

**GUIDELINE FOR A MANDATORY CODE OF PRACTICE FOR AN OCCUPATIONAL  
HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL  
SURVEILLANCE) FOR NOISE**

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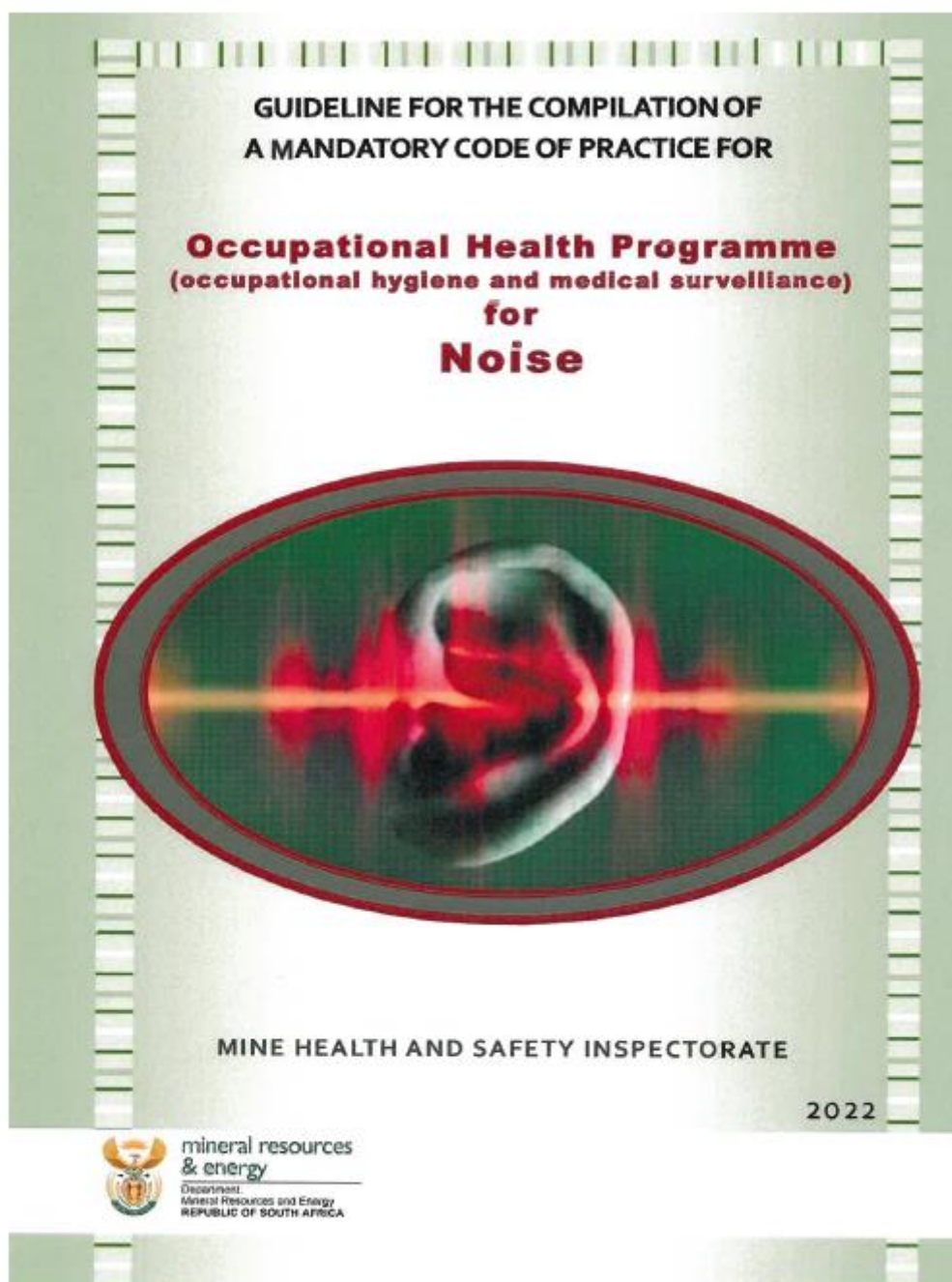
GN 1755 in GG 45903 of 11 February 2022

**I DAVID MSIZA**, Chief Inspector of Mines, under section 49(6) of the Mine Health and Safety Act, 1996 (Act 29 of 1996) and after consultation with the Council, hereby issues the guideline for an occupational health programme (occupational hygiene and medical surveillance) for thermal stress in terms of the Mine Health and Safety Act, as set out in the Schedule.

(Signed)

**DAVID MSIZA**  
**Chief Inspector of Mines**

## SCHEDULE



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**DEPARTMENT OF MINERAL RESOURCES AND ENERGY**

**MINE HEALTH AND SAFETY INSPECTORATE**

**GUIDELINE FOR THE COMPILATION OF A MANDATORY CODE OF PRACTICE FOR  
AN OCCUPATIONAL HEALTH PROGRAMME**

(OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE)

**FOR**

**NOISE**

(Signed)

CHIEF INSPECTOR OF MINES

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## **PART A** **THE GUIDELINE**

### **1 Foreword**

- 1.1 The commission of inquiry into safety and health in the mining industry chaired by Honourable Justice R N Leon identified occupational health as one of the four major issues affecting occupational health and safety in the South African mining industry.
- 1.2 In an attempt to address this issue a tripartite sub-committee was established under the auspices of the **MOHAC**. The **MOHAC** found it necessary that in order to address this issue a guideline for a mandatory **COP** for an occupational health programme for **noise** be drafted.
- 1.3 Significant risks to health exist in mining. In order to protect, monitor and promote employees' health status, an occupational health programme is required where exposure to such significant risks occur. The **MOHAC** considered it appropriate to prepare guidelines covering both occupational hygiene and medical surveillance to ensure compliance and uniform standards.
- 1.4 Where the employer's risk assessment indicates a need to establish and maintain a system of occupational hygiene measurements, or where such system is required by regulation, the employer must prepare and implement a **COP** based on this guideline.
- 1.5 This **DMRE** guideline will assist employers with the establishment of an occupational **hearing conservation programme**, but does not stipulate specific requirements for specific circumstances. It sets out a basic system for managing risk to health. The first component of any management system is finding out what the situation is, the second is deciding what to do about it, and the third is to implement appropriate controls.
- 1.6 This guideline replaces the earlier *guideline for the compilation of a mandatory **COP** for an occupational health programme for **noise*** with reference number DMR 16/3/2/4-A3 published by the **DMRE** in 2003.

- 1.7 This guideline should be read in conjunction with **SANS 10083**, instruction 171 and the *guideline for the compilation of a mandatory COP on minimum standards of fitness to perform work at a mine* (reference number DMR 16/3/2/3-A3) and the *guidance note for the implementation of STS in medical surveillance of NIHL* (reference number DMR 16/3/2/3-B8).

## 2 Legal Status of Guidelines and COPs

- 2.1 In accordance with section 9(2) of the **MHSA** an employer must prepare and implement a **COP** on any matter affecting the health and safety of employees and other persons who may be directly affected by activities at the mine if the **CIOM** requires it. These **COPs** must comply with any relevant guidelines issued by the **CIOM** [section 9(3) **MHSA**]. Failure by the employer to prepare or implement a **COP** in compliance with this guideline is a breach of the **MHSA**.

## 3 Objectives of the guideline

- 3.1 The objective of this guideline is to enable the employer at every mine to compile a **COP** which, if properly implemented and complied with, would assist in protecting the health of employees at the mine by **monitoring** and reducing their exposure to **noise**. This guideline provides guidance of a general nature on the required format and content for the **COP** and details sufficient technical background to enable the drafting committee at the mine to prepare a comprehensive and practical **COP** for their mine. This guideline sets out the two components of an occupational health programme namely:

### 3.1.1 Occupational hygiene

The employer is required in terms of regulation 9.2(2) or section 12 of the **MHSA** to establish and maintain a system of occupational hygiene measurements in respect of occupational exposure to **noise**.

### 3.1.2 Medical surveillance

The employer is required in terms of section 13 or regulation 11.4 of the **MHSA** to establish and maintain a system of medical surveillance.

## 4 Definitions and Acronyms

- 4.1 '**A-weighted sound pressure level or sound level ( $L_{pA}$ )**' means the sound pressure level in decibels, of **A-weighted sound pressure** given by the following equation (**SANS 10083**):

$$L_{pA} = 10 \log \left( \frac{p_A}{p_0} \right)^2$$

Where:

- (a)  $L_{pA}$  is the **A-weighted sound pressure level**.
  - (b)  $p_A$  is the A-weighted pressure in pascal.
  - (c)  $p_0$  is the reference sound pressure (20  $\mu$ Pa).
- 4.2 '**Baseline audiogram**' means an audiogram conducted for purposes of regulation 11.4(4) of the **MHSA** to establish a reference against which subsequent audiograms can be compared.
- 4.3 '**CIOM**' means Chief Inspector of Mines.
- 4.4 '**COIDA**' means the Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993).
- 4.5 '**CI**' means confidence interval.

- 4.6 **'COP'** means Code of Practice.
- 4.7 **'DMRE'** means the Department of Mineral Resources and Energy.
- 4.8 **'Decibel (dB)'** means the logarithmic unit for quantifying the level of a sound, where the base of the logarithm is the 10<sup>th</sup> root of 10 and the quantity concerned is proportional to power, relative to a reference level of 20 micro  $P_a$ .
- 4.9 **'Decibel, A-weighted (dBA)'** means the logarithmic unit for the level of a sound, as measured using a sound level meter's A-weighting network, which network applies weighting to the values for constituent frequencies of a sound in accordance with the human ear's sensitivity to it.
- 4.10 **'ENT specialist'** means ear, nose and throat specialist.
- 4.11 **'Equivalent continuous A-weighted sound pressure level ( $L_{Aeq, T}$ )'** means the value of the **A-weighted sound pressure level** in decibels, of a continuous steady sound that, during a specified time interval ( $T$ ), has the same mean square sound pressure as a sound under consideration, the level of which varies with time, and it is defined by the following equation (**SANS 10083**):

$$L_{Aeq, T} = 10 \log \left[ \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2_{A(t)}}{p_0^2} dt \right]$$

Where:

- $L_{Aeq, T}$  is the **equivalent continuous A-weighted sound pressure level**, in decibels, determined over a time interval  $T$  that starts at  $t_1$  and ends at  $t_2$ .
  - $p_0$  is the reference sound pressure level ( $p_0 = 20 \mu\text{Pa}$ ).
  - $p_A(t)$  is the instantaneous **A-weighted sound pressure** of the sound signal, in pascal.
- 4.12 **'Hearing conservation'** means the prevention or minimisation of noise-induced hearing impairment by the implementation of **hearing conservation** procedures.
- 4.13 **'Hearing conservation programme'** means the process aimed at the prevention of hearing impairment, involving the implementation of the following measures:
- (a) Assessment and prediction of **noise** exposure in all working places which may be accessed by any person.
  - (b) The reduction of the 8-hour rating level where this is expected to exceed the **noise** rating limit for **hearing conservation**.
  - (c) The introduction of a prohibition to persons entering such a working place unless such person is adequately protected.
  - (d) The introduction of a medical surveillance programme for all employees working in such working places.
  - (e) The introduction of a follow-up assessment programme as contemplated in (a) and (b) above.
- 4.14 **'Hz (Hertz)'** means the derived unit of frequency and is defined as one cycle per second.
- 4.15 **'Homogeneous exposure group (HEG)'** means a group of employees whose exposures to **noise** has been determined to be statistically similar enough that, by **monitoring** a representative number of individuals in the group, the exposures of the remaining workers can be defined.

- 4.16 '**ISLM**' means integrating sound level meter.
- 4.17 '**kHz (kilohertz)**' means a measure of frequency equivalent to 1 000 cycles per second.
- 4.18 ' **$L_{Aeq, 8h}$** ' means the 8-hour **equivalent continuous A-weighted sound pressure level** in decibels and is the steady sound pressure level which would in the course of an 8-hour period deliver the same A-weighted sound energy as that due to the actual noise on any particular representative working day.
- 4.19 '**MOHAC**' means the Mining Occupational Health Advisory Committee.
- 4.20 '**Monitoring**' means the repetitive and continued observation, measurement and evaluation of health, and/or environmental or technical data, according to prearranged schedules, using nationally or internationally acceptable methodologies.
- 4.21 '**MHSA**' means Mine Health and Safety Act, 1996 (Act 29 of 1996) as amended.
- 4.22 '**MHSC**' means the Mine Health and Safety Council.
- 4.23 '**NIHL**' means noise-induced hearing loss.
- 4.24 '**Noise**' means unwanted sound that could adversely affect health.
- 4.25 '**Noise zone**' means an area within which the **noise** equals or exceeds the **OEL**.
- 4.26 '**Occupational exposure limit (OEL) for noise**' means the value of the 8-hour rating level ( $L_{Aeq, 8h}$ ), at or above **85 dBA** which hearing impairment is likely to result.
- 4.27 '**OMP**' means Occupational Medical Practitioner.
- 4.28 '**Percentile**' means the value of a variable below which a certain per cent of observations fall. For example, the 20<sup>th</sup> **percentile** is the value (or score) below which 20 per cent of the observations may be found. The term **percentile** and the related term **percentile rank** are often used in the reporting of scores from norm-referenced tests.
- The 25<sup>th</sup> **percentile** is also known as the first quartile ( $Q_1$ ), the 50<sup>th</sup> **percentile** as the median or second quartile ( $Q_2$ ), and the 75<sup>th</sup> **percentile** as the third quartile ( $Q_3$ ).
- 4.29 '**PPE**' means personal protective equipment.
- 4.30 '**PLH**' means percentage loss of hearing.
- 4.31 '**RMS**' means root-mean-square.
- 4.32 '**Sampling cycle**' means the planned sampling programme for the year, which must terminate at the end of each calendar year.
- 4.33 '**SANS 1451**' means:
- (a) SANS 1451-1 (Ed. 1.02): Hearing protectors part 1: ear-muffs.
  - (b) SANS 1451-2 (Ed. 1.01): Hearing protectors part 2: ear-plugs.
  - (c) SANS 1451-3 (Ed. 1.03): Hearing protectors part 3: ear-muffs attached to an industrial safety helmet, or as amended from time to time.
- 4.34 '**SANS 10083**' means the measurement and assessment of occupational **noise** for **hearing conservation** purposes, or as amended from time to time.
- 4.35 '**SD**' means standard deviation.
- 4.36 '**SLM**' means sound level meter.

- 4.37 **'Standard threshold shift (STS)'** means an average change in hearing of 10 **dB** or more at the frequencies of 2 000 **Hz**, 3 000 **Hz** and 4 000 **Hz** in one or both ears, as compared to the employee's **STS baseline audiogram**.
- 4.38 **'STS baseline'** means the initial audiometric value determined at the first **STS** testing, and it is the better of the employee's two audiograms performed by an audiometrist on the same day that do not differ from each other by more than 10 **dB** for any of the frequencies in the 2 000 **Hz**, 3 000 **Hz** and 4 000 **Hz** test ranges.

## 5 Scope

- 5.1 This guideline covers a basic occupational health programme to assist in protecting employees from occupational **NIHL**. It further provides for the measurement of occupational exposures to **noise** and the linking of these exposures to employee medical records.
- 5.2 By virtue of regulations 9.2(1) and 9.2(2) of the **MHSA**, the employer is required to:
- 5.2.1 Ensure that occupational exposure to **noise** is maintained below the **OEL**.
- 5.2.2 Establish and maintain a system of occupational hygiene measurements, as contemplated in section 12 of the **MHSA**, of all working places where the **noise** exposure level  $\geq 82$  **dB**  $L_{Aeq, 8h}$ .
- 5.3 This guideline will assist the employer to comply with these statutory requirements.
- 5.4 This guideline will also assist the employer in covering, in the COP:
- 5.4.1 A **noise monitoring** programme component of the **hearing conservation programme** (from  $\geq 82$  **dB**  $L_{Aeq, 8h}$ ).
- 5.4.2 A formal **hearing conservation** programme which includes medical surveillance ( $\geq 85$  **dB**  $L_{Aeq, 8h}$ ).

## 6 Members of the task team

- 6.1 Occupational hygiene review sub-committee:

| STATE        | EMPLOYEES | EMPLOYERS |
|--------------|-----------|-----------|
| C Kekana     | M Grant   | B Mongoma |
| N Mokhonoana | T Mpete   | W Deyssel |
| B Novolo     |           | K Motseme |
|              |           | S Talane  |

- 6.2 Occupational medicine review sub-committee:

| STATE         | EMPLOYEES  | EMPLOYERS  |
|---------------|------------|------------|
| Dr L Ndelu    | I Sakala   | Dr P Lakha |
| Dr D Mokoboto | N Prinsloo |            |
| M A Hlapane   |            |            |
| D Mahlaba     |            |            |

## **PART B AUTHOR'S GUIDE**

- 1 The **COP** must, where possible, follow the sequence laid out in Part C: Format and content of the **COP**. The pages as well as the Chapters and sections must be



- numbered to facilitate cross-referencing. Wording must be unambiguous and concise.
- 2 It should be indicated in the **COP**, and on each Annexure to the **COP** whether:
    - 2.1 The Annexure forms part of the **COP** and must be complied with or incorporated in the **COP**, or whether aspects thereof must be complied with or incorporated in the **COP**.
    - 2.2 The Annexure is merely attached as information for consideration in the preparation of the **COP** (ie compliance is discretionary).
  - 3 When Annexures are used the numbering should be preceded by the letter allocated to that particular Annexure and the numbering should start at one (1) again, (eg 1, 2, 3, A1, A2, A3).
  - 4 Whenever possible illustrations, tables, graphs and the like should be used to avoid long descriptions and/or explanations.
  - 5 When reference has been made in the text to publications or reports, references to these sources must be included in the text as footnotes or side notes as well as in a separate bibliography.

### **PART C**

#### **FORMAT AND CONTENT OF THE MANDATORY COP**

#### **1 Title page**

- 1.1 The **COP** should have a title page reflecting at least the following:
  - 1.1.1 Name of mine.
  - 1.1.2 The heading: 'Mandatory Code of Practice for an Occupational Health Programme for **Noise**'.
  - 1.1.3 A statement to the effect that the **COP** was drawn up in accordance with **DMRE** guideline, reference number **DMRE** 16/3/2/4-B7 issued by the **CIOM**.
  - 1.1.4 The mine reference number for the **COP**.
  - 1.1.5 The effective date.
  - 1.1.6 Revision dates (if applicable).
  - 1.1.7 Mine code number.

#### **2 Table of contents**

- 2.1 The **COP** must have a comprehensive table of contents.

#### **3 Status of the mandatory COP**

- 3.1 This section must contain statements to the effect that:
  - 3.1.1 The **COP** was drawn up in accordance with reference number **DMRE** 16/3/2/4-B7, issued by the **CIOM**.
  - 3.1.2 This is a mandatory **COP** in terms of section 9(2) and (3) of the **MHSA**.
  - 3.1.3 The **COP** may be used in an accident investigation/inquiry to ascertain compliance, and also to establish whether the **COP** is effective and fit for purpose.
  - 3.1.4 The **COP** supersedes all previous relevant **COPs**.
  - 3.1.5 All managerial instructions, recommended procedures (voluntary **COPs**) and standards on the relevant topics must comply with the **COP** and must be reviewed to ensure compliance.

#### 4 Members of the drafting committee

- 4.1 In terms of section 9(4) of the **MHSA** the employer must consult with the health and safety committee on the preparation, implementation or revision of any **COP**.
- 4.2 It is recommended that the employer should, after consultation with the employees in terms of the **MHSA**, appoint a committee responsible for the drafting of the **COP**.
- 4.3 The members of the drafting committee assisting the employer in drafting the **COP** should be listed giving their full names, designations, affiliations and experience. This committee must include competent persons, sufficient in number, to effectively draft the **COP**.

#### 5 General information

- 5.1 General relevant information relating to the mine must be stated in this section of the **COP**.
- 5.2 The following minimum information must be provided:
  - 5.2.1 A brief description of the mine and its location.
  - 5.2.2 The commodities produced.
  - 5.2.3 The mining method or the combination of methods used at the mine must be listed. This section must discuss the degree of mechanisation, taking care to identify the potential **noise** sources.
  - 5.2.4 Other related **COPs** and management standards must be reviewed concurrently in order to avoid conflict of requirements as laid down by the mine. The objective would be to have an integrated system.
  - 5.2.5 The unique features of the mine that have a bearing on this **COP** should be cross-referenced to the risk assessment conducted.

#### 6 Terms and definitions

- 6.1 Any word, phrase or term of which the meaning is not absolutely clear, or which will have a specific meaning assigned to it in the **COP**, must be clearly defined. Existing and/or known definitions should be used as far as possible. The drafting committee should avoid jargon and abbreviations that are not in common use or that have not been defined. The definitions section should also include acronyms and technical terms used.

#### 7 Risk management

- 7.1 Section 11 of the **MHSA** requires the employer to identify hazards, assess the health and safety risks to which employees may be exposed to while at work, and record the significant hazards identified and the risks assessed. The employer must determine how the significant risks identified in the risk assessment process must be dealt with. This should be done with regard to the requirement of section 11(2) and (3) of the **MHSA** that, as far as reasonably practicable, attempts should first be made to:
  - Eliminate the risk.
  - Thereafter, control the risk at source.
  - Thereafter, minimise the risk.
  - Thereafter, insofar as the risk remains, provide **PPE** and institute a programme to monitor the risk.

- 7.2 To assist the employer with the risk assessment, all possible relevant information such as health statistics, ergonomic studies, research reports, manufacturers' specifications, approvals, design criteria and performance figure for all relevant equipment should be obtained and considered.
- 7.3 In addition to the periodic review required by section 11(4) of the **MHSA**, the **COP** should be reviewed and updated after significant changes are introduced to procedures, mining and ventilation layouts, mining methods, plant or equipment, and material.

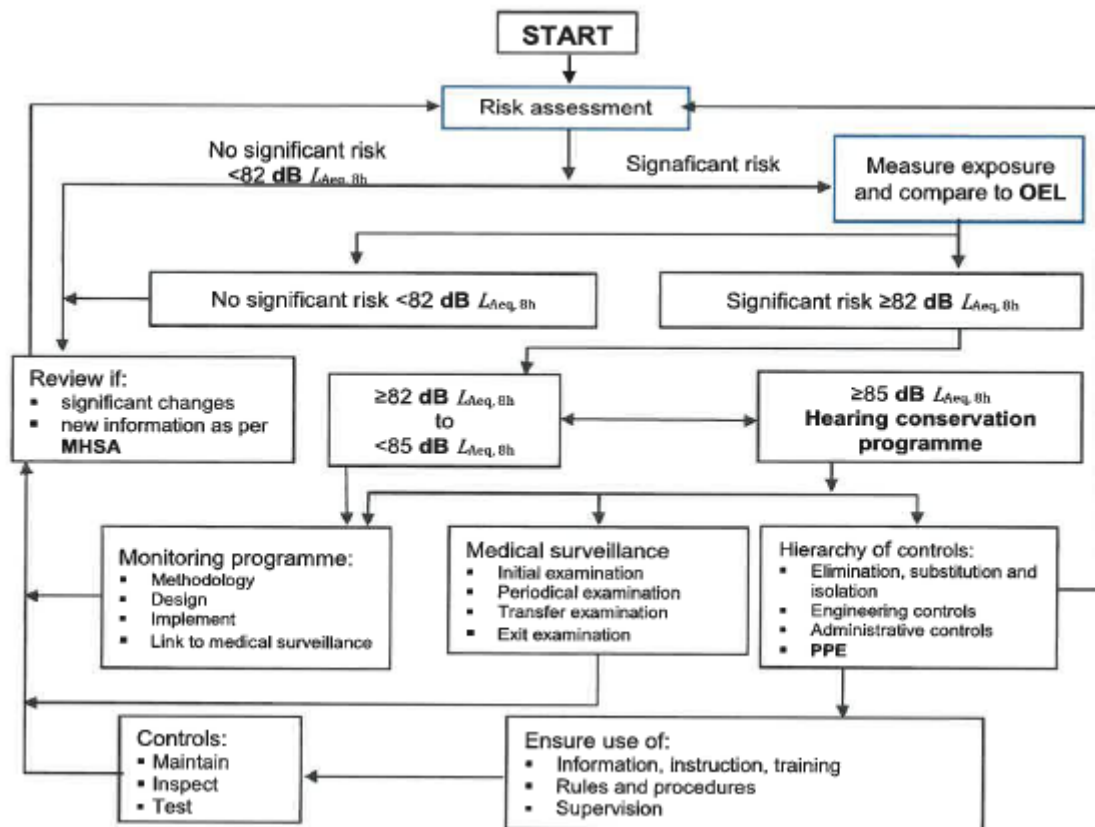
### 8 Aspects to be addressed in the COP

Every employer must establish and maintain a system of occupational hygiene measurements and a system of medical surveillance that addresses the following elements:

#### 8.1 Occupational health programme

The occupational health programme for **noise** to be implemented on the mine must be summarised in the **COP** in a flow chart similar to Figure 1 below.

