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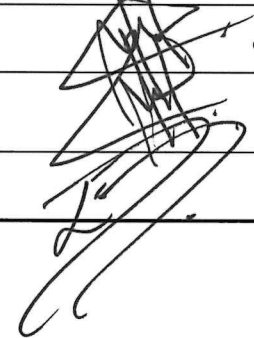
HEARING CONSERVATION PROGRAM

TNCL-OHS-SOP-0018



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Approvals:

TITLE	NAME	SIGNATURE	DATE
Occupational Health Lead	Dr Fredrick Weinand		08/03/2023
Safety Lead	Akida Waria		08/03/2023
Occupational Health and Safety Manager	Dr Kudra Said		08/03/2023
General Manager	Manny Dos Ramos		8-3-23



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Scope

Tembo Nickel Corporation Limited is committed to ensuring that employees remain safe and healthy while at work. This is through a systematic process of Hazards identification and Risk assessment and implementing practicable control measures.

To achieve the above goal, TNCL is committed to putting in place the Hearing Conservation program. The program will cover all TNCL employees and contractors to prevent the risk associated with occupational noise exposure; if it cannot be prevented, then implement practicable control measures to mitigate the risk


Definitions

"Audiometric zero"	Means milestone baseline. "Milestone baseline" means the initial audiometric value determined at the first STS testing.
"Reportable level"	This means the STS that is reported in terms of milestone monitoring if the average change in hearing is from "audiometric zero." NOTE an STS of 25dB or greater hearing loss at the same frequencies in the same ear is reportable.
"Standard threshold shift (STS)"	Means an average change in the hearing of 10dB or more at the frequencies of 2000Hz, 3000Hz and 4000Hz in one or both ears compared to the employee's milestone baseline audiogram.

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Abbreviations:

TNCL	Tembo Nickel Cooperation Ltd
STS	Standard Threshold Shift
dB	Decibel
TTS	Temporary Threshold Shift
SDS	Safety Data Sheet
OSHA	Occupational Health and Safety Authority
NIOSH	National Institute for Occupational Safety and Health
Hz	Hertz
EA	Exposure Action Value
EL	Exposure limit value
NRR	Noise Reduction Rate

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Policy

TNCL is committed to ensuring that no employee will suffer from a permanent disability that is associated with occupational noise exposure as far as reasonably practicable. The policy aims to prevent hearing loss associated with noise exposure and a psychological manifestation of noise exposure. This will be executed by a systematic occupational health program that will range from risk assessments to the hierarchy of control approaches.

This policy will be reviewed annually by the Occupational Health and Safety Manager. The policy will be communicated through toolbox meetings, workers' forums, and Tuesday's mass meetings.


Responsibilities

Departmental Managers/Supervisors

They must report to the Occupational Health clinic any employee who reports having reduced hearing threshold or any other noise exposure symptoms. They are also responsible for reporting any acoustic injury. Finally, they have to ensure that HIRA at their workplace, which includes noise as a physical hazard, has been conducted, and they have proof of that record. They are also responsible for ensuring that no employee will be allowed to work in noisy areas until they have undergone a medical examination and a certificate of fitness is offered.

Occupational Health Clinic

The clinic must conduct HIRA and facilitate the Occupational Hygiene assessment of noise is conducted. They have the overall responsibility of conducting the training, audiometric assessments and management of employees who have noise-induced hearing loss. The clinic is responsible for reporting the noise-induced hearing loss to the employer, OSHA and the compensation commissioner; the site occupational Health Lead will be the custodian of the operations of the program.

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General manager

The financing of the Hearing conservation program will be through the general manager budget for the TNCL. The contractors have to make sure they comply with the minimum standards of the TNCL.

Employees

The employees are obligated to do the following to fulfil the hearing conservation program:

- To be aware of the Hearing Conservation Program at the workplace.
- To present themselves for medical surveillance during the working hours
- Wear hearing protection devices if advised
- Wear a personal noise dosimeter during the noise exposure assessment
- To ensure they don't break the hearing protection or hearing monitoring devices on purpose.
- To follow all instructions given by the employer for the purpose of the hearing conservation program.

Introduction to Hearing Conservation Program

Pressure fluctuations sensed by the human ear are known as sound.

The pressure fluctuations are small changes in air pressure in the form of compressions and rarefactions. These small changes in air pressure may be as small as 20 millionths of a Pascal (20 μ Pa, that is, 20 micro-pascals or 2×10^{-5} Pa), which is the lowest audible level a healthy human ear can detect, up to as high as 200 Pascals (200 Pa) – the threshold of pain.

