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REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID AFRIKA

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government
printing

Department:
Government Printing Works
REPUBLIC OF SOUTH AFRICA

HIGH ALERT: SCAM WARNING!!!

TO ALL SUPPLIERS AND SERVICE PROVIDERS OF THE GOVERNMENT PRINTING WORKS

It has come to the attention of the *GOVERNMENT PRINTING WORKS* that there are certain unscrupulous companies and individuals who are defrauding unsuspecting businesses disguised as representatives of the *Government Printing Works (GPW)*.

The scam involves the fraudsters using the letterhead of *GPW* to send out fake tender bids to companies and requests to supply equipment and goods.

Although the contact person's name on the letter may be of an existing official, the contact details on the letter are not the same as the *Government Printing Works*. When searching on the Internet for the address of the company that has sent the fake tender document, the address does not exist.

The banking details are in a private name and not company name. Government will never ask you to deposit any funds for any business transaction. *GPW* has alerted the relevant law enforcement authorities to investigate this scam to protect legitimate businesses as well as the name of the organisation.

Example of e-mails these fraudsters are using:

PROCUREMENT@GPW-GOV.ORG

Should you suspect that you are a victim of a scam, you must urgently contact the police and inform the *GPW*.

GPW has an official email with the domain as @gpw.gov.za

Government e-mails DO NOT have org in their e-mail addresses. All of these fraudsters also use the same or very similar telephone numbers. Although such number with an area code 012 looks like a landline, it is not fixed to any property.

GPW will never send you an e-mail asking you to supply equipment and goods without a purchase/order number. *GPW* does not procure goods for another level of Government. The organisation will not be liable for actions that result in companies or individuals being resultant victims of such a scam.

Government Printing Works gives businesses the opportunity to supply goods and services through RFQ / Tendering process. In order to be eligible to bid to provide goods and services, suppliers must be registered on the National Treasury's Central Supplier Database (CSD). To be registered, they must meet all current legislative requirements (e.g. have a valid tax clearance certificate and be in good standing with the South African Revenue Services - SARS).

The tender process is managed through the Supply Chain Management (SCM) system of the department. SCM is highly regulated to minimise the risk of fraud, and to meet objectives which include value for money, open and effective competition, equitability, accountability, fair dealing, transparency and an ethical approach. Relevant legislation, regulations, policies, guidelines and instructions can be found on the tender's website.

Fake Tenders

National Treasury's CSD has launched the Government Order Scam campaign to combat fraudulent requests for quotes (RFQs). Such fraudulent requests have resulted in innocent companies losing money. We work hard at preventing and fighting fraud, but criminal activity is always a risk.

How tender scams work

There are many types of tender scams. Here are some of the more frequent scenarios:

Fraudsters use what appears to be government department stationery with fictitious logos and contact details to send a fake RFQ to a company to invite it to urgently supply goods. Shortly after the company has submitted its quote, it receives notification that it has won the tender. The company delivers the goods to someone who poses as an official or at a fake site. The Department has no idea of this transaction made in its name. The company is then never paid and suffers a loss.

OR

Fraudsters use what appears to be government department stationery with fictitious logos and contact details to send a fake RFQ to Company A to invite it to urgently supply goods. Typically, the tender specification is so unique that only Company B (a fictitious company created by the fraudster) can supply the goods in question.

Shortly after Company A has submitted its quote it receives notification that it has won the tender. Company A orders the goods and pays a deposit to the fictitious Company B. Once Company B receives the money, it disappears. Company A's money is stolen in the process.

Protect yourself from being scammed

- If you are registered on the supplier databases and you receive a request to tender or quote that seems to be from a government department, contact the department to confirm that the request is legitimate. Do not use the contact details on the tender document as these might be fraudulent.
- Compare tender details with those that appear in the Tender Bulletin, available online at www.gpwonline.co.za
- Make sure you familiarise yourself with how government procures goods and services. Visit the tender website for more information on how to tender.
- If you are uncomfortable about the request received, consider visiting the government department and/or the place of delivery and/or the service provider from whom you will be sourcing the goods.
- In the unlikely event that you are asked for a deposit to make a bid, contact the SCM unit of the department in question to ask whether this is in fact correct.

Any incidents of corruption, fraud, theft and misuse of government property in the *Government Printing Works* can be reported to:

Supply Chain Management: Ms. Anna Marie Du Toit, Tel. (012) 748 6292.
Email: Annamarie.DuToit@gpw.gov.za

Marketing and Stakeholder Relations: Ms Bonakele Mbhele, at Tel. (012) 748 6193.
Email: Bonakele.Mbhele@gpw.gov.za

Security Services: Mr Daniel Legoabe, at tel. (012) 748 6176.
Email: Daniel.Legoabe@gpw.gov.za

Closing times for **ORDINARY WEEKLY** **GOVERNMENT GAZETTE** **2022**

*The closing time is **15:00** sharp on the following days:*

- **31 December 2021**, Friday for the issue of Friday **07 January 2022**
- **07 January**, Friday for the issue of Friday **14 January 2022**
- **14 January**, Friday for the issue of Friday **21 January 2022**
- **21 January**, Friday for the issue of Friday **28 January 2022**
- **28 January**, Friday for the issue of Friday **04 February 2022**
- **04 February**, Friday for the issue of Friday **11 February 2022**
- **11 February**, Friday for the issue of Friday **18 February 2022**
- **18 February**, Friday for the issue of Friday **25 February 2022**
- **25 February**, Friday for the issue of Friday **04 March 2022**
- **04 March**, Friday for the issue of Friday **11 March 2022**
- **11 March**, Friday for the issue of Friday **18 March 2022**
- **17 March**, Thursday for the issue of Friday **25 March 2022**
- **25 March**, Friday for the issue of Friday **01 April 2022**
- **01 April**, Friday for the issue of Friday **08 April 2022**
- **07 April**, Thursday for the issue of Thursday **14 April 2022**
- **13 April**, Wednesday for the issue of Friday **22 April 2022**
- **21 April**, Thursday for the issue of Friday **29 April 2022**
- **28 April**, Thursday for the issue of Friday **06 May 2022**
- **06 May**, Friday for the issue of Friday **13 May 2022**
- **13 May**, Friday for the issue of Friday **20 May 2022**
- **20 May**, Friday for the issue of Friday **27 May 2022**
- **27 May**, Friday for the issue of Friday **03 June 2022**
- **03 June**, Friday for the issue of Friday **10 June 2022**
- **09 June**, Thursday for the issue of Friday **17 June 2022**
- **17 June**, Friday for the issue of Friday **24 June 2022**
- **24 June**, Friday for the issue of Friday **01 July 2022**
- **01 July**, Friday for the issue of Friday **08 July 2022**
- **08 July**, Friday for the issue of Friday **15 July 2022**
- **15 July**, Friday for the issue of Friday **22 July 2022**
- **22 July**, Friday for the issue of Friday **29 July 2022**
- **29 July**, Friday for the issue of Friday **05 August 2022**
- **04 August**, Thursday for the issue of Friday **12 August 2022**
- **12 August**, Friday for the issue of Friday **19 August 2022**
- **19 August**, Friday for the issue of Friday **26 August 2022**
- **26 August**, Friday for the issue of Friday **02 September 2022**
- **02 September**, Friday for the issue of Friday **09 September 2022**
- **09 September**, Friday for the issue of Friday **16 September 2022**
- **16 September**, Friday for the issue of Friday **23 September 2022**
- **23 September**, Friday for the issue of Friday **30 September 2022**
- **30 September**, Friday for the issue of Friday **07 October 2022**
- **07 October**, Friday for the issue of Friday **14 October 2022**
- **14 October**, Friday for the issue of Friday **21 October 2022**
- **21 October**, Friday for the issue of Friday **28 October 2022**
- **28 October**, Friday for the issue of Friday **04 November 2022**
- **04 November**, Friday for the issue of Friday **11 November 2022**
- **11 November**, Friday for the issue of Friday **18 November 2022**
- **18 November**, Friday for the issue of Friday **25 November 2022**
- **25 November**, Friday for the issue of Friday **02 December 2022**
- **02 December**, Friday for the issue of Friday **09 December 2022**
- **08 December**, Thursday for the issue of Thursday **15 December 2022**
- **15 December**, Thursday for the issue of Friday **23 December 2022**
- **22 December**, Thursday for the issue of Friday **30 December 2022**

LIST OF TARIFF RATES FOR PUBLICATION OF NOTICES

COMMENCEMENT: 1 APRIL 2018

NATIONAL AND PROVINCIAL

Notice sizes for National, Provincial & Tender gazettes 1/4, 2/4, 3/4, 4/4 per page. Notices submitted will be charged at R1008.80 per full page, pro-rated based on the above categories.