**FIGURE 1: Occupational health programme for noise**



##### 8.1.1 Risk assessment

The **COP** should set out measures to ensure that:

- (i) A qualitative and quantitative risk assessment process is followed and considers all the factors influencing the health of employees.
- (ii) The outcomes of the risk assessment will be utilised as inputs into the occupational health programme.

- (iii) Risk assessment will be carried out by a multi-disciplinary team including, but not limited to, the section 12(1) appointee and section 13(3) appointee of the **MHSA**.
- (iv) Where the available historical data is not sufficient to enable professional judgement, acceptable risk assessment methodologies should be used.

**NOTE:**

Chapter 3 of the handbook published by the Safety in Mines Research Advisory Committee (SIMRAC), the *Handbook on Occupational Health Practice in the South African mining industry*, may be consulted, and any other methodology, to assist in conducting a risk assessment.

The **COP** must address the points set out below:

8.1.1.1 Baseline risk assessment

At the initial commencement of a system of occupational hygiene measurements, as contemplated in section 12(2) of the **MHSA**, a baseline risk assessment as contemplated in section 11 of the **MHSA** is to be conducted to assess the exposure to **noise**.

The **noise** baseline risk assessment must as a minimum, address the following:

- (a) Conducting of **noise** measurements as per the **noise monitoring** strategy specified.
- (b) The areas on surface or underground where such **noise** sources may be present eg stope, face, development end, workshops, crushers, etc.
- (c) The nature of the key working place operations and activities that pose the greatest potential for exposure to **noise**.
- (d) Prioritisation of the significant **noise** sources ie  $\geq 82$  **dB**A, for **noise** management purposes, based on the workplace **noise** measurements conducted.
- (e) The occupations and number of employees who are being exposed to significant **noise** levels ie  $\geq 82$  **dB**  $L_{Aeq, 8h}$ .
- (f) The pattern, ie intermittent, continuous etc, the duration and the frequency of employee exposure to **noise** sources identified.
- (g) The actual exposure levels measured compared to the **OEL** per working shift eg day shift and night shift. Where the available historical **noise** data is insufficient to enable professional judgement regarding the extent of any risk, acceptable statistical methodologies should be used for this determination process.
- (h) The control measures in place, ie substitution, engineering, administration (including education and training), **noise** demarcation zones, **PPE** etc.
- (i) The additional control measures required to be instituted to reduce or maintain to below the **OEL**

and, if applicable, the planned programme of implementation.

- (j) The frequency of any ongoing **monitoring** to assess the effectiveness of the controls.

**NOTE:**

For the purpose of risk assessment, the commodity codes (and description), activity codes (and description) and occupational codes (and description) as set out in Annexure A: Mandatory codes should be used.

8.1.1.2 Review of risk assessment

The **COP** must address the review of the risk assessment whenever circumstances arise or change at the mine that could have an impact on the original assessments and at least in the following instances:

- (a) When outcomes of medical surveillance programmes indicate the need for it.
- (b) When a section 11(5) investigation of the **MHSA** and/or any other investigation(s) indicates the need.
- (c) When new or revised legislation is introduced.
- (d) When new mining methods are introduced.
- (e) When process changes are introduced (eg in process plants).
- (f) When new types of machinery are introduced.
- (g) On an annual basis, based on the **noise** measurements conducted as per the **noise monitoring** strategy specified under 8.2.1.4 below of the previous cycle.

8.1.2 Management of risk

8.1.2.1 Non-significant risk

The employer should put measures in place to ensure that a portfolio of evidence for **noise** measurements  $< 82 \text{ dB } L_{Aeq, 8h}$  be established and maintained.

8.1.2.2 Significant risk

The employer must ensure that a system of **noise** measurements consisting of area, source and personal exposure **monitoring**, is implemented for all workplaces with a **noise** level of  $\geq 82 \text{ dB } L_{Aeq, 8h}$ .

8.2 Hearing conservation programme

The **COP** should put measures in place to ensure that a **hearing conservation programme** be established and maintained for all workplaces with a **noise** level of  $\geq 85 \text{ dB } L_{Aeq, 8h}$ .

The **hearing conservation programme** should address the following aspects:

8.2.1 Occupational hygiene

8.2.1.1 Structure of the **hearing conservation programme**

The **COP** should put measures in place for the development and implementation of a functional structure

with clearly defined roles and responsibilities based on the need to coordinate critical activities within the **hearing conversation programme**.

The employer should establish a **hearing conservation committee** and appoint the following members (but not limited to):

- (a) Employer representative (chairperson).
- (b) Section 12(1) appointee of the **MHSA**.
- (c) Engineer for **noise** control purposes.
- (d) Procurement representative.
- (e) **OMP** of the **MHSA**.
- (f) Human Resources Development representative (education and training).
- (g) Fulltime health and safety representative.

#### 8.2.1.2 Risk assessment

The outcomes of the risk assessment will be utilised as inputs into the **hearing conservation programme**.

#### 8.2.1.3 Determination of **HEGs**

The **COP** must address the points set out below:

8.2.1.3.1 The **HEGs** must be identified for purposes of personal exposure **monitoring**. The baseline risk assessment will enable the initial identification of **HEGs**, which will be established as follows:

##### **Step 1**

Sub-divide the mine into sampling areas (ie surface = sampling area 1, underground section A = sampling area 2, underground section B = sampling area 3, underground section C = sampling area 4, etc).

##### **Step 2**

The sub-division of the sampling areas into activity areas as per the activity area code list found under Annexure A: Mandatory codes which must be complied with.

##### **Step 3**

Ensure that adequate measurements of personal **noise** exposures (also refer to paragraph 8.2.1.4.3 below) are taken in line with the identified activity areas. If sufficient historical personal exposure data is not available regarding the extent of the risk, a personal **monitoring** survey must be undertaken for each identified activity area. Acceptable methodology on personal **monitoring** as stipulated by **SANS 10083** should be used for this assessment.

#### Step 4

A statistical analysis (Annexure B: **HEG** determination - example of statistical approach is attached for information purposes only) of the personal **noise** measurement results obtained from the previous **sampling cycle**, or baseline **noise** survey for new **HEGs**, should be conducted as part of the determination and evaluation of **HEGs**.

The results of the statistical analysis conducted for the determination and evaluation of each **HEG** should be compared to the classification bands for personal **noise**, tabled in Annexure C: Mandatory classification bands.

**NOTE:**

An activity area eg stoping is not a **HEG**, this activity area ie stoping, must be further subdivided into **HEGs**.

#### 8.2.1.3.2

At the end of each **sampling cycle** (annually at the end of a calendar year) sampling results for each **HEG** must be statistically analysed and re-classified. Re-classification of **HEGs** should be done by means of statistical analysis based on the 90<sup>th</sup> **percentile** of all measurement results for the previous **sampling cycle**.

The total number of exposed employees will be determined at the beginning of an annual reporting cycle and would only change if there is an increase in employees during the quarterly reporting cycle (exposed individuals are only counted once in an annual reporting cycle to prevent duplicate counting).

**NOTE:**

In the event where a number of employees changes from quarter to quarter, the employer must indicate such changes in the comments section of the reporting form.

Reduction in employees would not reduce the total number of exposed employees during the reporting cycle.

#### 8.2.1.3.3

**HEGs** must be re-assessed whenever circumstances arise or change at the mine when the following occurs:

- (a) Exposure levels change due to controls being initiated and likewise, when controls deteriorate.
- (b) Employee complaints are received.
- (c) Processes are changed (eg change in procedures, mining layouts, mining methods, plant, equipment or material).

- (d) Occupational illness related to **noise**.
- (e) A change in exposure category based on the results of a trend analysis.
- (f) Other events warranting re-evaluation such as:
  - (i) New technological data.
  - (ii) New regulatory initiatives.

#### 8.2.1.4 **Noise monitoring** strategy

The **COP** should cover the following types of **noise monitoring**:

##### 8.2.1.4.1 Area **noise monitoring**

The **COP** should set out measures to ensure the following:

- (a) Area **noise monitoring** should be conducted in accordance with **SANS 10083**.
- (b) Area **noise monitoring** should be conducted to determine the boundaries of **noise zones** for purposes of demarcation. The following should be considered:
  - (i) Assessment and prediction of **noise** exposure in all working places which may be accessed by any person.
  - (ii) The reduction of the 8-hour rating level where this is expected to exceed the **OEL** for **hearing conservation**.
  - (iii) The introduction of a prohibition to persons entering such a working place unless such person is adequately protected.
  - (iv) The introduction of a medical surveillance programme for all employees working in such working places.
  - (v) The introduction of a follow-up assessment programme as contemplated under (i) and (ii) above.
  - (vi) All **noise zones** to be clearly demarcated on a mine plan or sketch.

**NOTE:**

Personal **noise** exposure measurement results must not be used for the determination of **noise zones**.

##### 8.2.1.4.2 **Noise source monitoring**

The **COP** should set out measures to ensure the following:

- (a) The **noise source monitoring** should be conducted in accordance with the noise guidance note (Annexure F: Guidance note for **noise** measurement of equipment to ensure conformance with **MHSC** milestones attached is for information purposes only).



- (b) That **noise** source **monitoring** is conducted to identify and record **noise** source(s) from 82 **dba** for maintaining and managing purposes. (Annexure E: **Noise** register template is attached for information purposes only).
- (c) That the **noise** sources emitting **noise** level  $\geq$  **OEL** are included in the **hearing conservation programme** and managed by the appointed functional structure in terms of this **COP**.
- (d) The data collection on the **noise** sources will be based on sampling a minimum of 5% (or a minimum of five if there is less than 100 pieces of that particular equipment type) of that equipment type total population over a 12-month period (samples should be representative of the various activities).
- (e) **Noise** source data will be recorded using rolling log averages on a quarterly basis (Annexure E: **Noise** register template is attached for information purposes only).

**NOTE:**

Personal **noise** exposure measurement results must not be used for the determination of **noise** sources.

8.2.1.4.3 Personal **noise** exposure **monitoring**

The **COP** should set out measures to ensure the following:

- (a) The personal **noise monitoring** should be conducted in accordance with **SANS 10083**.
- (b) Personal exposure **monitoring** is conducted to obtain representative results of employee shift exposures in a workplace. Samples taken according to the established monitoring schedule should be:
  - (i) Evenly spread per quarter over a full **sampling cycle** period for each **HEG**.
  - (ii) Randomly spread over each quarter.
  - (iii) Randomly spread across all occupations within the **HEG**.
- (c) A sampling strategy including a **monitoring** schedule for each **HEG** is compiled for the cycle period (annually), and records thereof are kept in line with section 12(3) of **MHSA**.
- (d) Sampling size and frequency.
- (e) The total number of samples should be evenly spread per **HEG** (and occupations within the **HEG**) and should be taken as per classification bands in Annexure C: Mandatory classification bands as per the following:
  - (i) Category A: 5% or five samples (whichever is greater) per quarter.

- (ii) Categories B and C: 5% or five samples (whichever is greater) per annum, to be evenly spread per quarter.
- (iii) Category D: sampling scheduled for this category. Measurement results that are below 82 **dB(A)** of the **OEL** will be reported under this category. A portfolio of evidence should be kept.
- (f) A section 12(1) appointee of the **MHSA** should use their professional judgment to decide whether additional samples need to be taken to confirm that **HEGs** are appropriately classified.

#### 8.2.1.5 Quality control

The **COP** must set out measures to ensure a quality control programme is developed and implemented, taking into account the following, but not limited to:

- (a) Instrumentation(s) used for a **noise monitoring** strategy must comply with the **SANS 10083**.
- (b) Measurement methods.
- (c) Competency of people conducting **noise** measurements.
- (d) Reporting.
- (e) Maintenance and calibration.
- (f) The training programme in place for a person conducting the **noise** measurements to take into account the following (but not limited to):
  - (i) Storage and maintenance of the sampling equipment.
  - (ii) Issuing of the sampling equipment.
  - (iii) Wearer of the sampling equipment.
  - (iv) Handling of the sampling equipment.
  - (v) Transportation of equipment.
  - (vi) Pre- and post-calibration of the measuring instrumentation checks.

**NOTE:**

Refer to Annexure G: Quality assurance for **noise** measurement and recording.

#### 8.2.1.6 Reporting and recording

The **COP** should address the following:

##### 8.2.1.6.1 Mandatory reports

Mandatory reporting must be done on a quarterly basis for all categories, that is A, B and C (refer to Annexure C: Mandatory classification bands and Annexure D: Reporting forms).

**NOTE:**

- For all categories A, B and C, the measurement results on the samples taken at that time must be reported within 60 days at the end of each quarter. The logarithmic average results must be reported at the end of each quarter.
- For category D, no reporting is required, however a portfolio of evidence should be kept at the mine.

To calculate the logarithmic average exposure for a given **HEG** or an occupation/a job category, the equation below should be used:

$$L_{Aeq} = 10 \log \frac{(\text{anti log } \frac{L_1}{10} + \text{anti log } \frac{L_2}{10} + \text{anti log } \frac{L_3}{10} + \text{anti log } \frac{L_4}{10} + \dots)}{n}$$

Where:

- $L$  = the noise levels measured ( $L_{Aeq}$ ) in **dB(A)**.
- $n$  = number of total samples

8.2.1.6.2 Record keeping system

A record keeping system, which records the exposure history of each **HEG** at the mine, and any other **noise monitoring** records eg calibration certificates, sampling sheets, etc, should be kept and be readily available at the mine, including any reasons for deviation on sample results such as:

- (a) Controls not operating effectively.
- (b) Events or factors which have influenced the results, eg excessive winds.

8.2.1.7 Occupational hygiene

The **COP** should stipulate how the hierarchy of controls have been applied as per the **hearing conservation programme**, considering the following:

- (a) Elimination.
- (b) Substitution and isolation.
- (c) Engineering controls.
- (d) Administrative controls.
- (e) **PPE**.

8.2.2 Medical surveillance

Sections 13(2)(c) and 17 of the **MHSA** requires for a system of medical surveillance to consist of an initial medical examination, other (periodic) medical examinations at appropriate intervals, and an exit medical examination.

Regulation 11.4(2) of the **MHSA** read with sections 11(3) and 11(4) of the **MHSA** provides that the system of medical surveillance in respect of **noise** must consist of:

- (a) A **baseline audiogram**.
- (b) Periodic audiograms.
- (c) An exit audiogram.

- (d) Any additional medical surveillance required in terms of the employer's risk assessment.

#### 8.2.2.1 Audiometry

This section details the requirements for audiometric testing procedures to be applied where a **hearing conservation programme** is required, ie where **noise** control engineering has not been possible or has failed to eliminate the **noise** hazard.

Audiometric testing in the absence of appropriate control measures cannot reduce the risk of **NIHL** and should not be regarded as a solution to the **noise** hazard, but as a means of identifying and prioritising problem areas to enable the formulation of appropriate interventions.

In conducting audiometric testing, the following should comply with **SANS 10083**:

- 8.2.2.1.1 Test frequencies for pure tone audiometric tests.
- 8.2.2.1.2 Test environment.
- 8.2.2.1.3 Audiometric equipment.
- 8.2.2.1.4 Maintenance and calibration of audiometric equipment.
- 8.2.2.1.5 Audiometric screening procedures:
  - (a) Screening audiometric tests should include confirmation of non-exposure to **noise** levels  $\geq 85$  **dB** for at least 16 hours, otoscopic evaluation and pure-tone air conduction testing.
  - (b) Before testing, an otoscopic examination should be conducted to ensure that there is no occluding ear wax nor any visible abnormality such as otitis media, perforation or other ear pathology, or any combination of these, that could result in the hearing loss and that (where applicable). Referral for ear wax removal to a medical practitioner for successful treatment is completed before testing is done.

#### 8.2.2.2 Mandatory audiometric testing

The employer must conduct audiometric tests at no cost to the employee. The test must be conducted by a registered audiometrist or acoustician, under the supervision of an **ENT specialist, OMP** or an audiologist.

##### 8.2.2.2.1 Baseline audiometry

- (a) The employer must provide for audiometric testing of the employees' hearing sensitivity for the purpose of establishing a valid **baseline audiogram** before an employee commences employment, or within 30 days of commencement of employment, or commencement of work within a **noise zone** and enrolment in a **hearing conservation programme**. A valid baseline result determined at a previous working place, shall satisfy this requirement provided that it meets the audiometric

test requirement of this document. **Baseline audiograms** should be used to:

- (i) Determine future compensable hearing loss.
  - (ii) Determine the hearing status of an employee.
- (b) The audiometric test must be preceded by a period of at least 16 hours during which there has been no exposure to noise levels  $\geq 85$  dB. The use of hearing protection devices during this period that comply with the requirements of **SANS 1451** will not satisfy this requirement.

The employee should not be allowed to commence work or enter any **noise zones** prior to the conclusion of the two audiometric evaluations forming part of the determination of the employee's **baseline audiogram**.

- (c) A **baseline audiogram** should be conducted using screening audiometry and where the results show an abnormality, the employee should be referred to the audiologist to establish a baseline as per **SANS 10083** diagnostic battery of tests given under 8.2.2.4.3 below.

When it is not possible to obtain a valid baseline audiometric test result, the test should be repeated within 30 days of employment, or before transfer to a **noise zone**.

- (d) Before repeating tests to establish a baseline, it should be ensured that:
- (i) The employee understands the audiometric testing procedure and is capable of responding in the required manner, re-instructing should be done when necessary.
  - (ii) The audiometric testing procedure is conducted correctly with equipment complying with the requirements laid down in this document.
  - (iii) There is no interference (such as environmental **noise**) or faulty equipment (such as a patient response button working intermittently) that could prevent the successful completion of valid baseline testing.
  - (iv) The particular tests used to determine a valid baseline were conducted on the same day. Results obtained on a previous day should be discarded and not used together with results obtained on another day to obtain a valid result.

When it is not possible for the audiometrist, after repeated testing, to obtain a valid baseline test result, the employee should be referred to an

audiologist to establish a valid **baseline audiogram**.

**NOTE:**

The instruction 171 baseline (refer to Annexure H: Instruction 171) that is done on a person entering the mining industry for the first time will be the baseline for the rest of his/her working career.

The **STS baseline audiograms** would have been completed by December 2017, as per the **DMRE** guidance note for the implementation of **STS** in the medical surveillance of **NIHL**. This baseline is repeated at every new employer, because it is used for the purpose of assisting the employer in preventing **NIHL**.

For someone entering the mining industry for the first time the instruction 171 **baseline audiogram** may be used as the **STS baseline audiogram**, at the first employer only.

8.2.2.2.2 Revised baseline audiometry

- (a) The instruction 171 baseline is revised when the employee has been compensated for **NIHL**, in which case the compensation audiogram becomes the new baseline.
- (b) The **STS baseline** is revised when there is an average change in hearing of 25 **dB** or more, at the frequencies of 2 000 **Hz**, 3 000 **Hz** and 4 000 **Hz** in one or both ears, as compared to the employee's **STS baseline audiogram**.
- (c) Both revised baselines must be diagnostic audiograms.

8.2.2.2.3 Initial screening audiometry

During an initial medical examination for an employee, the employer must conduct two screening audiograms to obtain the **STS baseline**. In the case of a person entering the mining industry for the first time, this would also serve as the instruction 171 baseline.

8.2.2.2.4 Periodic screening audiometry

(a) Periodic audiometry

The employer must conduct periodic audiometric evaluations on an annual basis for all employees having **noise** exposure levels that equal or exceed 85 **dB**A. Where employees are exposed to an 8-hour rating level equal to or in excess of 105 **dB**A, tests should be conducted at intervals not exceeding six months.

- (i) Periodic audiometric evaluation shall be preceded by a period of at least 16 hours during which there has been no exposure to **noise** levels that is equal to or in excess of 85 **dB**A. The use of hearing protection devices

during this period, even if it complies with the attenuation requirements of **SANS 10083**, will not satisfy this requirement.

- (ii) Before testing, an otoscopic examination shall be conducted on the external ear canals of an employee. It should be ensured that there is no visible abnormality such as otitis media, perforation or other ear pathology (or a combination of these) that could result in the hearing loss. Where required, successful treatment shall be completed before testing is done.
  - (iii) Obtain and record the medical history of the employee with relevance to previous traumatic incidents, medical treatment, ototoxic medication or other non-auditory events, which could have an effect on the hearing of an employee.
- (b) Periodic audiometry shall be used to determine:
- (i) The occurrence and extent of any **STS** ie to determine the need for further investigation, and to monitor the efficiency of the **hearing conservation programme**.
  - (ii) Whether a **PLH** shift of 10 has occurred for compensable hearing loss.
  - (iii) Whether the **PLH** shift of five has occurred for new early **NIHL**.
- (c) If a periodic audiometric result shows a new **PLH** shift of five or more, or a new **STS** of 25 **dB** from baseline, the employer shall refer the employee to an audiologist for diagnostic audiogram. Diagnostic battery of tests are given in 8.2.2.4.3 below.

#### 8.2.2.3 Investigations

- (a) When the periodic screening audiogram indicates the following, the employer must investigate and refer the employee for the following further intervention:
  - (i) Early **NIHL** (intervals of a **PLH**  $\geq$  5).
  - (ii) Investigating the reason for the shift (re-testing including otoscopic examinations).
  - (iii) **STS**  $\geq$  25 **dB**; referral of the employee to an **OMP**.
  - (iv) Compensable hearing loss (intervals of **PLH**  $\geq$  10 from the baseline audiometry); referral for diagnostic audiology or **ENT specialist**.
- (b) An analysis is required as to the contribution of **noise** exposure to the hearing loss of the employee by reconciling the contributing factors to an employees' hearing loss.

- (c) The diagnostic audiogram(s) must be performed to confirm that the above-mentioned **PLH** or **STS** is work related, a section 11(5) investigation of the **MHSA** must be initiated and may include amongst others, the following interventions:
- (i) Retraining of employees regarding the **hearing conservation programme** and the use of hearing protectors.
  - (ii) The hearing protection devices used by the employee should be carefully inspected for possible shortcomings or inadequacies, and if necessary be refitted with alternative hearing protectors before allowed to re-enter the **noise zone**.
  - (iii) Any necessary identified steps to be taken to prevent a possible further **STS** or **PLH** shift.
- (d) The employer should report all cases of confirmed compensable **NIHL** to the relevant authority, as per relevant legislation.

#### 8.2.2.4 Diagnostic audiometry

- 8.2.2.4.1 Diagnostic audiometry testing should be conducted by an audiologist to determine early **NIHL** (intervals of a **PLH**  $\geq 5$ ) or **STS**  $\geq 25$  **dB** or compensable hearing loss (intervals of **PLH**  $\geq 10$ ), according to the relevant legislation and the guidance note for the implementation of **STS** in medical surveillance of **NIHL**.
- 8.2.2.4.2 Diagnostic audiometry must be conducted using the equipment in accordance with the relevant requirements specified in **SANS 10083**.
- 8.2.2.4.3 The following battery of tests investigations may be done by the audiologist during diagnostic testing:
- (a) An otoscopic investigation to determine any visible pathology which could have led to the loss of hearing.
  - (b) A diagnostic test in accordance with the relevant legislation to calculate the **PLH** and **STS**.
  - (c) A pure tone conduction test at least at the frequencies as per **SANS 10083**.
  - (d) A bone conduction test at least at the test frequencies as per **SANS 10083**.
  - (e) A speech reception threshold test.
  - (f) A speech discrimination test.
  - (g) A full immittance test battery including tympanometry, ipsi- and contralateral acoustic reflex testing.





