

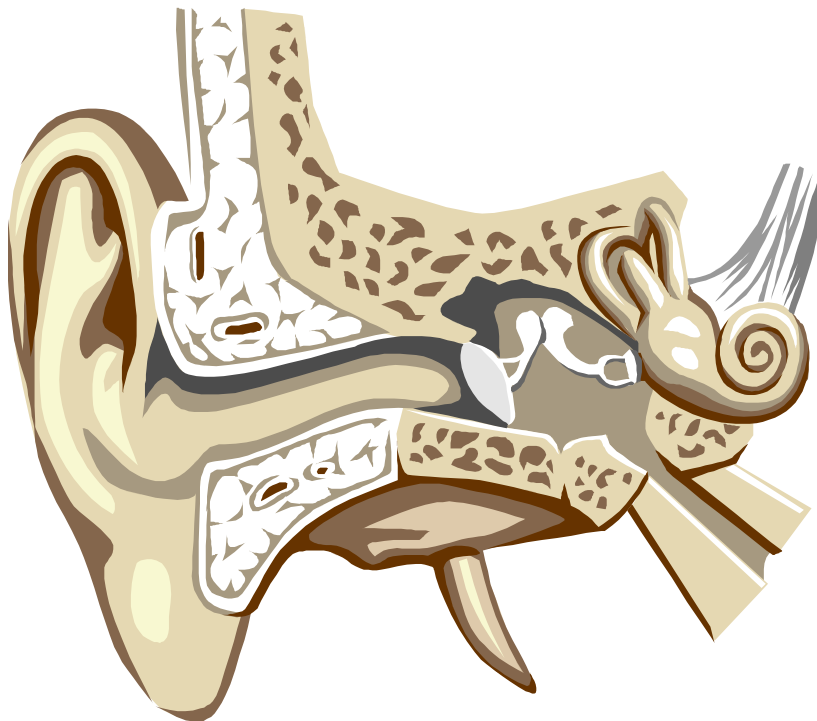


RAND MUTUAL ASSURANCE COMPANY LIMITED

GUIDE

TO

NOISE INDUCED HEARING LOSS (NIHL)



RMA GUIDE TO NOISE INDUCED HEARING LOSS

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INTRODUCTION

Noise induced hearing loss (NIHL) is a scheduled compensable disease in terms of Schedule 3 of the Compensation for Occupational Injuries and Diseases Act (COIDA act).

Impairment of hearing claimed to result from exposure to excessive noise at work usually manifests itself over a number of years and results in binaural impairment of hearing; i.e. both ears are affected more or less equally.

Immediate loss of hearing produced by one or more exposures to sudden intense forms of acoustic energy such as explosions, blasts, or changes in atmospheric pressure in the workplace is also potentially compensable (acoustic trauma / barotrauma).

NIHL is one of the most common health risk that industry has to contend with, particularly in the South African mining situation.

NIHL is responsible for $\pm 15\%$ of all claims submitted to RMA, and accounts for $\pm 45\%$ of costs paid out by the RMA to claimants.

No employer shall require or permit an employee to work in an environment in which he is exposed to an equivalent noise level equal to or exceeding 85 dB(A).

Mine Health and Safety Act: The employer must establish and maintain a system of medical surveillance of all employees in any working place where the equivalent, continuous A-weighted sound pressure level, normalised to an 8 hour working day or a 40 hour working week, does not exceed 85 dB (A).

COVER PROVIDED BY INSTRUCTION 171

- NIHL
- Deafness due to trauma (head injury).
- Acoustic trauma (blast / explosion, pressure gradients / barotrauma).
- Hearing loss in one or both ears.
- Conductive hearing loss (when the middle ear is injured).
- Perceptive hearing loss (when the inner ear is injured).
- Mixed hearing loss (conductive and perceptive).

- Right to benefits lapse if not brought to the attention of the **employer**, Compensation Commissioner, or mutual association concerned within 12 months from the commencement of the disease.
- The date and the commencement of the disease is the date of the first diagnostic audiogram showing a **hearing loss of 10%** or more above the baseline.

IMPACT OF INSTRUCTION 171

COID Act, 1993: Instruction 171. Effective from 16 May 2001. Supercedes all previous instructions regarding loss of hearing.

In addition to the 4 previously tested frequencies as per Instruction 168, the hearing loss at 4000 Hz must now be included in screening audiograms as well as in the calculation of Percentage Disability from Diagnostic Audiograms (see tables in Instruction 171).

A baseline screening audiogram must be available on all employees – implementation over the next two years.