Noise has both physiological and psychological health effects. The health effect of interest at the workplace is noise-induced hearing loss. The occupational noise exposure of interest is for employees routinely exposed to an eight-hour time-weighted average noise level of 85 dBA at or above the occupational exposure limit.


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Table one: Health effects of excessive noise exposure

Physiological Effects	Psychological and Other Effects
Noise-Induced Hearing Loss	Annoyance
Tinnitus	Efficiency and Concentration
Vaso Constriction	Disorientation
Muscle Tension	Speech Interference
Change in Heart Rate	Masks Warning Sound Alarms
Stomach (digestive) disorder	Interference when listening to Telecommunications, Radio & Television


The symptoms of noise exposure at the workplace include but are not limited to the following:

- Tinnitus
- Reduced threshold of hearing
- Speech and other sounds seem muffled.
- Difficulty understanding words, especially against background noise or in a crowd.
- Trouble hearing consonants.
- Needing to turn up the volume of the television or radio.
- Frequently asking others to speak more slowly, clearly and loudly.

A Hearing Conservation Program (HCP) aims to prevent the occurrence or reduce the progression of noise-induced hearing loss.

Legislations

The Occupational Health and Safety Act of Tanzania, 2003, states in section '60. Every factory or workplace where activities carried out involve Risk hazardous processes or hazardous equipment or use of hazardous chemical substances, likely to result in adverse health effects to people or serious damage to property or environment in case of accidents, the employer shall ensure that -

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(a) risk assessment annually or any other time when the need for the risk assessment deemed necessary is done by an approved inspection authority.

(b) evidence of the risk assessment is furnished to the Chief Inspector or an inspector when requested.

Section 62 states: Where in any factory or workplace, workers are employed in any process involving exposure to any injurious or offensive substance or environment, effective protective equipment shall be provided and

maintained by the employer for the use of the persons employed. Therefore, having a Hearing Conservation Program in the workplace is a statutory requirement after considering the risks identified during the baseline HIRA.

Hazards Identification and Risk Assessment


During the baseline HIRA, we identified noise as a hazard at certain workplaces and occupational groups. These workplaces are drill sites, the engineering workshop, the generator area and the main kitchen. Certain tasks like cutting grass with the cutting machine, engineering workshop when operating hand-arm vibration machines, and hammering/drilling activities also had high noise exposure. Therefore, these employees will be under the hearing conservation program.

A few employees also had solvent exposure; however, this was not quantified. These were mechanics at the drill rigs using solvent for surface preparation before welding and painters. No other chemical was identified during the assessment that can potentiate noise-induced hearing loss.

The current assessment will be repeated after every six months as the work process and activities are changing rapidly due to the proposed construction activities. The risk assessment can be done under shorter intervals when there is an occupational disease/injury, change of work process, or the site occupational health team advises.

Exposure assessment

The registered occupational hygienist or technologist must quantify the noise exposure at the workplace. The exposure assessment must cover the times when

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the exposure is high and the period of low exposure. Both the area assessment using the precision sound level meter and using personal sound dosimeter will be used. During the noise assessment, the occupational hygienist will quantify the exposure to solvents at the workplace.

The assessment will be conducted annually; however, shorter intervals can be advised for the same reasons as the HIRA above.

Currently, we use the same quantitative method to assess exposure through a phone application and HSE tool; see the table below.


Table two: Quick HSE guide on noise exposure assessment

<i>Test</i>	<i>Probable noise level</i>	<i>A risk assessment will be needed if the noise is like this for more than:</i>
The noise is intrusive but normal conversation is possible	80 dB(A)	6 hours
You have to shout to talk to someone 2 m away	85 dB(A)	2 hours
You have to shout to talk to someone 1 m away	90 dB(A)	45 minutes

Prevention and control of noise exposure

Exposure to noise at the workplace must be prevented, and if it's not reasonably practicable, the noise exposure must be controlled using the hierarchy of controls. The noise control at the workplace must be aimed at the source, pathway and receiver.



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Elimination

The employer shall ensure that risk from the exposure of his employees to noise is either eliminated at source or, where this is not reasonably practicable, reduced to as low a level as is reasonably practicable.

This general duty applies whenever there is a risk from noise and irrespective of whether any EAVs are exceeded. It is likely, however, that only inexpensive and simple measures will be reasonably practicable if the lower EAVs are not exceeded.

To comply with this duty, the following will be considered:

- Alternative processes, equipment and/or working methods which would eliminate risks from noise exposure;
- Take noise into account when selecting tools and machinery;

Substitution


Substituting the machines that produce much noise with the newer machine with new technology and less noise is advised. Currently, there is no noise-producing machine that needs this control measure; therefore, at this moment, we will rely on engineering controls, administrative controls and personal protective equipment.