Pricing for National, Provincial - Variable Priced Notices		
Notice Type	Page Space	New Price (R)
Ordinary National, Provincial	1/4 - Quarter Page	252.20
Ordinary National, Provincial	2/4 - Half Page	504.40
Ordinary National, Provincial	3/4 - Three Quarter Page	756.60
Ordinary National, Provincial	4/4 - Full Page	1008.80

EXTRA-ORDINARY

All Extra-ordinary National and Provincial gazette notices are non-standard notices and attract a variable price based on the number of pages submitted.

The pricing structure for National and Provincial notices which are submitted as **Extra ordinary submissions** will be charged at **R3026.32** per page.

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GOVERNMENT PRINTING WORKS - BUSINESS RULES

The **Government Printing Works (GPW)** has established rules for submitting notices in line with its electronic notice processing system, which requires the use of electronic *Adobe Forms*. Please ensure that you adhere to these guidelines when completing and submitting your notice submission.

CLOSING TIMES FOR ACCEPTANCE OF NOTICES

1. The *Government Gazette* and *Government Tender Bulletin* are weekly publications that are published on Fridays and the closing time for the acceptance of notices is strictly applied according to the scheduled time for each gazette.

2. Please refer to the Submission Notice Deadline schedule in the table below. This schedule is also published online on the Government Printing works website www.gpwonline.co.za

All re-submissions will be subject to the standard cut-off times.

All notices received after the closing time will be rejected.

Government Gazette Type	Publication Frequency	Publication Date	Submission Deadline	Cancellations Deadline
National Gazette	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Regulation Gazette	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Petrol Price Gazette	Monthly	Tuesday before 1st Wednesday of the month	One day before publication	1 working day prior to publication
Road Carrier Permits	Weekly	Friday	Thursday 15h00 for next Friday	3 working days prior to publication
Unclaimed Monies (Justice, Labour or Lawyers)	January / September 2 per year	Last Friday	One week before publication	3 working days prior to publication
Parliament (Acts, White Paper, Green Paper)	As required	Any day of the week	None	3 working days prior to publication
Manuals	Bi- Monthly	2nd and last Thursday of the month	One week before publication	3 working days prior to publication
State of Budget (National Treasury)	Monthly	30th or last Friday of the month	One week before publication	3 working days prior to publication
<i>Extraordinary Gazettes</i>	As required	Any day of the week	<i>Before 10h00 on publication date</i>	<i>Before 10h00 on publication date</i>
Legal Gazettes A, B and C	Weekly	Friday	One week before publication	Tuesday, 15h00 - 3 working days prior to publication
Tender Bulletin	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Gauteng	Weekly	Wednesday	Two weeks before publication	3 days after submission deadline
Eastern Cape	Weekly	Monday	One week before publication	3 working days prior to publication
Northern Cape	Weekly	Monday	One week before publication	3 working days prior to publication
North West	Weekly	Tuesday	One week before publication	3 working days prior to publication
KwaZulu-Natal	Weekly	Thursday	One week before publication	3 working days prior to publication
Limpopo	Weekly	Friday	One week before publication	3 working days prior to publication
Mpumalanga	Weekly	Friday	One week before publication	3 working days prior to publication

GOVERNMENT PRINTING WORKS - BUSINESS RULES

Government Gazette Type	Publication Frequency	Publication Date	Submission Deadline	Cancellations Deadline
Gauteng Liquor License Gazette	Monthly	Wednesday before the First Friday of the month	Two weeks before publication	3 working days after submission deadline
Northern Cape Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 working days after submission deadline
National Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 working days after submission deadline
Mpumalanga Liquor License Gazette	Bi-Monthly	Second & Fourth Friday	One week before publication	3 working days prior to publication

EXTRAORDINARY GAZETTES

3. *Extraordinary Gazettes* can have only one publication date. If multiple publications of an *Extraordinary Gazette* are required, a separate Z95/Z95Prov *Adobe* Forms for each publication date must be submitted.

NOTICE SUBMISSION PROCESS

4. Download the latest *Adobe* form, for the relevant notice to be placed, from the **Government Printing Works** website www.gpwonline.co.za.
5. The *Adobe* form needs to be completed electronically using *Adobe Acrobat / Acrobat Reader*. Only electronically completed *Adobe* forms will be accepted. No printed, handwritten and/or scanned *Adobe* forms will be accepted.
6. The completed electronic *Adobe* form has to be submitted via email to submit.egazette@gpw.gov.za. The form needs to be submitted in its original electronic *Adobe* format to enable the system to extract the completed information from the form for placement in the publication.
7. Every notice submitted **must** be accompanied by an official **GPW** quotation. This must be obtained from the *eGazette* Contact Centre.
8. Each notice submission should be sent as a single email. The email **must** contain **all documentation relating to a particular notice submission**.
 - 8.1. Each of the following documents must be attached to the email as a separate attachment:
 - 8.1.1. An electronically completed *Adobe* form, specific to the type of notice that is to be placed.
 - 8.1.1.1. For *National Government Gazette* or *Provincial Gazette* notices, the notices must be accompanied by an electronic Z95 or Z95Prov *Adobe* form
 - 8.1.1.2. The notice content (body copy) **MUST** be a separate attachment.
 - 8.1.2. A copy of the official **Government Printing Works** quotation you received for your notice. (*Please see Quotation section below for further details*)
 - 8.1.3. A valid and legible Proof of Payment / Purchase Order: **Government Printing Works** account customer must include a copy of their Purchase Order. **Non-Government Printing Works** account customer needs to submit the proof of payment for the notice
 - 8.1.4. Where separate notice content is applicable (Z95, Z95 Prov and TForm 3, it should **also** be attached as a separate attachment. (*Please see the Copy Section below, for the specifications*).
 - 8.1.5. Any additional notice information if applicable.

GOVERNMENT PRINTING WORKS - BUSINESS RULES

9. The electronic *Adobe* form will be taken as the primary source for the notice information to be published. Instructions that are on the email body or covering letter that contradicts the notice form content will not be considered. The information submitted on the electronic *Adobe* form will be published as-is.
10. To avoid duplicated publication of the same notice and double billing, Please submit your notice **ONLY ONCE**.
11. Notices brought to **GPW** by “walk-in” customers on electronic media can only be submitted in *Adobe* electronic form format. All “walk-in” customers with notices that are not on electronic *Adobe* forms will be routed to the Contact Centre where they will be assisted to complete the forms in the required format.
12. Should a customer submit a bulk submission of hard copy notices delivered by a messenger on behalf of any organisation e.g. newspaper publisher, the messenger will be referred back to the sender as the submission does not adhere to the submission rules.

QUOTATIONS

13. Quotations are valid until the next tariff change.
 - 13.1. **Take note:** **GPW**'s annual tariff increase takes place on **1 April** therefore any quotations issued, accepted and submitted for publication up to **31 March** will keep the old tariff. For notices to be published from 1 April, a quotation must be obtained from **GPW** with the new tariffs. Where a tariff increase is implemented during the year, **GPW** endeavours to provide customers with 30 days' notice of such changes.
14. Each quotation has a unique number.
15. Form Content notices must be emailed to the *eGazette* Contact Centre for a quotation.
 - 15.1. The *Adobe* form supplied is uploaded by the Contact Centre Agent and the system automatically calculates the cost of your notice based on the layout/format of the content supplied.
 - 15.2. It is critical that these *Adobe* Forms are completed correctly and adhere to the guidelines as stipulated by **GPW**.
16. **APPLICABLE ONLY TO GPW ACCOUNT HOLDERS:**
 - 16.1. **GPW** Account Customers must provide a valid **GPW** account number to obtain a quotation.
 - 16.2. Accounts for **GPW** account customers **must** be active with sufficient credit to transact with **GPW** to submit notices.
 - 16.2.1. If you are unsure about or need to resolve the status of your account, please contact the **GPW** Finance Department prior to submitting your notices. (If the account status is not resolved prior to submission of your notice, the notice will be failed during the process).
17. **APPLICABLE ONLY TO CASH CUSTOMERS:**
 - 17.1. Cash customers doing **bulk payments** must use a **single email address** in order to use the **same proof of payment** for submitting multiple notices.
18. The responsibility lies with you, the customer, to ensure that the payment made for your notice(s) to be published is sufficient to cover the cost of the notice(s).
19. Each quotation will be associated with one proof of payment / purchase order / cash receipt.
 - 19.1. This means that **the quotation number can only be used once to make a payment.**

GOVERNMENT PRINTING WORKS - BUSINESS RULES**COPY (SEPARATE NOTICE CONTENT DOCUMENT)**

20. Where the copy is part of a separate attachment document for Z95, Z95Prov and TForm03
- 20.1. Copy of notices must be supplied in a separate document and may not constitute part of any covering letter, purchase order, proof of payment or other attached documents.
- The content document should contain only one notice. (You may include the different translations of the same notice in the same document).
- 20.2. The notice should be set on an A4 page, with margins and fonts set as follows:
- Page size = A4 Portrait with page margins: Top = 40mm, LH/RH = 16mm, Bottom = 40mm;
Use font size: Arial or Helvetica 10pt with 11pt line spacing;
- Page size = A4 Landscape with page margins: Top = 16mm, LH/RH = 40mm, Bottom = 16mm;
Use font size: Arial or Helvetica 10pt with 11pt line spacing;

CANCELLATIONS

21. Cancellation of notice submissions are accepted by **GPW** according to the deadlines stated in the table above in point 2. Non-compliance to these deadlines will result in your request being failed. Please pay special attention to the different deadlines for each gazette. Please note that any notices cancelled after the cancellation deadline will be published and charged at full cost.
22. Requests for cancellation must be sent by the original sender of the notice and must be accompanied by the relevant notice reference number (N-) in the email body.