**noise zone.** The record of the audiometric evaluations shall form part of the individual's medical surveillance records and be retained in accordance with legal requirements [section 15(1) and (2), and 17 of the **MHSA**].

- (b) Audiometry evaluation for exit shall be preceded by a period of at least 16-hours during which there has been no exposure to **noise** levels greater or equal to 85 **dB**A. The use of hearing protection devices during this period, even if it complies with the requirements of **SANS 1451** (parts 1, 2 or 3), will not satisfy this requirement.
- (c) The following actions are applicable for exit audiometric evaluations:
- (i) The individual's **PLH** shall be derived from the audiometric evaluation using the approved frequency-specific tables and compared with the **PLH** derived from the **baseline audiogram**.
- (ii) Where the audiometric evaluation indicates an increase in **PLH** of 10 or greater relative to the baseline audiometric evaluation, and is confirmed by repeat audiometry evaluations, the individual shall be referred for diagnostic audiometry. If no **baseline audiogram** is available, it will be assumed that the individual's hearing was normal before exposure to **noise**.
- (iii) Where an individual is referred for a diagnostic audiogram as contemplated in the preceding point, the **PLH** derived from it, and any increase in **PLH** relative to the **baseline audiogram**, shall be entered in the individual's record of medical surveillance [section 17(4)(b) of the **MHSA**]. If the diagnostic audiogram confirms a **PLH** shift of 10 or more, the employee should be referred to the relevant compensation body.
- (v)[sic] The audiogram and the **PLH** derived from it shall be recorded on the individual's exit certificate [section 17(1)-(4) of the **MHSA**], and a copy of the exit certificate shall be entered in the individual's record of medical surveillance [section 17(4)(b) of the **MHSA**].
- (vi)[sic] Any employee diagnosed with a **PLH** shift of 5% or an **STS** of 25 **dB** for the first time on exit should have the relevant investigation as stated in 8.2.2.3 above.

- (d) The employer must ensure that the employee is given a copy of the following on exit:
  - (i) The employee's exit certificate.
  - (ii) A copy of the employee's record of hazardous work (**DMRE 276**).
  - (iii) Baseline audiometric evaluation results.
  - (iv) The results of the exit audiometric test.

#### 8.2.2.6 Confidentiality

Employees' records of medical surveillance must be kept confidential in line with section 15(1) of the **MHSA**.

Ethical standards should be followed by all professionals involved in the **hearing conservation programme** referred to in this document.

### 8.2.3 Training and awareness of employees

8.2.3.1 The employer must provide training to employees exposed to **noise** levels  $\geq 82$  **dB**A within 30 days of employment and periodic training must be conducted at intervals of at least 12 months.

Training must include the following:

- (a) The effects of **noise** on hearing.
- (b) The purpose and value of wearing hearing protectors.
- (c) The advantages and disadvantages of the hearing protectors to be offered.
- (d) The various types of hearing protectors offered by the employer and the care, fitting and use of each type.
- (e) The employer shall make copies of this guideline available to affected employees or their representatives, and shall keep a copy at the workplace.
- (f) The employers' and employees' respective responsibilities in maintaining mine **noise** controls.
- (g) The purpose and value of audiometric testing and a summary of the procedures.

8.2.3.2 The employer must keep proof of records of all formal training for each employee indicating the date and content. The employer shall provide, upon request, all materials relating to the employees' training and education programme pertaining to this guideline to the **DMRE**. It is recommended that employers also keep records of all informal training regarding **noise** at the workplace.

### 8.3 Recording and reporting

The **COP** should address the following:

#### 8.3.1 Record keeping system

A record keeping system, which records the **exposure** history of each **HEG**, and the employee's medical surveillance records should be kept as per the relevant legislative requirements (section 12 and 13 of the **MHSA**) and these records should be readily available at the mine.

#### 8.3.2 Occupational medicine reporting

##### 8.3.2.1 Health incident reporting

Reporting of the **NIHL** cases must be done on the **DMRE** 231 reporting form within 30 days of diagnosis.

##### 8.3.2.2 Annual medical reporting

All cases of compensable **NIHL** must be reported on an annual basis to the **DMRE** on the **DMRE** 165 form.

### 8.4 Linking to medical surveillance records

This **COP** must describe a system in place that addresses the linkage between occupational hygiene measurements and the medical surveillance records as contemplated in section 12(3) of the **MHSA**.

### 8.5 Compensation

For compensation of **NIHL** refer to instruction 171 (Annexure H: Instruction 171).

## **PART D IMPLEMENTATION**

### **1 Implementation plan**

- 1.1 The employer must prepare an implementation plan for its **COP** that makes provision for issues such as organisational structures, responsibilities of functionaries and, programmes and schedules for the **COP** that will enable proper implementation of the **COP**. (A summary of and a reference to, a comprehensive implementation plan may be included).

### **2 Compliance with the COP**

- 2.1 The employer must institute measures for **monitoring** and ensuring compliance with the **COP**.

### **3 Access to the COP and related documents**

- 3.1 The employer must ensure that a complete **COP** and related documents are kept readily available at the mine for examination by any affected person.
- 3.2 A registered trade union with members at the mine or where there is no such union, a health and safety representative at the mine, or, if there is no health and safety representative, an employee representing the employees at the mine, must be provided with a copy on written request to the manager. A register must be kept of such persons or institutions with copies to facilitate updating of such copies.
- 3.3 The employer must ensure that all employees are fully conversant with those sections of the **COP** relevant to their respective areas of responsibilities.

## ANNEXURE A MANDATORY CODES

*(This Annexure forms part of the guideline and must be complied with)*

### 1 Main Commodity Code List

The main commodity being produced by the mine.

| COMMODITY                    | CODE | COMMODITY                          | CODE |
|------------------------------|------|------------------------------------|------|
| Asbestos                     | AS   | Malmesbury Hornfels                | MH   |
| Attapulgitite                | AP   | Manganese                          | MN   |
| Bentonite                    | BT   | Marble                             | MB   |
| Calcrete                     | CA   | Mercury                            | HG   |
| Cement                       | CE   | Mica                               | MC   |
| Chrome                       | CR   | Mineral-pigments                   | MP   |
| Clay                         | CY   | Montmorillonite                    | MM   |
| Coal                         | CL   | Nepheline                          | NP   |
| Cobalt                       | Co   | Nickel                             | Ni   |
| Copper                       | CU   | Norite                             | NR   |
| Diamonds                     | DI   | Perlite                            | PL   |
| Dolerite                     | DR   | Phosphates                         | PH   |
| Dolomite                     | DM   | Platinum group metals              | PT   |
| Dwyka                        | DK   | Prospecting (unspecified minerals) | PR   |
| Emeralds                     | EM   | Pyrophyllite                       | PY   |
| Feldspar                     | FD   | Quartzite                          | QZ   |
| Felsite                      | FT   | Quartzite dimension stone          | QD   |
| Fireclay                     | FII  | Salt                               | NA   |
| Flintclay                    | FY   | Sand                               | SA   |
| Fluorspar                    | FS   | Shale                              | SH   |
| Fullers-earth                | FU   | Silica                             | SI   |
| Gas and condensate (MOSSGAS) | GC   | Silicon-metal                      | SM   |
| Gold                         | AU   | Sillimanite                        | ST   |
| Granite                      | GT   | Slag                               | SG   |
| Granite dimension stone      | GD   | Slate Dimension Stone              | SD   |
| Gravel                       | GV   | Soil                               | SL   |
| Gypsum                       | GS   | Talc                               | TC   |
| Ilmenite                     | IL   | Tigers-eye                         | TE   |
| Iron-ore                     | FE   | Tin                                | SN   |
| Jasper                       | JP   | Titanium                           | TN   |
| Kaolin                       | KA   | Uranium                            | UR   |
| Kieselguhr                   | KG   | Vanadium                           | VA   |
| Lead                         | PB   | Wollastonite                       | WS   |
| Limestone                    | LS   | Zinc                               | ZN   |
| Magnesite                    | MA   |                                    |      |

### 2 Activity Area Code List

Alphabetical index of the activity areas.

| ACTIVITY AREA              | CODE |
|----------------------------|------|
| Assay/laboratory           | 32   |
| Chemical process           | 27   |
| Concentrating              | 24   |
| Conventional mining (coal) | 01   |

|                                   |           |
|-----------------------------------|-----------|
| Continuous miner (coal)           | <b>02</b> |
| Crushing                          | <b>20</b> |
| Development (single shift)        | <b>09</b> |
| Development (multi-blast)         | <b>10</b> |
| Dumps/dump recycling              | <b>34</b> |
| Final products                    | <b>29</b> |
| Ground handling (conveyor/loco's) | <b>15</b> |
| Handgot (coal)                    | <b>04</b> |
| Heat process                      | <b>25</b> |
| Longwall mining (coal)            | <b>03</b> |
| Milling/pulverising               | <b>21</b> |
| Opencast                          | <b>07</b> |
| Raise boring/Dry drilling         | <b>12</b> |
| Raw material                      | <b>19</b> |
| Refining                          | <b>28</b> |
| Rock mining coal                  | <b>06</b> |
| Roving plant                      | <b>30</b> |
| Roving surface                    | <b>31</b> |
| Roving underground                | <b>17</b> |
| Scraper block caving              | <b>14</b> |
| Screening/grading                 | <b>22</b> |
| Separation processes              | <b>23</b> |
| Shaft sinking                     | <b>11</b> |
| Shafts and services               | <b>16</b> |
| Smelting                          | <b>26</b> |
| Stooping/pillar extraction (coal) | <b>05</b> |
| Stoping                           | <b>08</b> |
| Surface Workshops                 | <b>33</b> |
| Trackless Mining                  | <b>13</b> |
| Underground workshops             | <b>18</b> |

### **3 Occupation Code List**

Alphabetical index of the occupational codes.

| <b>OCCUPATION</b>  | <b>CODE</b>  |
|--|--------------|
| Acclimatisation supervisor                               | <b>70301</b> |
| Acclimatisation worker                                   | <b>70302</b> |
| Accommodation worker (other accommodation) [nec]         | <b>80699</b> |
| Accommodation worker (residential) [nec]                 | <b>80599</b> |
| Accountant [nec]   | <b>10206</b> |
| Accounting/financial management                          | <b>10200</b> |
| Accounting/financial worker [nec]                        | <b>10299</b> |
| Acid plant official                                      | <b>30402</b> |
| Acid plant worker  | <b>30404</b> |
| Administration/secretarial management                    | <b>10900</b> |
| Administrative officer                                   | <b>10903</b> |
| Administrative/financial management (multi-disciplinary) | <b>10000</b> |
| Administrative/financial management [nec]                | <b>10099</b> |
| Administrative/financial/business worker [nec]           | <b>19999</b> |

|   |              |
|---|--------------|
| Advocate/barrister                            | <b>60601</b> |
| Agricultural management (multi-disciplinary)  | <b>90000</b> |
| Agricultural management [nec]                 | <b>90099</b> |
| Agricultural worker [nec]                     | <b>99999</b> |
| Air conditioning/refrigeration engineer       | <b>40412</b> |
| Air conditioning/refrigeration mechanic       | <b>40413</b> |
| Air transport management                      | <b>81100</b> |
| Air transport officer                         | <b>81101</b> |
| Air transport worker [nec]                    | <b>81199</b> |
| Air and water services team leader/supervisor | <b>21507</b> |
| Air and water services worker                 | <b>21508</b> |
| Airport controller                            | <b>81102</b> |
| Amalgamator                                   | <b>30110</b> |
| Ambulance officer                             | <b>70803</b> |
| Anaesthetist                                  | <b>70101</b> |
| Aptitude tester                               | <b>60106</b> |
| Aptitude testing supervisor                   | <b>60105</b> |
| Aqua-jet operator                             | <b>21406</b> |
| Architect                                     | <b>50901</b> |
| Architectural assistant                       | <b>50902</b> |
| Architectural management                      | <b>50900</b> |
| Architectural worker [nec]                    | <b>50999</b> |
| Armature winder                               | <b>40320</b> |
| Assay/chemistry/laboratory worker [nec]       | <b>50499</b> |
| Assay technician                              | <b>50403</b> |
| Assayer                                       | <b>50401</b> |
| Assistant driller (ocean)                     | <b>29909</b> |
| Assessor                                      | <b>10511</b> |
| Assopulp worker                               | <b>35910</b> |
| Attorney/solicitor/conveyancer                | <b>60602</b> |

| <b>OCCUPATION</b>               | <b>CODE</b>  |
|---------------------------------|--------------|
| Audio visual tester             | <b>70303</b> |
| Audiologist/speech therapist    | <b>70322</b> |
| Audiometrist                    | <b>70323</b> |
| Auditing management             | <b>10100</b> |
| Auditing worker [nec]           | <b>10199</b> |
| Auditor (computer/systems)      | <b>10102</b> |
| Auditor (internal and external) | <b>10101</b> |
| Auto electrician                | <b>40319</b> |
| Backfill worker                 | <b>20805</b> |
| Baker                           | <b>35020</b> |
| Banking officer                 | <b>11114</b> |
| Banking/investment management   | <b>11100</b> |
| Banking/investment worker [nec] | <b>11199</b> |
| Banksman/onsetter               | <b>21304</b> |
| Bargemaster (ocean)             | <b>81202</b> |
| Barber/hairdresser              | <b>80803</b> |
| Barman                          | <b>80706</b> |
| Barrister/advocate              | <b>60601</b> |

|   |              |
|---|--------------|
| Beer maker  | <b>35110</b> |
| Beerhall supervisor                                 | <b>80705</b> |
| Bell signaller                                      | <b>21305</b> |
| Beltsman  | <b>30205</b> |
| Bio-medical engineer                                | <b>70304</b> |
| Biokineticist                                       | <b>70102</b> |
| Blacksmith  | <b>40422</b> |
| Blacksmith: apprentice                              | <b>40424</b> |
| Blacksmith: chargehand                              | <b>40421</b> |
| Blacksmith: foreman                                 | <b>40420</b> |
| Blacksmith: operative                               | <b>40423</b> |
| Blacksmith: worker [nec]                            | <b>40425</b> |
| Blaster (supervisory)                               | <b>20306</b> |
| Blaster: opencast/quarry (non-supervisory)          | <b>20502</b> |
| Blaster: surface works (non-supervisory eg smelter) | <b>20503</b> |
| Blaster: underground metal (non-supervisory)        | <b>20501</b> |
| Blasting worker [nec]                               | <b>20599</b> |
| Boiler attendant                                    | <b>40803</b> |
| Boilermaker: operative (grade 1)                    | <b>40450</b> |
| Boilermaker: operative (aide) (grade 2)             | <b>40451</b> |
| Book binder   | <b>36015</b> |
| Bosun (ocean)                                       | <b>81202</b> |
| Bookkeeper  | <b>10208</b> |
| Box/orepass controller                              | <b>21404</b> |
| Brick maker   | <b>36710</b> |
| Bricklayer  | <b>40614</b> |
| Bricklayer: aide                                    | <b>40617</b> |
| Builder   | <b>40615</b> |
| Building service worker [nec]                       | <b>80499</b> |
| Building services management                        | <b>80400</b> |

| <b>OCCUPATION</b>                | <b>CODE</b>  |
|----------------------------------|--------------|
| Building worker [nec]            | <b>40618</b> |
| Building worker: operative       | <b>40616</b> |
| Business analyst (computers)     | <b>50503</b> |
| Business management              | <b>10001</b> |
| Butcher                          | <b>35010</b> |
| Buyer/purchaser                  | <b>10312</b> |
| Cable joiner                     | <b>40343</b> |
| Calcinating worker               | <b>30508</b> |
| Canteen supervisor               | <b>80701</b> |
| Canteen worker                   | <b>80703</b> |
| Caretaker/housekeeper            | <b>80501</b> |
| Carpenter                        | <b>40621</b> |
| Carpenter and joiner             | <b>40622</b> |
| Carpenter and joiner: apprentice | <b>40623</b> |
| Carpenter and joiner: chargehand | <b>40620</b> |
| Carpenter and joiner: foreman    | <b>40619</b> |
| Carpenter: aide                  | <b>40624</b> |
| Carpenter: worker [nec]          | <b>40625</b> |



|   |              |
|---|--------------|
| Cashier                                 | <b>10209</b> |
| Caster                                  | <b>30507</b> |
| Catering management                     | <b>80700</b> |
| Cementer (ocean)                        | <b>21699</b> |
| Catering worker [nec]                   | <b>80799</b> |
| Cementation driller/injector            | <b>21602</b> |
| Cementation supervisor                  | <b>21601</b> |
| Cementation worker [nec]                | <b>21699</b> |
| Chairlift operator                      | <b>21307</b> |
| Chairman (group)                        | <b>00000</b> |
| Change house team leader/supervisor     | <b>80604</b> |
| Change house worker                     | <b>80605</b> |
| Checker                                 | <b>10395</b> |
| Chef/cook                               | <b>80702</b> |
| Chemical engineer                       | <b>40701</b> |
| Chemical engineering management         | <b>40700</b> |
| Chemical engineering worker [nec]       | <b>40799</b> |
| Chemical process worker [nec]           | <b>30499</b> |
| Chemist                                 | <b>50402</b> |
| Chemist technician                      | <b>50404</b> |
| Chief executive                         | <b>00000</b> |
| Child minder                            | <b>80802</b> |
| Chiropodist/podiatrist                  | <b>70320</b> |
| Cinema/video operator                   | <b>60805</b> |
| Civil engineer                          | <b>40601</b> |
| Civil engineering management            | <b>40600</b> |
| Civil engineering technician            | <b>40610</b> |
| Civil engineering worker [nec]          | <b>40699</b> |
| Civil/building chargehand (other) [nec] | <b>40651</b> |
| Civil/building foreman (other) [nec]    | <b>40650</b> |

| <b>OCCUPATION</b>                      | <b>CODE</b>  |
|--|--------------|
| Civil/building tradesman (other) [nec] | <b>40652</b> |
| Cleaner (office)/tea maker             | <b>80402</b> |
| Clerk of works                         | <b>40611</b> |
| Clerk (accounts/finance)               | <b>10295</b> |
| Clerk (agriculture) [nec]              | <b>99995</b> |
| Clerk (air transport)                  | <b>81195</b> |
| Clerk (architectural)                  | <b>50995</b> |
| Clerk (auditing)                       | <b>10195</b> |
| Clerk (banking/investment)             | <b>11195</b> |
| Clerk (catering)                       | <b>80795</b> |
| Clerk (club)                           | <b>80695</b> |
| Clerk (creative arts)                  | <b>60995</b> |
| Clerk (economics)                      | <b>10795</b> |
| Clerk (engineering planning)           | <b>40195</b> |
| Clerk (engineering)                    | <b>49995</b> |
| Clerk (environmental)                  | <b>51095</b> |
| Clerk (estate/township)                | <b>80395</b> |
| Clerk (first aid)                      | <b>70895</b> |

|                                 |              |
|---------------------------------|--------------|
| Clerk (general eg filing) [nec] | <b>10995</b> |
| Clerk (geology)                 | <b>50195</b> |
| Clerk (hostel/quarters)         | <b>80595</b> |
| Clerk (industrial engineering)  | <b>50795</b> |
| Clerk (industrial relations)    | <b>60295</b> |
| Clerk (insurance)               | <b>10595</b> |
| Clerk (legal)                   | <b>60695</b> |
| Clerk (library)                 | <b>60795</b> |
| Clerk (marketing/sales)         | <b>10895</b> |
| Clerk (medical)                 | <b>79995</b> |
| Clerk (metallurgical plant)     | <b>39995</b> |
| Clerk (mining planning)         | <b>20195</b> |
| Clerk (mining) [nec]            | <b>29995</b> |
| Clerk (payroll/timekeeping)     | <b>10495</b> |
| Clerk (personnel)               | <b>60195</b> |
| Clerk (printing)                | <b>36095</b> |
| Clerk (property/mining rights)  | <b>10695</b> |
| Clerk (public relations)        | <b>60895</b> |
| Clerk (rail transport)          | <b>81095</b> |
| Clerk (road transport)          | <b>80995</b> |
| Clerk (rock mechanics)          | <b>50395</b> |
| Clerk (safety/loss control)     | <b>50895</b> |
| Clerk (school)                  | <b>60495</b> |
| Clerk (security)                | <b>80195</b> |
| Clerk (sports/recreation)       | <b>61095</b> |
| Clerk (statistics)              | <b>50695</b> |
| Clerk (stores)                  | <b>10395</b> |
| Clerk (strategic planning)      | <b>00295</b> |
| Clerk (survey)                  | <b>50295</b> |
| Clerk (tax)                     | <b>11295</b> |

| <b>OCCUPATION</b>                          | <b>CODE</b>  |
|--|--------------|
| Clerk (training)                           | <b>60395</b> |
| Clerk (welfare)                            | <b>60595</b> |
| Clinical assistant                         | <b>70202</b> |
| Club management                            | <b>80600</b> |
| Club secretary                             | <b>80601</b> |
| Club team leader                           | <b>80602</b> |
| Club worker                                | <b>80603</b> |
| Coal auger operator                        | <b>20604</b> |
| Coal cutter operator                       | <b>20601</b> |
| Coal plough operator                       | <b>20605</b> |
| Coal preparation worker                    | <b>30211</b> |
| Coking plant attendant                     | <b>30509</b> |
| Collator                                   | <b>36014</b> |
| Commissionaire (offices)                   | <b>80401</b> |
| Commissionaire (residential accommodation) | <b>80502</b> |
| Company secretary (administrative)         | <b>10900</b> |
| Compressor attendant                       | <b>40804</b> |
| Computer operator                          | <b>50508</b> |

|   |              |
|---|--------------|
| Computer programmer                                       | <b>50505</b> |
| Concentration/flotation worker [nec]                      | <b>30399</b> |
| Consultant (administrative/financial) [nec]               | <b>19996</b> |
| Consultant (agriculture) [nec]                            | <b>99996</b> |
| Consultant (engineering) [nec]                            | <b>49996</b> |
| Consultant (general management) [nec]                     | <b>09996</b> |
| Consultant (humanities) [nec]                             | <b>69996</b> |
| Consultant (medical) [nec]                                | <b>79996</b> |
| Consultant (metallurgy/beneficiation/manufacturing) [nec] | <b>39996</b> |
| Consultant (mining production) [nec]                      | <b>29996</b> |
| Consultant (scientific/technical) [nec]                   | <b>59996</b> |
| Consultant (service occupation) [nec]                     | <b>89996</b> |
| Consultant (tax)  | <b>11296</b> |
| Consulting engineer (engineering support)                 | <b>40000</b> |
| Consulting engineer (mining)                              | <b>20000</b> |
| Consulting metallurgist                                   | <b>30003</b> |
| Continuous miner driver                                   | <b>20602</b> |
| Contractor (outside)                                      | <b>49902</b> |
| Control room operator                                     | <b>30202</b> |
| Conveyancer/attorney/solicitor                            | <b>60602</b> |
| Conveyer worker [nec]                                     | <b>20299</b> |
| Conveyer belt attendant                                   | <b>21202</b> |
| Conveyer belt team leader/supervisor                      | <b>21201</b> |
| Cook/chef   | <b>80702</b> |
| Corporate secretary (administration)                      | <b>10901</b> |
| Cost accountant   | <b>10205</b> |
| Cost controller   | <b>10205</b> |
| Crane driver  | <b>81301</b> |
| Crane driver trainer                                      | <b>81398</b> |
| Creative worker [nec]                                     | <b>60999</b> |