Engineering controls

The available machine at the workplace will need preventive maintenance as per the manufacturer's instructions to replace parts and consumables so that they can produce less noise. The grass-cutting machines, vector control spraying machines and drill rigs will need preventative maintenance as per schedule.

Administrative controls

Job rotation is an essential measure of reducing exposure to noise; this will reduce the length of exposure. Also, reducing the number of people who will be exposed to noise is an important administrative measure.

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Information, Instruction and Training

Where his employees are exposed to noise which is likely to be at or above a lower exposure action value, the employer shall provide those employees and their representatives with suitable and sufficient information, Instruction and training.

The information, Instruction and training provided under that paragraph shall include the following:


- The nature of risks from exposure to noise;
- The organisational and technical measures taken in order to comply with the requirements of noise control
- The exposure limit values and upper and lower exposure action values
- The significant findings of the risk assessment, including any measurements taken, with an explanation of those findings;
- The availability and provision of personal hearing protectors under regulation and their correct use.
- Why and how to detect and report signs of hearing damage;
- The entitlement to health surveillance and its purposes;
- Safe working practices to minimise exposure to noise; and
- The collective results of any health surveillance

The information, Instruction and training shall be updated to take account of significant changes in the type of work carried out or the working methods used by the employer.

The employer shall ensure that any person, whether or not his employee, who carries out work in connection with the employer's duties under this program has suitable and sufficient information, Instruction and training.

It is important that employees understand the level of risk they may be exposed to, how it is caused and the possible effects and consequences. It is important for the employer also to tell employees:

- Their likely noise exposure(s) and the risk of hearing the noise create;

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- What is the employer doing to control risks and exposures;
- How to use equipment provided to control noise;
- Where and how to obtain hearing protection;
- How to correctly fit and wear any hearing protectors provided and what their limitations are;
- How to report defects in hearing protectors and noise-control equipment;
- The employee's duties under this Hearing Conservation Program;
- What health surveillance will employees be provided with, and how you are going to provide it.
- What symptoms should they look out for (such as difficulty in understanding speech in conversation or when using the telephone or permanent ringing in the ears), to whom, and how should they report them?


Health surveillance

Health surveillance is a programme of periodic and suitable health checks, performed and interpreted by a competent person, to identify early signs and symptoms of work-related ill health and to allow action to be taken to prevent its progression and protect other employees.

It is also important to monitor controls' effectiveness, though it is not a substitute for controlling risk at source. Suitable health surveillance usually includes regular hearing checks (audiometric testing).

The employee will be under medical surveillance if the risk assessment indicates that there is a risk to health, i.e., a risk from exposure to noise without taking account of the noise reduction provided by hearing protection. This means the worker would be under medical surveillance if:

- Regular and frequent daily exposure or peak sound pressure levels at or above an upper EAV (85dBA). This can also be indicated by weekly personal noise exposures that are mostly above the upper EAV;
- Occasional exposure at or above an upper EAV where there is a reason to be concerned that preventive measures may not be effective (e.g., if, on the day high noise exposures occur, the daily personal noise exposure or peak sound

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pressure is well above an upper EAV, making the worker highly reliant on personal hearing protection);

- Exposure between the lower and upper EAVs, or exposure only occasionally above the upper EAV, where the employee's health may be at particular risk from this noise. Employees at particular risk include, for example, those with pre-existing hearing loss, those having treatment with certain medication, or those who have been exposed to certain chemicals, which can increase the risk of further damage to hearing in combination with noise.


Baseline audiometry

An audiometric programme should begin with a baseline audiogram conducted before exposure to hazardous noise or as soon as possible after initial exposure, followed by a schedule of audiometric testing to monitor hearing threshold levels over time. For quality control purposes, it is particularly important to obtain a baseline that, as far as possible, is not influenced by TTS. This reflects the importance of this initial test as a reference point for all future comparisons.

At the baseline examination, it is also important to obtain information about the individual's job, previous noise exposures and medical history in order to establish fitness to work in a noisy environment and any adjustments or restrictions that may be required. At all subsequent tests, the individual should be asked about any changes in personal circumstances, work patterns and noise exposure, and any complaints relating to the ears or hearing. If changes are indicated, these should be recorded.

Conducting and Recording of a Baseline Audiogram:

- A baseline audiogram must be conducted on all employees in any working place; an eight-hour working day or a forty-hour working week is equal to or exceeds 85 decibels A (dBA).
- A baseline audiogram must be conducted on every current employee exposed to noise.
- Every new employee exposed to noise must have a baseline audiogram done within fourteen days of commencement of employment.