AMENDMENTS TO NOTICES

23. With effect from 01 October 2015, **GPW** will not longer accept amendments to notices. The cancellation process will need to be followed according to the deadline and a new notice submitted thereafter for the next available publication date.

REJECTIONS

24. All notices not meeting the submission rules will be rejected to the customer to be corrected and resubmitted. Assistance will be available through the Contact Centre should help be required when completing the forms. (012-748 6200 or email info.egazette@gpw.gov.za). Reasons for rejections include the following:
- 24.1. Incorrectly completed forms and notices submitted in the wrong format, will be rejected.
- 24.2. Any notice submissions not on the correct *Adobe* electronic form, will be rejected.
- 24.3. Any notice submissions not accompanied by the proof of payment / purchase order will be rejected and the notice will not be processed.
- 24.4. Any submissions or re-submissions that miss the submission cut-off times will be rejected to the customer. The Notice needs to be re-submitted with a new publication date.

GOVERNMENT PRINTING WORKS - BUSINESS RULES**APPROVAL OF NOTICES**

25. Any notices other than legal notices are subject to the approval of the Government Printer, who may refuse acceptance or further publication of any notice.
26. No amendments will be accepted in respect to separate notice content that was sent with a Z95 or Z95Prov notice submissions. The copy of notice in layout format (previously known as proof-out) is only provided where requested, for Advertiser to see the notice in final Gazette layout. Should they find that the information submitted was incorrect, they should request for a notice cancellation and resubmit the corrected notice, subject to standard submission deadlines. The cancellation is also subject to the stages in the publishing process, i.e. If cancellation is received when production (printing process) has commenced, then the notice cannot be cancelled.

GOVERNMENT PRINTER INDEMNIFIED AGAINST LIABILITY

27. The Government Printer will assume no liability in respect of—
 - 27.1. any delay in the publication of a notice or publication of such notice on any date other than that stipulated by the advertiser;
 - 27.2. erroneous classification of a notice, or the placement of such notice in any section or under any heading other than the section or heading stipulated by the advertiser;
 - 27.3. any editing, revision, omission, typographical errors or errors resulting from faint or indistinct copy.

LIABILITY OF ADVERTISER

28. Advertisers will be held liable for any compensation and costs arising from any action which may be instituted against the Government Printer in consequence of the publication of any notice.

CUSTOMER INQUIRIES

Many of our customers request immediate feedback/confirmation of notice placement in the gazette from our Contact Centre once they have submitted their notice – While **GPW** deems it one of their highest priorities and responsibilities to provide customers with this requested feedback and the best service at all times, we are only able to do so once we have started processing your notice submission.

GPW has a 2-working day turnaround time for processing notices received according to the business rules and deadline submissions.

Please keep this in mind when making inquiries about your notice submission at the Contact Centre.

29. Requests for information, quotations and inquiries must be sent to the Contact Centre **ONLY**.
30. Requests for Quotations (RFQs) should be received by the Contact Centre at least **2 working days** before the submission deadline for that specific publication.

GOVERNMENT PRINTING WORKS - BUSINESS RULES

PAYMENT OF COST

31. The Request for Quotation for placement of the notice should be sent to the Gazette Contact Centre as indicated above, prior to submission of notice for advertising.
32. Payment should then be made, or Purchase Order prepared based on the received quotation, prior to the submission of the notice for advertising as these documents i.e. proof of payment or Purchase order will be required as part of the notice submission, as indicated earlier.
33. Every proof of payment must have a valid **GPW** quotation number as a reference on the proof of payment document.
34. Where there is any doubt about the cost of publication of a notice, and in the case of copy, an enquiry, accompanied by the relevant copy, should be addressed to the Gazette Contact Centre, **Government Printing Works**, Private Bag X85, Pretoria, 0001 email: info.egazette@gpw.gov.za before publication.
35. Overpayment resulting from miscalculation on the part of the advertiser of the cost of publication of a notice will not be refunded, unless the advertiser furnishes adequate reasons why such miscalculation occurred. In the event of underpayments, the difference will be recovered from the advertiser, and future notice(s) will not be published until such time as the full cost of such publication has been duly paid in cash or electronic funds transfer into the **Government Printing Works** banking account.
36. In the event of a notice being cancelled, a refund will be made only if no cost regarding the placing of the notice has been incurred by the **Government Printing Works**.
37. The **Government Printing Works** reserves the right to levy an additional charge in cases where notices, the cost of which has been calculated in accordance with the List of Fixed Tariff Rates, are subsequently found to be excessively lengthy or to contain overmuch or complicated tabulation.

PROOF OF PUBLICATION

38. Copies of any of the *Government Gazette* or *Provincial Gazette* can be downloaded from the **Government Printing Works** website www.gpwonline.co.za free of charge, should a proof of publication be required.
39. Printed copies may be ordered from the Publications department at the ruling price. The **Government Printing Works** will assume no liability for any failure to post or for any delay in despatching of such *Government Gazette(s)*

GOVERNMENT PRINTING WORKS CONTACT INFORMATION

Physical Address:

Government Printing Works

149 Bosman Street

Pretoria

Postal Address:

Private Bag X85

Pretoria

0001

GPW Banking Details:

Bank: ABSA Bosman Street

Account No.: 405 7114 016

Branch Code: 632-005

For Gazette and Notice submissions: Gazette Submissions:

For queries and quotations, contact: Gazette Contact Centre:

E-mail: submit.egazette@gpw.gov.za

E-mail: info.egazette@gpw.gov.za

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DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT**NO. 1751****11 February 2022****ANTARCTIC TREATIES ACT, 1996
(ACT NO. 60 OF 1996)****ANTARCTIC TREATIES REGULATIONS**

I, Barbara Dallas Creecy, the Minister of Forestry, Fisheries and the Environment, have, under section 6(1)(b) and (c) of the Antarctic Treaties Act, 1996 (Act No. 60 of 1996), made the Antarctic Treaties Regulations in the Schedule hereto.



**BARBARA DALLAS CREECY
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT**

SCHEDULE

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CHAPTER 1 DEFINITIONS AND OBJECTS

1. Definitions

In these regulations, unless the context indicates otherwise, a word or expression that is defined in the Act has the same meaning in these regulations, and in addition—

“**Act**” means the Antarctic Treaties Act, 1996 (Act No. 60 of 1996);

“**alien species**” has the meaning assigned to it in section 1 of the National Environmental management: Biodiversity Act, 2004 (Act No. 10 of 2004);

“**Antarctic seal**” means the Southern Elephant seal (*Mirounga leonina*), Leopard seal (*Hydrurga leptonyx*), Weddell seal (*Leptonychotes weddelli*), Crabeater seal (*Lobodon carcinophagus*), Ross seal (*Ommatophaca rossi*) and the Southern fur seal (*Arctocephalus* sp.);

“**Antarctic Treaty**” means the Antarctic Treaty, signed in Washington DC, United States of America on 1 December 1959;

“**Antarctic Treaty area**” means the area south of 60 degrees South Latitude, including all ice shelves;

“**authorised operator**” means an operator who organises activities in the Republic to be carried out in the Antarctic Treaty area, which activities require authorisation in terms of the Act, these regulations or any other law applicable in the Antarctic Treaty area;

“**director**” means a director as defined in the Companies Act, 2008 (Act No. 71 of 2008);

“**environmental emergency**” means any incident that has occurred, that results in, or imminently threatens to result in, any significant and harmful impact in the Antarctic Treaty area;