| <b>OCCUPATION</b>                  | <b>CODE</b>  |
|------------------------------------|--------------|
| Credit controller                  | <b>10207</b> |
| Critical path scheduler            | <b>20103</b> |
| Crop worker                        | <b>90499</b> |
| Crossing attendant                 | <b>81009</b> |
| Crusher attendant                  | <b>30207</b> |
| Cupola man                         | <b>30505</b> |
| Cutter                             | <b>49903</b> |
| Cyanidation team leader/supervisor | <b>30403</b> |
| Cyanidation worker                 | <b>30405</b> |
| Data base administrator            | <b>50513</b> |
| Data base technician               | <b>50514</b> |
| Data capture supervisor            | <b>50510</b> |
| Data capture typist                | <b>50511</b> |
| Day pusher (ocean)                 | <b>29908</b> |
| Deck attendant (ocean)             | <b>29910</b> |
| Deck leader (ocean)                | <b>20313</b> |
| Data controller (computers)        | <b>50509</b> |
| Dental assistant                   | <b>70504</b> |

|   |              |
|---|--------------|
| Dental mechanic                               | <b>70503</b> |
| Dental specialist (eg oral pathologist) [nec] | <b>70499</b> |
| Dental surgeon/dentist                        | <b>70401</b> |
| Dental therapist                              | <b>70502</b> |
| Dental worker [nec]                           | <b>70599</b> |
| Dermatologist                                 | <b>70103</b> |
| Designer (engineering)                        | <b>40102</b> |
| Detective                                     | <b>80104</b> |
| Developer                                     | <b>20303</b> |
| Development management (hardware)             | <b>50501</b> |
| Development management (software)             | <b>50502</b> |
| Development team leader/supervisor            | <b>20310</b> |
| Development team worker                       | <b>20701</b> |
| Diamond drill team leader/supervisor          | <b>50111</b> |
| Diamond drill worker                          | <b>50112</b> |
| Diamond driller                               | <b>50110</b> |
| Diecaster                                     | <b>40501</b> |
| Diesel mechanic                               | <b>40477</b> |
| Diesel mechanic: apprentice                   | <b>40478</b> |
| Diesel mechanic: chargehand                   | <b>40476</b> |
| Diesel mechanic: foreman                      | <b>40475</b> |
| Dietician                                     | <b>70305</b> |
| Diplomatic/political liaison officer          | <b>60802</b> |
| Diver (ocean)                                 | <b>29911</b> |
| Disinfestation worker                         | <b>40905</b> |
| Dog handler                                   | <b>80105</b> |
| Domestic servant                              | <b>80801</b> |
| Dragline operator                             | <b>21102</b> |
| Dragline supervisor                           | <b>21101</b> |
| Drains cleaner                                | <b>29906</b> |

| <b>OCCUPATION</b>                        | <b>CODE</b>  |
|--|--------------|
| Draughting technician                    | <b>49994</b> |
| Draughtsperson (architectural)           | <b>50994</b> |
| Draughtsperson (chemical engineering)    | <b>40794</b> |
| Draughtsperson (civil engineering)       | <b>40694</b> |
| Draughtsperson (electrical engineering)  | <b>40394</b> |
| Draughtsperson (geological)              | <b>50194</b> |
| Draughtsperson (mechanical engineering)  | <b>40594</b> |
| Draughtsperson (mining production) [nec] | <b>29994</b> |
| Draughtsperson [nec]                     | <b>49994</b> |
| Draughtsperson (survey)                  | <b>50294</b> |
| Draughtsperson (technical services)      | <b>59994</b> |
| Drill rig operator (jumbo)               | <b>20401</b> |
| Drill sharpener                          | <b>40528</b> |
| Driller: hand percussion/jackhammer      | <b>20402</b> |
| Driller: hand (coal)                     | <b>20403</b> |
| Driller: opencast/large diameter         | <b>20404</b> |
| Drilling worker [nec]                    | <b>20499</b> |
| Drillsmith                               | <b>40527</b> |

|  |              |
|--|--------------|
| Driver: ambulance (code 08)                                | <b>80908</b> |
| Driver: bulldozer  | <b>21103</b> |
| Driver: forklift   | <b>80905</b> |
| Driver: haul truck (underground and opencast)              | <b>21109</b> |
| Driver: heavy articulated motor vehicle (code 13)          | <b>80911</b> |
| Driver: heavy motor vehicle (eg bus/ambulance code 10)     | <b>80909</b> |
| Driver: light motor vehicle/car (code 08)                  | <b>80907</b> |
| Driver: mobile industrial/agricultural equipment (code 07) | <b>80906</b> |
| Driver: motorcycle (code 01-04)                            | <b>80903</b> |
| Driver: tractor (code 05)                                  | <b>80904</b> |
| Driving instructor   | <b>80998</b> |
| Dryerman   | <b>30406</b> |
| Dump team leader/supervisor                                | <b>30702</b> |
| Dump worker  | <b>30703</b> |
| Dumpsman   | <b>30701</b> |
| Duplicator   | <b>10907</b> |
| Ear, nose and throat specialist                            | <b>70104</b> |
| Economics assistant  | <b>10703</b> |
| Economics management                                       | <b>10700</b> |
| Economics worker [nec]                                     | <b>10799</b> |
| Economist [nec]  | <b>10702</b> |
| Economy controller   | <b>10205</b> |
| Editor   | <b>60901</b> |
| Educational management                                     | <b>60400</b> |
| Educational/school worker [nec]                            | <b>60499</b> |
| EEG technician   | <b>70306</b> |
| Electrical chargehand (other) [nec]                        | <b>40341</b> |
| Electrical engineer  | <b>40301</b> |
| Electrical engineering management                          | <b>40300</b> |
| Electrical engineering worker [nec]                        | <b>40399</b> |

| <b>OCCUPATION</b>                        | <b>CODE</b>  |
|--|--------------|
| Electrical foreman (other) [nec]         | <b>40340</b> |
| Electrical technician                    | <b>40310</b> |
| Electrical tradesman (other) [nec]       | <b>40342</b> |
| Electrician                              | <b>40314</b> |
| Electrician: aide                        | <b>40317</b> |
| Electrician: apprentice                  | <b>40315</b> |
| Electrician: chargehand                  | <b>40313</b> |
| Electrician: foreman                     | <b>40312</b> |
| Electrician: underground section         | <b>40316</b> |
| Electrician: worker [nec]                | <b>40318</b> |
| Electricity generator worker             | <b>40802</b> |
| Electro mechanic/millwright/minewright   | <b>40437</b> |
| Electronic technician                    | <b>40311</b> |
| Employee assistance programme management | <b>60500</b> |
| Encoder                                  | <b>19910</b> |
| Energy systems management                | <b>40800</b> |
| Energy systems officer                   | <b>40805</b> |
| Energy systems team leader/supervisor    | <b>40801</b> |

|   |              |
|---|--------------|
| Energy systems worker [nec]                 | <b>40899</b> |
| Engineer [nec]                              | <b>40201</b> |
| Engineering assistant [nec]                 | <b>40205</b> |
| Engineering foreman [nec]                   | <b>40004</b> |
| Engineering inspector                       | <b>40202</b> |
| Engineering management (multi-disciplinary) | <b>40001</b> |
| Engineering management [nec]                | <b>40099</b> |
| Engineering team leader [nec]               | <b>49901</b> |
| Engineering technical worker [nec]          | <b>40299</b> |
| Engineering technician [nec]                | <b>40203</b> |
| Entertainer                                 | <b>60905</b> |
| Environmental assistant                     | <b>51004</b> |
| Environmental construction supervisor       | <b>51007</b> |
| Environmental construction worker           | <b>51008</b> |
| Environmental engineer                      | <b>51001</b> |
| Environmental engineering management        | <b>51000</b> |
| Environmental observer                      | <b>51005</b> |
| Environmental officer                       | <b>51003</b> |
| Environmental superintendent                | <b>51002</b> |
| Environmental worker [nec]                  | <b>51099</b> |
| Equipper                                    | <b>21504</b> |
| Estate/township management                  | <b>80300</b> |
| Estate/township officer                     | <b>80301</b> |
| Estate/township team leader/supervisor      | <b>80302</b> |
| Estate/township worker [nec]                | <b>80399</b> |
| Estimator/calculator                        | <b>40104</b> |
| Executive director [nec]                    | <b>00000</b> |
| Explosives issuer                           | <b>10317</b> |
| Facilities management (computers)           | <b>50506</b> |
| Fan attendant                               | <b>40344</b> |

| <b>OCCUPATION</b>                                   | <b>CODE</b>  |
|---|--------------|
| Farm manager  | <b>90001</b> |
| Filing/records officer                              | <b>10904</b> |
| Filter operator/worker                              | <b>30302</b> |
| Filter team leader/supervisor                       | <b>30301</b> |
| Financial accountant                                | <b>10204</b> |
| Financial analyst                                   | <b>10201</b> |
| Financial economist                                 | <b>10701</b> |
| Financial engineer                                  | <b>10202</b> |
| Financial/accounting management                     | <b>10200</b> |
| Financial/admin management (multi-disciplinary)     | <b>10000</b> |
| Firefighting/rescue officer                         | <b>80202</b> |
| Firefighting/rescue team leader/supervisor          | <b>80203</b> |
| Firefighting/rescue trainer                         | <b>80298</b> |
| Firefighting/rescue worker [nec]                    | <b>80299</b> |
| Fireman/stoker                                      | <b>81005</b> |
| Firemaster  | <b>80201</b> |
| First aid attendant                                 | <b>70802</b> |
| First aid management/medical station superintendent | <b>70800</b> |

|  |              |
|--|--------------|
| First aid team leader/supervisor         | <b>70801</b> |
| First aid trainer                        | <b>70898</b> |
| First aid training superintendent        | <b>70898</b> |
| First aid worker [nec]                   | <b>70899</b> |
| Fitter and turner                        | <b>40428</b> |
| Fitter and turner: apprentice            | <b>40429</b> |
| Fitter and turner: chargehand            | <b>40427</b> |
| Fitter and turner: foreman               | <b>40426</b> |
| Fitter (including machining): apprentice | <b>40433</b> |
| Fitter (including machining)             | <b>40432</b> |
| Fitter (including machining): chargehand | <b>40431</b> |
| Fitter (including machining): foreman    | <b>40430</b> |
| Fitter: operative (grade 1)              | <b>40434</b> |
| Fitter: operative aide (grade 2)         | <b>40435</b> |
| Fitter: worker [nec]                     | <b>40436</b> |
| Forester                                 | <b>90301</b> |
| Forestry engineer                        | <b>90300</b> |
| Forestry worker                          | <b>90399</b> |
| Forger                                   | <b>40502</b> |
| Founder                                  | <b>40505</b> |
| Furnace worker [nec]                     | <b>30599</b> |
| Game ranger                              | <b>90501</b> |
| Ganger/plate/tracklayer (main line)      | <b>40656</b> |
| Garage mechanic: aide                    | <b>40480</b> |
| Garage serviceman                        | <b>40481</b> |
| Garage worker [nec]                      | <b>40482</b> |
| Garden supervisor/groundsman             | <b>90102</b> |
| Garden worker                            | <b>90199</b> |
| General engineering supervisor           | <b>40002</b> |
| General engineering worker [nec]         | <b>49999</b> |

| <b>OCCUPATION</b>                   | <b>CODE</b>  |
|-------------------------------------|--------------|
| General management [nec]            | <b>00199</b> |
| General manager (company)           | <b>00102</b> |
| General manager (mine)              | <b>00101</b> |
| General miner                       | <b>20305</b> |
| General practitioner                | <b>70201</b> |
| Geochemist                          | <b>50103</b> |
| Geological management               | <b>50100</b> |
| Geological observer/field assistant | <b>50109</b> |
| Geological worker [nec]             | <b>50199</b> |
| Geologist                           | <b>50101</b> |
| Geology technician                  | <b>50108</b> |
| Geophysicist                        | <b>50102</b> |
| Grab operator                       | <b>21401</b> |
| Grade officer                       | <b>50408</b> |
| Graphic artist                      | <b>60904</b> |
| Grinderman/pulveriser               | <b>30210</b> |
| Groundsman/garden supervisor        | <b>90102</b> |
| Guest house/quarters management     | <b>80500</b> |

|   |              |
|---|--------------|
| Guillotine operator                             | <b>36013</b> |
| Gynaecologist                                   | <b>70105</b> |
| Hairdresser/barber                              | <b>80803</b> |
| Handyman (maintenance)                          | <b>40654</b> |
| Handyman (mining)                               | <b>21504</b> |
| Haulage team leader/supervisor                  | <b>21001</b> |
| Haulage/underground rail transport worker [nec] | <b>21099</b> |
| Health/food inspector                           | <b>70307</b> |
| Herdsmen/stable hand                            | <b>90502</b> |
| Hoist driver                                    | <b>21302</b> |
| Hoisting worker [nec]                           | <b>21399</b> |
| Horticulturist                                  | <b>90101</b> |
| Hospital cleaner                                | <b>79901</b> |
| Hospital secretary                              | <b>10902</b> |
| Hospital superintendent                         | <b>70002</b> |
| Hospital worker/orderly                         | <b>70324</b> |
| Hostel management                               | <b>80505</b> |
| Hostel official                                 | <b>80506</b> |
| Hostel team leader/supervisor                   | <b>80507</b> |
| Housekeeper/caretaker                           | <b>80501</b> |
| Humanities management (multi-disciplinary)      | <b>60000</b> |
| Humanities management [nec]                     | <b>60099</b> |
| Humanities worker [nec]                         | <b>69999</b> |
| Hydraulic prop team leader/supervisor           | <b>20801</b> |
| Hydraulic prop worker                           | <b>20802</b> |
| Hydraulic technician                            | <b>40411</b> |
| Hygiene services worker [nec]                   | <b>40999</b> |
| Induna/tribal representative                    | <b>60203</b> |
| Industrial engineer                             | <b>50701</b> |
| Industrial engineering management               | <b>50700</b> |

| <b>OCCUPATION</b>                           | <b>CODE</b>  |
|---|--------------|
| Industrial engineering officer              | <b>50704</b> |
| Industrial engineering technician           | <b>50702</b> |
| Industrial engineering worker [nec]         | <b>50799</b> |
| Industrial physician                        | <b>70106</b> |
| Industrial relations assistant              | <b>60202</b> |
| Industrial relations management             | <b>60200</b> |
| Industrial relations practitioner           | <b>60201</b> |
| Industrial relations worker [nec]           | <b>60299</b> |
| Info services/computer worker [nec]         | <b>50599</b> |
| Information centre management (computers)   | <b>50516</b> |
| Information services management             | <b>50500</b> |
| Instrument engineer                         | <b>40321</b> |
| Instrument mechanic (industrial)            | <b>40325</b> |
| Instrument mechanic apprentice (industrial) | <b>40326</b> |
| Instrument mechanic chargehand (industrial) | <b>40324</b> |
| Instrument mechanic foreman (industrial)    | <b>40323</b> |
| Instrument technician                       | <b>40322</b> |
| Insurance adviser                           | <b>10596</b> |



|  |       |
|--|-------|
| Insurance management                     | 10500 |
| Insurance worker [nec]                   | 10599 |
| Internist/specialist physician           | 70107 |
| Inventory controller                     | 10315 |
| Irrigation engineer                      | 90400 |
| Issuer (explosives)                      | 10317 |
| Issuer (stores, non-explosive)           | 10316 |
| Journalist/writer                        | 60902 |
| Junior engineer (civil engineering)      | 40602 |
| Junior engineer (electrical engineering) | 40302 |
| Junior engineer (mechanical engineering) | 40402 |
| Junior engineer [nec]                    | 40207 |
| Kennel worker                            | 90503 |
| Kilnman                                  | 30504 |
| Kitchen worker                           | 80703 |
| Laboratory assistant                     | 50406 |
| Laboratory manager/superintendent        | 50400 |
| Laboratory technician                    | 50405 |
| Labour controller                        | 60103 |
| Ladleman                                 | 30506 |
| Lamp room team leader/supervisor         | 40346 |
| Lamp room worker                         | 40347 |
| Lampsman                                 | 40345 |
| Land rehabilitation engineer             | 90200 |
| Land rehabilitation supervisor           | 90201 |
| Land rehabilitation worker               | 90299 |
| Lasher/loader [nec]                      | 29905 |
| Laundry supervisor                       | 80503 |
| Laundry worker                           | 80504 |
| Leaching worker                          | 30407 |

| OCCUPATION                                | CODE  |
|---|-------|
| Learner miner                             | 20309 |
| Learner official (assay/chemistry)        | 50409 |
| Learner official (electrical engineering) | 40303 |
| Learner official (engineering) [nec]      | 40206 |
| Learner official (geology)                | 50113 |
| Learner official (mechanical engineering) | 40403 |
| Learner official (metallurgy)             | 30105 |
| Learner official (mining)                 | 20202 |
| Learner operative                         | 40208 |
| Legal assistant                           | 60603 |
| Legal management                          | 60600 |
| Legal worker [nec]                        | 60699 |
| Librarian                                 | 60701 |
| Library assistant                         | 60702 |
| Library management                        | 60700 |
| Library worker [n.e.c]                    | 60799 |
| Lift operator                             | 21306 |
| Liquor outlet supervisor                  | 80705 |

|                                      |              |
|--------------------------------------|--------------|
| Lithographer                         | <b>36010</b> |
| Livestock worker [nec]               | <b>90599</b> |
| Load haul dump driver                | <b>21106</b> |
| Loader driver (rail)                 | <b>21004</b> |
| Loader driver (trackless)            | <b>21104</b> |
| Loco driver (main line - SPOORNET)   | <b>81003</b> |
| Loco driver (not main line)          | <b>81004</b> |
| Loco driver (underground)            | <b>21002</b> |
| Loco guard (underground)             | <b>21003</b> |
| Longwall sheerer operator            | <b>20603</b> |
| Magazine master                      | <b>10317</b> |
| Magnetometer specialist              | <b>50106</b> |
| Maintenance supervisor               | <b>40653</b> |
| Management accountant                | <b>10203</b> |
| Marketing assistant                  | <b>10812</b> |
| Marketing officer                    | <b>10810</b> |
| Marketing and sales management       | <b>10800</b> |
| Marketing/sales worker [nec]         | <b>10899</b> |
| Mason                                | <b>40626</b> |
| Mason aide                           | <b>40627</b> |
| Masseur/masseuse                     | <b>70308</b> |
| Matron/nursing services management   | <b>70600</b> |
| Mechanic (ocean)                     | <b>40414</b> |
| Maxillo-facial and oral surgeon      | <b>70402</b> |
| Mechanical charge hand               | <b>40521</b> |
| Mechanical engineer                  | <b>40401</b> |
| Mechanical engineering management    | <b>40400</b> |
| Mechanical engineering worker [nec]  | <b>40599</b> |
| Mechanical foreman (other) [nec]     | <b>40520</b> |
| Mechanical rockbreaking worker [nec] | <b>20699</b> |

| <b>OCCUPATION</b>                                   | <b>CODE</b>  |
|---|--------------|
| Mechanical technician                               | <b>40410</b> |
| Mechanical tradesman (other) [nec]                  | <b>40522</b> |
| Media technician                                    | <b>60908</b> |
| Medical advisor                                     | <b>70001</b> |
| Medical labourer                                    | <b>79901</b> |
| Medical officer                                     | <b>70201</b> |
| Medical orthoptist/prosthetist                      | <b>70309</b> |
| Medical physicist                                   | <b>70310</b> |
| Medical specialist [nec]                            | <b>70199</b> |
| Medical station superintendent/first aid management | <b>70800</b> |
| Medical technician                                  | <b>70311</b> |
| Medical technologist                                | <b>70312</b> |
| Medical worker [nec]                                | <b>79999</b> |
| Medical/health care management (multi-disciplinary) | <b>70000</b> |
| Medical/health care management [nec]                | <b>70099</b> |
| Meshing and lacing team leader/supervisor           | <b>20803</b> |
| Meshing and lacing worker                           | <b>20804</b> |
| Messenger/postal worker                             | <b>11010</b> |

|  |              |
|--|--------------|
| Metallurgical official [nec]                   | <b>30103</b> |
| Metallurgical worker [nec]                     | <b>30199</b> |
| Metallurgical/plant management                 | <b>30000</b> |
| Metallurgical/plant superintendent             | <b>30001</b> |
| Metallurgical/plant supervisor                 | <b>30002</b> |
| Metallurgist                                   | <b>30101</b> |
| Metallurgy technician (extractive)             | <b>30102</b> |
| Microscopist                                   | <b>51006</b> |
| Milling worker                                 | <b>30208</b> |
| Millwright/electro mechanic/minewright         | <b>40437</b> |
| Mine construction team leader/supervisor [nec] | <b>21510</b> |
| Mine construction worker [nec]                 | <b>21599</b> |
| Mine manager                                   | <b>00101</b> |
| Mine overseer                                  | <b>20002</b> |
| Mine planning/valuation engineer               | <b>20101</b> |
| Mine police/security guard                     | <b>80103</b> |
| Mine production management [nec]               | <b>20099</b> |
| Mine production supervisor [nec]               | <b>20399</b> |
| Mine production worker [nec]                   | <b>29999</b> |
| Mine secretary (administration)                | <b>10900</b> |
| Mine transport worker [nec]                    | <b>21499</b> |
| Miner (general)                                | <b>20305</b> |
| Mineralogist                                   | <b>50104</b> |
| Miner's assistant (cheesa)                     | <b>20504</b> |
| Mining engineer [nec]                          | <b>20201</b> |
| Mining technical worker [nec]                  | <b>20299</b> |
| Mining technician [nec]                        | <b>20210</b> |
| Mixed farming worker [nec]                     | <b>90699</b> |
| Model maker                                    | <b>40103</b> |
| Model maker (survey)                           | <b>50205</b> |

| <b>OCCUPATION</b>                          | <b>CODE</b>  |
|--|--------------|
| Money market dealer                        | <b>11113</b> |
| Monorail winch operator                    | <b>21308</b> |
| Monorope winch operator                    | <b>21309</b> |
| Motorman (ocean)                           | <b>40543</b> |
| Mortuary attendant                         | <b>70313</b> |
| Motor mechanic                             | <b>40473</b> |
| Motor mechanic apprentice                  | <b>40474</b> |
| Motor mechanic chargehand                  | <b>40472</b> |
| Motor mechanic foreman                     | <b>40471</b> |
| Motor/diesel mechanic operative            | <b>40479</b> |
| Moulder                                    | <b>40504</b> |
| Multi task worker (underground production) | <b>20704</b> |
| Multi task worker (opencast production)    | <b>20705</b> |
| Musician                                   | <b>60905</b> |
| Network technician (computers)             | <b>50515</b> |
| Neurologist                                | <b>70108</b> |
| Night pusher (ocean)                       | <b>29908</b> |
| Neurosurgeon                               | <b>70109</b> |

|   |              |
|---|--------------|
| Night shift cleaner                     | <b>20308</b> |
| Nurse (charge/senior sister)            | <b>70601</b> |
| Nurse (enrolled/staff)                  | <b>70603</b> |
| Nurse (registered all categories) [nec] | <b>70602</b> |
| Nursing assistant                       | <b>70604</b> |
| Nursing instructor                      | <b>70698</b> |
| Nursing services management/matron      | <b>70600</b> |
| Nursing worker [nec]                    | <b>70699</b> |
| Occupational therapist                  | <b>70314</b> |
| Occupational health physician           | <b>70120</b> |
| Occupational hygienist                  | <b>70121</b> |
| Offshore installation manager (ocean)   | <b>00101</b> |
| Onsetter/banksman                       | <b>21304</b> |
| Operations research officer             | <b>50703</b> |
| Operations/network operator (computers) | <b>50507</b> |
| Ophthalmologist                         | <b>70110</b> |
| Optical dispenser                       | <b>70316</b> |
| Optician/optometrist                    | <b>70315</b> |
| Oral hygienist                          | <b>70501</b> |
| Orderly/hospital worker                 | <b>70324</b> |
| Orepass/box controller                  | <b>21404</b> |
| Orthodontist                            | <b>70403</b> |
| Orthopaedic surgeon                     | <b>70111</b> |
| Orthoptist                              | <b>70317</b> |
| Paediatrician                           | <b>70113</b> |
| Painter and decorator/maintenance hand  | <b>40637</b> |
| Painter and decorator (worker) [nec]    | <b>40638</b> |
| Panel beater                            | <b>40470</b> |
| Paper maker                             | <b>35911</b> |
| Paper manufacturing management          | <b>35900</b> |