If a baseline audiogram is unavailable the assumption will be that hearing is normal and the patient will be compensated at percentage loss of hearing (PLH) value of the diagnostic audiogram that is submitted.

Whereas under Instruction 168 binaural hearing impairment was calculated by manipulation of the decibel sum of the hearing threshold levels (DSHTL), under Instruction 171 the Percentage Loss of Hearing (PLH) is calculated using tables. These actuarial tables are weighted according to the importance of the frequency measured, with reference to speech perception. If a baseline PLH is available, this value is subtracted from the PLH obtained from the diagnostic audiogram. At each annual screening audiogram the PLH would be calculated.

Compensation would thus be paid by the employer* causing the NIHL (* the employer's mutual association, or the Compensation Commissioner, as the case may be, would assume the liability).

Previously the employer in whose employ the worker was at the time of the diagnosis, carried the liability for the worker irrespective of how long the worker was in his employ. These new regulations will allow apportionment of liability.

There will be no basis for discrimination against new workers.

Workers will only be compensated for a fixed amount of deterioration (10%).

Difficulty with implementing Inst. 171: the regulations in terms of the Occupational Health and Safety act (OHSA) and the Mine Health and Safety act (MHSA) have not been Gazetted as yet.

IMPLEMENTATION OF THE CHANGES – MANAGEMENT OF THE BASELINING PERIOD

Compliance with the MOHAC guidelines in those industries where they are used – mainly the Mining industry.

The equipment used for screening audiograms have to be set up to record the hearing acuity at the 4000 Hz frequency as well as the previously recorded frequencies (500, 1000, 2000, 3000).

Adequate measures for preservation of these records must be ensured.

PERCENTAGE LOSS OF HEARING (PLH)

Using the approved frequency specific tables the **sum** of the hearing losses at 500, 1000, 2000, 3000, and 4000 Hz is calculated from an audiogram. This is the PLH.

The tables are supplied as part of Instruction 171.

THE PURPOSE OF AUDIOLOGICAL TESTING FOR COMPENSATION

- To distinguish between NIHL and other causes of hearing loss.
- To quantify binaural hearing impairment.

DEFINITIONS OF NOISE

Unwanted sound.

Sound which has some or other undesirable effect on humans.

Statutory Limits:

- ⊗ Sound levels which exceed the maximum laid down by the SABS 083 standard of 1983.
- ⊗ Sound levels which exceed 85 dB (A).
- ⊗ Sound levels which exceed the N85 noise rating curve level.

AUDIOGRAM

A chart, graph or table obtained from an audiometric test showing an employee's hearing threshold levels as a function of frequency as determined during a measurement of a person's hearing threshold levels by means of monaural, pure tone, air conduction threshold tests (these frequencies are 500, 1000, 2000, 3000, and 4000 Hz. as stipulated by Inst. 171; other frequencies also done on standard audiogram).

BASELINE AUDIOGRAM

An audiogram obtained from audiometric examination performed prior to employment or within 30 days of employment.

It is performed after a period of at least 16 hours has elapsed since the employee was last exposed to noise.

The use of hearing protection devices to effect this attenuation will **not** be acceptable [Mine Health and Safety Act].

All subsequent audiograms will be compared to this to determine deterioration in percentage hearing loss (PLH).

If it is impossible for the audiometrist to establish baseline hearing levels (i.e. differences ≥ 10 dB for any of the measured test frequencies), baseline hearing levels may be established by using other techniques, such as Speech Reception Thresholds.

Regulations required to outline baseline period have not been Gazetted as yet (originally contemplated as 2 years).

SCREENING AUDIOGRAM

An audiogram that is obtained as part of ongoing medical surveillance.

It is performed after a period of at least 16 hours has elapsed since the employee was last exposed to noise.

Appropriate hearing protection devices may be used to fulfil the 16 hour noise free requirement.

Objectives: Monitor auditory status of the individual;

Early identification of auditory damage.

The employer **must ensure** that a periodic (screening) audiogram is obtained at least annually for all employees subject to medical surveillance (i.e. workers exposed to an equivalent noise level (Neq) exceeding 85 dB.):

- 12 monthly if noise levels ≥ 85 dB(A).
- 6 monthly if noise levels ≥ 105 dB(A).

All employees subject to medical surveillance must have an Exit audiogram when they are permanently transferred to a working place in respect of which medical surveillance is not required. An audiogram conducted within the preceding 6 months may be used as an exit audiogram (presuming that no event has occurred subsequent to this test that may have affected hearing).

DIAGNOSTIC AUDIOGRAM

An audiogram performed by an audiologist registered as such by the Health Professions Council of South Africa.

Employee must have been removed from noise for at least **24** hours prior to the test.