“indigenous species” means a species that occurs, or has historically occurred, naturally in a free state in nature within the Antarctic Treaty Area, but excludes a species that has been introduced in the Antarctic Treaty Area as a result of human activity;

“Management Plan” means a plan to manage the activities within and protect a specially protected area as contemplated in Articles 5 and 6 of Annex 5 to the Protocol;

“MARPOL 73/78” means the International Convention for the Prevention of Pollution from Ships 1973/1978;

“National Environmental Management Act” means the National Environmental Management Act, 1998 (Act No. 107 of 1998);

“operator” means any person, governmental and non-governmental, which organises activities to be carried out in the Antarctic Treaty area, but does not include—

- (a) a natural person who is an employee, contractor, subcontractor, agent, or who is in the service of such person; and
- (b) a juristic person which is a contractor or subcontractor acting on behalf of any State, including the Republic;

“reasonable” as applied to preventative measures and response action, means measures or actions which are appropriate, practicable, proportionate and is based on the availability of objective criteria and information, including—

- (a) risks to the Antarctic environment, and the rate of its natural recovery;
- (b) risks to human life and safety; and
- (c) technological and economic feasibility;

“response action” means reasonable measures taken after an environmental emergency has occurred including to avoid, minimise or contain the impact of that environmental emergency, which may include clean-up processes, and determining the extent of that emergency and its impact;

“Rotary Biological Contactor process” is a biological treatment process used in the treatment of wastewater after primary treatment, and is a type of secondary biological treatment, that allows wastewater to come in contact with a biological medium in order to remove pollutants in the wastewater before discharge of the treated wastewater into a body of water such as the sea;

“Seals Convention” means the Convention for the Conservation of Antarctic Seals London, 1972;

“specially protected area” means an Antarctic specially protected area designated in terms of Annex 5 to the Protocol;

“specific environmental management Act” has the meaning assigned to it in section 1 of the National Environmental Management Act;

“these Regulations” includes any permit issued in terms of these Regulations; and

“the Protocol” means the Protocol on Environmental Protection to the Antarctic Treaty, Madrid, 1991.

- (2) Unless the context indicates otherwise the words and phrases defined in Article 1 of Annex 2 and Annex 4 to the Protocol shall have the same meaning in these regulations.

2. Objects

The objects of these regulations are—

- (a) To protect the Antarctic environment, its dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values;
- (b) to prevent, minimise and contain the impact of environmental emergencies on the Antarctic environment and dependent and associated ecosystems;
- (c) to prioritise scientific research and to preserve the value of Antarctica as the area to conduct such research;
- (d) to regulate and manage activities that take place within the Antarctic Treaty area;
- (e) to provide for protection of certain areas and species within the Antarctic Treaty area; and
- (f) to prevent, minimise and mitigate pollution within the Antarctic Treaty area.

CHAPTER 2

ENVIRONMENTAL PROTECTION

3. Prohibition on mining

No person may conduct any prospecting, mining, exploration, production or related activities in the Antarctic Treaty area.

4. Prohibition on nuclear testing and waste disposal

No person may undertake any nuclear testing, explosions, or dispose of any radioactive material or waste within the Antarctic Treaty area.

5. Environmental Impact Assessment

- (1) A person wishing to carry out any activity in the Antarctic Treaty area for which advanced notice is required in terms of Article 7(5) of the Antarctic Treaty, must follow the prior assessment process set out in Annex 1 to the Protocol to assess the impacts of these activities on the Antarctic environment or any dependent or associated ecosystems, prior to the commencement of such activity.
- (2) The assessment procedure in sub-regulation (1) must also be applied to any change in any activity, whether such change arises from an increase or decrease in the intensity of an existing activity, from the addition of an activity, the decommissioning of a facility or otherwise.
- (3) Unless an activity contemplated in sub-regulation (1) is required to be subjected to a Comprehensive Environmental Evaluation as provided for in Annex 1 to the Protocol, all such activities must at least undergo an Initial Environmental Evaluation as provided for in Article 2 of Annex I to the Protocol to determine if such activity has a less than minor or transitory impact.
- (4) If an Initial Environmental Evaluation as contemplated in sub-regulation (3) determines that a proposed activity is likely to have no more than a minor or transitory impact, the Minister may issue a permit to allow that activity to proceed.

- (5) No person may undertake any activity contemplated in sub-regulation (4) except on the authority of a permit issued by the Minister.
- (6) If an Initial Environmental Evaluation indicates or it is otherwise determined that a proposed activity is likely to have a more than minor or transitory impact, a Comprehensive Environmental Evaluation must be prepared and processed in terms of Article 3 of Annex 1 to the Protocol.
- (7) If after the completion of a Comprehensive Environmental Evaluation, an activity is authorised to proceed in terms of the processes set out in Article 3 of Annex 1 to the Protocol, application for a permit must be made to the Minister before the activity can commence.
- (8) The Minister may in respect of any permit issued in terms of this regulation, impose any conditions deemed necessary including-
 - (a) measures to monitor environmental indicators;
 - (b) measures to verify and assess the impact of the activity;
 - (c) the provision of any other information necessary to report on or continuously assess the impact of the activity; and
 - (d) measures necessary to mitigate the environmental impact of the activity.

6. Conservation of Antarctic flora and fauna

- (1) No person shall take, destroy or engage in harmful interference in relation to any indigenous species except on the authority of a permit issued by the Minister.
- (2) The Minister may issue a permit contemplated in sub-regulation (1) in the following circumstances-
 - (a) to collect specimens for scientific research;
 - (b) to collect specimens for museums, herbaria, zoological and botanical gardens or other educational or cultural institutions or uses; or
 - (c) to provide for unavoidable consequences of scientific activities not authorised in paragraphs (a) or (b), or the construction and operation of scientific support facilities.
- (3) When considering a permit application in terms of sub-regulation (2), the Minister must have regard to the criteria and factors detailed in Article 3(3) of Annex 2 to the Protocol and the provisions of

the National Environmental Management Act and any specific environmental management Act as it may relate to Antarctic flora and fauna.

- (4) All the species listed in Appendix A of Annex 2 to the Protocol are hereby designated as Specially Protected Species.
- (5) The Minister may not issue a permit relating to a Specially Protected Species except if such activity—
 - (a) is for a compelling scientific purpose;
 - (b) will not jeopardise the survival or recovery of that species or local population of that species;
 - (c) makes use of non-lethal techniques; and
 - (d) does not impact on the well-being of the particular animal.
- (6) Subject to sub-regulations (7) and (8), no person may introduce any alien species onto land, any ice shelf or the water within the Antarctic Treaty area except on the authority of a permit issued by the Minister.
- (7) The introduction of any domestic animal to, or the keeping of domestic animal in the Antarctic Treaty area is prohibited.
- (8) A permit contemplated in sub-regulation (6) may only be issued for those species listed in Appendix B of Annex 2 to the Protocol.
- (9) Sub-regulation (6) does not apply to the introduction of food into the Antarctic Treaty area, provided no live animals are introduced for the purposes of food. All plants and animal parts and products must be kept under controlled conditions and may only be disposed of in accordance with Annex 3 to the Protocol and Appendix C to Annex 2.
- (10) No person may fly or land a helicopter or any other aircraft, use a vessel, vehicle, firearm or explosive in a manner that disturbs any concentration of indigenous species.

- (11) The Minister may direct a person that has introduced any plant or animal without a permit in terms of these regulations, to remove or destroy these species, including any trace of them, unless removing or destroying such species will cause more damage to the environment than allowing them to remain.
- (12) If the directive in sub-regulation (11) is not complied with, the Minister may take measures to remove the plant or animal and claim the costs of such removal including rehabilitation, from the responsible person.

7. Protection of Antarctic seals

- (1) Subject to sub-regulation (2), no person may within the Antarctic Treaty area, kill, capture or cause any harm to an Antarctic seal except on the authority of a permit issued by the Minister.
- (2) No person may kill, capture or cause harm to any Ross seal (*Ommatophaca rossi*), Southern elephant seal (*Mirounga leonina*) or fur seal (*Arctocephalus* sp.).
- (3) A permit contemplated in sub-regulation (1), may only be issued for a Crabeater seal (*Lobodon carcinophagus*), Leopard seal (*Hydrurga leptonyx*) or Weddell seal (*Leptonychotes weddelli*) and only for the following purposes:
 - (a) To provide food for any person or animal where no other reasonable alternative is available; or
 - (b) for scientific research.
- (4) When considering an application for a permit contemplated in sub-regulation (3) and when imposing conditions on such permit, the Minister must have regard to the provisions of Annex 1 to the Seals Convention.