| <b>OCCUPATION</b>                | <b>CODE</b>  |
|----------------------------------|--------------|
| Paper tester                     | <b>35912</b> |
| Pathologist (medical)            | <b>70112</b> |
| Patternmaker                     | <b>40503</b> |
| Paver                            | <b>40629</b> |
| Paymaster                        | <b>10404</b> |
| Payroll administrator            | <b>10402</b> |
| Payroll controller               | <b>10401</b> |
| Payroll management               | <b>10400</b> |
| Payroll worker [nec]             | <b>10499</b> |
| PC programmer/product specialist | <b>50517</b> |
| Performing artist                | <b>60905</b> |
| Periodontist                     | <b>70404</b> |
| Personal assistant/secretary     | <b>10905</b> |
| Personal care worker [nec]       | <b>80899</b> |
| Personnel assistant/masiza       | <b>60102</b> |
| Personnel management             | <b>60100</b> |
| Personnel officer/practitioner   | <b>60101</b> |
| Personnel worker [nec]           | <b>60199</b> |

|   |              |
|---|--------------|
| Pharmaceutical worker [nec]             | <b>70799</b> |
| Pharmacist                              | <b>70701</b> |
| Photographer                            | <b>60906</b> |
| Physiologist                            | <b>70318</b> |
| Physiotherapist                         | <b>70319</b> |
| Pilot (aircraft)                        | <b>81103</b> |
| Pipes and tracks team leader/supervisor | <b>21505</b> |
| Pipes and tracks worker                 | <b>21506</b> |
| Pit worker                              | <b>20703</b> |
| Planned maintenance foreman             | <b>40003</b> |
| Planning management (engineering)       | <b>40100</b> |
| Planning management (mining)            | <b>20100</b> |
| Planning observer                       | <b>20104</b> |
| Planning officer                        | <b>20102</b> |
| Planning officer (engineering)          | <b>40101</b> |
| Planning worker (engineering) [nec]     | <b>40199</b> |
| Planning worker (mining) [nec]          | <b>20199</b> |
| Plant team leader/supervisor            | <b>30204</b> |
| Plant worker [nec]                      | <b>30299</b> |
| Plant/reduction official                | <b>30201</b> |
| Plasterer                               | <b>40628</b> |
| Plastic surgeon                         | <b>70114</b> |
| Plater                                  | <b>40448</b> |
| Plater/boilermaker                      | <b>40447</b> |
| Plater/boilermaker apprentice           | <b>40449</b> |
| Plater/boilermaker chargehand           | <b>40446</b> |
| Plater/boilermaker foreman              | <b>40445</b> |
| Plater/boilermaker worker [nec]         | <b>40452</b> |
| Plater/welder                           | <b>40455</b> |
| Plater/welder apprentice                | <b>40457</b> |

| <b>OCCUPATION</b>                    | <b>CODE</b>  |
|--------------------------------------|--------------|
| Plater/welder chargehand             | <b>40454</b> |
| Plater/welder foreman                | <b>40453</b> |
| Plater/welder worker [nec]           | <b>40458</b> |
| Plate/track layer/ganger (main line) | <b>40656</b> |
| Play school supervisor               | <b>60404</b> |
| Plumber                              | <b>40632</b> |
| Plumber aide                         | <b>40635</b> |
| Plumber apprentice                   | <b>40633</b> |
| Plumber chargehand                   | <b>40631</b> |
| Plumber foreman                      | <b>40630</b> |
| Plumber operative                    | <b>40634</b> |
| Plumber worker [nec]                 | <b>40636</b> |
| Podiatrist/chiroprapist              | <b>70320</b> |
| Pool gang worker                     | <b>09801</b> |
| Postal worker/messenger              | <b>11010</b> |
| Power hammer operator                | <b>40530</b> |
| Press operator                       | <b>40529</b> |
| Pre-primary school assistant         | <b>60405</b> |

|   |              |
|---|--------------|
| Printer [nec]   | <b>36011</b> |
| Printing machine operator                                       | <b>36012</b> |
| Printing management   | <b>36000</b> |
| Printing supervisor   | <b>36001</b> |
| Printing worker [nec]   | <b>36099</b> |
| Process controller  | <b>30203</b> |
| Producer/director (creative arts)                               | <b>60900</b> |
| Production/section/underground manager                          | <b>20001</b> |
| Productivity officer  | <b>50705</b> |
| Project manager (administration/financial) [nec]                | <b>19992</b> |
| Project manager/officer (agriculture) [nec]                     | <b>99992</b> |
| Project manager/officer (engineering) [nec]                     | <b>49992</b> |
| Project manager/officer (general management) [nec]              | <b>09992</b> |
| Project manager/officer (humanities) [nec]                      | <b>69992</b> |
| Project manager/officer (medical/health) [nec]                  | <b>79992</b> |
| Project manager/officer (mining) [nec]                          | <b>29992</b> |
| Project manager/officer (reduction/beneficiation/manufacturing) | <b>39992</b> |
| Project manager/officer (scientific/technical) [nec]            | <b>59992</b> |
| Project manager/officer (services) [nec]                        | <b>89992</b> |
| Property broker   | <b>10601</b> |
| Property/mining rights management                               | <b>10600</b> |
| Property/mining rights officer                                  | <b>10602</b> |
| Property/mining rights worker [nec]                             | <b>10699</b> |
| Prospector  | <b>50107</b> |
| Prosthetist/Orthotist   | <b>70309</b> |
| Prosthodontist  | <b>70405</b> |
| Psychiatrist  | <b>70115</b> |
| Psychologist (clinical)   | <b>60501</b> |
| Psychologist (industrial)                                       | <b>60104</b> |
| Public relations assistant                                      | <b>60803</b> |

| <b>OCCUPATION</b>             | <b>CODE</b>  |
|-------------------------------|--------------|
| Public relations management   | <b>60800</b> |
| Public relations officer      | <b>60801</b> |
| Public relations worker [nec] | <b>60899</b> |
| Pulveriser/grinderman         | <b>30210</b> |
| Pump team leader/supervisor   | <b>40531</b> |
| Pump worker                   | <b>40532</b> |
| Pupil metallurgist            | <b>30104</b> |
| Purchaser/buyer               | <b>10312</b> |
| Purchasing/stores management  | <b>10300</b> |
| Quantity surveyor             | <b>40613</b> |
| Quarryman                     | <b>20307</b> |
| Radio/medic (ocean)           | <b>79999</b> |
| Radio mechanician             | <b>40327</b> |
| Radio operator                | <b>11012</b> |
| Radiographer                  | <b>70321</b> |
| Radiologist                   | <b>70116</b> |
| Rail transport management     | <b>81000</b> |
| Rail transport officer        | <b>81001</b> |

|   |              |
|---|--------------|
| Rail transport team leader                                | <b>81002</b> |
| Rail transport worker [nec]                               | <b>81099</b> |
| Raise/tunnel borer operator                               | <b>20607</b> |
| Raise/tunnel borer supervisor                             | <b>20606</b> |
| Receiver (stores)   | <b>10313</b> |
| Receptionist/typist/word processor operator               | <b>10906</b> |
| Records/filing officer                                    | <b>10904</b> |
| Reduction/beneficiation/manufacturing management [nec]    | <b>30099</b> |
| Reduction/beneficiation/manufacturing worker [nec]        | <b>39999</b> |
| Reduction/plant official                                  | <b>30201</b> |
| Reeler  | <b>21403</b> |
| Refiner   | <b>30601</b> |
| Refining worker [nec]                                     | <b>30699</b> |
| Refrigeration plant operator                              | <b>40415</b> |
| Refrigeration plant team leader/supervisor                | <b>40414</b> |
| Refrigeration/air conditioning engineer                   | <b>40412</b> |
| Refrigeration/air conditioning mechanic                   | <b>40413</b> |
| Refuse collector  | <b>40906</b> |
| Registrar (medical)                                       | <b>70202</b> |
| Rescue training service management                        | <b>80200</b> |
| Rescue/firefighting officer                               | <b>80202</b> |
| Rescue/firefighting team leader/supervisor                | <b>80203</b> |
| Rescue/firefighting trainer                               | <b>80298</b> |
| Rescue/firefighting worker [nec]                          | <b>80299</b> |
| Researcher (agriculture) [nec]                            | <b>99997</b> |
| Researcher (engineering) [nec]                            | <b>49997</b> |
| Researcher (general management) [nec]                     | <b>09997</b> |
| Researcher (humanities) [nec]                             | <b>69997</b> |
| Researcher (medical) [nec]                                | <b>79997</b> |
| Researcher (metallurgy/beneficiation/manufacturing) [nec] | <b>39997</b> |

| <b>OCCUPATION</b>                       | <b>CODE</b>  |
|---|--------------|
| Researcher (mining production) [nec]    | <b>29997</b> |
| Researcher (rock mechanics)             | <b>50397</b> |
| Researcher (scientific/technical) [nec] | <b>59997</b> |
| Researcher (service occupation) [nec]   | <b>89997</b> |
| Rigger and ropeman                      | <b>40508</b> |
| Rigger and ropeman apprentice           | <b>40509</b> |
| Rigger and ropeman chargehand           | <b>40507</b> |
| Rigger and ropeman foreman              | <b>40506</b> |
| Rigger and ropeman worker [nec]         | <b>40511</b> |
| Rigger aide                             | <b>40510</b> |
| Road builder                            | <b>40655</b> |
| Road transport management               | <b>80900</b> |
| Road transport officer                  | <b>80901</b> |
| Road transport team leader              | <b>80902</b> |
| Road transport worker [nec]             | <b>80999</b> |
| Rock breaking worker [nec]              | <b>20799</b> |
| Rock mechanics engineer                 | <b>50301</b> |
| Rock mechanics management               | <b>50300</b> |

|  |              |
|--|--------------|
| Rock mechanics officer                               | <b>50302</b> |
| Rock mechanics worker [nec]                          | <b>50399</b> |
| Rock support worker [nec]                            | <b>20899</b> |
| Roof bolt machine operator                           | <b>20806</b> |
| Roof bolt worker                                     | <b>20807</b> |
| Roughneck(ocean)                                     | <b>29909</b> |
| Roustabout (ocean)                                   | <b>81201</b> |
| Rubber reliner                                       | <b>40523</b> |
| Safety/loss control auditor                          | <b>50802</b> |
| Safety/loss control management                       | <b>50800</b> |
| Safety/loss control observer assistant               | <b>50803</b> |
| Safety/loss control officer                          | <b>50801</b> |
| Safety/loss control worker [nec]                     | <b>50899</b> |
| Sales representative                                 | <b>10811</b> |
| Salvage yard aide                                    | <b>10319</b> |
| Salvage and reclamation worker (surface)             | <b>10320</b> |
| Salvage and reclamation worker (underground)         | <b>29907</b> |
| Sample worker  | <b>50204</b> |
| Sampler  | <b>50203</b> |
| Sanitation worker                                    | <b>40904</b> |
| Saw doctor   | <b>40540</b> |
| Saw sharpener  | <b>40542</b> |
| Sawmill mechanic                                     | <b>40541</b> |
| Sawyer   | <b>35710</b> |
| School principal                                     | <b>60401</b> |
| Scientific/technical management (multi-disciplinary) | <b>50000</b> |
| Scientific/technical management [nec]                | <b>50099</b> |
| Scientific/technical worker [nec]                    | <b>59999</b> |
| Scraper winch bell operator                          | <b>20902</b> |
| Scraper winch driver                                 | <b>20901</b> |

| <b>OCCUPATION</b>                       | <b>CODE</b>  |
|---|--------------|
| Scraping worker [nec]                   | <b>20999</b> |
| Screensman                              | <b>30209</b> |
| Sea transport worker [nec]              | <b>81299</b> |
| Secretarial/administrative worker [nec] | <b>10999</b> |
| Secretarial/administration management   | <b>10900</b> |
| Secretary/personal assistant            | <b>10905</b> |
| Section leader                          | <b>29901</b> |
| Section/production/underground manager  | <b>20001</b> |
| Securities officer                      | <b>11112</b> |
| Security guard/mine police              | <b>80103</b> |
| Security inspector/officer              | <b>80101</b> |
| Security management                     | <b>80100</b> |
| Security supervisor (eg sergeant)       | <b>80102</b> |
| Security worker [nec]                   | <b>80199</b> |
| Sedimentologist                         | <b>50105</b> |
| Seismic network technician              | <b>50306</b> |
| Seismologist                            | <b>50305</b> |
| Self-propelled machine driver [nec]     | <b>21107</b> |



|  |              |
|--|--------------|
| Service worker [nec]                     | <b>89999</b> |
| Services management (multi-disciplinary) | <b>80000</b> |
| Services management [nec]                | <b>80099</b> |
| Sewage plant operator                    | <b>40903</b> |
| Shaft foreman                            | <b>20301</b> |
| Shaft sinker                             | <b>21501</b> |
| Shaft timberman worker                   | <b>21503</b> |
| Shaft timberman/timberman                | <b>21502</b> |
| Shakerhand (ocean)                       | <b>29909</b> |
| Share transfer officer                   | <b>11111</b> |
| Sheetmetal worker                        | <b>40459</b> |
| Shift boss                               | <b>20302</b> |
| Shot blast operator                      | <b>40526</b> |
| Shotcrete worker                         | <b>20804</b> |
| Shovel operator                          | <b>21105</b> |
| Shunter                                  | <b>81007</b> |
| Shuttlecar driver                        | <b>21108</b> |
| Signaller                                | <b>81008</b> |
| Signwriter                               | <b>40639</b> |
| Skipman                                  | <b>21303</b> |
| Slimes dam team leader/supervisor        | <b>30704</b> |
| Slimes dam worker                        | <b>30705</b> |
| Slimes dam/dump worker [nec]             | <b>30799</b> |
| Smelter                                  | <b>30501</b> |
| Smelter team leader/supervisor           | <b>30502</b> |
| Smelter worker                           | <b>30503</b> |
| Social worker                            | <b>60502</b> |
| Solicitor/attorney/conveyancer           | <b>60602</b> |
| Sorter                                   | <b>30206</b> |
| Spannerman/driller's assistant           | <b>20405</b> |

| <b>OCCUPATION</b>            | <b>CODE</b>  |
|------------------------------|--------------|
| Spectrographer               | <b>50407</b> |
| Speech therapist/audiologist | <b>70322</b> |
| Sports worker [nec]          | <b>61099</b> |
| Sports/recreation assistant  | <b>61002</b> |
| Sports/recreation management | <b>61000</b> |
| Sports/recreation officer    | <b>61001</b> |
| Stable hand/herdsman         | <b>90502</b> |
| Stacker operator             | <b>21402</b> |
| Stage worker                 | <b>21509</b> |
| Standards officer            | <b>10311</b> |
| Statistical officer          | <b>50602</b> |
| Statistical worker [nec]     | <b>50699</b> |
| Statistician                 | <b>50601</b> |
| Statistics management        | <b>50600</b> |
| Stevedore                    | <b>81201</b> |
| Stockbroker                  | <b>11110</b> |
| Stoker/fireman               | <b>81005</b> |
| Stone packer                 | <b>29904</b> |

|  |              |
|--|--------------|
| Stope team leader/supervisor                           | <b>20311</b> |
| Stope team worker                                      | <b>20702</b> |
| Stoper   | <b>20304</b> |
| Storekeeper  | <b>10314</b> |
| Stores controller                                      | <b>10310</b> |
| Stores issuer (non-explosive)                          | <b>10316</b> |
| Stores receiver  | <b>10313</b> |
| Stores worker [nec]                                    | <b>10399</b> |
| Stores/purchasing management                           | <b>10300</b> |
| Strata control observer                                | <b>50304</b> |
| Strata control officer                                 | <b>50303</b> |
| Strategic planning analyst                             | <b>00201</b> |
| Strategic planning management                          | <b>00200</b> |
| Strategic planning worker [nec]                        | <b>00299</b> |
| Stripper operator                                      | <b>30408</b> |
| Student (administrative/financial) [nec]               | <b>19993</b> |
| Student (agriculture) [nec]                            | <b>99993</b> |
| Student (engineering) [nec]                            | <b>49993</b> |
| Student (geology)                                      | <b>50193</b> |
| Student (humanities) [nec]                             | <b>69993</b> |
| Student (medical)                                      | <b>79993</b> |
| Student (metallurgy/beneficiation/manufacturing) [nec] | <b>39993</b> |
| Student (mining production) [nec]                      | <b>29993</b> |
| Student (scientific/technical) [nec]                   | <b>59993</b> |
| Student (service occupation) [nec]                     | <b>89993</b> |
| Supervisor's assistant (underground)                   | <b>29902</b> |
| Supplementary medical worker [nec]                     | <b>70399</b> |
| Surgeon (general)                                      | <b>70117</b> |
| Survey management                                      | <b>50200</b> |
| Survey worker [nec]                                    | <b>50299</b> |

| <b>OCCUPATION</b>                                     | <b>CODE</b>  |
|---|--------------|
| Surveyor (land)                                       | <b>50201</b> |
| Surveyor (mine)                                       | <b>50202</b> |
| Sweeper/vamper  | <b>29903</b> |
| Systems accountant                                    | <b>10203</b> |
| Systems analyst                                       | <b>50504</b> |
| Systems/network programmer                            | <b>50512</b> |
| Tailor  | <b>34510</b> |
| Tea maker/office cleaner                              | <b>80402</b> |
| Teacher (nursery education)                           | <b>60404</b> |
| Teacher (primary education)                           | <b>60403</b> |
| Teacher (secondary education)                         | <b>60402</b> |
| Team leader/supervisor (other mining production work) | <b>20312</b> |
| Technical assistant engineering [nec]                 | <b>40204</b> |
| Technical assistant mining [nec]                      | <b>20211</b> |
| Technical services management                         | <b>50001</b> |
| Technical services department (TSD) officer [nec]     | <b>59901</b> |
| Telecommunications worker [nec]                       | <b>11099</b> |
| Telephonist   | <b>11011</b> |

|  |              |
|--|--------------|
| Television cameraman                     | <b>60907</b> |
| Thoracic surgeon                         | <b>70118</b> |
| Timber, pulp and paper worker [nec]      | <b>35999</b> |
| Timekeeper                               | <b>10403</b> |
| Tip team leader/supervisor               | <b>21405</b> |
| Tip worker                               | <b>21406</b> |
| Toolmaker                                | <b>40512</b> |
| Toolpusher (ocean)                       | <b>20312</b> |
| Tour guide                               | <b>60804</b> |
| Town planner                             | <b>40612</b> |
| Tracer [nec]                             | <b>49994</b> |
| Trackless machine team leader/supervisor | <b>21101</b> |
| Trackless machine trainer (eg dragline)  | <b>21198</b> |
| Trackless machine worker [nec]           | <b>21199</b> |
| Track/plate layer/ganger (main line)     | <b>40656</b> |
| Train guard                              | <b>81006</b> |
| Trainer (administrative/financial) [nec] | <b>19998</b> |
| Trainer (agriculture) [nec]              | <b>99998</b> |
| Trainer (chemical engineering)           | <b>40798</b> |
| Trainer (civil engineering)              | <b>40698</b> |
| Trainer (computers)                      | <b>50598</b> |
| Trainer (crane driving)                  | <b>81398</b> |
| Trainer (electrical engineering)         | <b>40398</b> |
| Trainer (firefighting/rescue)            | <b>80298</b> |
| Trainer (first aid)                      | <b>70898</b> |
| Trainer (general engineering) [nec]      | <b>49998</b> |
| Trainer (general management) [nec]       | <b>09998</b> |
| Trainer (humanities) [nec]               | <b>69998</b> |
| Trainer (mechanical engineering)         | <b>40598</b> |
| Trainer (medical) [nec]                  | <b>79998</b> |

| <b>OCCUPATION</b>                                      | <b>CODE</b>  |
|--|--------------|
| Trainer (metallurgy/beneficiation/manufacturing) [nec] | <b>39998</b> |
| Trainer (mining production) [nec]                      | <b>29998</b> |
| Trainer (nursing)                                      | <b>70698</b> |
| Trainer (road driving)                                 | <b>80998</b> |
| Trainer (safety/loss control)                          | <b>50898</b> |
| Trainer (scientific/technical) [nec]                   | <b>59998</b> |
| Trainer (security)                                     | <b>80198</b> |
| Trainer (service occupation) [nec]                     | <b>89998</b> |
| Trainer/instructor [nec]                               | <b>60398</b> |
| Training assistant                                     | <b>60302</b> |
| Training management                                    | <b>60300</b> |
| Training officer [nec]                                 | <b>60301</b> |
| Training worker [nec]                                  | <b>60399</b> |
| Translator   | <b>60903</b> |
| Transport worker [nec]                                 | <b>81399</b> |
| Tribal representative/induna                           | <b>60203</b> |
| Typist/word processor operator/receptionist            | <b>10906</b> |
| Unclassified occupation (unknown/no specific skill)    | <b>09999</b> |

|   |              |
|---|--------------|
| Typist/word processor operator/receptionist           | <b>10906</b> |
| Underground/production/section manager                | <b>20001</b> |
| Uranium plant official                                | <b>30401</b> |
| Urologist   | <b>70119</b> |
| User support (computers)                              | <b>50518</b> |
| Valuator  | <b>10510</b> |
| Waiter/waitress                                       | <b>80704</b> |
| Water, effluent and sanitation management             | <b>40900</b> |
| Water, effluent and sanitation officer                | <b>40907</b> |
| Water, effluent and sanitation team leader/supervisor | <b>40901</b> |
| Water treatment operator                              | <b>40902</b> |
| Weighbridge attendant                                 | <b>10395</b> |
| Welder  | <b>40456</b> |
| Welfare assistant                                     | <b>60504</b> |
| Welfare officer                                       | <b>60503</b> |
| Welfare worker [nec]                                  | <b>60599</b> |
| Winch operator \ driver                               | <b>40526</b> |
| Winch transporter team leader                         | <b>40525</b> |
| Winch transporter/erector                             | <b>40524</b> |
| Winding engine driver (licensed)                      | <b>21301</b> |
| Wireline operators (ocean)                            | <b>20406</b> |
| Word processor operator/typist/receptionist           | <b>10906</b> |
| Work study observer/assistant                         | <b>50707</b> |
| Work study officer                                    | <b>50706</b> |
| Wrapper   | <b>35913</b> |
| Writer/journalist                                     | <b>60902</b> |
| Yard supervisor                                       | <b>10318</b> |
| Yard worker [nec]                                     | <b>10321</b> |

**ANNEXURE B**  
**HEG DETERMINATION - EXAMPLE OF STATISTICAL APPROACH**

*(For information only)*

**1 Introductory Information**

In statistics, a **CI** is a particular kind of interval estimate of a population parameter. Instead of estimating the parameter by a single value, an interval likely to include the parameter is given. Thus, **CI**s are used to indicate the reliability of an estimate. How likely the interval is to contain the parameter is determined by the confidence level or confidence coefficient. Increasing the desired confidence level will widen the confidence interval.

A **CI** is always qualified by a particular confidence level, usually expressed as a percentage. The end points of the **CI** are referred to as confidence limits.

## STEP 1

Action to be performed:

- (a) Capture sampling data in Microsoft Excel.
- (b) Calculate the A-weighting network frequency **RMS** sound pressure in pascals, for each sound pressure level measurement in **dBA**, by making use of the formula below:

$$L_{pA} = 10 \log \left( \frac{p_A}{p_0} \right)^2$$

Formulae in Microsoft Excel:

=POWER(10,(A2/20))\*0.00002

Where:

- 'A4' = cell where sound pressure level (**dBA**) data is entered in Microsoft Excel spread sheet
- (c) Determine the descriptive statistics for the data by utilising Microsoft Excel **Analysis ToolPak**.

To install the **Analysis ToolPak** (early versions of Microsoft Excel):

- (a) On the **Tools** menu, select **Add-Ins**.
- (b) If the **Analysis ToolPak** is not listed in the **Add-Ins** dialog box, click **Browse** and locate the drive, folder name and file name for the **Analysis ToolPak Add-Ins** (Analys32.xll), usually located in the **Library/Analysis folder**, or run the **Setup-programme** if it is not installed.
- (c) Select the **Analysis ToolPak** check box.