The wearing of hearing protectors will **not** fulfil this requirement.

The client must be referred for a diagnostic audiogram when the screening audiogram shows an average binaural hearing loss deterioration $\geq 10\%$ from initial PLH.

Only one diagnostic audiogram needs to be done but if it is confirmed that there is an average binaural loss $\geq 10\%$ PLH, in the 5 specified frequencies, a further audiogram must be done in order to have **two consistent audiograms**. If diagnostic audiograms are inconsistent a third one is done. If this is still not within the 10dB limit the employer should delay the assessment for a period of six months. If after six months the diagnostic audiograms are not consistent then referral to an ENT Specialist to determine the loss (if any) is advised.

REQUIREMENTS FOR DIAGNOSTIC AUDIOGRAMS:

- Pure tone air conduction;
- Pure tone bone conduction;
- Comment on employee's response to test environment;
- Comment on whether or not test results are consistent with any previous audiograms.
- Speech Reception Threshold (SRT) to be commented on if there is doubt about the consistency of the audiograms;
- Comment on whether employee suffers from tinnitus;
- Audiologist to ensure that every measure has been taken to put testee at ease and that testee understands what is required in the test situation (preferably in own language).

SPEECH RECEPTION THRESHOLD

When the audiometrist is unable to obtain consistent audiograms, the speech reception threshold should be determined. This will assist in the assessment of the case by the C.C. / RMA medical department.

AUDITORY BRAIN STEM RESPONSE (ABR) / ACOUSTIC EVOKED POTENTIAL (AEP)

The two main reasons for doing electrophysiological tests of auditory function are:

1. To determine signal detection threshold.
2. To make inferences concerning functional and structural integrity of the neural components of auditory pathways.

There is good correlation between ABR test results and behavioural pure tone thresholds (audiograms) at the frequencies 2000 – 4000 Hz. Its use in NIHL is thus limited to establishing whether there is a correlation between the patient's response in the test situation and the electrophysiological response of the brain over which the patient has no control. It is **not** used to calculate P.D.

This test should only be requested by the Occupational Medical Practitioner, ENT Surgeon, or by the RMA Medical Department after consultation with the audiologist.

If an ABR is done without prior motivation and approval procedure, C.C. / RMA may deny liability for costs.

The audiologist must have had training and experience in this procedure.

CHARACTERISTICS OF NIHL

Prolonged exposure to moderately intense noise causes metabolic changes of the hair cells in the cochlea leading to degeneration and loss. Exposure to extremely high noise causes direct mechanical damage to the hearing structures.

- NIHL is sensorineural (affecting the hair cells in the inner ear);
- Bilateral and symmetrical;
- It develops gradually, but most rapidly in the first 10 years of exposure;
- It starts in the higher frequencies (3000 –6000 Hz), i.e. greater loss at these frequencies than at 500 – 2000 Hz. Given stable exposure conditions, losses at 3000, 4000, and 6000 Hz will usually reach a maximal point in 10 to 15 years.
- The greatest loss usually occurs at 4000 Hz. The audiogram has a characteristic “ski-slope” appearance. This “notch” at 4000 Hz deepens with additional years of exposure, but reaches a plateau after about 15 to 20 years of exposure. The high frequency hearing loss usually averages 50 – 70 dB. With additional years of exposure, there is some spread of hearing loss to the lower frequencies, but the maximum loss at low frequencies is much less (usually not more than 20 dB). Presbycusis can eliminate this “notch” since it affects the higher frequencies.
- After many years (> 10 yrs) of high energy noise exposure the frequencies above and below 4000 Hz show threshold changes and eventually may become a virtually straight line, or be somewhat erratic.
- Continuous noise exposure is more damaging than interrupted noise exposure which allows the ear a rest period.
- Previous noise exposure does not make the ear more sensitive to future noise exposure. As hearing threshold increases, the rate of loss decreases.
- Speech discrimination is usually good (this is one of the reasons to test for Speech Reception Threshold in cases suspected of pseudohypoacusis);
- The loss stabilises when exposure is discontinued.
- It almost never produces a profound hearing loss. Usually low frequency limits are about 40 dB and high frequency limits about 75 dB.

MONAURAL HEARING LOSS

Only one ear is affected. Common causes are infections (especially unnoticed viral), trauma, and rarely tumours.

Work related causes are: barotrauma, acoustic trauma, direct injury, fractured skull, barotitis with complications, etc.

Monaural NIHL may occur where one ear is preferentially exposed to noise (e.g. use of firearms – the one ear may be turned to the sound, as the head is turned to allow the shooters' dominant eye a better alignment with the gunsights).