8. Antarctic specially protected areas and sites

- (1) No person may enter an Antarctic specially protected area except on the authority of a permit issued by the Minister.

- (2) The Minister may only issue a permit contemplated in sub-regulation (1) in accordance with the requirements of the Management Plan for that specially protected area.
- (3) Where a specially protected area does not have a Management Plan, the Minister may only issue a permit to enter such area, for a compelling scientific purpose, which cannot be served elsewhere and which will not jeopardise the natural ecological system in the specially protected area.
- (4) A permit contemplated in sub-regulation (1) must at least contain the following details:
 - (a) The extent and location of the specially protected area;
 - (b) the specific activities that are authorised, the time period, location and by whom such activities may be undertaken;
 - (c) relevant conditions within the Management Plan; and
 - (d) any other conditions which the Minister may deem necessary.
- (5) A permit holder must at all times carry a certified copy of a permit while in a specially protected area.
- (6) No person may damage, remove or destroy any listed Historic sites and Monuments designated in terms of Annex 5 to the Protocol.

CHAPTER 3

LIABILITY ARISING FROM ENVIRONMENTAL EMERGENCIES

9. Preventative Measures

- (1) Any authorised operator operating in or located within the Antarctic Treaty area must implement the following preventative measures:
 - (a) Specialised structures or equipment incorporated into the design and construction of facilities or means of transportation;

- (b) specialised procedures incorporated into the operation or maintenance of facilities or means of transportation; and
 - (c) specialised training of personnel; and
 - (d) any other measures,
- provided for by the Minister in any norms and standards, guideline or policy.

10. Contingency Plans

- (1) Any authorised operator operating in or located within the Antarctic Treaty area, shall compile a contingency plan for responding to any incident which has or may have an adverse effect on the Antarctic Treaty area or dependent and associated ecosystems, which plan must be approved by the Minister and must include the following:
 - (a) procedures for conducting an assessment of the nature of the incident;
 - (b) notification protocols;
 - (c) identification and mobilisation of resources;
 - (d) response plans;
 - (e) training;
 - (f) record keeping;
 - (g) demobilisation; and
 - (h) any other information required.
- (2) If an environmental emergency occurs, the master of a vessel and an authorised operator shall immediately notify the Department's Director of Marine Pollution of the incident.
- (3) If a contingency plan requires the support of other operators, research programmes or other Parties to the Antarctic Treaty, the signed agreements relating to such support must be submitted to the Minister 60 calendar days before the activity starts.

11. Response Action

- (1) Any authorised operator, operating in or located within the Antarctic Treaty area who causes or is responsible for an environmental emergency shall take immediate steps as contemplated in

section 30 of the National Environmental Management Act. For the purposes of these regulations the term 'relevant authority' in section 30 shall mean the Minister.

- (2) Any other State that wishes to take response action to an environmental emergency must notify the authorised operator and the secretariat of the Antarctic Treaty prior to taking any such response action, except where a threat of significant and harmful impact to the Antarctic environment is imminent and it would be reasonable in all the circumstances to take immediate response action, in which case the relevant State shall notify the authorised operator and the secretariat of the Antarctic Treaty as soon as possible.
- (3) Such other State contemplated in sub-regulation (2), shall not take response action to an environmental emergency unless:
 - (a) A threat of significant and harmful impact to the Antarctic environment is imminent and it would be reasonable in all the circumstances to take immediate response action; or
 - (b) the authorised operator has failed within a reasonable time to notify the secretariat of the Antarctic Treaty that it will take the response action itself; or
 - (c) where that response action has not been taken within a reasonable time after such notification.
- (4) Where an authorised operator takes response action itself, but is willing to be assisted by another State, the authorised operator shall coordinate the response action as directed by the Minister in terms of sub-regulation (1).
- (5) If any authorised operator takes any response action in respect of any other State's operator or other person, which has caused or was responsible for an environmental emergency, it shall notify the Minister, who shall notify the other State and the secretariat of the Antarctic Treaty of the intention to assist or take action beforehand, except where a threat of significant and harmful impact to the Antarctic Treaty area is imminent and it would be reasonable in all the circumstances to take immediate response action, in which case such authorised operator shall notify the Minister as soon as possible.

- (6) An authorised operator shall not take response action to an environmental emergency contemplated in sub-regulation (5) unless:
- (a) A threat of significant and harmful impact to the Antarctic environment is imminent and it would be reasonable in all the circumstances to take immediate response action; or
 - (b) the responsible person or State has failed within a reasonable time to notify the secretariat of the Antarctic Treaty that it will take the response action itself; or
 - (c) where that response action has not been taken within a reasonable time after such notification.
- (7) Where it is unclear which person or State is the responsible person for the environmental emergency, or it appears that there may be more than one person or State responsible, if the authorised operator takes response action, it shall notify the Minister who must consult and notify the secretariat of the Antarctic Treaty of the circumstances.
- (8) If any authorised operator takes response action it shall consult and coordinate their action as directed by the Minister and shall, where practicable, take into account all relevant expert guidance which has been provided to the Antarctic Treaty Consultative Meeting.

12. Liability

- (1) Any authorised operator operating in or located within the Antarctic Treaty area that fails to take prompt and reasonable response action to environmental emergencies arising from its activities, shall be liable to pay the costs of response action taken by the Republic and any other person or State who took the required response action.
- (2) When a South African government operator should have taken response action but failed to do so, and no response action was taken by any other country, the government operator shall be liable to pay the costs of the response action which should have been undertaken. Such money shall be paid directly into the Fund as detailed in Article 12 of Annex 6 to the Protocol.
- (3) When a non-governmental authorised operator should have taken response action but failed to do so, and no response action was taken by any other person, the non-governmental authorised

operator shall be liable to pay an amount of money that reflects the costs of the response action that should have been taken. Such money is to be paid directly to the Fund as detailed in Article 12 of Annex 6 to the Protocol.

- (4) Liability for any environmental emergency in the Antarctic Treaty area shall be strict liability.
- (5) When an environmental emergency arises from the activities of two or more operators, they shall be jointly and severally liable, except that an operator which establishes that only part of the environmental emergency resulted from its activities, shall be liable in respect of that part only.

13. Exemptions from Liability

- (1) An operator shall not be liable in terms of regulation 12, if it proves that the environmental emergency was caused by:
 - (a) An act or omission which was reasonable in the circumstances, to protect human life or safety;
 - (b) an event constituting a natural disaster of an exceptional character, which could not have been reasonably foreseen, either generally or in the particular case, provided all reasonable preventative measures have been taken that are designed to reduce the risk of environmental emergencies and their potential adverse impact;
 - (c) an act of terrorism; or
 - (d) an act of belligerency against the activities of the operator.
- (2) An operator, or its agents, contractors or operators specifically authorised by it to take such action on its behalf, shall not be liable for an environmental emergency resulting from response action taken by it to the extent that such response action was reasonable in the circumstances.

14. Limits of Liability

- (1) The maximum amount, for which each operator may be liable, in respect of each environmental emergency, shall be determined as provided for in Article 9 of Annex 6 to the Protocol, as amended by any Resolution, Decision, Measure or other means.

- (2) Liability shall not be limited if it is proved that the environmental emergency resulted from an act or omission of the operator, committed with the intent to cause such emergency, or recklessly and with knowledge that such emergency would probably result.

15. Insurance and other financial security

- (1) Any authorised operator other than a government operator, operating in or located within the Antarctic Treaty area shall maintain adequate insurance or other financial security, such as the guarantee of a bank or similar financial institution, to cover liability under these regulations up to the applicable limits contemplated in regulation 14.
- (2) An authorised operator other than a government operator, must also have sufficient insurance or provide an equivalent guarantee for costs of any kind incurred by an organ of state or other person in connection with any searches, rescue operations or medical transport that have to be carried out in relation to the activity in the Antarctic Treaty area. The insurance or guarantee must cover such expenses irrespective of any negligence by the authorised operator or any other person in the expedition or involved in the activity.
- (3) The Minister must, prior to issuing a permit in terms of these regulations, determine whether the insurance or guarantee provided in terms of sub-regulation (2) is sufficient.

CHAPTER 4

WASTE DISPOSAL AND MANAGEMENT

16. Waste removal and incineration

- (1) The wastes listed in Article 2 of Annex 3 to the Protocol shall be removed from the Antarctic Treaty area by the generator of such waste in the manner and in accordance with the conditions provided for in such Article.
- (2) No person shall incinerate any waste or any other material within the Antarctic Treaty area.

