

MODULE 10: FACT SHEETS

THIS MODULE IS FOR Chief executive officer
Production/engineering staff
Maintenance staff
Nurse/medical staff
Purchasing staff
Employee representatives
OHS committee

INTENDED OUTCOMES The fact sheets are intended to raise awareness about:

- the effects of noise and the value of good hearing;
- noise and noise control;
- ways of reducing noise exposure;
- personal hearing protectors.

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FACT SHEET 1: EFFECTS OF NOISE AND VALUE OF GOOD HEARING

GOOD HEARING IS IMPORTANT

You depend on your hearing:

- to communicate;
- to socialise;
- to learn;
- to keep in touch with the world around you;
- to be warned of impending danger;
- to be entertained;
- to enjoy music and the sounds of nature.

Taking care of your hearing makes sense.

NOISE IN NEW ZEALAND WORKPLACES

Up to half a million New Zealanders work in noisy jobs. Noise is a leading cause of hearing loss in adults. Many workers in the State of Victoria in Australia have had their hearing tested as part of a Victorian government programme.

Some key findings were:

- over 80,000 workers were found to have damaged hearing, with many more workers yet to be tested;
- in some factories, more than half the workers had impaired hearing.

Though there are no data available for the situation in New Zealand, it is likely to be similar. The population of New Zealand (3.5 million) is about 80% of that of the State of Victoria (4.4 million).

Noise problems are not confined to large organisations. There are a large number of workers exposed to excessive noise in small manufacturing enterprises.

WHAT DOES NOISE DO TO THE EAR?

Noise destroys delicate nerve cells in the inner ear that transmit sound messages to the brain. The nerve cells are replaced by scar tissue which does not respond to sound.

The damage is painless but is also permanent and there is no cure. Hearing aids can be of some help but fall far short of restoring normal hearing.

**HOW DOES
INNER EAR
DAMAGE
AFFECT
HEARING?**

Noise-induced hearing loss (NIHL) does not result in total deafness. Those parts of the ear which process high-frequency sound are more affected than other parts of the ear. The ability to hear low-frequency sounds can remain almost normal. This partial hearing loss can have a number of strange effects, including the following:

- In quiet surroundings, such as the countryside, you may hear far away thunder or a distant car (both faint low-frequency sounds) as well as anyone else. At the same time, you may fail to hear closer sounds which are clearly audible to others, such as the song of a bird or a cicada or the rustle of a small animal in the grass (faint high-frequency sounds). Such apparent inconsistencies in your behaviour can make people think you are a dreamer or that you sometimes just pretend not to hear.
- Inconsistencies may also occur when listening to speech. The loudness of speech is determined by its low-frequency content, so it sounds as loud to a person with NIHL as it does to most people; on the other hand the intelligibility of speech is determined by its high-frequency content. To a person with NIHL, many words sound the same and speech sounds jumbled. The typical complaints of a person with NIHL are, “Don’t shout, I’m not deaf” and, “I can hear but I can’t understand”. It’s easy to see why someone unaware of the nature of NIHL can mistake this hearing difficulty for low intelligence and misinterpret requests to repeat what is said as a deliberate tactic to annoy or make conversation difficult.

**EFFECTS OF
HEARING
IMPAIRMENT**

If your hearing is impaired it can affect many areas of your life.

Talking with people

If you have NIHL, everyone seems to mumble, so it is

hard to have relaxed conversations, use the telephone, deal with people in shops and follow what's going on at meetings.

Social life

You may find yourself avoiding people because you are embarrassed about not being able to hear properly. Your family and social life may suffer. At work, you may be passed over for promotion.

Quality of life

Being hard of hearing takes pleasure away from things like music, television, films and the sounds of nature.

Ringling in the ears

As well as impaired hearing, you may also suffer from “ringing in the ears”. This can be very distressing, especially if you are trying to sleep.

Safety/emergencies

If you have NIHL, you don't always hear what's going on around you. You could miss a warning sound or a cry for help, or misunderstand an important message. In an emergency you could be a danger to yourself or others.

WARNING SOUNDS

Because enemy troops are usually detected by the sounds they make, the US Army studied the effects of hearing loss on enemy troop detection.