To install the **Analysis ToolPak** (later versions of Microsoft Excel):

- (a) On the **File** menu, select **Options** and then click on **Add-Ins**.
- (b) If the **Analysis ToolPak** is not listed in the **Add-Ins** dialog box, select the **Add-ins** option from the **Manage** field and click on the **Go** button. Select the **Analysis ToolPak** and **Analysis ToolPak - VBA** and click the **OK** button. If the **Analysis ToolPak** and **Analysis ToolPak - VBA** are not listed, locate the drive, folder name, and file name for the **Analysis ToolPak Add-Ins** (Analys32.xll), usually located in the **Library/Analysis folder**, or run the **Setup-programme** if it is not installed.
- (c) Select the **Analysis ToolPak** check box.

How to use the **Analysis ToolPak**.

- (a) Before using the analysis tool, you must first arrange the data you want to analyse in one column (eg A1 to A40 - if you have 40 values that you want to analyse).
- (b) On the **Tools** menu, click **Data Analysis**.
- (c) In the **Analysis Tools** box, select the **Descriptive Statistics** tool.
- (d) Enter the input range (eg A1 to A40).
- (e) Select the **Grouped by Columns** option.
- (f) Select the output range (eg B1 to B40).
- (g) Select the **Summary Statistics** option.

- (h) Select the **Confidence Level of Mean** option and enter this value as being 95%.
- (i) Select **OK**.

Expected result:

| EXAMPLE OF DATA ENTERED INTO MICROSOFT EXCEL |                                    |
|--|------------------------------------|
| SOUND PRESSURE LEVEL DATA (dBA)              | CALCULATED RMS SOUND PRESSURE (Pa) |
| 82.5   | 0.266704286                        |
| 82.6   | 0.269792577                        |
| 82.7   | 0.272916627                        |
| 82.9   | 0.279273672                        |
| 83.2   | 0.289087954                        |
| 83.1   | 0.285778792                        |

| EXPECTED RESULT AFTER COMPLETING ACTIONS AS INDICATED UNDER STEP 1 |          |
|--|----------|
| DESCRIPTIVE STATISTICS   |          |
| Mean   | 0.35142  |
| Standard error   | 0.020882 |
| Median   | 0.33271  |
| Mode   | 0.289088 |
| <b>SD</b>  | 0.083528 |
| Sample variance  | 0.006977 |

|      |             |
|------|-------------|
| 83.2 | 0.289087954 |
| 83.8 | 0.309763324 |
| 85   | 0.355655882 |
| 85.1 | 0.359774183 |
| 85.2 | 0.363940172 |
| 85.3 | 0.413076031 |
| 85.7 | 0.432543705 |

|                          |          |
|--------------------------|----------|
| Kurtosis                 | -0.27375 |
| Skewness                 | 0.85202  |
| Range                    | 0.265441 |
| Minimum                  | 0.266704 |
| Maximum                  | 0.532145 |
| Sum                      | 5.622721 |
| Count                    | 16       |
| Confidence level (95.0%) | 1.165475 |

## STEP 2

Action to be performed:

From the descriptive statistical analysis calculate the following:

- (a) **2SD** = 2 x **SD** eg 2 x 0.0835 = 0.167
- (b) Mean - **2SD** = Mean - **2SD** eg 0.351 - 0.167 = 0.184
- (c) Mean + **2SD** = Mean + **2SD** eg 0.351 + 0.167 = 0.518
- (d) 90<sup>th</sup> **percentile** value by utilising the following Microsoft Excel formula:  
= **PERCENTILE** (A1:A40,0.9) = 0.459 (for the data used in this example)

Where:

- 'A1:A40' = Range where data is entered in Microsoft Excel spread sheet.
- '0.9' = The **percentile** to be calculated, in this case the 90<sup>th</sup> **percentile**.

Convert the calculated **RMS** sound pressure (Pa) back to sound pressure level (**dB(A)**) by utilising the following Microsoft Excel formula:

$$=(10*\text{LOG}(\text{POWER}(\text{SUM}(14/0.00002),2)))$$

Where:

- '14' = cell where **RMS** sound pressure (Pa) data is entered in Microsoft Excel spread sheet

| <b>CALCULATIONS</b>                |         |
|------------------------------------|---------|
| Mean                               | = 84.90 |
| Mean - <b>2SD</b>                  | = 79.30 |
| Mean + <b>2SD</b>                  | = 88.27 |
| 90 <sup>th</sup> <b>percentile</b> | = 87.21 |

*Interpretation:*

From the calculation performed above it can already be estimated that this **HEG** is NOT statistically correct defined as:

- The mean value (84.90) falls within the 'C category' and the 90<sup>th</sup> **percentile** value (87.21) falls within the 'B category'. For a **HEG** to be statistically correctly defined, the mean value and 90<sup>th</sup> **percentile** value will almost always fall within the same classification band.

### STEP 3

*Action to be performed:*

Determine if 95% of the samples taken falls within **2SD** from the mean value.

*Example:*

- 95% of the samples must be between 'Mean - **2SD**' (79.30) and 'Mean + **2SD**' (88.27)
- From the data, zero samples are smaller than 'Mean - **2SD**' and one sample (88.5) is larger than 'Mean + **2SD**'.

*Interpretation:*

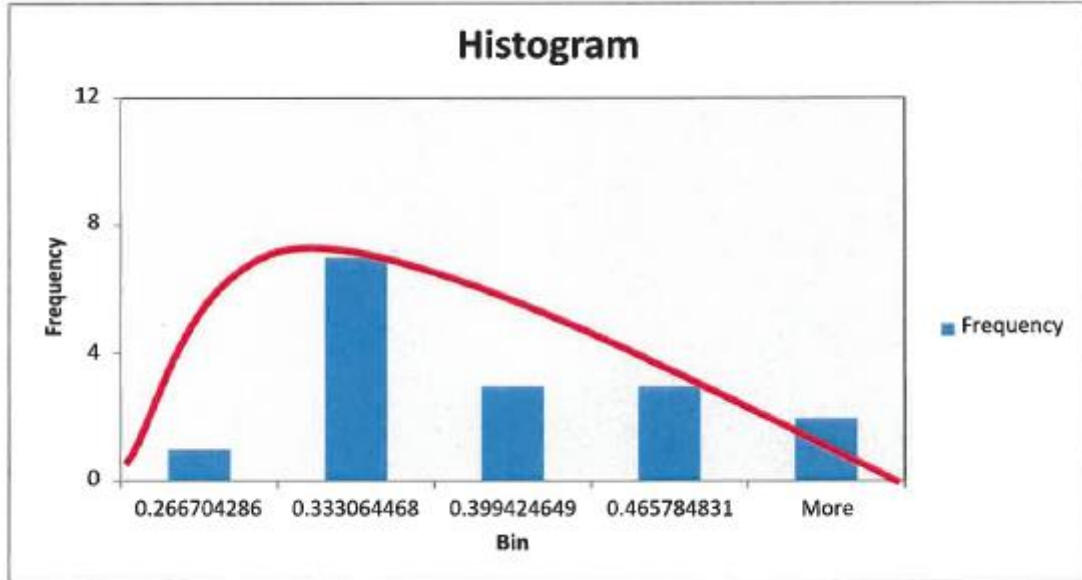
One out of 16 samples falls outside the **2SD** from the mean value, which represents 6.25% of the sample group (ie  $1/16 \times 100 = 6.25\%$ ). This is more than the allowable 5% and therefore the **HEG** cannot be seen as statistically correctly defined.

**STEP 4**

*Action to be performed:*

Draw a histogram to graphically indicate the data.

*Expected result:*



*Interpretation:*

From the histogram it is also clear that the **HEG** is NOT statistically correctly defined (no bell curve). Only two things can be done to correct this situation:

- (a) Obtain more samples to determine the correct distribution of samples within the **HEG**. This is currently being forced by the legislated sampling strategy as the 'logarithmic average' value being reported, (for an **OEL** of 85 in this example) falls within a 'B category' (5% sampled over 12 months) but the 90<sup>th</sup> **percentile** value is reported as an 'A category' thus forcing more samples to be taken (5% over 6 months).
- (b) Conduct an investigation to determine if more than one **HEG** is being represented by the data.

**STEP 5**

*Action to be performed:*

Conduct an investigation to determine if more than one **HEG** is being represented by the data. This can be done by investigation and following the methodology as explained up to this point (for example):

- After investigation, the **HEG** was divided into two separate **HEGs** (electrical workshop **HEG** and mechanical workshop **HEG**).
- The data collected was then allocated to the two **HEG's** and the statistical analysis revealed the following:

Electrical workshop noise measurement results:

| SOUND PRESSURE LEVEL DATA (dBA) | CALCULATED RMS SOUND PRESSURE (Pa) |
|---------------------------------|------------------------------------|
| 82.5                            | 0.266704286                        |
| 82.6                            | 0.269792577                        |
| 82.7                            | 0.272916627                        |
| 82.9                            | 0.279273672                        |
| 83.2                            | 0.289087954                        |



|      |             |
|------|-------------|
| 83.1 | 0.285778792 |
| 83.2 | 0.289087954 |
| 83.8 | 0.309763324 |

| DESCRIPTIVE STATISTICS   |          |
|--------------------------|----------|
| Mean                     | 0.282801 |
| Standard error           | 0.004916 |
| Median                   | 0.282526 |
| Mode                     | 0.289088 |
| <b>SD</b>                | 0.013905 |
| Sample variance          | 0.000193 |
| Kurtosis                 | 0.944465 |
| Skewness                 | 0.902975 |
| Range                    | 0.043059 |
| Minimum                  | 0.266704 |
| Maximum                  | 0.309763 |
| Sum                      | 2.262405 |
| Count                    | 8        |
| Confidence level (95.0%) | 0.687951 |

Calculations from the descriptive statistical analysis:

| CALCULATIONS                       |         |
|------------------------------------|---------|
| Mean                               | = 0.283 |
| 2 x <b>SD</b>                      | = 0.028 |
| Mean - 2 <b>SD</b>                 | = 0.255 |
| Mean + 2 <b>SD</b>                 | = 0.311 |
| 90 <sup>th</sup> <b>percentile</b> | = 0.295 |

Convert the calculated **RMS** sound pressure (Pa) back to sound pressure level (**dB**A):

| CALCULATIONS                       |         |
|------------------------------------|---------|
| Mean                               | = 83.01 |
| Mean - 2 <b>SD</b>                 | = 82.11 |
| Mean + 2 <b>SD</b>                 | = 83.82 |
| 90 <sup>th</sup> <b>percentile</b> | = 83.38 |

*Action to be performed:*

From the calculation performed above it can already be estimated that this **HEG** is statistically correct defined as:

- (a) The mean value (83.01) falls within the 'C category' and the 90th **percentile** value (83.38) also falls within the 'C category'.

*Interpretation:*

Determine if 95% of the samples taken falls within 2**SD** from the mean value.

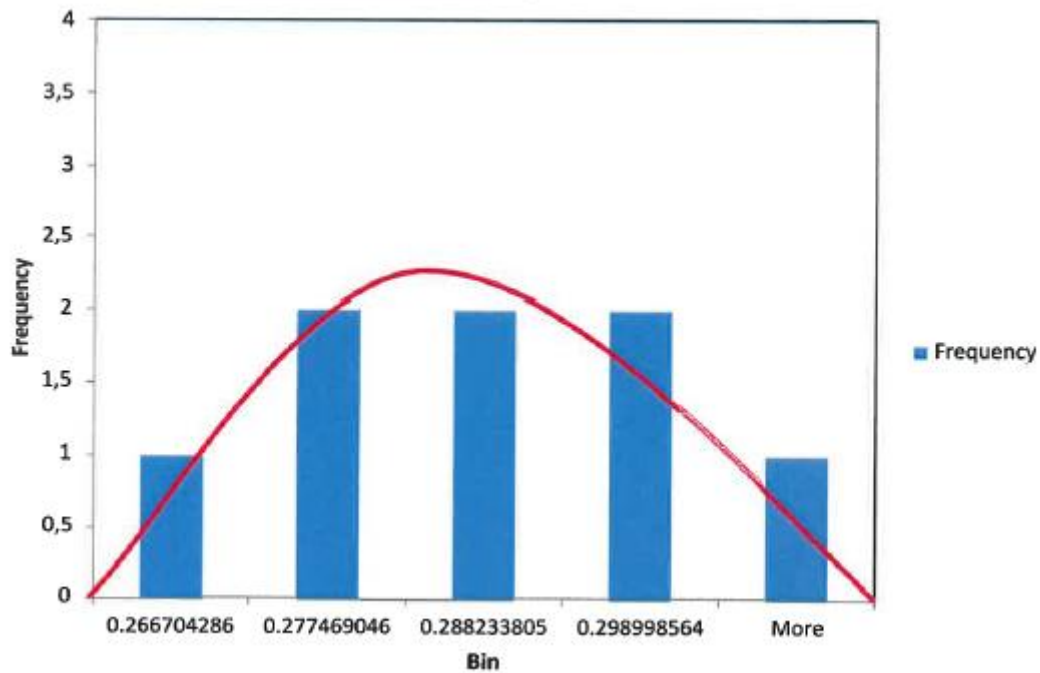
- 95% of the samples must be between 'Mean - 2**SD**' (82.11) and 'Mean + 2**SD**' (83.82)
- From the data zero samples are smaller than 'Mean - 2**SD**' and zero samples are [sic] than 'Mean + 2**SD**'.

None out of eight samples falls outside the 2**SD** from the mean value, which represents 0% of the sample group (ie  $1/8 \times 100 = 0\%$ ). This is less than the allowable 5% and therefore the **HEG** is statistically correctly defined.

Action to be performed:

Draw a histogram to graphically indicate the data.

**Histogram**



Mechanical workshop noise measurement results:

| SOUND PRESSURE LEVEL DATA (dBA) | CALCULATED RMS SOUND PRESSURE (Pa) |
|---------------------------------|------------------------------------|
| 85                              | 0.355655882                        |
| 85.1                            | 0.359774183                        |
| 85.2                            | 0.363940172                        |
| 86.3                            | 0.413076031                        |
| 86.7                            | 0.432543705                        |
| 86.4                            | 0.417859226                        |
| 87.7                            | 0.485322019                        |
| 88.5                            | 0.532145012                        |

| DESCRIPTIVE STATISTICS   |          |
|--------------------------|----------|
| Mean                     | 0.42004  |
| Standard error           | 0.022346 |
| Median                   | 0.415468 |
| Mode                     | #N/A     |
| <b>SD</b>                | 0.063204 |
| Sample variance          | 0.003995 |
| Kurtosis                 | -0.2504  |
| Skewness                 | 0.77433  |
| Range                    | 0.176489 |
| Minimum                  | 0.355656 |
| Maximum                  | 0.532145 |
| Sum                      | 3.360316 |
| Count                    | 8        |
| Confidence level (95.0%) | 1.37295  |

Calculations from the descriptive statistical analysis:

| CALCULATIONS                       |         |
|------------------------------------|---------|
| Mean                               | = 0.420 |
| 2 x <b>SD</b>                      | = 0.126 |
| Mean - 2 <b>SD</b>                 | = 0.294 |
| Mean + 2 <b>SD</b>                 | = 0.546 |
| 90 <sup>th</sup> <b>percentile</b> | = 0.499 |

Convert the calculated **RMS** sound pressure (Pa) back to sound pressure level (**dB(A)**):

| CALCULATIONS                       |         |
|------------------------------------|---------|
| Mean                               | = 86.45 |
| Mean - 2 <b>SD</b>                 | = 83.34 |
| Mean + 2 <b>SD</b>                 | = 88.73 |
| 90 <sup>th</sup> <b>percentile</b> | = 87.95 |

*Action to be performed:*

From the calculation performed above it can already be estimated that this **HEG IS** statistically correct defined, as:

The mean value (86.45) falls within the 'B category' and the 90th **percentile** value (88.95) also falls within the 'B category'.

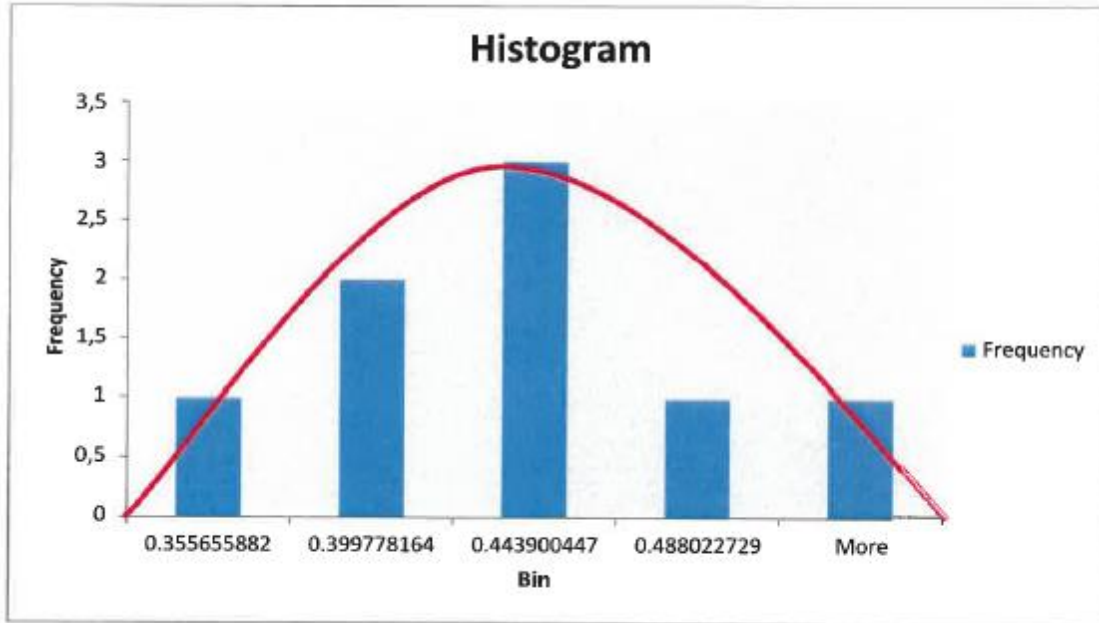
*Interpretation:*

Determine if 95% of the samples taken falls within 2**SD** form the mean value.

- 95% of the samples must be between 'Mean - 2**SD**' (83.34) and 'Mean + 2**SD**' (88.73)
- From the data zero samples are smaller than 'Mean - 2**SD**' and zero samples are [sic] than 'Mean + 2**SD**'.

None out of eight samples falls outside the 2**SD** form the mean value, which represents 0% of the sample group (ie  $1/8 \times 100 = 0\%$ ). This is less than the allowable 5% and therefore the **HEG** is statistically correctly defined.

Action to be performed:  
 Draw a histogram to graphically indicate the data.



**ANNEXURE C  
 MANDATORY CLASSIFICATION BANDS**

*(This Annexure forms part of the guideline and must be complied with)*

| CATEGORY | PERSONAL EXPOSURE LEVEL | GENERAL ACTION   |
|----------|-------------------------|--|
| A        |                         | Exposures $\geq 105$ dB $L_{Aeq, 8h}$                            |
| B        |                         | Exposures $\geq 85$ and $< 105$ dB $L_{Aeq, 8h}$                 |
| C        |                         | Exposures $\geq 82$ dB $L_{Aeq, 8h}$ and $< 85$ dB $L_{Aeq, 8h}$ |
| D        |                         | Exposures $< 82$ dB $L_{Aeq, 8h}$                                |

**Frequency Monitoring Table for Noise**

| CATEGORY | NUMBER OF SAMPLES AND FREQUENCY                           |
|----------|---|
| A        | 5% or five samples per quarter                            |
| B & C    | 5% or five samples per annum to be evenly spread annually |
| D        | Portfolio of evidence to be kept at the mine              |

**ANNEXURE D  
 REPORTING FORMS**

*(This Annexure forms part of the guideline and must be complied with)*

**REPORTING FORM**

|  |  |   |                 |  |                |  |  |  |
|--|--|---|-----------------|--|----------------|--|--|--|
| <b>MINE NAME:</b>  |  |   |                 |  |                |  |  |  |
| <b>QUARTERLY NOISE EXPOSURE REPORT FORM 21.9(2)(e) in terms of regulation 9.2(7)</b> |  |   |                 |  |                |  |  |  |
| <b>MAIN COMMODITY CODE:</b>  |  | <table border="1"> <tr> <td>DMRE MINE CODE:</td> <td></td> </tr> <tr> <td>SUB MINE CODE:</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table> | DMRE MINE CODE: |  | SUB MINE CODE: |  |  |  |
| DMRE MINE CODE:  |  |   |                 |  |                |  |  |  |
| SUB MINE CODE:   |  |   |                 |  |                |  |  |  |
|  |  |   |                 |  |                |  |  |  |
| <b>SAMPLE AREA:</b>  |  |   |                 |  |                |  |  |  |
| <b>ACTIVITY AREA CODE:</b>   |  |   |                 |  |                |  |  |  |
| <b>HEG DESCRIPTION:</b>  |  |   |                 |  |                |  |  |  |

|   |           |           |           |           |                       |   |  |
|---|-----------|-----------|-----------|-----------|-----------------------|---|--|
| <b>HEG CLASSIFICATION BAND:</b><br>(based on 90th percentile statistical analysis of the previous annual results]   |           |           |           |           |                       | <b>REPORTING PERIOD:</b><br>(eg January to March) |  |
| <b>ANNUAL 90<sup>th</sup> PERCENTILE RESULT FOR THE HEG:</b><br>(based on all individual measurements obtained from all quarters during the previous measurement cycle) |           |           |           |           |                       |   |  |
| <b>NUMBER OF EXPOSED EMPLOYEES:</b><br>(where there are new employees number of exposed employees reported should be progressive)                                       | <b>Q1</b> | <b>Q2</b> | <b>Q3</b> | <b>Q4</b> | <b>ANNUAL RESULTS</b> |   |  |
|   |           |           |           |           |                       |   |  |
| <b>NUMBER OF SAMPLES PLANNED FOR THE CURRENT SAMPLING CYCLE:</b>  |           |           |           |           |                       |   |  |
| <b>NUMBER OF SAMPLES TAKEN:</b>   |           |           |           |           |                       |   |  |
| <b>QUARTERLY HEG CLASSIFICATION:</b><br>(based in the Log average)  |           |           |           |           |                       |   |  |

| OCCUPATION CODE IN HEG | OCCUPATION DESCRIPTION IN A HEG | NUMBER OF PERSONS PER OCCUPATION | Each recorded sound pressure level measured ( $L_{Aeq, 8h}$ ) within the HEG linked to the occupation code |
|------------------------|---------------------------------|----------------------------------|--|
|                        |                                 |                                  |  |
|                        |                                 |                                  |  |
|                        |                                 |                                  | <b>Logarithmic average sound pressure level of the HEG, results to be allocated to medical record</b>      |

|  |  |
|--|--|
| <b>Reasons for individual result/s exceeding the annual HEG Classification</b>   |  |
| <b>Corrective actions that will be implemented to mitigate the individual result/s exceeding the annual HEG Classification</b> |  |

**ANNEXURE E  
NOISE REGISTER TEMPLATE**  
(For information purposes only)

|                                 |  |               |  |
|---------------------------------|--|---------------|--|
| <b>EQUIPMENT NOISE REGISTER</b> |  |               |  |
| Commodity:                      |  | Mine name:    |  |
| Shaft/operation:                |  | Date updated: |  |



## PURPOSE

To manage the **noise** hazard effectively, industry focus must be on a strategy to eliminate and control **noise** at source by implementing an accepted, practical and effective industry-wide '*buy-and-maintain-quiet*' initiative. This initiative is the outcome of a standing decision taken by mining companies to procure equipment/machinery, and maintain existing equipment that conforms to specific **noise** emission requirements.

This document serves as an industry guideline for the implementation of the 2014 **noise** milestones. It also details the required **noise** measurement procedure to ensure the employment of uniform measurement procedures under realistic operating conditions.

The guideline has been developed for use by persons who have been found competent by the occupational hygienist appointed under section 12.1 of the **MHSA** to conduct **noise** measurements by virtue of their knowledge, training and experience.