If the monaural deafness is **not** work related, this ear is considered to be "normal" for the purpose of impairment calculation. If the unaffected ear shows work related hearing loss, the calculations are based only on this ear's loss. In practice this means that the audiogram values obtained for the unaffected ear, is used also for the affected ear (the presumption is that the monaurally deaf ear would have been affected to the same degree as the "good ear", if it had not been deaf).

COST OF EXAMINATIONS

- ⊗ Cost of audiometric screening to be borne by the employer in terms of the Two Year Rule.
- ⊗ Audiological testing and medical reports to be borne by the employer for those cases where the employer is individually liable for medical costs (Two Year Rule cases). RMA will bear costs where the employee is covered from date of accident (Day One cases).

AUDIOMETRIST

A “competent person” in terms of the MHS Act that may include:

- A person registered as such by the Health Professions Council of South Africa.
- A graduate in speech therapy and audiology.
- A person with a certificate recognised by the Department of Labour or the Department of Minerals and Energy.
- An Occupational Medical Practitioner.
- An ENT Specialist.

CALCULATION OF PERMANENT DISABLEMENT

Initial PLH is calculated from the **better** of the two initial screening baseline audiograms performed on the same day.

Only deterioration by 10% or more from initial PLH would be compensable.

The hearing threshold levels (HTL) from the **better** of the two diagnostic audiograms will be used. Ensure that all documentation is present and correct.

Using the PLH tables (annexure A), calculate a PLH for each of the following 5 frequencies: 500, 1000, 2000, 3000, 4000 Hz. (use pure tone air conduction results).

The tables are weighted to favour the more important of the speech frequencies.

Sum the values for each frequency to obtain the PLH.

If a baseline PLH is available, this value is subtracted from the PLH obtained from the diagnostic audiogram.

If a baseline PLH is unavailable, the PLH from the diagnostic audiogram is taken as the value from which Permanent Disablement is calculated.

Permanent Disablement is calculated by halving the value of the PLH (as above).

100% hearing impairment is thus equal to 50% Permanent Disability (P.D.).

FACTORS INFLUENCING A TEST SUBJECT'S RESPONSE

Alertness, intelligence, general health, age, previous test experience, language difficulties, physical limitations, and motivation for compensation.

Clinicians must be experienced in making forensic hearing evaluations, and understand the variety of factors affecting the test results, as well as test equipment deficiencies.

Reasons for inconsistencies in audiogram:

- presence of tinnitus.
- Unfamiliar test situation.
- Inability to grasp response requirements.
- Profound deafness, also if monaural.
- Significant ear disease (not work related).
- Deafness simulation / pseudohypoacusis (for legal reasons you must **never** write down the term ‘malingering’ on a patient’s documents. When the case is referred to the RMA state one of the above reasons or point out the discrepancies between the tests).

Fraudulent claims of all types are on the increase, but so is the litigiousness of patients.

DISCREPANCIES BETWEEN AUDIOGRAMS

- C.C. / RMA has the right to refer employee to another centre when discrepancies occur;
- If there are obvious discrepancies between the two audiograms (such as a ≥ 10 dB difference in a specific frequency), a third audiogram should be done.
- If there is a difference of more than 10 dB between tracings at any one frequency the audiogram may be considered inconsistent; if it affects several frequencies it may **not** be suitable for compensation purposes.
- Where there is an obvious discrepancy without a valid explanation **no** further audiograms are to be done for at least 6 months.

- If at 6 months there is still a discrepancy the patient is referred to an ENT Specialist to determine the loss (if any) independently.
- RMA approval should be obtained before additional audiograms are carried out – RMA can **not** be held liable for the costs of these tests if prior approval has not been obtained.

PERSONS TO BE SUBMITTED FOR COMPENSATION

The worker **must** be exposed to noise in excess of 85 dB (A) during the working day to have a claim for NIHL.

Employees whose hearing has deteriorated more than 10% Percentage Loss of Hearing (PLH) from the baseline audiogram.

Employees with more than 10% PLH and for whom no baseline is available.

Review of compensation will be considered as above.

It is generally accepted that hearing does not deteriorate further as a result of noise once the employee has been removed from the source of noise. Where a person has been removed from noise work (e.g. retirement, retrenchment, redeployment) the claim must be registered within 12 months of leaving this work.

Claims are **not** to be submitted for new recruits who have developed NIHL whilst working for employers who are **not** members of the RMA. These claims are referred directly to the Compensation Commissioner in Pretoria for adjudication.

NIHL CHECKLIST FOR HEALTH PRACTITIONER

STEP 1 Patient History.