They found that a sentry with normal hearing would have almost two minutes warning of an approaching enemy soldier walking on leaves.

A sentry with poor hearing — about the same as moderate industrial deafness — would not hear the approach until the enemy was five steps away.

The same sentry with an additional temporary hearing loss, such as could be experienced after a day's work in a noisy factory, *would not hear the enemy approach at all.*

OTHER EFFECTS OF NOISE

Noise exposure which is high enough to cause permanent damage will usually cause temporary

hearing problems by the end of the working day. Hearing may be poor for some hours after work just at the time when it is needed for relaxing with family or friends, enjoying television or participating in other leisure activities. Hearing will usually recover overnight but if noise exposure continues, less and less recovery occurs and the temporary changes gradually become permanent.

Noise can be a safety hazard. It can distract attention, drown out the sound of a malfunctioning machine, an alarm signal, a warning shout or a cry for help. Many people find high workplace noise levels irritating and stressful. Communicating in noisy areas requires extra effort and concentration and there is a risk that messages or instructions will be misunderstood, leading to mistakes, frustration and possible safety problems.

FACT SHEET 2: QUESTIONS AND ANSWERS ON NOISE AND NOISE CONTROL

WHAT'S A BIT OF HEARING LOSS

It is often incorrectly said that hearing loss is not as bad as losing a finger or being injured in an accident.

Many hearing impaired people would gladly trade a finger to have normal hearing again.

Recent research at the University of Montreal highlights a number of consequences of noise-induced hearing loss (Hetu R., Riverin L., Lalande L., Getty C. and St Cyr C. "Qualitative analysis of the handicap associated with occupational hearing loss", *British Journal of Audiology*, vol. 22, pp. 251-64, 1988). The research, which was based on reports from industrial workers, revealed that workers have to expend extra effort to overcome their hearing loss, suffer from anxiety, stress and fatigue and feel isolated in groups.

EFFORTS

Extra effort is required by the workers because:

- they must be more attentive in communicating with others;
- they must concentrate more in conversations;
- it is annoying to ask others to repeat themselves;
- adjustments demand a great deal of effort.

ANXIETY AND STRESS

Anxiety and stress were caused because:

- noise at home is bothersome;
- ringing in the ears is very annoying;
- workers worry about the condition of their hearing and the noise level at work;
- noise at work led to aggressive behaviour; and
- of the inability to hear the telephone ringing.

FATIGUE

Workers reported that:

- after work it is very annoying to feel the sensation that their ears are blocked;

- they have headaches;
- they need peace and quiet;
- they feel too tired for normal activities.

EFFECTS ON
GROUP ACTIVITIES

Workers said that their hearing problems had led to changes in their social activities because:

- they are less communicative in groups;
- they are more and more isolated in groups;
- they participate less and less in group discussions;
- their inability to follow group discussions is annoying.

Therefore the real question is, “If it’s entirely preventable, what’s the point of having the ears of a 70-year-old when you’re only 20?”

**I’M YOUNG,
WHAT DOES
IT MATTER?**

“I’m young, I’ll worry about it later. It’s mostly the older ones who are hard of hearing”, is sometimes said.

However, most older workers with noise-induced hearing loss have had it since they were young. The reason it is more noticeable among older workers is that the additional hearing loss that comes with age makes it impossible for them to hide their difficulties.

The time to prevent noise-induced hearing loss is from the first day in a noisy environment. You may have thought, “I’ll notice if noise is affecting my hearing and I’ll do something about it then”.

Unfortunately, however, you probably won’t notice. Noise-induced hearing loss develops gradually over a period of months to years, depending on the degree of exposure. The process is slow and painless and very few people notice it happening until quite a lot of hearing has been lost.

There is no cure for noise-induced hearing loss, so all you will be able to do is learn how to live with a permanent hearing impairment.

**WHAT MAKES
A NOISE
HARMFUL?**

The two main aspects of noise which determine whether it is harmful are:

- how loud the noise is;
- how long you are exposed to it each day.

Noise starts to be a risk to hearing when it is about as loud as heavy city traffic, that is about 85 decibels (85 dB(A)). You can work all day in noise levels below 85 decibels with little risk of hearing damage.

