generating a sound power of 80 dB may result in noise level of Laeq 85 dB(A) or higher.

For further information

NT WorkSafe

Contact NT WorkSafe on 8999 5010 or 1800 019 115 or call in personally to one of our offices.

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Internet websites

NT WorkSafe:

http://www.worksafe.nt.gov.au

The Territory Business Centres:

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