- number of years exposed to noise at work;
- occurrence of ear infections, acute & chronic;
- any surgery to the ear (e.g. tympanoplasty);
- is there a genetic / familial cause for deafness (e.g. otosclerosis).

STEP 2 Occupational Health Clinic for Screening Audiometry.

- Clinic sister to examine ears for excess wax or infection which must be treated and cured before audiometry.
- Full occupational history.

STEP 3 Contact employer to establish noise exposure levels as determined by Occupational Hygienist.

STEP 4 Make sure screening audiometer is currently properly calibrated and that the 500, 1000, 2000, 3000, and 4000 Hz frequencies are tested.

STEP 5 If the average loss in decibels in the above 5 frequencies is greater than 10% PLH then consider referring for diagnostic audiometry.

STEP 6 Diagnostic audiometry is generally done by a qualified audiologist under strictly controlled conditions. Audiograms must not differ by more than 10 dB at any frequency.

STEP 7 The patient is referred to an Occupational Medical Practitioner or ENT surgeon who examines the ears and gives a report (see Inst.171, Section 1.8 for details). Please give legible reports.

Medical report to comment on:

- ⊗ whether cause of deafness is occupational related or not;
- ⊗ whether there are non work related causes for the deafness;
- ⊗ whether the hearing loss conforms to NIHL or a medical condition;
- ⊗ ENT Specialist must comment on a large air- bone conduction gap.
- ⊗ presence of tinnitus;
- ⊗ period of exposure to high energy noise [≥ 85 dB (A)] per working shift;
- ⊗ whether the employee has “sensitive ears” - shown by a substantial deterioration in the audiograms over a short period of time (± 3 years);
- ⊗ whether the employee will benefit from hearing augmentation;
- ⊗ no comments are to be made on the level of permanent disability as these calculations may legally only be done by the Compensation Commissioner / RMA (under licence).

STEP 8 If the above criteria indicate that the hearing loss is due to documented exposure to noise at work and to no other cause, refer patient to the Compensation Commissioner or the mutual association concerned.

NIHL CHECKLIST FOR THE AUDIOLOGIST

- The individual to be tested must not have been exposed to noise work for at least 24 hours prior to the audiogram (duration of TTS is at least 16 hours).
- Two screening **baseline** audiograms to accompany every claim.
- Two diagnostic audiograms-pure tone air and bone conduction curves- done by registered audiologist.
- The audiologist and/or the audiology centre must be registered by the RMA
- Audiograms may be done on the same day- not in sequence but at different sittings.
- Audiograms must not differ by more than 10 dB at any frequency.
- If diagnostic audiograms are inconsistent a third one may be done.
- Speech Reception Threshold test to be done if above tests remain inconsistent.
- Attestation of proof of identity and a photostat copy of Identity Document (or similar) to be included in claim document.
- Comments by audiologist welcome, and will be read by us if legible (e.g. co-operation of testee, dependability of result, cause of deafness, speech reception threshold, etc).

Does the patient exhibit any of the following:

- Vague symptomatology during initial interview?
- Exaggerated attempts to hear throughout interview and testing?
- Pure tone audiogram grossly inconsistent with the clients' observed hearing ability?
- Pure tone audiogram inconsistent with clients' reported symptomatology?

Test result indicators for hearing loss confirmation:

- Speech reception threshold and pure tone average must agree within 10 dB;
- Are there good discrimination scores for speech when presented at 15 dB or less above the pure tone average?
- Is the audiogram flat for a case of NIHL with no additional / alternative diagnosis?
- Is there a marked degree of variability in pure tone thresholds within a test or between any repeat tests?
- Are the acoustic reflex thresholds within 15 dB of hearing thresholds at the same frequencies?
- Is there an air bone gap with normal acoustic reflexes in the same (probe) ear?

Unilateral hearing losses:

- Does unmasked bone conduction match air conduction in the poorer ear?
- Does the audiogram lack a shadow curve with no masking?
- Is there a positive speech or pure tone Stenger?

Slow Vertex Potentials (SVP):

- SVP pure tone average more than 10 dB better than behavioural pure tone average?