Above 85 decibels, the risk increases rapidly as the noise gets louder. At 100 decibels, for example, exposure should be no more than 15 minutes a day.

Although the best way of judging if a noise is harmful is for a trained person to measure it, there are also some simple indicators. Some of the indicators that a noise is likely to be harmful are:

- the noise is as loud or louder than heavy city traffic;
- you have to raise your voice to speak to someone a metre away;
- people who have worked in the noise for a while seem to be a bit deaf;
- things sound different after exposure to the noise;
- you hear ringing or other noises in your ears after exposure to the noise;
- you often have to strain to catch what people are saying;
- you have to turn the radio or TV higher than you used to;
- members of your family say you seem to be having problems with your hearing.

**CAN LOUD
MUSIC HARM
MY HEARING?**

Yes, it certainly can. One exposure is unlikely to cause permanent harm, although you may notice some temporary effects like muffled hearing. However, the risk of permanent hearing damage increases:

- the more often you are exposed;
- the louder the music;
- if you have already been exposed to loud noise that day, for example in a noisy job.

The safe way to listen to your favourite music is to:

- alternate between loud and quiet music;
- give your ears a complete rest for ten minutes every half hour;
- be alert for effects such as ringing in your ears or muffled hearing.

If you experience such effects, take them as a warning that you are over-loading your ears and change your listening habits. Be particularly careful if you work in a noisy job, because noise exposures add up.

**EMPLOYER:
WHY SHOULD
I HAVE TO
WORRY?**

An employer has said, “Why should I have to worry about the noise in my factory when young people can go to a disco after work and blast their ears off?”

Our ears are able to cope with exposure to loud noise provided it doesn’t last too long and is not repeated too often.

Although disco and other amplified music can be very loud, exposures are typically brief and infrequent compared with exposures at work. Therefore, much less hearing damage is caused.

In a survey of over a thousand young people in Sydney, many of whom had often attended concerts and discos, researchers from the National Acoustic Laboratories (the Commonwealth Government scientific laboratory that specialises in the study of noise and hearing) failed to find any clear cases of music-induced hearing loss. (Carter N., Waugh R., Keen K., Murray N. and Bulteau V., “Amplified music and young people’s hearing”, *Medical Journal of Australia*, vol. 2, pp. 125-8, August 7, 1982.)

This is not to say that no one has ever suffered hearing damage as a result of loud music, but it does indicate that significant damage is rare. By contrast, there are now about 9,000 cases of occupational hearing loss every year in New Zealand.

Another point to bear in mind is that employers are under a legal obligation to control noise exposure in the workplace. Government takes the view that, just as the existence of non-occupational risks of injury does not

relieve employers of the responsibility to guard dangerous machines, the existence of non-occupational noise hazards does not relieve employers of the responsibility to control noise hazards in the workplace.

**ISN'T NOISE
CONTROL
EXPENSIVE?**

It is often assumed that noise control is very expensive and that in most cases it is probably impossible to do anything about the noise anyway.

It's true that some noise controls are expensive, especially if equipment has to be modified after installation. This is why it makes sense to buy quiet. Even if it is more expensive, it is better to buy quiet equipment at the outset than to make costly modifications later.

To help break down the myth that noise control work always costs a fortune, consider the following examples of really inexpensive noise solutions:

- A noise consulting firm achieved a 50 decibel reduction (that's a lot) in the noise made by cyclone separators by inserting a small metal plate that broke up a resonant airflow that was causing a high-pitched whistle. The cost was \$1 per machine.
- After advice from a noise consultant, one of the maintenance staff of a small company built sound-proof enclosures around several noisy machines. The machine operators helped with the design to ensure that access and production were not affected. The enclosures were made of plywood and ceiling insulation material enclosed in plastic garbage bags and chicken wire. The material cost was about \$440 per enclosure. The enclosures were effective and removed the need for the operators to wear hearing protectors.
- A French company has developed an "intelligent" rock breaker that senses the nature of the rock and then adjusts the strength and direction of the impacts to break it up as efficiently as possible. Operation is claimed to be virtually vibration-free, with no overheating and little noise.

A lot of noise control work is neither expensive nor complicated once some basic principles are understood. An excellent guide to noise control principles, written

in simple language and clearly illustrated, is now available from Bruel and Kjaer. Details are at the end of this fact sheet.