17. Disposal of waste on land

- (1) Waste not disposed of in terms of regulation 16, may not be disposed of into ice-free areas or any freshwater system.
- (2) Sewage, domestic liquid wastes and other liquid wastes not removed from the Antarctic Treaty area, shall not be disposed of onto sea ice, ice shelves or the grounded ice-sheet.
- (3) Waste generated by a station located inland on ice shelves or on the grounded ice-sheet may be disposed of in deep ice pits where such disposal is the only practicable option; and such pits shall not be located on known ice-flow lines, which terminate at ice-free areas or in areas of high ablation.
- (4) Wastes generated at field camps shall be removed by the generator of such wastes to the supporting station or ship for disposal.

18. Disposal of waste at sea

- (1) Sewage and domestic liquid waste may be directly discharged into the sea, provided that such discharge—
 - (a) occurs where conditions exist for initial dilution and rapid dispersal; and
 - (b) of large quantities of such wastes shall be treated by at least maceration, and large quantities include waste generated at a station where the average weekly occupancy over the austral summer between 15 October and 15 March, is 30 individuals or more.
- (2) The bi-product of the treatment of sewage by the Rotary Biological Contacter process or similar process may be disposed of into the sea, provided that such disposal does not have an adverse effect on the local environment and complies with Annex 4 to the Protocol.

19. Prohibited substances

- (1) No person shall introduce onto land, any ice shelf or into the water within the Antarctic Treaty area, the substances listed in Article 7 of Annex 3, except for scientific, medical or hygiene purposes.
- (2) The possession, use or disposal of poly-vinyl chlorides is prohibited within the Antarctic Treaty area.

20. Waste management plans

- (1) The Minister shall, in accordance with Article 8 of Annex 3 to the Protocol—
 - (a) develop a waste classification system;
 - (b) prepare and annually review a waste management plan; and
 - (c) prepare an inventory of past activities,in respect of any station, camp or ship owned or operated by the State.

CHAPTER 5**MARINE POLLUTION FROM SHIPS**

This chapter applies to all South African flagged vessels and to all authorised operators within the Antarctic Treaty area.

21. Discharge of oil

Any discharge of oil or oily mixtures shall comply with the provisions of Article 3 of Annex 4 to the Protocol.

22. Discharge of noxious liquid substances

The discharge of any noxious liquid substance or any chemicals is prohibited within the Antarctic Treaty area.

23. Disposal of garbage

- (1) The disposal of all garbage into the sea is prohibited including the following:
 - (a) all plastics including synthetic ropes, fishing nets and bags; and
 - (b) paper products, rags, glass, metal, bottles, crockery, incineration ash, dunnage, lining and packing material.
- (2) Food waste may only be disposed of into the sea if it has been passed through a comminuter or grinder and is capable of passing through a screen with openings of a maximum of 25 millimetres. Such disposal into the sea may only occur at least 12 nautical miles from land or any ice shelf, unless authorised under Annex 5 of MARPOL 73/78.
- (3) If any substance or material covered by this regulation is mixed with any other substance or material for discharge or disposal, the more stringent or restrictive disposal or discharge requirements must apply.
- (4) The provisions of sub-regulation (1) do not apply to—
 - (a) The escape of garbage as a result of damage to a vessel or its equipment, provided all reasonable measures were taken before and after such damage to prevent or minimise such escape; or
 - (b) the accidental loss of synthetic fishing nets, provided all reasonable measures were taken to prevent such loss.
- (5) All vessels shall keep a garbage record book which contains the following information:
 - (a) Type of substance being disposed of;
 - (b) date of disposal;
 - (c) amount or volume being disposed of; and
 - (d) GPS location of disposal.

24. Discharge of sewage

- (1) The discharge of untreated sewage into the sea within 12 nautical miles from land or any ice shelf, within the Antarctic Treaty area is prohibited.
- (2) Beyond 12 nautical miles from land or any ice shelf within the Antarctic Treaty area, sewage may only be discharged into the sea at the rate specified in Annexure 1 to these regulations, and while a vessel is travelling at a speed of not less than 4 knots.
- (3) Sub-regulation (1) and (2) does not apply to any vessel certified to carry not more than 10 persons.
- (4) All vessels and land based stations shall keep a sewage record book which contains the following information:
 - (a) Type of substance being disposed of;
 - (b) date of discharge;
 - (c) amount or volume being discharged;
 - (d) GPS location of discharge; and

25. Ship capacity and reception facilities

- (1) Every vessel entering the Antarctic Treaty area shall be fitted with sufficient capacity to retain—
 - (a) all sludge, dirty ballast, tank washing water and other oily residues and mixtures;
 - (b) garbage; and
 - (c) noxious liquid substances.
- (2) All vessels must discharge the substances in sub-regulation (1)(a) and (b) at a reception facility after leaving the Antarctic Treaty area.

CHAPTER 6

PERMITS

26. Application for a permit

- (1) An application for a permit or renewal of a permit, in terms of these regulations must—
 - (a) be made to the Minister on the application form obtained from the Department;
 - (b) be accompanied by proof of payment of the application fee if prescribed;
 - (c) be accompanied by all supporting documents required to assess the application including those required by the application form and these regulations;
 - (d) be submitted—
 - (i) electronically, or by hand as required; and
 - (ii) with the original, or certified copies of the documentation in support of the application, as required; and
 - (e) be completed in full and signed by the relevant person or persons as indicated in the application form.
- (2) An application for a permit must be submitted at least 180 calendar days prior to the date of departure to the Antarctic Treaty area.
- (3) If an applicant fails to fully complete all required parts of, or provide all information required by, the application form or these regulations; the application will be rendered incomplete and will not be considered.
- (4) The Department must, within 14 calendar days after receipt of an application for or renewal of a permit, acknowledge receipt of the application in writing.

27. Assessment of applications

- (1) The Minister may, after receiving an application submitted in terms of these regulations—
 - (a) request the applicant to provide specific information by a specified date;

- (b) request the applicant to carry out further investigations and to provide that information within a specified time; or
 - (c) request the applicant to consult with specific organisations, authorities, persons or interested parties and submit the reports of the required consultations within a specified time.
- (2) In assessing an application for a permit or renewal of a permit the Minister may, in addition to those factors detailed in these regulations, also have regard to the following—
 - (a) whether or not the applicant has been convicted of contravening the Act, the National Environmental Management Act or any other specific environmental management Act; or
 - (b) whether the applicant, or any director of the applicant, either personally or while a director of another entity, has contravened conditions of prior or existing permits or authorisations granted to the applicant, or a director of the applicant, or an entity to whom a director of the applicant was at the time a director, in terms of the Act, the National Environmental Management Act or any other specific environmental management Act, including these regulations.
- (3) A failure to comply with any request made in terms of sub-regulation (1) renders the application incomplete and it may not be considered.

28. Decision on applications

- (1) The Minister may, in relation to an application for a permit or renewal of a permit in terms of these regulations—
 - (a) issue a permit subject to conditions; or
 - (b) refuse the application.
- (2) A permit must be issued in writing and must include the following details:
 - (a) The identity and contact details of the permit-holder;
 - (b) the geographic location of the infrastructure or activity to be undertaken;
 - (c) the validity period of the permit; and

- (d) the conditions included in the permit.
- (3) A decision to refuse a permit must include—
 - (a) the reasons for the decision; and
 - (b) the date of the decision.
- (4) The Minister's decision on an application for a permit or renewal of a permit must be made within 60 calendar days from the date that all documentation and information required by, or requested in terms of, these regulations was received by the Minister.
- (5) A permit may be issued for a maximum period of 3 years.
- (6) A permit may be issued subject to conditions.
- (7) Any permit issued in terms of these regulations is not transferable.

29. Permit renewal

- (1) A permit-holder may, between 90 and 60 calendar days before the lapse of a permit, apply to the Minister for a renewal of any permit issued in terms of these regulations, for a maximum period of 1 year, whereafter a new application for a permit must be made.
- (2) In an application for a renewal of a permit, the Minister may consider—
 - (a) whether the activity has varied significantly, in relation to the parameters set in the original permit's conditions; and
 - (b) any other relevant consideration.

30. Suspension, amendment and cancellation of permits

- (1) Subject to sub-regulations (2) and (3), a permit issued under these regulations may at any time be suspended, cancelled or amended.
- (2) A permit may be suspended, cancelled or amended by the Minister, if—

- (a) the Minister is satisfied on the basis of information that was not considered when the permit was issued, that it is necessary or desirable to suspend, cancel or amend the permit to prevent deterioration or further deterioration of the environment within the Antarctic Treaty area;
 - (b) other similar permits held by other persons have also been reviewed and the suspension, cancellation or amendment does not unfairly discriminate against the holder in relation to other holders of similar permits;
 - (c) the permit holder is in breach of a condition contained in the permit;
 - (d) the permit holder provided incorrect or false information in the application for the permit;
 - (e) the holder of a permit has been convicted of an offence in terms of the Act, the National Environmental Management Act or a specific environmental management act or any regulations issued thereunder;
 - (f) the reason for the issuing of the permit no longer exists;
 - (g) it is necessary to meet the Republic's international obligations; or
 - (h) the permit holder failed to comply with a directive issued in terms of Regulation 36.
- (3) A permit may be amended by the Minister—
- (a) if an error needs to be corrected or rectified;
 - (b) at the request of the applicant;
 - (c) for the proper management and implementation of these Regulations; or
 - (d) where the conditions or circumstances have changed since the original permit was issued.