NIHL CHECKLIST FOR RMA CLAIMS TECHNICIANS

- **Service record** – employer to confirm in writing.
This is critical and must enable accurate deduction from the information what the intensity and duration of noise exposure is or was, and the period of employment in a specific occupation. Note that previous noise exposure will be considered, even if the recent occupation has not been in noise. The last shift / date worked in high energy noise must be documented.
- **Medical report** to be completed by Occupational Medical Practitioner or ENT Surgeon, as per the provisions of Instruction 171, Section 1.8. The Medical Practitioner should certify that the hearing loss is compatible with NIHL, acoustic trauma or occupational injury, and that no other cause for the hearing loss was found on examination. In atypical cases an appropriate explanation should be provided.
- **Two diagnostic audiograms** are required – done by registered audiologist. The audiologist or the audiology centre must be approved by the RMA.
If diagnostic audiograms are inconsistent (see above), the assessment, depending on circumstances, must be repeated after at least a 6 month delay.
If after 6 months the audiograms are still not consistent, the patient must be referred to an ENT specialist to determine the loss (if any).
- **Two screening baseline audiograms** to accompany every claim (photocopy).
- **Attestation of proof of identity** - a photocopy of Identity Document (or similar) countersigned by the audiologist performing the audiogram to be included in claim document.

- **Previous** Occupational Deafness settlements to be taken into account. If employee was previously compensated then a new claim (Notice of Accident) must be submitted.

REQUEST TO REVIEW PERMANENT DISABILITY

Claims will only be reviewed if there has been a substantial deterioration and the employee has been moved to another job with a drop in income or when the employee leaves the employer.

COMMON AUDITORY PATHOLOGY

High frequency sensorineural hearing loss may be caused by the following entities:

- Acoustic neuroma, labyrinthitis, ototoxicity (medical drugs, industrial agents), viral infections, acoustic trauma / barotrauma, head trauma, hereditary hearing loss, diabetes, presbycusis.

Other causes of hearing loss:

- Outer ear - impacted wax, foreign object, atresia, tumour, external otitis.
- Middle ear – perforation, Otosclerosis, trauma, tumour, otitis media (acute & chronic).
- Inner ear – noise, trauma, Meniere's syndrome.

These conditions must (where appropriate) be mentioned in the Medical Report.

MEDICAL EXAMINATION AND TREATMENT

Medical examination must take into account:

- Tinnitus;
- unhealed ear drum perforations, scarring of ear drum;
- infections (especially if recurrent);
- ear operations (e.g. mastoidectomy).

Medical treatment should be provided and the employee should receive periodical payments when on sick leave if the condition is workrelated.

RMA GUIDELINES FOR THE ISSUE OF HEARING AIDS

Research has shown that a person becomes hearing handicapped only when the average hearing loss reaches a level of 40 dB or more.

- Approval for the issue of a hearing aid **must** be obtained from RMA **before** costs are incurred and hearing aid issued for Day One Medical claimants.
- If a single hearing aid is prescribed it is usually fitted to the better ear.
- Binaural hearing aids will only be considered if there is a well reasoned motivation from the audiologist.
- Most importantly the worker must be able to benefit from the wearing of a hearing aid, taking into consideration such factors as working environment, type of work done, level of sophistication, attitude towards the wearing of a hearing aid, and results of the wearing of a hearing aid provided on a trial basis.
- Retired workers: special care must be taken when considering a request for high technology sophisticated hearing aids especially if binaural hearing aids are required. Presbycusis would be a definite factor contributing to the deafness as well as the fact that the individual is not in a working situation. Therefore other factors such as a motivation from the audiologist, service record, age, benefit obtained from augmentation, costs, etc, must be taken into consideration.

- Average hearing loss of 40 dB in the 5 frequencies 500, 1000, 2000, 3000, 4000 Hz is a guideline except in special circumstances depending mainly on type of **work** done.
- Hearing aids are to be of “reasonable cost” as per the COID Act.
- High cost, high technology micro hearing aids such as CIC (completely in the canal), ITC (in the canal), and external (e.g. adjustable hearing aids), will only be issued in exceptional circumstances and on special motivation after taking all factors into consideration.
- Hearing aid to last at least 5 years or more before replacement will be considered except where special circumstances or a motivation from an audiologist / ENT Surgeon prevails.
- Wilful damage, such as bathing or showering with hearing aids in place, will not be considered a reasonable cause for replacement.
- Lost hearing aids will **not** be replaced.
- Strict records to be kept on the issue of hearing aids.
- Batteries are only supplied with the initial issue. Thereafter it is the responsibility of the worker to replace the batteries.

Hearing aids should **never** be worn whilst working in a noise zone.

THE INFLUENCE OF NOISE ON HUMANS

May cause NIHL.

Interferes with speech / sound communication.

Temporary Threshold Shift (TTS): exposure to noise diminishes the sensitivity of the ear to sound. This is why a period of at least 16 hours must have elapsed after exposure to noise before an audiogram is done.