## NOISE MEASUREMENT FOR INDIVIDUAL PIECES OF EQUIPMENT AND MACHINERY MEASUREMENT CRITERIA

Noise levels should be measured directly with an **ISLM** that meets at least the accuracy requirements for a class-2 instrument (given in IEC 61672-1 and SANS 61672-1), and is fitted with a windshield specified by the **ISLM** manufacturer. The following measurement criteria should be applied:

- **OEL: 85 dBA.**
- Threshold level/low threshold limit: **80 dBA.**
- Energy exchange or doubling rate: **3 dBA.**

The instrument supplier normally sets these measurement criteria prior to delivery, but this should be confirmed before use. For instruments with a facility to alter the measurement criteria via on-board software or firmware, the above criteria should be confirmed or corrected using the instrument's set-up mode.

## INSTRUMENT SETTINGS

The following instrument settings should be used for  $L_{Aeq, T}$  measurements:

- A-weighting: *on*
- Time weighting: '*fast*' or '*impulse*' if the **noise** is impulsive and the **SLM** has impulse-integrating capability. If the **noise** is impulsive but the **SLM** does not provide for impulse-integration, increase the measured  $L_{Aeq, T}$  by **5 dBA** for moderately impulsive **noise** (eg pneumatic rock drill) or **12 dBA** for highly impulsive **noise** (eg compressed air-driven charging-up of blast holes or hammer blows in an artisan workshop)
- Sound incidence: where applicable, '*frontal*' if the microphone is facing a **noise** source, or '*random*' if the **noise** is non-directional/multi-directional
- Frequency filter: *out* (off)
- Operating mode: *integrate* or  $L_{Aeq}$

## GENERAL PROCEDURES

The following general procedures must be followed for  $L_{Aeq, T}$  measurements:

- Confirm the **SLM's** acoustic sensitivity with a sound calibrator immediately before and after each series of measurements, usually before commencing a shift and immediately after completion of the shift. This should be done using a class-2 calibrator (minimum) as defined in SANS 60942/SABS-IEC 60942. If the two calibration checks do not coincide to within **1 dBA** [**SANS 10083**],

results of the intervening measurements must be discarded and the measurements repeated.

- For the purpose of measuring individual pieces of equipment and machinery, measurements should be taken 1 m away from the specific noise source, as far as reasonably practicable.

### MEASUREMENT PROCEDURES

Measure  $L_{Aeq, T}$  for a representative time at a selected microphone position:

- For steady **noise**, a measurement time of one minute is adequate.
- Where the **noise** varies or is cyclical, the measurement time should be sufficient to capture variations in level and include a reasonable number of work task cycles, to ensure representative results.

This  $L_{Aeq, T}$  measurement for the variation or cyclical **noise** level will then be recorded as the representative **noise** level for the individual piece of equipment or machine.

### NEW (TYPE/DESIGN) EQUIPMENT CONSIDERATIONS

**Noise** measurements must comply with ISO 3744/SANS3744. As a rule of thumb, the impact of the **noise** emitted from a new type or design of equipment underground can be estimated by doubling the sound pressure level measured on surface. This is achieved by adding 3 **dB**A to the **noise** level displayed on the manufacturer's certificate to allow for sound reflected from solid boundaries (reverberation).

### REPORTING AND RECORDING RESULTS OF NOISE MEASUREMENTS

#### Data collection

- For equipment noise emissions above 100 **dB**A, the data collection will be based on sampling a minimum of 5% (or a minimum of 5 if there is less than 100 pieces of that particular equipment type) of that equipment type total population over a 12-month period (samples should be representative of the various activities).

**(Refer to the example in Appendix 2)**

The **logarithmic average** must be calculated for reporting purposes per quarter.

The following formula can be used to calculate the logarithmic average ( $L_{Aeq}$ ):

---


$$L_{Aeq} = 10 \log \frac{(\text{anti log } \frac{L_1}{10} + \text{anti log } \frac{L_2}{10} + \text{anti log } \frac{L_3}{10} + \text{anti log } \frac{L_4}{10} + \dots)}{n}$$

Where:  
 $L$  = the noise levels measured ( $L_{Aeq}$ ) in **dB**A for equipment.  
 $n$  = number of total samples



**EXAMPLE:**  
(MINIMUM OF 5% OR A MINIMUM OF FIVE OVER A 12-MONTH PERIOD)

**EXAMPLE ON QUARTER 1 DATA**

Rock drill 1 = L1 = 105.0 dBA  
 Rock drill 2 = L2 = 103.8 dBA  
 Rock drill 3 = L3 = 108.2 dBA  
 Rock drill 4 = L4 = 104.6 dBA

$$L_{Aeq} = 10 \log \frac{(\text{anti log } \frac{105.0}{10} + \text{anti log } \frac{103.8}{10} + \text{anti log } \frac{108.2}{10} + \text{anti log } \frac{104.6}{10})}{n}$$

$L_{Aeq} = 105.8 \text{ dBA}$   
 $n = \text{number of total samples}$

**Note:**

The example calculation above is based on the example quarter 1 data collected, based on a sampling strategy of sampling 5% of equipment or a minimum of five samples over 12-month period (whichever is the greater) and explained in more detail below.

**CALCULATION OF THE LOGARITHMIC AVERAGE**

For quarter 1 the logarithmic average for the quarter is calculated using readings 1, 2, 3 and 4 as indicated below. The same applies to calculate the log average for the quarter going forward.

|                         | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 |
|-------------------------|-----------|-----------|-----------|-----------|
| Log average             | 105.8     | 105.4     | 103.9     | 106.0     |
| Log average for quarter |           | 105.6     | 104.8     | 105.3     |
| Reading (1)             | 105.0     | 104.1     | 105.7     | 105.0     |
| Reading (2)             | 103.8     | 105.6     | 99.9      | 103.8     |
| Reading (3)             | 108.2     | 106.9     | 104.2     | 108.2     |
| Reading (4)             | 104.6     | 104.2     | -         | 104.6     |
| Reading (5)             | -         | -         | -         | 106.9     |

**CALCULATION OF THE ROLLING LOGARITHMIC AVERAGE**

To calculate the logarithmic rolling average for quarter 2, readings 1, 2, 3 and 4 of quarter 1 as well as readings 1, 2, 3 and 4 of quarter 2 are used as indicated below. The same applies for the next quarters.

|                         | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 |
|-------------------------|-----------|-----------|-----------|-----------|
| Log average             | 105.8     | 105.4     | 103.9     | 106.0     |
| Log average for quarter |           | 105.6     | 104.8     | 105.3     |
| Reading (1)             | 105.0     | 104.1     | 105.7     | 105.0     |
| Reading (2)             | 103.8     | 105.6     | 99.9      | 103.8     |
| Reading (3)             | 108.2     | 106.9     | 104.2     | 108.2     |
| Reading (4)             | 104.6     | 104.2     | -         | 104.6     |
| Reading (5)             | -         | -         | -         | 106.9     |

For equipment between 85 dBA and 100 dBA data collection will be based on the noise risk register as follows:

- Identify the equipment to be measured.
  - Determine background area for the measurement.
  - Identify the equipment that can be switched-off safely.
  - Switch-off the identified equipment.
  - Record the background noise.
  - List the equipment that could not be switched off during the recording of the background noise.
  - Record equipment noise.
- (Refer to the example in Appendix 1)**

**DATA REPORTING**

- Noise data will be reported using rolling log averages on a quarterly basis.
- Total number of pieces of equipment type must be reported quarterly.

**(Refer to the example in Appendix 2)**

Results should be recorded and documented so as to ensure uniform workplace operating conditions, measurement procedures and microphone positions, thereby allowing meaningful comparisons with future results. The following information must be recorded:

- **Instrument type, serial number (including microphone), calibration data, etc.**
- **Working place, environmental and equipment information such as:**

|  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Mining company</li> <li>• Mine/shaft/operation</li> <li>• Commodity</li> <li>• Type of mining</li> <li>• Workplace (use Annexure A:<br/><br/>Mandatory codes eg stoping, development, etc)</li> <li>• Excavation area (m<sup>2</sup>)</li> <li>• Type of excavation</li> <li>• Equipment being measured - name and description</li> <li>• Model/type</li> <li>• Serial/equipment number</li> <li>• Equipment category</li> <li>• Power source (pneumatic/electric/electro hydraulic/hydro power)</li> <li>• Manufacturer/supplier</li> <li>• Activities/processes measured</li> </ul> | <ul style="list-style-type: none"> <li>• Activities - equipment that runs continuously eg pump, compressor, etc.</li> <li>• Process - cyclical operations eg rock drill collaring, drilling and extracting, etc.</li> <li>• Silenced/not silenced.</li> <li>• Number of pieces of equipment per shaft.</li> <li>• Noise level (<b>dba</b>) - (log average to be recorded).</li> <li>• Noise level (<b>dba</b>) - (all scenarios to be recorded).</li> <li>• Type of ventilation.</li> <li>• Air velocity.</li> <li>• List background noise levels and the sources that constitute the background noise.</li> <li>• Compressed air pressure for pneumatic-driven equipment.</li> <li>• Date of report.</li> </ul> |
|--|--|

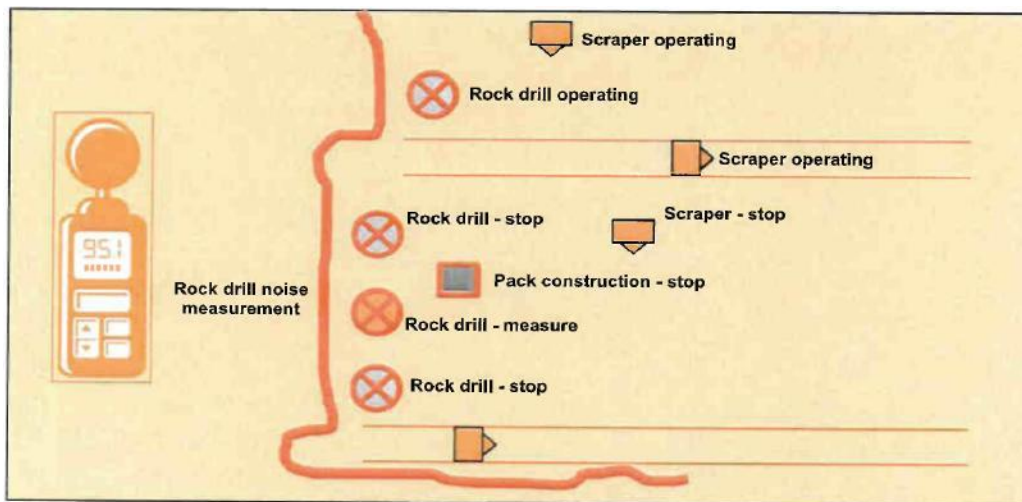
## APPENDIX 1

### EXAMPLE OF EQUIPMENT NOISE MEASUREMENT PROCESS

When the noise level of an individual piece of equipment needs to be measured, the environment in which the measurement will take place must be assessed to determine which other equipment is operating in the vicinity. This is necessary as such background noise will have an effect on the noise measurement results of the piece of equipment to be measured. In order to obtain the most accurate noise measurement result, it is important to isolate any other operating equipment as far as practicable. Only equipment which can be safely isolated and which will not have an effect on the health and safety of employees should be isolated. The type of equipment which could not be isolated must be recorded and included in the noise measurement report.

**BELOW ARE THE STEPS TO FOLLOW PRIOR TO PERFORMING NOISE MEASUREMENT ON AN IDENTIFIED PIECE OF EQUIPMENT:**

- 1 Identify the equipment to be measured.
- 2 Determine the background **noise** level present in the area to be measured (define the distance away from the equipment to be measured eg 6 m away).
- 3 Which equipment or activities can be safely stopped or switched off?
- 4 Isolate the equipment and activities identified in step 3 above, where required.
- 5 Conduct background **noise** measurements.
- 6 Record the background **noise** level present, together with the relevant information on the equipment and/or activities which could not be isolated.
- 7 Conduct **noise** measurements according to steps 3 and 4 above. Measurement of any cyclic equipment must take place from the initial start to the end of such cycle ie a rock drill will be measured from starting the machine, collaring, drilling and withdrawing the machine.
- 8 Once the **noise** measurement process for the equipment being evaluated is complete, all other equipment and/or activities which constituted the background **noise** within the area could be restarted and the entire process should be repeated for every other piece of equipment to be evaluated.
- 9 Record all the other relevant information, as specified in the data reporting section of the guidance note for **noise** measurement of equipment to ensure compliance with **MHSC** milestones (the report should also indicate the microphone positions in relation to the equipment and surroundings evaluated, for future reference).



**APPENDIX 2**

**EQUIPMENT NOISE REPORTING GUIDE**

**Background**

During 2016, the Minerals Council South Africa published a 'Guidance Note on the Noise Measurement of Equipment to Ensure Compliance with **MHSC** Milestones' factsheet.

The purpose of this guidance note was to serve as an industry guideline for the implementation of the **MHSC** noise milestones, and also detail the required noise measurement procedures to ensure the employment of uniform measurement procedures under realistic operation conditions. This would allow for the comparability of the noise measurement data of various mines, as part of the South African mining industry's journey towards compliance to the **MHSC** noise milestones.

**Purpose**

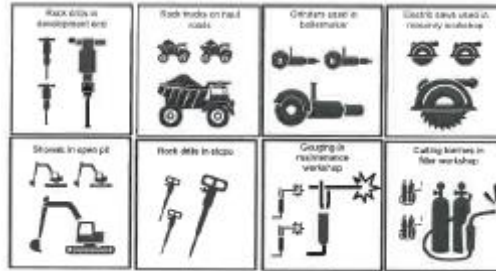
The purpose of this step-by-step guide is to assist mining companies in grouping (also referred to as equipment populations) of equipment for noise measurement, as well as recording and reporting of individual pieces of equipment. It is envisaged that the implementation of this step-by-step allow for comparable equipment noise reporting by mining companies.

**STEP-BY-STEP EQUIPMENT NOISE REPORTING GUIDE**



**STEP 1:**

Group equipment according to the equipment type/model into populations based on the activity area in Annexure A: Mandatory codes (eg S215 rock drills used in stoping activity area as a population).



**STEP 2:**

Conduct **noise** measurements on 5% of the equipment population, as per activity area (eg five samples for an equipment population of 100 S215 rock drills per activity area).



**STEP 3:**

Calculate the logarithmic average **noise** level for the equipment population, making use of the **noise** measurement results obtained in step 2.

$$L_{avg} = 10 \log \frac{(anti \log 10^{105.8}) + (anti \log 10^{105.4}) + (anti \log 10^{103.9}) + (anti \log 10^{106.0})}{n}$$

$L_{avg} = 105.8 \text{ dBA}$      $n = \text{number of total samples}$

**STEP 4:**

Report the logarithmic average **noise** result from step 3 for the equipment population for **noise** milestone tracking purposes and not according to individual measurement results.

**Calculation of the logarithmic average**

For quarter 1 the logarithmic average for the quarter is calculated using readings 1, 2, 3 and 4 as indicated below. The same applies to calculate the log average for the quarter going forward.

|                         |       |       |       |       |
|-------------------------|-------|-------|-------|-------|
| Log Average             | 105.8 | 105.4 | 103.9 | 106.0 |
| Log Average for quarter | 105.6 |       | 104.8 | 105.3 |
| Reading (1)             | 105.0 | 104.1 | 105.7 | 105.0 |
| Reading (2)             | 103.8 | 105.6 | 99.9  | 103.8 |
| Reading (3)             | 108.2 | 106.9 | 104.2 | 108.2 |

|             |       |       |   |       |
|-------------|-------|-------|---|-------|
| Reading (4) | 104.6 | 104.2 | - | 104.6 |
| Reading (5) | -     | -     | - | 106.9 |

A: This logarithmic average result of the **noise** measurements for the entire population of equipment measured will be used for the reporting of **noise** milestone tracking.

B: This individual piece of equipment within the equipment population should be investigated (step 5) and not reported as an individual piece of equipment exceeding 107 **dB**A.

*Note: Should the logarithmic average **noise** result for the equipment population be greater or equal to 107 **dB**A, then the entire S215 rock drill population used in the stopping activity area is reported as equipment greater or equal to 107 **dB**A.*



### STEP 5:

Investigate any individual **noise** measurement recorded for the sampled equipment population which was equal to or above the milestone sound pressure limit of 107 **dB**A.

*Note: The workplace information specified in the 'Data reporting' section of the 'Guidance Note on the **Noise** Measurement of Equipment to Ensure Compliance with **MHSC** Milestones' factsheet should inform the investigation process.*

## ANNEXURE G QUALITY ASSURANCE FOR NOISE MEASUREMENT AND RECORDING

*(For information purposes only)*

### Determination of the equivalent continuous rating level ( $L_{Req, T}$ )

#### Sound measuring equipment

**Integrating sound level meter configuration**, that complies at least with the accuracy requirements specified for a type-2 instrument in SANS 61672-1 and SANS 61672-2. Use a windscreen of a type specified by the manufacturer as being suitable for the particular microphone and which does not detectably influence the accuracy of the meter under the ambient conditions of the test.

**Sound calibrator** that complies with the requirements prescribed for a type-2 calibrator in SANS 60942.

#### Calibration of equipment

##### General

Ensure that all items of sound measuring equipment used are calibrated against the requirements of SANS 60942, SANS 61672-1 and SANS 61672-2 (by an accredited facility), at intervals not exceeding one year for the sound calibrator and two years for the rest of the equipment, that it comply with the requirements for accuracy as required.

The calibration **laboratory** should:

- (a) Prove traceability in accordance with the relevant national legislation.
- (b) Implement and maintain a quality management system in accordance with SANS 17025.
- (c) Be accredited by a recognised accreditor.

#### NOTE:

If the equipment is repaired, it should not be put into service before a comprehensive calibration is undertaken in accordance and an availability of a calibration certificate.

### Acoustic sensitivity

Using the sound calibrator, the acoustic sensitivity of the meter immediately before and after each series of sound level measurements should be checked and the results of the sound measurements should be discarded if the two checks do not coincide to within 1.0 **dB**.

**NOTE:**

If measurements are conducted over extended time periods for each series, acoustic sensitivity checks should be conducted at regular intervals, ie at least once or twice a day.

### Microphone positions

Single locations (where the risk to the only occupant has to be determined).

Place the microphone at the approximate position of the person's ear that receives the higher sound level.

Larger areas (where the average risk to the people in the area has to be determined).

Where practicable, ensure that the microphone is about 1.5 m above the floor or ground (as relevant) and at least 1.2 m away from walls and other large flat surfaces, and scan the area under investigation with the microphone while the instrument is integrating. Alternatively, select at least three positions that are well distributed over the area under investigation, use the following microphone heights and take measurements at each position:

- (a) For standing persons: 1.5 m above the floor or ground on which the persons are standing.
- (b) For seated persons: 0.9 m above the middle of the seat plane, with the seat set at, or as near as possible to, the midpoint of its horizontal and vertical adjustment.

**NOTE:**

If the workers' locations are very close to the **noise** sources, the microphone position and direction have to be precisely stated in the test report.

### Interference

Ensure (as far as possible) that the measurements are not affected by **noise** from extraneous sources and extraneous influences, for example wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. The measured signal should preferably be at least 10 **dB** higher than that of any unavoidable extraneous **noise** and other interference. If this difference is from 3 **dB** to 9 **dB**, the appropriate correction may be calculated in accordance with the following equation:

$$L_{corr} = 10 \log [10^{L_m/10} - 10^{L_i/10}]$$

Where:

- $L_{corr}$  is the corrected sound pressure level
- $L_m$  is the measured sound pressure level.
- $L_i$  is the interference sound pressure level.

If the difference is less than 3 **dB**, the readings taken during the period of the interference should be discarded.

### Measurement time intervals

Choose measurement time intervals such that the results are representative of the shift time interval, and that the variations in the rating level owing to the variation of the

emission at the source, are adequately covered. The choice of the measurement time interval will depend on the method of data acquisition and on the time structure of the **noise**.

If the **noise** displays a clear periodicity, ensure that the measurement time intervals cover at least three periods, where possible. If continuous measurement over the period is not possible, choose the time intervals that each represents a part of the cycle, and that together represent a complete sample that is characteristic of the **noise**. If the sound pressure level varies stepwise, select the measurement time intervals that each represents a period within which the **noise** can be considered approximately steady. If the **noise** is of a random nature, choose the measurement time intervals as to give sufficient independent samples to adequately characterise the **noise**.

**NOTE 1:**

The measurements should preferably be made for the entire duration of a normal work day shift. If the measurement time intervals are shorter than the duration of a normal shift, the individual measurement time intervals, when added together should constitute the duration of the entire shift time interval.

**NOTE 2:**

If the measurements are sampling measurements, the sampling equivalent continuous rating levels should be representative of the entire measurement time interval during which they are taken, and should be allocated the entire measurement time interval which they represent.

**NOTE 3:**

If the shift duration is other than 8-hour, the equivalent continuous 8-hour rating levels should be calculated in accordance.

**NOTE 4:**

If the shift time interval is  $x$ -hour the shift time interval becomes the 8-hour reference time interval.

**Procedures to determine the rating level ( $L_{Req, T}$ )**

General

Three alternative procedures are described in descending order of preference, to permit different classes of instruments to be used. In cases of dispute, use the procedure using I-time weighting and integration (preferred procedure).

**NOTE 1:**

If the **noise** level varies significantly over a period of time or from day to day, enough additional measurements should be taken to cover a full cycle of **noise** variations.

**NOTE 2:**

In the case of a steady **noise**, the value of the **equivalent continuous A-weighted sound pressure level** may be obtained directly by visually averaging the readings on a sound level meter that complies with the prescribed requirements, while using S-time weighting, provided that the **noise** variations do not exceed 5dB.

**Impulsive sound**

**Procedure using I-time weighting and integration (preferred procedure)**

Use this procedure when instrumentation is available that can integrate while using I-time weighting. Carry out the procedure as follows:

- (a) Set the meter to A-weighting and select I-time weighting.
- (b) Measure the **equivalent continuous A-weighted sound pressure level** ( $L_{Aeq, T}$ ) directly, using an appropriate microphone position, during a suitable measurement time interval.

- (c) Where a number of individual measuring positions have been selected, follow the above procedure for each position and calculate the average on a mean square pressure basis as per below formula, to obtain the rating level ( $L_{Req, T}$ ).

$$L_{Req, T} = 10 \log \frac{1}{n} \sum_{i=1}^n 10^{L_{Req, Ti}/10}$$

Where:

- $L_{Req, Ti}$  is the equivalent continuous rating level at the  $i$ -th measurement position.
- $n$  is the number of measurement positions (at least three).

- (d) For composite measurements, use the equation:

$$L_{Req, T} = 10 \log \sum f_i 10^{L_{Req, Ti}/10}$$

Where:

- $L_{Req, Ti}$  is the equivalent continuous rating level at the  $i$ -th partial level.
- $f_i$  is the duration of each partial  $L_{Req, Ti}$  expressed as a fraction of the total time over which  $L_{Req, T}$  is calculated.

**NOTE:**

Where sampling techniques are used to determine the representative equivalent continuous rating level the duration  $f_i$  will represent the proportionate duration fraction of the sound level which is representative of the total portion of the measurement time interval to which the particular sample applies, and not the actual duration of the sample measurement.

**Procedure using integration and a derived impulse correction ( $C_i$ )**

Use this procedure when the available instrumentation is equipped with an integration function, an S-time weighting function and an I-time weighting function, but is not capable of integrating while the time weighting functions are being applied. Carry out the procedure as follows:

- (a) Set the meter to A-weighting and select the integrating mode.
- (b) Measure the **equivalent continuous A-weighted sound pressure level** ( $L_{Aeq, T}$ ) directly, using an appropriate microphone position, during a suitable measurement time interval.
- (c) Select the sound pressure level mode and I-time weighting and note the average maximum reading.
- (d) Select the sound pressure level mode and S-time weighting and note the average maximum reading.
- (e) For each measurement position and each measurement time interval, calculate the difference between the readings obtained in (c) and (d) above, and call this the impulse correction ( $C_i$ ).

$$C_i = L_{p, I} - L_{p, S}$$

$$(C_i \geq 0)$$

Where:

- $L_{p, I}$  is the sound pressure level measured in accordance with (c).
  - $L_{p, S}$  is the sound pressure level measured in accordance with (d).
- (f) Add  $C_i$  to the reading obtained in (b) above, to obtain the rating level ( $L_{Req, T}$ )  
ie  $L_{Req, T} = L_{Aeq, T} + C_i$



- (g) Where a number of individual measuring positions have been selected, follow the above procedure for each position and calculate the average on a mean square pressure basis to obtain the rating level ( $L_{Req, T}$ ).
- (h) For composite measurements, use equation:

$$L_{Req, T} = 10 \log \sum f_i 10^{L_{Req, Ti}/10}$$

**NOTE:**

The measurements described under (a) to (d) should be done simultaneously (unless the **noise** radiation is absolutely homogeneous and constant). This means that three sound level meters should be used, or a recording should be made which may be analysed in sequence afterwards. If a recording of the **noise** is made, it should be ensured that the record/replay characteristics of the entire chain of the equipment comply with the requirements of SANS 61672-1 and SANS 61672-2, and that a calibration signal is recorded before and after each recording.