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- The baseline of an employee conducted in terms of this Instruction applies as that employee's baseline for his total working career.
- An employee's baseline must be recorded, and such a record must be kept for 40 years.

Transfer between workplaces or changing employer


- The baseline audiogram results, as well as the most recent subsequent audiogram conducted whilst in employment, should be given to an employee when he is no longer exposed to noise or leaves employment at that workplace.
- The baseline audiogram, as well as the most recent audiogram with the PLH as calculated, must be presented at employment to the new employer.
- At recruitment, the new employer must record the baseline as well as the subsequent PLH sustained with the previous employer, and the latter may be verified with an initial audiogram at recruitment.

Use of the Baseline Audiogram

- The baseline must be recorded for the purpose of using these values for all future reference to the baseline of an employee.
- The baseline audiogram should then be used in determining any future compensable hearing loss.

Standards for the Baseline Audiogram:

- Testing for the baseline audiogram must be done 16 hours after an employee has been removed from an environment in which the noise level was equal to or exceeded 85 dBA. The use of hearing protection devices to effect this attenuation will not be acceptable.
- The baseline audiogram is the better of the employee's two audiograms performed on the same day and that do not differ from each other by more than 10 dB for any of the following measured test frequencies, i.e. 0.5, 1, 2, 3, and 4 kilohertz (kHz).
- If it is impossible to obtain two audiograms that comply with the requirements, the employee must be referred to a competent person to establish baseline hearing levels.

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- Suppose it is impossible for the competent person to establish baseline-hearing levels; then the competent person may establish baseline-hearing levels by using other techniques, such as speech reception thresholds.

Entry audiometry

Pre-employment audiometry will be conducted immediately or within two weeks of employment. The employee should present he/her baseline medical and exit medical examination if the employee has them. Otherwise, a baseline medical will be conducted if the employee has no history of noise exposure. Most of the technical details listed in the baseline medical will also apply, except that, only one medical will be conducted.

Pre-placement audiometry

The employees who are moving from one department to another may also undergo placement audiometry if they are moving to departments where the noise is a risk factor.


Periodic audiometry

The schedule of audiometric testing should include annual tests for the first two years of exposure and, thereafter, a test once every three years. More frequent testing may be required if significant changes in hearing level are detected, or the risk of hearing damage has increased. When the exposure is at or above the 105dBA, the audiometric assessment must be conducted after every six months as the risk of noise-induced hearing loss is high.

As a quality control measure, it would be advisable to repeat any audiogram which showed a difference from the previous result of more than 10 dB at any frequency.

The technical procedures for conducting audiometry must include the following:

- The audiometer must be engineering calibrated annually by a certified competent person.
- The audiometer must undergo weekly biological monitoring
- Daily checks must be conducted
- The test must be performed by the competent person

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- The sixteen hours noise-free period without HPD must be adhered to.
- Clinical history and otoscopic examination must be conducted before the test.
- Both the patient and technician must sign

The standards that will be used for the classification of the audiogram will be the HSE classification which will take the consideration of age and the biological sex of the employee and STS milestone baseline early; these are for early identification of the hearing pathology so that appropriate corrective action can be taken. Finally, the PLH will be used for reporting for compensation purposes if the work-related disease is diagnosed. The compensatable PLH is the PLHS of 10dBA or more.


HSE classification:

<i>Category</i>	<i>NIHL seen on audiogram?</i>	<i>Calculation†</i>	<i>Action</i>
1 Acceptable hearing ability	No*	Sum of hearing levels at 1, 2, 3, 4 and 6 kHz	Repeat health surveillance at next routine interval
2 Mild hearing loss	Stable NIHL may be present ⁺	Sum of hearing levels at 1, 2, 3, 4 and 6 kHz	Consider earlier repeat health surveillance than routine, taking into account factors such as extent of hearing loss
3 Significant hearing loss or new/ progressive NIHL	Yes, newly identified or progressive NIHL may be present (this category may also include more severe but stable NIHL)	Sum of hearing levels at 1, 2, 3, 4 and 6 kHz	Refer for medical assessment. Timing of next health surveillance depends on outcome of assessment
4 Rapid hearing loss⁺ Reduction in hearing level of 30 dB or more, within 3 years or less	Possible	Sum of hearing levels at 3, 4 and 6 kHz	Refer for medical assessment. Timing of next health surveillance depends on outcome of assessment

* If NIHL is or may be present, the worker cannot be Category 1.

+ By definition at least one previous audiogram must be available for comparison.

† Compare value with figure given for appropriate age band and gender in Table 13.