OBJECTIVES OF A HEARING CONSERVATION PROGRAM

- Prevent hearing loss;
- Reduce the degree to which noise interferes with speech / sound communication;
- Comply with legal and statutory requirements;
- Reduce the organisation's expenses for compensation of hearing loss.

MEASURING NOISE FOR HEARING CONSERVATION PURPOSES

Sound pressure waves are measured in Pascals, represented on a logarithmic scale, the units of which are known as decibels (dB).

This method of measurement represents sound pressure almost in the same way as the ear experiences it.

The Sound Level Meter uses a pressure sensitive microphone to measure the root mean square (r.m.s.) sound pressure level in dB. This is proportionate to the flow of sound energy.

Sound level meters are equipped with three weighting networks; A, B, and C. The A-weighting network [dB (A)] is used in industrial hearing conservation programs since it imitates the sounds encountered by the ear the best. The result of this measurement is then also called the sound level or noise level.

An integrating sound level meter incorporates sound energy over a longer term (hours) and divides the measured values by the period of the measurement to provide a direct reading, the Equivalent Noise Level (Leq.). Small noise dosimeters may be carried in a worker's pocket if he moves around in the work place and is thus exposed to varying noise levels.

These measurements must be done by the Occupational Hygienist.

MEASURING EQUIPMENT

To comply with at least a Type 3 audiometer specified in IEC Publication 645-1.

Calibrated in accordance with SABS 0154-1 and subsequently at yearly intervals.

SABS has issued a certificate of compliance indicating:

- Make, model, and serial number;
- Type and serial numbers of headphones;
- Date of calibration;
- Name and address of organisation and person performing the calibration;
- Number of the certificate issued.

The test environment to consist of a room in compliance with specifications of SABS 0182.

REGISTRATION OF AUDIOLOGICAL TESTING EQUIPMENT

The RMA must officially recognise the facility as meeting the requirements for compensation purposes and approval must be granted in writing.

All registered operations performing audiological examinations for compensation purposes will be required to complete a questionnaire on a regular basis to ensure that the standards, especially the calibration of equipment, are being met.

RMA CONTACT NUMBERS:

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GLOSSARY of TERMS

ABR – auditory brainstem response.

Acoustic Immittance test: A battery of tests that provide objective information on the mechanical transfer function of sound of the outer and middle ear. Depending on the status of the outer and middle ear and cochlear functions, provides data on the neural integrity of the auditory nerve function at the level of the brain stem.

Acoustic reflexes: A component of the immittance test battery.

Reflexive contraction of the middle ear muscle (the stapedius) resulting from acoustic stimulation at high intensity levels.

Reflexes may be present, partially present, elevated or absent, depending on a number of auditory conditions.

AEP – auditory evoked potential (same as ABR).

Air Conduction – the process by which sound is normally conducted through the air in the external auditory meatus to the middle ear and then to the inner ear.

Audiogram – a record of hearing level measured at several different frequencies. The audiogram may be represented graphically or numerically.

Barotitis media – damage to the middle ear due to ambient pressure changes.

Barotrauma – perforation of the ear drum as a result of a large differential in ambient air pressure between the external and middle ear.

Bone conduction threshold testing – bone stimulation is done and frequency tracings recorded.

Disability – the absence or loss, or a decrease of an individual’s capacity to meet personal, social or occupational demands; or to meet statutory or regulatory requirements *because of* an impairment.

Evaluation of disability – this is a **non-medical assessment** of the degree to which an individual is disabled. Disability is evaluated administratively and is based on many non-medical factors such as workplace demands, education, age, environmental factors, and the individual’s anticipated capacity to carry out particular tasks or perform specified functions.

‘Disability’ is the gap between what the person can do and what the person needs or wants to do.

Decibel (dB) – a unit based on the logarithm of the ratio of a measured sound pressure to a reference sound pressure.

dB(A) – notation used in noise measurement. The A-weighting is a filter network on a sound level meter which approximates the frequency response of human hearing. A-weighted noise measurements provide a good indication of the risk to hearing from a given noise.

Frequency – the rate at which pressure oscillations are produced, expressed as cycles per second / Hertz (the subjective correlate of frequency is pitch).

Hertz (Hz) – cycles per second.

Intensity – the amplitude of the pressure fluctuations, expressed in decibels (dB). The subjective correlate of intensity is loudness.

Impairment – the loss, or loss of use, or derangement of any body part or system or function. Impairment involves anatomic or physiologic deficits and should be evaluated medically.

Lex – a worker's total exposure to noise, averaged over the entire workday and adjusted to an equivalent 8-hour exposure.

Listener information – obtaining case history information and observation of the testee.