Another useful publication (also listed at the end) is *100 Practical Applications of Noise Reduction Methods*, from which the following examples are drawn. They show noise levels at the operator's position of various machines before and after simple, inexpensive treatments. In most cases, the noise level has been reduced to the point where the operator would not need to wear hearing protectors.

<i>Problem Machine</i>	<i>Noise Control</i>	<i>Noise level (dB(A))</i>		<i>Cost (\$)</i>
		<i>Before</i>	<i>After</i>	
paper reeler	replace steel with with bronze gears	99	86	825
paper cutter	replace steel with plastic gear	93	85	275
plastic grinder	redesign feed hopper	95	83	110
book binder	line case guard with polyurethane	95	85	45
grinder	replace steel with plastic chute	92	82	50% less
band saw	enclose in acoustic curtains	101	91	2,500

The expense of noise control work has to be weighed against the existing costs of noise. *Module 6: Costs/Benefits* explores this question and concludes that untreated noise costs the average manufacturing enterprise over \$17,000 per year, to say nothing of the effects on the employees' hearing and health.

Inexpensive noise controls like those listed above are a profitable investment for an organisation and they have very positive health, safety and comfort benefits for employees.

PUBLICATIONS

Bruel and Kjaer Ltd., *Noise Control - Principles and Practice*, Bruel and Kjaer Ltd., Denmark 1986, available from Reid Technology Ltd, PO Box 1898, Auckland.

Health and Safety Executive, *100 Practical Applications of Noise Reduction Methods*, HMSO, London, 1983.

FACT SHEET 3: WAYS OF AVOIDING HEARING DAMAGE

HOW CAN HEARING DAMAGE BE AVOIDED?

The best way to avoid hearing damage is to cut down the noise that people are exposed to. The main ways to do this are by:

Controlling the source of noise

A great deal of noise control is just common sense. Large noise reductions were made in one factory simply by lining metal chutes and bins with scrap conveyor belting.

Stopping the noise from reaching people

This may be done by moving a noisy machine away from people, by building a soundproof enclosure around it or by putting up a barrier between the machine and people.

Reducing the time people are exposed

Quiet work, like packing or inspecting, should be done in a quiet place. Where possible, people should swap between noisy and quiet jobs so that nobody gets exposed for too long.

While it is up to the employer to approve such changes, employees may be able to contribute ideas and help with trialing changes. If you can see ways your workplace might be made quieter, suggest them to your supervisor, safety committee or employer.

If exposure is still excessive after all possible control measures have been taken, individual protection is available from earmuffs or earplugs. *Fact Sheet 4: Hearing Protectors* has detailed information about personal hearing protectors.

DUTIES AND RESPONSIBILITIES

Employees' health and safety at work is protected by law. Employers have a duty to protect employees and to keep them informed about health and safety matters. Employees have a responsibility to look after themselves.

Employers have a duty to keep noise exposure within safe limits. The preferred ways of doing this are to

reduce the amount of noise made by plant and equipment and/or to reduce the amount of time employees are exposed to noise.

If these methods fail to reduce noise exposure below the legally specified limits, the employer has a responsibility to provide employees with suitable hearing protectors and to provide adequate information and instruction in their use.

Employees also have duties. They include:

- taking care of their own health and safety and that of others who may be affected by what they do;
- using noise controls supplied with machinery or installed in the workplace;
- reporting damaged noise control equipment and hearing protectors for repair or replacement;
- using hearing protectors in declared noise areas.

COOPERATION

Cooperation between managers and employees is likely to produce the most cost-effective and mutually satisfactory solutions to noise problems in the workplace.

Managers can contribute by:

- developing noise management policies, plans and practices in consultation with workers;
- arranging for a full assessment to be made of noisy areas in the workplace;
- fully investigating engineering noise control options;
- discussing control options with workers to ensure minimal adverse effects on ease of operation, maintenance access and productivity;
- seeking outside advice on noise control as necessary;
- specifying the lowest affordable noise limits when purchasing plant and equipment;
- signposting noisy areas and equipment;
- providing good quality graded hearing protectors;
- involving workers in the selection of hearing

protectors and allowing them choice to ensure that they can obtain a suitable fit;

- always wearing hearing protectors themselves in noisy areas.