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Standard Threshold Shift in the medical surveillance of noise-induced hearing loss

Determine milestone baseline

- A milestone baseline audiogram must be conducted on every current employee working in a noise zone.
- A milestone baseline audiogram must be conducted within fourteen days of commencement of employment on every new employee exposed to a noise zone.
- Milestone baselines must only be conducted if the employee was removed from the noise zone for at least 16 hours.
- A milestone baseline audiogram is the better of the employee's two audiograms performed by an audiometrist on the same day and that do not differ from each other by more than 10dB for any of the frequencies in 2000, 3000 and 4000Hz test ranges in one or both ears.
- If two audiograms do not conform to the requirements above, the employee must be referred to an audiologist to establish the milestone baseline.
- All subsequent audiograms conducted during medical surveillance examinations will be compared to the milestone baseline audiogram to determine if an STS has occurred and if the STS is reportable.
- The milestone baseline on the employee, as conducted in terms of this guidance note, will be considered as the employee's milestone for the purposes of reporting for the duration of their total working career at that specific employer or until a reportable level is reached.
- When a reportable level is reached, the audiogram conducted at that time becomes the new milestone baseline for the purposes of future monitoring.

Monitoring for STS

- During medical surveillance, the audiogram of the employee must be evaluated to determine if an STS has occurred and whether it is reportable.
- Once a reportable STS has been determined, the employee must be informed of the STS and the implications thereof.
- The employee must be counselled on the danger of exposure to noise and the hearing protection measures.

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- The employer must be advised on management measures to prevent permanent hearing loss for this employee.

[Process for measurement and management of STS](#)

Step 1 – Is there an STS compared to the milestone baseline?

That is – is there an average change in the hearing of 10dB or more at the frequencies of 2000,

3000 and 4000 in one or both ears? If No – no further action. If Yes:

Step 2

Determine if the STS is 25dB or greater. If No – no further action. If Yes:

Step 3

Determine whether the hearing loss is work-related. If No – counsel the employee on the danger of risk outside the work environment

If Yes - Counsel the employee on the danger of exposure to noise in the workplace.

Advise the employer to take appropriate management measures to prevent permanent hearing loss in employees who are exposed to the significant noise level.

[Additional notes](#)

1. Example of the calculation of STS

Example 1

L500 L1K L2K L3K L4K L6K L8K

Milestone 5 5 20 15 5 5 20

Surveillance 10 10 20 15 10 5 30

STS calculation $0 + 0 + 5 = 5$ divided by 3 = 1.66 dB therefore no STS left

R500 R1K R2K R3K R4K R6K R8K

Milestone 20 15 5 10 15 25 25

Surveillance 15 15 20 10 30 20 35

STS calculation $15 + 0 + 15 = 30$ divided by 3 = 10 - STS 10dB right


This employee had an STS of 10dB

Example 2

L500 L1K L2K L3K L4K L6K L8K

Milestone 5 5 10 15 5 5 5

Surveillance 5 10 15 30 20 5 10

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STS calculation $5+15+15 = 35$ divided by 3 = 11.66 STS 11dB left

R500 R1K R2K R3K R4K R6K R8K

Milestone 5 10 5 10 10 15 10

Surveillance 10 15 15 15 35 15 10

STS calculation $10+5+ 25= 40$ divided by 3 = 13.3dB STS 13 dB right

This employee has an STS in both ears

2. All software will need to be updated to include the milestone baselines and the STS

calculations. Some of the software version has been upgraded already. Please check with your service provider.

Exit audiometry.


Exit medical examination must be conducted immediately or within two weeks after the termination of employment or when the employee will no longer work in the noise area. The exit medical will be classified as above, and a copy of the exit medical and the baseline will be given to the employee. The technical aspect of conducting audiometry will also be applicable.

Diagnostic Audiogram

After conducting the screening audiogram above, before reporting to OSHA or to the compensation commissioner, the definitive diagnosis must be reached. For an employee with an NIHL pattern in the audiogram and/or HSE shows referral level and/or STS reportable, the employee must be referred to the diagnostic audiologist, ENT surgeon, or speech therapist for the diagnostic audiogram. The employee must undergo the speech perception threshold, Auditory Brain Stem Reflex (ABR) or Otoacoustic emission, bone conduction masked and unmasked, and Tympanometry. The report must be furnished to the site occupational health team.

Hearing protection

The employer who carries out work which is likely to expose any employees to noise at or above a lower exposure action value shall make personal hearing protectors available upon request to any employee who is so exposed. Suppose an employer is unable by other means to reduce the noise levels to which an employee is likely to

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be exposed below an upper exposure action value; in that case, he shall provide personal hearing protectors to any employee so exposed.