Masking: the process by which the threshold of audibility for one sound is raised by the presence of another (masking) sound. A specialised amount of calibrated noise is introduced in the non-testing ear to eliminate the possibility of test signal crossover, used whenever there is unilateral or bilateral asymmetrical hearing loss.

Neq – the impulse corrected continuous equivalent noise level.

Noise induced hearing loss (NIHL) – the cumulative permanent loss of hearing exceeding a designated criterion. NIHL is always of the sensori-neural type which develops over months or years of hazardous noise exposure.

Nosocusis: refers to the influence of toxins and non-acoustic factors which aggravate the damaging effects of noise. Examples are lead, benzene, carbon monoxide, ototoxic drugs (e.g. aminoglycoside antibiotics), etc.

Occupational hearing loss (deafness) – a hearing impairment of one or both ears, partial or complete, arising out of and in the course of an individual worker's employment.

Otoacoustic Emissions (OAE): Sounds created by active bio-mechanical processes within the outer cochlear hair cells of normal-hearing ears.

Since OAE' s are present in normal ears, it can be assumed that the absence of OAE' s is a sign of irregular cochlear function which could be an indication of hearing loss.

OAE testing provides a fast, objective and non-invasive method for testing a number of abnormalities including, among others, detecting early signs of noise exposure.

Permanent Threshold Shift (PTS): the prolonged exposure to noise causes permanent damage to the hearing mechanism. Industrial noise typically causes an early PTS at 4000 Hz. This hearing loss spreads to neighbouring frequencies if exposure to noise is not terminated.

Presbycusis: the decrease of auditory sensitivity with age (> 60 yrs). Mainly affects frequencies over 4000 Hz. It is never apportioned and is included in the calculations for hearing impairment.

Pure tone air conduction threshold testing – the standard behavioural procedure for describing auditory sensitivity.

Pure tone or speech Stenger test: A test for pseudohypoacusis or functional hearing loss (malingering). Can also be used to assess patients thought to have unilateral pseudohypoacusis.

Acoustic stimuli are presented simultaneously to each ear and the patient should perceive the stimulus only in the ear that has the greater sensitivity. Failure to respond is a positive Stenger, indicating pseudohypoacusis.

Sound is vibratory energy – fluctuations in pressure in a medium (usually air) generated by a vibrating object.

Speech discrimination – the ability to understand the spoken word.

Speech Reception Threshold – procedures used to establish the threshold of speech level.

Sociocusis: exposure to noise outside the working realm.

Somatic effects of noise on humans:

Increased hormone secretion from the adrenal cortex and medulla – possible cardiovascular effects over long term.

Intense noise between 100 and 130 dB(A) interferes with sight.

Intense noise above 125 dB(A) affects the organs of balance.

Shadow curve: A patient with severe to profound unilateral hearing loss will hear a tone in the opposite or contralateral ear (which has normal hearing). The thresholds will mimic those in the better ear but will be reduced by about 50 to 60 dB.

The result is a shadow curve due to cross-over resulting from sound being perceived by the better ear even through presented to the poorer ear.

Failure to show a shadow effect is considered a positive indication of pseudohypoacusis.

Symbolisation – method of recording of audiometric threshold data in an audiogram by means of symbols, e.g:

	Unmasked		Masked	
	Left	Right	Left	Right
Air Conduction	X	O		Δ
Bone Conduction	or >	; or <	[or >	< or]
No Response	↓	↓	↓	↓

Tinnitus: a ringing / buzzing / roaring / clicking sound in the ears (complication of noise exposure). There is no scientific way in which the level of tinnitus can be measured and it is therefore not compensatable per se.

Tympanometry – the measurement of the mobility of the middle ear structures as a function of the differential pressure across the ear drum.

Is a component of the immittance test battery. It is a middle ear function test and is an objective measurement of the tympanic compliance as a function of mechanically varying the air pressure in a hermetically sealed external ear canal.

FORMS

Example of a suggested prototype medical report required for occupational deafness and noise induced hearing loss claims for compensation purposes.

Name:

Co. No Ind. No.

Date attended to:

Complaints:

Previous History:

Barotrauma
Acoustic trauma
Ear infections:

Otitis media
Mastoiditis
Other

Head injury
Ototoxic drugs

YES	NO	DATE

Number of years exposed to high energy noise

Is severe tinnitus present?

Other illnesses:

Examination:

Diagnosis and comment:

Medical attendant:

Name:

Qualification:

Signature:

EXAMPLES OF CALCULATIONS:

An excel program is available on the RMA Website: www.randmutual.co.za and can be downloaded for use. This will automatically perform the necessary calculations to determine PLH according to the tables provided in Instruction 171.