CHAPTER 7

COMPLIANCE AND ENFORCEMENT

31. Powers of inspectors

- (1) Where the Minister has designated an inspector in terms of section 5 of the Act, the inspector shall have the powers and functions as detailed in this Chapter.

32. Proof of designation

- (1) An identity card issued in terms of section 5(2) of the Act must include the following information:
- (a) The full names and identity number of the person designated as an inspector;
 - (b) a recent photograph of that person;
 - (c) the name of the organ of state of which that person is an employee and the employee number of that person;
 - (d) the mandate of the person to enforce this Act;
 - (e) the full names and post description of the designating authority who designated the person as an inspector;
 - (f) the signature of the designating authority;
 - (g) the date on which the person was designated as an inspector; and
 - (h) where applicable, that the inspector is a peace officer *ex officio*.

33. Inspection powers

- (1) An inspector may, without a warrant and at any reasonable time, conduct inspections, for the purposes of ascertaining compliance with the Act or these Regulations—

- (a) enter any facility and inspect that facility, its infrastructure, equipment, any product and any document or record;
 - (b) stop, enter and inspect any vehicle, vessel or aircraft;
 - (c) question any person who, in the reasonable opinion of the inspector, may be capable of furnishing any information which the inspector may require;
 - (d) require any person employed or present at any facility, on any vehicle or any vessel to assist in the examination of such facility, vehicle or vessel and of any document, in order to ascertain whether the Act or these Regulations has been complied with;
 - (e) make copies of any document, audio, visual or audio-visual recording;
 - (f) take photographs or make audio, visual or audio-visual recordings of anything or any person;
 - (g) take samples;
 - (h) take possession of items required to be assessed in order to ascertain compliance; and
 - (i) give any reasonable and lawful instruction.
- (2) An inspector must—
- (a) provide a receipt for an item removed during the inspection;
 - (b) subject to sub-regulation 2(c), keep any item removed in such a way that it is secured against damage;
 - (c) where the item removed is likely to perish dispose of it in such a manner as the circumstances may require; and
 - (d) return any item removed insofar as this does not pose a threat to human health, animal health or the environment, and subject to the outcome of any criminal proceedings that may have commenced.

34. Criminal investigation powers

- (1) Where an inspector has reasonable grounds to believe that an offence under the Act or these Regulations has been committed, the inspector may, with a warrant, subject to sub-regulation (2)—
- (a) enter and search any facility, its infrastructure, equipment, any product and any document or record;

- (b) stop, enter and inspect any vehicle, vessel or aircraft, for the purpose of searching for admissible evidence of an offence committed
 - (c) require any person who may have information concerning a possible offence to furnish his or her personal information, including his or her name, identity number, mobile phone number and address.
 - (c) seize anything in or on a premise, land, vehicle, vessel, container, bag, box or item that—
 - (i) is concerned in or is on reasonable grounds believed to be concerned in the commission of an offence;
 - (ii) may be used as evidence in the prosecution of any person for an offence;
 - (iii) is intended to be used, or is on reasonable grounds believed to be intended to be used, in the commission of an offence;
 - (iv) which is being, or is likely to be, used in a manner that is causing or may cause significant pollution or degradation of the environment;
 - (g) give any lawful and reasonable instruction.
- (2) An inspector may act without a warrant in terms of sub-regulation (1), but only if—
- (a) the person in control of the premises consents to the entry and inspection; or
 - (b) there are reasonable grounds to believe that a warrant would on application be issued, but that the delay that may be caused by applying for a warrant would defeat the object of the entry or inspection.
- (3) An inspector must provide receipt for any item seized in terms of sub-regulation (1).

35. Disposal of seized items

- (1) The provisions of sections 30 to 34 of the Criminal Procedure Act (Act No. 51 of 1977) apply, with necessary changes, to the disposal of anything seized in terms of regulation 34.
- (2) When an item is seized in terms of regulation 34, an inspector may request the person who was in control of the item immediately before the seizure of the item, to take it to a place designated by the inspector, and if the person refuses to take the item to the designated place, the inspector may do so.

- (3) In order to secure a vehicle or vessel that has been seized, the inspector may take reasonable steps necessary to secure that vehicle or vessel.
- (4) An item seized, including a part of a vehicle or vessel referred to in sub-regulation (3), must be kept in such a way that it is secured against damage.
- (5) Notwithstanding the provisions of sub-regulation (4) anything seized under regulation 34 that is likely to perish may be disposed of in such a manner as the circumstances may require.

36. Power to issue directives

- (1) An inspector may, subject to sub-regulation (2), issue a directive if there are reasonable grounds for believing that a person has not complied with a provision of the Act or these Regulations.
- (2) Before issuing a directive, an inspector must give the person to whom the inspector intends to issue the directive a reasonable opportunity to make representations in writing to the inspector as to why he or she should not issue the directive as intended.
- (3) If an inspector has reasonable grounds to believe that giving written notice of his or her intention to issue a directive in accordance with sub-regulation (2), will cause a delay resulting in significant harm to the environment, human health or to the well-being of a live animal the inspector may issue a directive without complying with sub-regulation (2).
- (4) A directive issued in terms of sub-regulation (1) must set out—
 - (a) details of the conduct constituting non-compliance or details of the disease as the case may be;
 - (c) any steps the person must take and the period within which those steps must be taken;
 - (d) any thing which the person may not do, and the period during which the person may not do it; and
 - (e) the procedure to be followed in lodging an objection to the directive with the Minister.

(5) An inspector may, on good cause shown, vary a directive and extend the period within which the person must comply with the directive.

(6) A person who receives a directive must comply with that directive within the time period stated in the directive.

37. Objection to directive

- (1) Any person who receives a directive in terms of regulation 36 may object to the directive by making representations, in writing, to the Minister within 30 days of receipt of the directive, or within such longer period as the Minister may determine.
- (2) After considering any representations made in terms of sub-regulation (1) and any other relevant information, the Minister may confirm, modify or set aside a directive or part thereof and must specify the period within which the person who received the directive must comply with any part of that directive that is confirmed or modified.
- (3) An objection to a directive does not suspend a directive unless the Minister declares otherwise.

CHAPTER 8 GENERAL PROVISIONS

38. Entry to Antarctica

- (1) No person may enter or remain in the Antarctica Treaty area, except on the authority of a permit issued by the Minister.
- (2) Sub-regulation (1) does not apply to—
 - (a) a member of an expedition organised by the Department; or
 - (b) a person referred to in section 5 of the Act.

- (3) No South African vessel or aircraft may enter the Antarctic Treaty area, except on the authority of a permit issued by the Minister.
- (4) Sub-regulation (3) does not apply to—
 - (a) a vessel or aircraft travelling to an immediate destination outside Antarctica; or
 - (b) a vessel or aircraft belonging to the Republic; or
 - (c) a vessel or aircraft duly chartered by the Republic.

39. Emergencies

The provisions of regulations 5, 6, 7, 8 and Chapters 4 and 5, shall not apply to activities undertaken in instances of emergency relating to the safety of human life, ships, aircraft or equipment and facilities of high value or the protection of the environment.

40. Observers and inspections

All areas within the Antarctic Treaty area, including all stations, installations and equipment within those areas, and all vessels and aircraft at points of discharging or embarking cargo or personnel, shall be open at all times to inspection by any Departmental official, any person designated in terms of section 5(1) of the Act, or observers designated in accordance with Article 7 of the Antarctic Treaty.

41. Notification

- (1) Any person, South African flagged vessel or authorised operator, must within 30 calendar days prior to departure, notify the Minister, of:
 - (a) All expeditions to the Antarctic Treaty area;
 - (b) the activity to be undertaken in the Antarctic Treaty area;
 - (c) all stations in Antarctica occupied or intended to be occupied by South African citizens; and
 - (d) any military personnel or equipment intended to be introduced.