If in any area of the workplace under the control of the employer, an employee is likely to be exposed to noise at or above an upper exposure action value for any reason, the employer shall ensure that –


- The area is designated a Hearing Protection Zone.
- The area is demarcated and identified by means of the sign specified for the purpose of indicating that ear protection must be worn.
- Access to the area is restricted where this is practicable, and the risk from exposure justifies it and shall ensure so far as is reasonably practicable that no employee enters that area unless that employee is wearing personal hearing protectors.
- Hearing protection devices should not be used as an alternative to controlling noise by technical and organisational means.

The duty to provide hearing protectors depends on the exposure levels. Where employees are exposed between the lower and upper EAVs, the employer must provide protectors to employees who ask for them. Where employees are likely to be exposed at or above an upper EAV, the employer must provide hearing protectors.

The employer has to ensure the hearing protectors are used and require the employees to use them.

The employer should select hearing protection to eliminate risk to hearing where this is possible and, if not, to reduce the risk to as low a level as is reasonably practicable. The employer should aim for a noise level between 70 and 80 dB(A) at the ear.

Table three: Indication of good protection

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A-weighted noise level (dB)	Select a protector with the right SNR
85 to 90	20 or less
90 to 95	20 to 30
95 to 100	25 to 35
100 to 105	30 or more

Protectors that result in noise below 70 dB(A) at the ear because this is 'over-protection' and can cause safety risks through the inability to hear, for example, nearby traffic or warning sound signals. Over-protection can also cause communication difficulties and can make wearers feel isolated.

When consulting with employees or their representatives on the selection of hearing protection, you should include the many different types and makes available protectors that:

- Provide the required protection.
- It can be worn with comfort throughout the period of exposure to high noise.
- are compatible with any required use of other personal protective equipment (PPE)
- can be satisfactorily stored, cleaned, and maintained.


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Figure one: Hearing protection zone sign



Table four: Type of hearing protection

<i>Type</i>	<i>Description</i>	<i>Advantages</i>	<i>Notes on suitability and use</i>	<i>Care and maintenance</i>
Earmuffs	<p>Hard plastic cups which fit over and surround the ears and are sealed to the head by cushion seals filled with soft plastic foam or a viscous liquid.</p> <p>Tension to assist the seal is provided by a headband.</p> <p>The inner surfaces of the cups are covered with a sound-absorbing material, usually a soft plastic foam.</p>	<p>Easy to fit and use.</p> <p>Clearly visible, therefore easily monitored.</p>	<p>Headbands can prevent the use of a hard hat.</p> <p>Headband can be worn behind the neck or under the chin if an under-hat support strap is provided. However, the protection offered may differ between wear modes.</p> <p>It may be uncomfortable in warm conditions.</p> <p>It may not be suited for</p>	<p>Check seals for cleanliness, hardening, tearing and misshaping.</p> <p>Check cup condition for cracks, holes, damage and unofficial modifications.</p> <p>Avoid over-bending or twisting the headband, which may degrade performance. Check the tension of the headband (compare it with a new earmuff).</p>



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	Available in a range of sizes.		<p>use with safety glasses and other forms of PPE (check compatibility).</p> <p>Long hair, woolly hats, beards and jewellery may interfere with seals and reduce protection.</p>	<p>Store in a clean environment.</p> <p>Follow the manufacturer's instructions.</p>
Helmet-mounted earmuffs	<p>Individual cups are attached to safety headgear, such as a visor or a hard hat, usually by adjustable arms.</p> <p>Noise-protection information should be obtained for the specific combination of earmuffs and helmets.</p>	Can overcome the difficulties with compatibility with hard hats.	<p>It may not be suited for use with safety glasses and other forms of PPE (check compatibility).</p> <p>Good performance requires a suitable helmet/ear muff combination and a good fit to head size.</p> <p>It may be uncomfortable in warm conditions.</p> <p>Long hair, woolly hats, beards and jewellery may interfere with seals and reduce protection.</p>	As for earmuffs, plus ensure the seals do not sit on the side of the helmet for long periods, as this can damage them and affect their performance.