**Procedure using integration and an estimated impulse correction ( $C_i$ )**

Use this procedure when only a simple integrating sound level meter without appropriate additional functions is available. Carry out the procedure as follows:

- (a) Set the meter to A-weighting and select the integrating mode.
- (b) Measure the **equivalent continuous A-weighted sound pressure level** ( $L_{Aeq, T}$ ) directly, using an appropriate microphone position, during a suitable measurement time interval.
- (c) Decide whether the **noise** is of an impulsive nature, if so, add an impulse correction ( $C_i$ ) of:
  - (i) Five to the reading obtained in (b) above, in the event of regular impulsive sound.
  - (ii) 12 to the reading obtained in (b) above, in the event of highly impulsive sound to obtain the rating level ( $L_{Req, T}$ ) ie

$$L_{Req, T} = L_{Aeq, T} + C_i$$

Where:

- $C_i$  is +5 **dB** for regular impulsive sound.
- $C_i$  is +12 **dB** for highly impulsive sound.
- $C_i$  is 0 in all other cases.

**NOTE:**

For high-energy impulsive sounds, advice by a specialist should be obtained. It may, in these cases be accepted that the equivalent continuous rating level exceeds the maximum allowable limit and special **hearing conservation** measures are required.

- (d) Where a number of individual measuring positions have been selected, follow the above procedure for each position and calculate the average on a mean square pressure basis, to obtain the rating level ( $L_{Req, T}$ ).
- (e) For composite measurements, use equation:

$$L_{Req, T} = 10 \log \sum f_i 10^{L_{Req, Ti}/10}$$

**NOTE:**

The impulse correction is only added, individually or separately, for the measurement time intervals when it was present in the **noise** emission.

### Determination of the shift equivalent continuous, rating level ( $L_{Req, Ts}$ )

Using the procedures given above, calculate the shift equivalent continuous rating level as follows:

$$L_{Req, Ts} = 10 \log \frac{1}{T_s} \sum T_i 10^{L_{Req, Ti}/10}$$

Where:

- $L_{Req, Ts}$  is the equivalent continuous rating level, determined for a time interval of the duration of the work shift.
- $L_{Req, Ti}$  is the individual equivalent continuous rating level, determined for the individual measurement time intervals ( $T_i$ ).
- $T_i$  is the individual measurement time intervals for the measured equivalent continuous rating levels ( $L_{Req, Ti}$ ).
- $T_s$  is the total duration of the work shift.

**NOTE:**

$L_{Req, Ts}$  may be determined for a series of measurement time intervals which, when added together, represent the total shift time interval. If a sampling procedure is used, the individual measurement time intervals should be representative of the entire measurement time interval, and should be calculated for the time intervals which they represent, and not for the actual time durations over which the measurements were conducted. Thus, the individual measurement time intervals in the equation, when added together should result in the total shift time interval.

### Determination of the 8-hour equivalent continuous rating level ( $L_{Req, 8h}$ )

If the individual work shifts differ in duration from a normal 8-hour work shift, the 8-hour equivalent continuous rating level ( $L_{Req, 8h}$ ) should be calculated from the following equation:

$$L_{Req, 8h} = L_{Req, Ts} + 10 \log \frac{T_s}{8}$$

Where:

- $L_{Req, 8h}$  is the equivalent continuous 8-hour rating level.
- $L_{Req, Ts}$  is the equivalent continuous rating level, determined for a time interval of the duration of the work shift.
- $T_s$  is the total duration of the work shift in hours.
- Eight is the total duration of the reference time interval in hours.

**NOTE:**

If the time duration of the work shift is 8-hours, the equivalent continuous shift rating level becomes the equivalent continuous 8-hour rating level and the above calculation is not required.

### Preparation for assessment of measurement area

- 1 The purpose of this procedure is to determine the boundaries of **noise zones** for purposes of demarcation.
- 2 Obtain a plan of the measurement area or draw a dimensioned sketch. Show the relevant positions of all equipment or processes that create **noise** and indicate adjacent reflecting and absorbing surfaces. Use this plan or sketch as a basis for zoning the area.
- 3 Carry out a preliminary survey of **noise** levels in the entire measurement area, using short duration  $L_{Req, T}$  measurements. Identify work areas, operators' positions

and any other location that can be accessed, where the 8-hour **noise** rating level ( $L_{Req, 8h}$ ) equals or exceeds 85 **dB**A.

- 4 Use the information obtained from the above survey to determine preliminary **noise zone** boundaries. Indicate on a plan or sketch the preliminary boundaries of **noise zones** where the 8-hour rating level ( $L_{Req, 8h}$ ) equals or exceeds 85 **dB**A. Ensure that every area, or location that can be accessed, where the 8-hour rating level ( $L_{Req, 8h}$ ) equals or exceeds 85 **dB**A is included within the boundaries of a **noise zone**.

Procedures for drivers' cabins of vehicles and operators' positions for machinery and equipment

Measurement procedures

- 1 Determine the rating level in accordance with over-sufficient measurement time intervals in such that all significant variations of the **noise** levels at the operator's position are measured and included. Ensure that during the measurement time interval, the **noise** that is characteristic of the specific work area and that is representative of the activities performed by the employee, does actually occur. For monitoring tests, slight deviations from the type test conditions may be tolerated, for example, the microphone positions and operating conditions as required.

Operating conditions

- 2 Determine the rating level under normal operating conditions and detail these conditions in the test report.

**NOTE:**

For measurements where the employee moves around continuously, or is operating a vehicle, it is recommended that the **noise** exposure be determined in accordance with requirements of personal dosimetry.

Reassessment of measurement area (rezoning)

- 1 If any changes occurred (for example, changes in production processes, machinery, and position of large surfaces, or a combination of these) that could result in a change in, or redistribution of, **noise** levels, or if there is any suspicion that the previous assessment is no longer valid, it is necessary to reassess the measurement area.
- 2 If there is a reduction in **noise** levels, reassessment could result in the de-restriction of areas previously classified as **noise zones**.
- 3 Owing to the aging and normal wear and tear of equipment, it is advisable that the **noise** measurements be repeated at intervals not exceeding two years.

Reduction of **noise**

- 1 In areas where the 8-hour rating level ( $L_{Req, 8h}$ ) equals or exceeds 85 **dB**A, use the best reasonably practical engineering means to reduce the **noise** to below this limit, for example by acoustically enclosing the machines or the processes or the operator.

**NOTE:**

For the best practicable engineering means to reduce **noise** levels, see SANS 11688 and SANS 11690.

## Personal dosimetry

### Calculation of noise exposure levels

**NOTE:**

This **noise** exposure level is not the same as the A-weighted sound exposure level referred to in SANS 10103.

### Procedure using sound exposure

#### Sound exposure meter

For personnel without fixed work locations (for example supervisors, overseers, maintenance staff and drivers of vehicles) or for personnel who have been identified as being unduly sensitive to **noise**-induced impairment of hearing, the value of the A-weighted sound exposure ( $E_{A, T}$ ) can be determined (on a regular sampling basis) by means of personal sound exposure meters that comply with the relevant accuracy requirements of IEC 61252.

#### Procedure

The personal sound exposure meter should be worn in accordance with the manufacturer's instructions.

Position the microphone of the sound exposure meter approximately 0.10 m from the ear that receives the higher value of the rating level.

**NOTE 1:**

A helmet or frame can be used to support the microphone.

**NOTE 2:**

The microphone should be positioned on the shoulder of the employee, if convenient.

**NOTE 3:**

If the measuring instrument or parts of it are worn on the employee, care should be taken not to disturb the performance of the person and especially not to introduce safety risks. Similarly, care should be taken to avoid misuse of the instrument during measurements.

**NOTE 4:**

The position of the microphone should be reported.

### Operating conditions

Determine the exposure rating level under normal operating conditions compared to the **OEL** and a 3 **dB** exchange rate, over a sufficiently long period of time to be representative of the individual's exposure to **noise**.

#### Calculation procedure

The **noise** exposure level normalised to a nominal 8-hour workday, ( $L_{ex, 8h}$ ), in **dB**, is calculated from the A-weighted sound exposure, ( $E_{A, T_e}$ ) in pascal squared seconds ( $Pa^2.s$ ), using the following equation:

$$L_{A, T_e} = 10 \log \frac{E_{A, T_e}}{1.15 \times 10^{-5}}$$

Where:

- $E_{A, T_e}$  is the A-weighted sound exposure over a time interval ( $T_e$ ), in pascal squared seconds ( $Pa^2.s$ ).
- $T_e$  is the effective duration of the workday in hours.

Selected values of sound exposures with corresponding values of **noise** exposure levels normalised to a nominal 8-hour workday are given for illustration in the table below:

**A-weighted sound exposures ( $E_{A, T_e}$ ) and corresponding values of noise exposure levels normalised to a nominal 8-hour workday ( $L_{ex, 8h}$ ).**

| 1  | 2                  |
|--|--------------------|
| $E_{A, T_e}$<br>$Pa^2 \cdot s \cdot 10^{-3}$ | $L_{ex, 8h}$<br>dB |
| 0.364  | 75                 |
| 0.458  | 76                 |
| 0.576  | 77                 |
| 0.726  | 78                 |
| 0.913  | 79                 |
| 1.15   | 80                 |
| 1.45   | 81                 |
| 1.82   | 82                 |
| 2.29   | 83                 |
| 2.89   | 84                 |
| 3.64   | 85                 |
| 4.58   | 86                 |
| 5.76   | 87                 |
| 7.26   | 88                 |

| 1  | 2                  |
|--|--------------------|
| $E_{A, T_e}$<br>$Pa^2 \cdot s \cdot 10^{-3}$ | $L_{ex, 8h}$<br>dB |
| 9.13   | 89                 |
| 11.5   | 90                 |
| 14.5   | 91                 |
| 18.2   | 92                 |
| 22.9   | 93                 |
| 28.9   | 94                 |
| 36.4   | 95                 |
| 45.8   | 96                 |
| 57.6   | 97                 |
| 72.6   | 98                 |
| 91.3   | 99                 |
| 115.0  | 100                |

Notes on the use of personal sound exposure meters:

- Personal sound exposure meters may not be used for the demarcation of **noise zones**.
- IEC 61252 specifies acoustical and electrical performance requirements for personal sound exposure meters of only one accuracy grade. This accuracy

grade corresponds to that of an integrating sound level meter which complies with the type-2 requirements of SANS 61672-1 and SANS 61672-2 for an **A-weighted sound pressure level** range from 80 **dBA** to 130 **dBA** and a nominal frequency range from 63 **Hz** to 8 **kHz**.

- The report should indicate that a sound exposure meter/dosimeter was used for the measurements.

## **ANNEXURE H INSTRUCTION 171**

(For information purposes only)

**GOVERNMENT GAZETTE**

**16 MAY 2001**

**22296**

A61311

A 10/4/3/4

Circular instruction 171

### **THE DETERMINATION OF PERMANENT DISABLEMENT RESULTING FROM HEARING LOSS CAUSED BY EXPOSURE TO EXCESSIVE NOISE AND TRAUMA**

#### **1 COIDA**

The following instructions are issued to clarify the position in regard to claims for impairment of hearing:

- 1.1 An occupational disease due to excessive **noise** in industry.
- 1.2 An occupational injury due to factors other than excessive industrial **noise** [head trauma (resulting from eg blows to the head), or acoustic trauma causing the immediate loss of hearing produced by one or more exposures to sudden intense forms of acoustic energy such as explosions, gunfire or blasts].  
**Such 'accidents' may cause binaural (both ears) or monaural (one ear) impairment of hearing.**
- 1.3 In loss of hearing 'by accident' in either one or in both ears the impairment may be caused by either conductive loss when the middle ear is injured or by perceptive loss when the inner ear is injured or by a combination of both conductive and perceptive loss when both the middle and the inner ear are injured the so-called 'mixed deafness'.
- 1.4 Impairment of hearing claimed to result from exposure to excessive **noise** in industry (occupational **noise** of an excessive nature) usually manifests itself over a number of years and results in binaural impairment of hearing.
- 1.5 The provisions of section 65(4) of the **MHSA** of the act referring to prescription shall be strictly applied with due regard to the provisions of section 38 of the **MHSA**.
- 1.6 The date of the commencement of the disease shall be the date of the first audiogram showing an increase from the baseline in the **PLH** by 10% or more. The **PLH** values are calculated using the results of the **baseline audiogram** and the diagnostic audiogram using the attached tables.

**1.7 Persons to be submitted for compensation consideration would be:**

- Employees who's **PLH** has deteriorated by more than 10% **PLH** from the **baseline audiogram**.
- Employees who have more than 10% **PLH** and for whom no baseline is available (see section 5).

**1.8 A medical opinion must be provided by either:**

- 1.8.1 An **ENT specialist** if the case is complicated or the degree of disablement is expected to exceed 15% (**PLH** > 30% from baseline).
- 1.8.2 An **OMP** if the case is uncomplicated and the degree of disablement is expected to be 15% or less (**PLH** 30% from baseline).

**2 Binaural Hearing Impairment**

In cases where binaural hearing impairment is claimed as a result of mechanical or acoustic trauma, the principles as laid down under paragraph 1.4, 1.5 and 1.6 for occupational hearing loss due to excessive **noise** in industry apply, with the exception that the **ENT surgeon** or **OMP** should certify that the impairment found on examination is compatible with the nature of the injury sustained, or is due to acoustic trauma of the nature and intensity experienced by the employee and that no other cause(s) for the impairment of hearing were found on examination.

**3 Monaural Hearing Impairment**

**NIHL** affects both ears to more or less an equal degree and the impairment is due to a perceptive loss. If, therefore, the loss of hearing is monaural, it must be assessed whether the loss is commensurate with **noise** exposure to one ear more than the other such as gun shots in security workers. The assessment of permanent disablement for the loss of hearing in one or both ears as detailed, takes cognisance of such additional factors as tinnitus, unhealed perforations of the tympanic membranes with possible recrudescence of infections following thereon and/or mastoidectomies. In the event of recurring infections in the two latter instances, medical treatment should be provided and the employee should receive periodical payments.

**4 Documentation to accompany a Claim for Compensation**

Claims will be submitted either to the Compensation Commissioner or the Mutual Association as applicable. Over and above the standard documentation required ie employer's report of an occupational disease/injury (WC1.1/2) and notice of an occupational disease/injury and claim for compensation (WC1.14/3), the following documents are required:

- 4.1 **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.
- 4.2 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 laid down by the South African Bureau of Standards (SABS 083-1983) and which is known as the N85 **Noise** Rating Curve Level.
- 4.3 **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.
- 4.4 **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 at different sittings. The audiograms must not differ by more than 10 **dB** at any frequency. The better diagnostic audiogram will be used to calculate the **PLH** for compensation purposes.

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

- 4.5 **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.
- 4.6 **Proof of employee's identity.** The audiologist performing the audiogram should attest in writing to the employee's identity.

## 5 Calculation of Permanent Disablement

- 5.1 The better of the two diagnostic audiograms will be used. Ensure that all documentation (4) is present and correct.
- 5.2 Calculate (from **PLH** tables - Annexure H: Instruction 171 published from the **COIDA** is as stated on this guideline under 5.2: Calculation of permanent disablement) a **PLH** for each of the following frequencies: 500 **Hz**, 1 000 **Hz**, 2 000 **Hz**, 3 000 **Hz** and 4 000 **Hz** (air conduction results to be taken except if specified otherwise by the medical officer).
- 5.3 Sum the values for each frequency to obtain the **PLH**.
- 5.4 If a baseline **PLH** is available, this value is subtracted from the **PLH** obtained from 5.3.
- 5.5 If a baseline **PLH** is unavailable, the **PLH** in 5.3 is taken as the value from which permanent disability will be calculated.
- 5.6 Permanent disablement is calculated by halving the value of the **PLH** obtained in either: 5.4 (if a baseline **PLH** is available) or 5.5 (if a baseline **PLH** is unavailable).

## 6 Determination of PLH

Using the hearing threshold levels determined by baseline, periodic screening, exit or diagnostic audiometry (as applicable), determine the contribution to **PLH** from hearing losses at the frequencies of 0.5; 1; 2; 3 and 4 **kHz**, using tables A1-1 to A1-5, respectively. Then sum the contributions from the stated frequencies to determine **PLH**.

| HTL in worse ear (dB) | 4 contribution to PLH by hearing loss at 0.5 kHz in better ear and given hearing loss at 0.5 kHz in worse ear |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|-----------------------|---|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|------|
|                       | Hearing threshold level in better ear (dB)  |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | ≤ 15  | 20  | 25  | 30  | 35  | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | ≥ 95 |
| ≤ 15                  | 1.2   |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 20                    | 0.4   | 0.6 |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 25                    | 0.6   | 1.0 | 1.4 |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 30                    | 1.0   | 1.4 | 2.0 | 2.8 |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 35                    | 1.3   | 1.8 | 2.5 | 3.4 | 4.5 |    |    |    |    |    |    |    |    |    |    |    |      |

| HTL in worse ear (dB) | 5 contribution to PLH by hearing loss at 1 kHz in better ear and given hearing loss at 1 kHz in worse ear |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                       | Hearing threshold level in better ear (dB)  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



|      | ≤ 15 | 20  | 25  | 30  | 35  | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | ≥ 95 |
|------|------|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|------|
| ≤ 15 | 0.5  |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 20   | 0.8  | 1.2 |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 25   | 1.2  | 1.8 | 2.7 |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 30   | 1.8  | 2.6 | 3.8 | 5.3 |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 35   | 2.6  | 3.5 | 4.7 | 6.3 | 8.5 |    |    |    |    |    |    |    |    |    |    |    |      |

| HTL in worse ear (dB) | 6 contribution to PLH by hearing loss at 2 kHz in better ear and given hearing loss at 2 kHz in worse ear |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|-----------------------|---|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|------|
|                       | Hearing threshold level in better ear (dB)  |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | ≤ 15  | 20  | 25  | 30  | 35  | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | ≥ 95 |
| ≤ 15                  | 0.3   |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 20                    | 0.5   | 0.8 |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 25                    | 0.8   | 1.1 | 1.7 |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 30                    | 1.1   | 1.5 | 2.3 | 3.2 |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 35                    | 1.5   | 2.1 | 2.9 | 3.8 | 5.1 |    |    |    |    |    |    |    |    |    |    |    |      |

| HTL in worse ear (dB) | 7 contribution to PLH by hearing loss at 3 kHz in better ear and given hearing loss at 3 kHz in worse ear |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |      |
|-----------------------|---|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|------|
|                       | Hearing threshold level in better ear (dB)  |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | ≤ 15  | 20  | 25  | 30  | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | ≥ 95 |
| ≤ 15                  | 0.1   |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |      |
| 20                    | 0.2   | 0.3 |     |     |    |    |    |    |    |    |    |    |    |    |    |    |      |
| 25                    | 0.3   | 0.5 | 0.7 |     |    |    |    |    |    |    |    |    |    |    |    |    |      |
| 30                    | 0.5   | 0.7 | 1.0 | 1.4 |    |    |    |    |    |    |    |    |    |    |    |    |      |

| HTL in worse ear (dB) | 8 contribution to PLH by hearing loss at 4 kHz in better ear and given hearing loss at 4 kHz in worse ear |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|-----------------------|---|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|------|
|                       | Hearing threshold level in better ear (dB)  |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | ≤ 15  | 20  | 25  | 30  | 35  | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | ≥ 95 |
| ≤ 15                  | -   |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 20                    | 0.1   | 0.1 |     |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 25                    | 1.0   | 0.2 | 0.3 |     |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 30                    | 0.2   | 0.3 | 0.5 | 0.8 |     |    |    |    |    |    |    |    |    |    |    |    |      |
| 35                    | 0.3   | 0.5 | 0.7 | 1.0 | 1.5 |    |    |    |    |    |    |    |    |    |    |    |      |

16 November 2001

1194

### Instruction 171 (supplement)

Transitional arrangements between instruction 168 and 171

#### Introduction

This instruction sets out the procedures to be followed to ensure proper management and implementation of instruction 171 as well as a smooth transition from the repealed instruction 168 to the new instruction 171.

#### Conducting and recording of a baseline audiogram

- 1 A **baseline audiogram** must be conducted on all employees in any working place where the **equivalent continuous A-weighted sound pressure level**,

normalised to an eight hour working day or a 40-hour working week, is equal to or exceeds 85 **dBA**.

- 2 A **baseline audiogram** must be conducted on every current employee exposed to **noise** as contemplated in (1) within two years of the date of this instruction.
- 3 From the date on which circular instruction 171 was published, every new employee exposed to **noise** as specified in (1) must have a **baseline audiogram** done within 30 days of commencement of employment.
- 4 The baseline of an employee conducted in terms of this instruction applies as that employee's baseline for his/her total working career.
- 5 An employee's baseline must be recorded and such record must be kept for 40 years.

#### **Transfer between working places or changing employer**

- 1 The **baseline audiogram** results, as well as the most recent subsequent audiogram conducted whilst in employment, should be given to an employee when he/she is no longer exposed to **noise** or leaves employment at that working place.
- 2 The **baseline audiogram** as well as the most recent audiogram with the **PLH** as calculated, must be presented at employment to the new employer.
- 3 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**

- 1 The **baseline audiogram** must be used to calculate any current hearing loss sustained in terms of instruction 168. Where an employee has occupational hearing loss compensatable in terms of instruction 168, referral must be made to the Compensation Commissioner or the Mutual Association as applicable, for consideration of compensation.
- 2 The baseline must be recorded for the purpose of using these values for all future reference to the baseline of an employee.
- 3 The **baseline audiogram** should then be used in determining any future compensatable hearing loss in terms of instruction 171.
- 4 Following two years from the date of this instruction, where there was failure to conduct a baseline of an employee's hearing during these two years, it would be assumed that it was normal for the purposes of the baseline as set out in instruction 171.

#### **Standards for the baseline audiogram**

- 1 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.
- 2 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, ie 0.5, 1, 2, 3, and 4 **kHz**.
- 3 If it is impossible to obtain two audiograms that comply with the requirements of (2), the employee must be referred to a competent person to establish baseline-hearing levels.

- 4 If it is impossible for the competent person to establish baseline-hearing levels as contemplated in (2), the competent person may establish baseline-hearing levels by using other techniques, such as speech reception thresholds.

This instruction supplements instruction 171.

#### **ANNEXURE I REFERENCES**

- (1) IEC 60942: Electro-acoustics - sound calibrators.
- (2) IEC 61672-1: Sound level meters, part 1: specifications.
- (3) ISO 11200:2014: Acoustics - **noise** emitted by machinery and equipment; guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions.
- (4) ISO 3744: Acoustics - determination of sound power levels and sound energy levels of **noise** sources using sound pressure; engineering methods for an essentially free field over a reflecting plane.
- (5) **SANS 10083**: The measurement and assessment of occupational **noise** for **hearing conservation** purposes.
- (6) SANS 3744: Acoustics - determination of sound power levels and sound energy levels of **noise** sources using sound pressure; engineering methods for an essentially free field over a reflecting plane.
- (7) SANS 60942: Electro-acoustics - sound calibrators.
- (8) SANS 61672-1: Electro-acoustics - sound level meters, part 1: specifications.
- (9) Mine Ventilation Society of South Africa: Learning material for the certificate in mine environmental control, workbook 5.