Employees can contribute by:

- taking a constructive interest in the workplace's noise problems;
- helping to develop policies, plans and practices for dealing with workplace noise problems;
- suggesting possible noise controls for machines they operate;
- helping plant engineers or consultants design solutions;
- using any noise control equipment supplied;
- taking responsibility for the preservation of their own hearing by using hearing protectors whenever they are in the presence of hazardous noise.

FACT SHEET 4: HEARING PROTECTORS

INTRODUCTION

If noise exposure at work can't be made safe by limiting the level of noise or the amount of time employees are exposed to it, employers have a responsibility to provide employees with suitable hearing protectors and employees have a responsibility to use them.

The main types of hearing protector are earmuffs and earplugs. Either type can provide effective protection provided it makes an airtight seal in your ear (plugs) or around it (muffs).

Hearing protectors reduce sound to safe levels rather than block it out completely. A well-fitted hearing protector will give at least the same noise reduction as can be obtained by pressing the hands very firmly over the ears (see Figure 1).

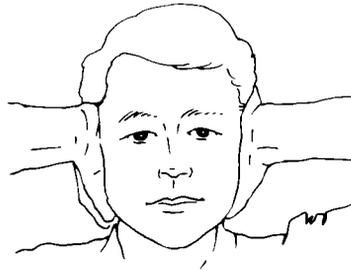


Figure 1: Well-fitted hearing protectors give at least the same noise reduction as pressing your hands firmly against the ears

WHAT TO EXPECT FROM HEARING PROTECTORS

If you have never worn hearing protectors before, use this method to find out what to expect from them:

- find a noisy place at work;
- block your ears firmly with the heels of your hands as shown in Figure 1;
- experiment with different positions of your hands and different pressures.

Your hearing protectors should give about the same noise reduction as the best you can achieve with your hands.

FITTING EARPLUGS

Always READ THE INSTRUCTIONS supplied with the ear plugs.

Some earplugs, for example, the compressible foam type, come in only one size. If the plugs are made in several sizes, you need the correct size for each ear.

To fit the left ear:

- Reach around your head with your right hand and take hold of the back of your left ear about half way down (see Figure 2).
- Gently pull your ear outwards and upwards to straighten your ear canal.
- Insert the plug into your ear canal with your left hand.

To fit the right ear:

- Reach around your head with your left hand and take hold of the back of your right ear about half way down.
- Gently pull your ear outwards and upwards to straighten your ear canal.
- Insert the plug into your ear canal with your right hand.

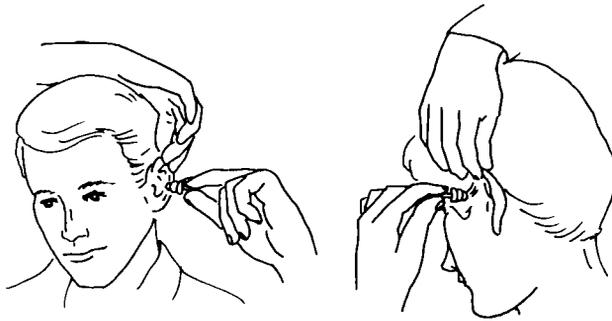


Figure 2: The correct method for fitting ear plugs

If the plug is a compressible foam type:

- Roll the plug slowly and smoothly into a cylinder about this round ○ (4.5- 5 mm). Depending on how small you roll the plug, it can take up to 30 seconds to do this, possibly longer if you haven't done it before.
- Immediately insert the plug well into the ear canal and hold it in place until it has begun to expand

and block the noise. Aim to get three-quarters of the length of the plug into the canal.

Points to remember are:

- Plugs can work loose and may need to be re-positioned;
- Remove plugs slowly so that suction cannot hurt your ear.

FITTING EARMUFFS

The following points will assist you to fit your earmuffs:

- Inspect the muffs and note which way they are meant to be worn. Some earmuff cups are marked TOP or FRONT and should be worn that way. Oval-shaped cups are meant to be worn so that the oval is vertical (NOT as in Figure 3).



Figure 3: Incorrect location of ear muff cups

- Extend the headband to its maximum length (Figure 4).