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<p>Earplugs</p>	<p>Earplugs fit into the ear or cover the ear canal to form a seal. They sometimes have a cord or a neckband to prevent loss.</p> <p>Some earplugs are reusable, and others are designed to be disposed of after one use – check the manufacturer's instructions.</p> <p>Available in different forms (pre-shaped, user-formable, semi- insert) and different sizes.</p>	<p>Often suitable for use with safety glasses and other forms of PPE.</p>	<p>It can be hard to fit – it will only be effective when fitted properly, so correct fitting is essential. See the manufacturer's instructions and provide training.</p> <p>Difficult to check the correct fit by observation.</p> <p>It can work loose over time, so check and refit as appropriate in a quiet environment.</p> <p>It may not be suitable where the hearing protection is likely to be removed often, particularly in dusty or dirty environments.</p> <p>It may not be suitable for certain individuals due to medical conditions.</p>	<p>Clean reusable earplugs regularly and ensure they are not damaged or degraded – follow the manufacturer's instructions.</p> <p>Disposable earplugs should only be used once.</p> <p>Hands should be clean when fitting earplugs.</p> <p>Reusable earplugs should be issued to an individual and not shared.</p> <p>Ensure adequate supplies of disposable earplugs.</p> <p>Follow the manufacturer's instructions.</p>
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Earmuffs



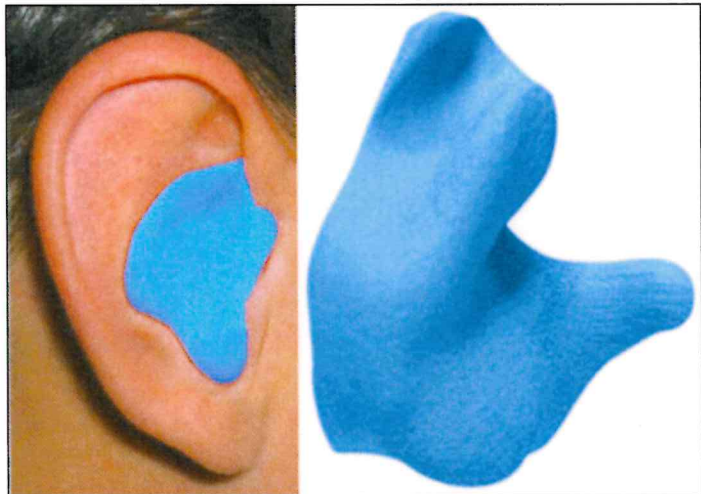
Earplugs




Helmet-mounted Earmuffs.



Custom-made earplugs.



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Calculation of NRR

A common method used for **single protection** (either muffs or plugs) is as follows

- Determine the laboratory-based noise attenuation provided by the HPD. This is referred to as the Noise Reduction Rating (NRR) and is listed on the packaging.
- Subtract the NRR from the C-weighted TWA workplace noise level as follows:

$$\text{Estimated exposure (dBA)} = \text{TWA (dBC)} - \text{NRR}$$

If C-weighted noise level data is not available, A-weighted data can be used by Subtracting a 7 dB correction factor from the NRR, as follows:

$$\text{Estimated exposure (dBA)} = \text{TWA (dBA)} - (\text{NRR} - 7)$$

Example:

TWA=100 dBA, muff NRR=19 dB

Estimated Exposure = $100 - (19-7) = 88$ dBA

For **dual protection** (ear muffs and plugs are used simultaneously), use the following:

1. Determine the laboratory-based NRR for the **higher-rated** protector (NRRh).
2. Subtract 7 dB from NRRh if using A-weighted sound level data.
3. Add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.
4. Subtract the remainder from the TWA as follows:

$$\text{Estimated Exposure (dBA)} = \text{TWA (dBC)} - (\text{NRRh} + 5), \text{ or}$$

$$\text{Estimated Exposure (dBA)} = \text{TWA (dBA)} - [(\text{NRRh} - 7) + 5]$$

Example:

TWA=110 dBA, plug NRR=29, and muff NRR=25 dB

Estimated Exposure = $110 - [(29 - 7) + 5] = 83$ dBA


OSHA's experience and the published scientific literature have shown that laboratory-obtained real ear attenuation for HPDs can seldom be achieved in the workplace. To adjust for workplace conditions, **OSHA strongly recommends applying a 50% correction factor** when estimating field attenuation. This is especially important when considering whether engineering controls are to be implemented. The equations above would then be modified as follows:

Single Protection:

$$\text{Estimated Exposure (dBA)} = \text{TWA (dBC)} - [\text{NRR} \times 50\%], \text{ or}$$

$$\text{Estimated Exposure (dBA)} = \text{TWA (dBA)} - [(\text{NRR} - 7) \times 50\%]$$

Dual Protection:

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Estimated Exposure (dBA) = TWA (dBC) - [(NRRh x 50%) + 5] , or

Estimated Exposure (dBA) = TWA (dBA) - {[(NRRh - 7) x 50%] + 5}


Management of abnormal results

Should the employee be identified to have abnormal results during the periodic medical examination, a thorough assessment will be conducted by:

- Referring the employee for diagnostic test
- Repeating the HIRA and advising on control measures
- To identify the work-relatedness of the condition
- Should the case meet the criteria for reporting, it will be reported to the compensation commissioner and OSHA.
- The employee will receive necessary medical intervention and reasonable accommodation at the workplace.
- Both the employee and employer will be notified about the work-related condition.
- An incident report should be raised, and an investigation must be conducted should the condition be classified as work-related.

When submitting the case for the purpose of compensation, the following must be submitted:

- Claimant's service record – this should confirm in writing exposure to excessive occupational noise. The intensity and duration of exposure should be commensurate with the hearing impairment.
- It should be proved that the noise was of such a nature and intensity and exposure to it of such duration as to be likely to have caused permanent noise-induced hearing impairment. The compensability of a claim can only be considered where noise level readings exceed the maximum N85 Noise Rating Curve Level.
- Medical opinion – this should state that the hearing loss is compatible with noise-induced hearing impairment. In atypical cases, an appropriate explanation should be provided.
- Audiograms – two audiograms conducted by the diagnostic audiologist should be submitted. The audiograms should be performed after at least 24 hours have elapsed from the last exposure to excessive noise. The audiograms may be done on the same day but in different settings. The audiograms must not differ by more than 10 dB at any frequency. A better diagnostic audiogram will be used to calculate PLH for

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compensation purposes. If required, a third audiogram shall be performed. If this is still not within the 10dB limit, then the assessment shall be delayed for a period of 6 months. If audiograms of the required quality are still not obtained after six months, then a referral to an ENT specialist will be made in order to determine hearing loss.

- A copy of the baseline audiogram (and calculated PLH)-This is important as the baseline PLH will be subtracted from the better diagnostic audiogram PLH to determine the hearing loss for which the Commissioner, Mutual Association or Employer Individually Liable is responsible.
- Proof of employee's identity – the audiologist performing the audiogram should attest in writing to the employee's identity.

Storage

The employer should make proper provisions for the storage of reusable protectors, such as storage bags for earmuffs and clean lockers and custom-made ear plugs, where employees can keep them with other clothing. For the earplugs, the user department must ensure that the earplugs box is stored per manufacturer instructions, away from dust, excessive heat etc.

Distribution, maintenance and replacement

The disposable earplugs must be made available for each employee who will be exposed to noise. The user department should stock the items and make them accessible to the employees. For the earmuffs and custom-made earplugs, the individual employees should be assigned his/her earmuff or custom-made earplugs, the serial number must be recorded, and the employee and the supervisor must sign.

Earmuffs should be checked annually to see if there are any defects which need to be maintained, especially the rubber. This will be conducted under the maintenance team, who will ensure the earmuffs are checked annually. Any loss or replacement of earmuffs or custom-made earplugs must first go through the supervisor, and then the OHS manager must approve.

Health records


All medical records should be stored for forty years. The medical records should be available for any person to see under the consent of the employee. The risk assessment reports, exposure assessment, and maintenance measures should be available for health and safety representatives and the approved inspection authority. The medical records' hard copies will

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be stored in the clinic cabinet, which will be secured with access control. The soft copies will be stored in the clinic computer with a password and access control.


Communication

The hearing conservation program will be communicated to the site-specific induction as the induction package during the toolbox meetings, workers' forums and during the morning leadership meeting. The site notice board will also be used to convey the message.

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Appendices.

Appendix one: [Daily and weekly noise exposure calculator](#)



Noise Calculator - Main menu

The *Control of Noise at Work Regulations 2005* define actions based on Exposure Action Values (LEAV and UEAV) and the Exposure Limit Value (ELV) for personal daily or weekly noise exposures.

V4-12 March 2021

Main Menu

Zoom to fit

Daily Noise Exposure
Action Value Calculator

Daily Noise Exposure
Limit Value Calculator

Weekly Noise Exposure
Calculator

Instructions

Hover the cursor over **yellow** text for additional information

**Daily Noise Exposure
Action Value Calculator**

Applicable to all daily noise exposure calculations:
For any noise exposure use the **Daily Noise Exposure Action Value Calculator**

**Daily Noise Exposure
Limit Value Calculator**

Applicable for daily noise exposure calculations if you are using **hearing protection** to control noise risk:
Use the **Daily Noise Exposure Limit Value Calculator** if you are using hearing protection as part of your noise control programme

**Weekly Noise Exposure
Calculator**

Applicable if you have daily noise exposure on one or two working days a week that is at least 5 dB higher than other days:
To estimate weekly exposures use the **Weekly Noise Exposure Calculator**

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Appendix two: Health surveillance using audiometric testing.