Figure 4: Extend headband to its maximum length

- Brush as much hair as possible away from your ears (Figure 5).



Figure 5: Brush hair away from ears while fitting muffs

- Place the muffs over your ears, making sure that the ears fit right inside the cups (Figure 6).



Figure 6: Ears fit inside the earmuff cups

- Hold the cups firmly in place by pressing inwards and upwards with your thumbs, then tighten the headband so that it takes the weight of the cups and holds them firmly in position (Figure 7).



Figure 7: Tightening the headband to hold cups firmly in position

- Now run your fingers around the cushions to check that they are making a good seal against your head everywhere. Some things that can prevent a good seal are prominent cheek bones, an unusually deep groove behind the lower jaw, thick hair, a cap (Figure 8 left) and spectacle frames (Figure 8 right).



Figures 8: Caps and spectacle frames can prevent a good seal

- If you are unable to get a good seal, try different earmuffs, change your spectacle frames to a thinner type or try earplugs instead.

**LOOKING
AFTER YOUR
HEARING
PROTECTORS**

To ensure your hearing protectors are hygienic and continue to provide adequate protection:

- Keep your earmuffs and earplugs clean with soap and water.
- Replace hard or damaged earplugs with a new pair immediately.
- DON'T stretch the headband of your earmuffs. It makes them less effective.
- Replace the cushions on your earmuffs as soon as they start to harden.
- Immediately replace worn or damaged parts of earmuffs.

**GET USED TO
WEARING
HEARING
PROTECTORS**

It takes two to three weeks to get used to wearing hearing protectors. Everyone finds them a bit strange to start with, but once you are used to them you will appreciate their good points, that is:

- You'll feel less stressed while you're working;
- You'll feel less tired at the end of the day;

AND

- You'll know your hearing is safe.

**SOME
QUESTIONS
AND
COMPLAINTS**

Is there any danger in putting earplugs in your ears?

Earplugs are soft and are not long enough to reach far into the ear canal so it's virtually impossible to do yourself any harm with them. However, if you have an ear infection, or have ever had ear surgery, check with a nurse or doctor before using earplugs.

What if I don't wear hearing protectors all the time?

Taking protectors off even for short periods can cancel their protective effect. To be fully protected, you need to wear protectors all the time you are exposed to loud noise.

My hearing protectors feel uncomfortable.

Earmuffs and earplugs will probably feel awkward and uncomfortable when you first start to wear them. Usually these feelings vanish in about two weeks and you really begin to appreciate the relative peace and quiet the protectors create. If you are having problems, speak to your supervisor or health and safety representative about trying different protectors.

If I wear hearing protectors, I won't be able to hear my machine properly.

Your machine will certainly sound different when you wear protection, but you should still be able to detect changes in the noise it makes.

Is there any point in wearing hearing protectors if my hearing is already impaired?

Your ears will go on being damaged as long as they are exposed to excessive noise. The hearing you have left is very precious. There certainly is a point in protecting it.

I won't be able to hear what people are saying if I wear hearing protectors.

Actually, if your hearing is normal the opposite is true. You will find it easier to understand what people are

saying when you wear protectors because your ears are no longer overloaded. The effect is like wearing sunglasses, that is, you can see better when the glare is cut down. If your hearing is already impaired, you may not be able to understand speech better when you wear protectors. Depending on the kind of impairment, you could find it harder to understand speech.

If you have this problem, don't give up the protectors. It's important to protect your remaining hearing. Ask people to speak up, or find another way to communicate. For example, use hand signals or a note pad.

What about noise exposures outside work?

This is an important question. Noise exposures add up, so you need to watch your noise exposure outside work too. Wear hearing protectors if you use power tools like saws, grinders, motor mowers or chainsaws and limit your exposure to very loud music.

If you shoot, wear protectors if you fire anything louder than a .22 rifle. Always wear hearing protectors on indoor firing ranges.

Should I have my hearing checked?

Employers are required to provide regular free hearing checks for their noise-exposed employees. If you are concerned about your hearing, or would like to have regular hearing checks but your employer doesn't have a hearing check programme, ask your family doctor or your local branch of the Occupational Safety and Health Service of the Department of Labour for advice.