- (2) The Minister may condone a shorter notification period in appropriate circumstances including—
 - (a) emergencies where the notification period in sub-regulation (1) was not able to be complied with; or
 - (b) any other circumstance deemed appropriate by the Minister.
- (3) The notification contemplated in sub-regulation (1), must include—
 - (a) the name of the responsible person or operator;
 - (b) the scope of the activity, including an initial environmental evaluation, contemplated in regulation 5;
 - (c) the technology and measures that will be used to limit any harmful effects;
 - (d) information on how the requirement of insurance or an equivalent guarantee contemplated in regulation 15 is to be met before the activity starts;
 - (e) contingency plans contemplated in regulation 10; and
 - (f) any other information requested by the Minister.

42. Postponing, amending or prohibiting an activity

- (1) The Minister may amend, postpone or completely prohibit an activity contemplated in regulation 33, if its implementation may result in adverse effects on the Antarctic environment or dependent and associated ecosystems or the safeguarding of life and health which are contrary to -
 - (a) the objects of these Regulations;
 - (b) the provisions of these Regulations; or
 - (c) international resolutions, advice or recommendations adopted by the Republic.
- (2) The Minister may postpone or amend an activity to ensure that an environmental evaluation is carried out in accordance with regulation 5.
- (3) If an activity which has commenced leads to unforeseen adverse effects on the Antarctic environment or dependent and associated ecosystems, the Minister may make amendments to the activity, postpone the activity, or completely prohibit the activity if this is necessary to prevent, mitigate or contain the unforeseen adverse effects.

43. Reporting

- (1) An authorised operator must prepare and submit a report to the Minister every six months relating to the activity and the use of any permit issued in terms of these Regulations, including a final report within 30 calendar days of the conclusion of the activity.
- (2) The report shall be in the form and contain the information obtainable from the Department.

44. Offences and Penalties

- (1) In addition to any offence contained in section 9 of the Act, any person who contravenes or fails to comply with:

- (a) regulations 3, 4, 5(1) to (3), 5(5) to 5(7), 6(1), 6(6), 6(7), 6(9), 6(10), 7(1), 7(2), 8(1), 8(5), 8(6), 10(1), 10(2), 11(1), 11(4), 11(6), 11(8), 15, 16, 17, 18, 19, 21, 22, 23(1) to (3), 23(5), 24(1), 24(2), 24(4), 25, 38(1), 38(3), 41(1) and 43(1) in these Regulations;

- (b) a lawful and reasonable instruction of an inspector; and

- (c) a directive issued in terms of regulation 36(1),

is guilty of an offence and liable on conviction to—

- (a) imprisonment for a period not exceeding five years;

- (b) a fine; or

- (c) to both such fine and such imprisonment.

45. Short title and commencement

These Regulations are called the Antarctic Treaties Regulations, 2021, and commence on the date of publication in the *Gazette*.

ANNEXURE 1

The permissible rate of discharge for untreated sewage as prescribed in Resolution MEPC.157(55)

DISCHARGE RATE (m³/h)					
Speed (knots)	4	6	8	10	12
Draft (m)					
5	4.63	6.95	9.26	11.58	13.89
6	5.56	8.33	11.11	13.89	16.67
7	6.48	9.72	12.96	16.21	19.45
8	7.41	11.11	14.82	18.52	22.22
9	8.33	12.50	16.67	20.48	25.00

DEPARTMENT OF HOME AFFAIRS

NO. 1752

11 February 2022

ALTERATION OF SURNAMES IN TERMS OF SECTION 26 OF THE BIRTHS AND DEATHS REGISTRATION ACT, 1992 (ACT NO. 51 OF 1992)

The Director-General has authorized the following persons to assume the surnames printed in *italics*:

1. Lekoko David Maroane - 851223 5579 *** - Pilla Village, 64 Ntshielle Section, MADIKWE, 2840 - *Modutwane*
2. Siyanda Khulekani Mpanza - 990903 5828 *** - Enkandla Area, TUGELA RERRY, 3010 - *Myaka*
3. Phiwakahle Lethukuthula Ngcobo - 931028 5360 *** - B256 Adams, ADAMS MISSION, 4100 - *Hlela*
4. Mahlatse Motladi - 890801 0478 *** - 33 Gustav Schmiki, PHILIPNEL PARK, 0183 - *Mashabela*
5. Aubrey Muzikayise Mkhize - 810929 5409 *** - Sompukane Area, UMBUMBULU, 4105 - *Makhanya*
6. Samkelo Colin Mthetheli - 001024 5739 *** - 67 Siems Place, Southlands, PIETERMARITZBURG, 3201 - *Madondo*
7. Thabiso Seseane - 960418 5201 *** - 45110 Monageng, MAMELODI, 0122 - *Sebata*
8. Andile Gcina Ndunakazi - 000211 5527 *** - 91 Kwamakhutha Township, AMANZIMTOTI, 4126 - *Gumede*
9. Mabuya Mabhongo Ngwenya - 930730 5372 *** - 26 Park Street, DANNHAUSER, 3080 - *Sibeko*
10. Thembisile Fiona Sithole - 811103 0816 *** - A2510 Illovo Township, AMANZIMTOTI, 4126 - *Lugogwana*
11. Phillemon Lifa Sibiyi - 760711 5616 *** - Mtshali Road, Ezimbokodweni, ISIPINGO, 4126 - *Gumede*
12. Dikgang Calvin Caliph Trawalley - 920127 5369 *** - 15 Rue Auguste, Langon, PARIS, 75013 - *Maboea*
13. Gordon Lucky Katiso Montoedi - 750330 5459 *** - 158 Lethabong Section, MABOLOKA, 0197 - *Moeng*
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15. Mpho Koketso Natasha Raophala - 010802 0450 *** - 540 Appelblar Lushof, TZANEEN, 0850 - *Modiba*
16. Mbuso Mboniswa Myeza - 791002 5686 *** - Kwa Khoza Res, ESHOWE, 3815 - *Cele*
17. Lindokuhle Sandile Nhlakanipo Mkhaywa - 931219 5578 *** - 29344 Molahleni Street, TSAKANE, 1550 - *Mavuso*
18. Sinethemba Pretty Zuma - 990408 0546 *** - Xosheyakhe Area, BULWER, 3244 - *Dlangisa*
19. Wandile Richmond Makosi - 700117 5768 *** - 6455 Nu 1, MDANTSANE, 5219 - *Mniki*
20. Samuel Magane - 910730 5269 *** - 34842 Barcelona, Extension 34, ETWATWA, 1519 - *Mabettele*
21. Promise Welcome Matlala - 980106 5384 *** - Stand 01576, Hlanikahle, Monsterlus, MPUDULLE, 1057 - *Tompane*
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24. Luyanda Khanyile - 010314 5388 *** - 5187 Mbuyazwe Street, KIASHA PARK, 1829 - *Khumalo*
25. Tshireletso Botsime - 970404 6033 *** - Lomanyaneng, MAFIKENG, 2745 - *Mahoko*
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30. Solly Katlego Makgata - 950815 5955 *** - Mashamothane, BURGERSFORT, 1150 - *Sefiti*
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105. Trueman Thembinkosi Hadebe - 750628 5451 *** - 4925 Ward E, OSIZWENI, 2952 - *Nkosi*
106. Sphiwe Edwin Nkosi - 780424 5380 *** - 33895x6 Moswane Street, MAMELODI EAST, 0122 - *Modise*
107. Esselina-Itumeleng Molefi - 790829 0415 *** - 28 Villa La Montagne, 5 Wilhelmina Avenue, Constantia Kloof, ROODEPOORT, 1715 - *Sefatsa*
108. Bertha Lesego Mabele - 930203 0738 *** - 4659 Tiger Fish Street, Allendale, MIDRAND, 2125 - *Mashishi*
109. Clement Sthembiso Mahlangu - 001013 5235 *** - 609 Block R, SOSHANGUVE, 0152 - *Choba*
110. Calvin Lishivha - 901117 5680 *** - 1079 Goyapele Street, Molapo, SOWETO, 1818 - *Muleya*
111. Lucky Rapula Gaseitsiwe - 970316 5333 *** - 918 Corner Tunisia Crescent, TSUTSUMANI, 2090 - *Mpanza*
112. Tando Sandiso Maliwa - 880728 5778 *** - 17 Kius Arthur Avenue, Camelot, Kuilsriver, CAPE TOWN, 7850 - *Nxiweni*
113. Lungayi Mona - 630907 5964 *** - Ngqwara Area, MQANDULI, 5080 - *Dyantyi*
114. Molatelo Lerato Pearl Makgatho - 970615 0513 *** - 33 Vis Rivier Avenue, Safarituine, RUSTENBURG, 0299 - *Segwati*
115. Sibusiso Jacob Hlatshwayo - 910703 5248 *** - No 16 Smitfield, HARTEBEEKSKOP, 1192 - *Kholwane*
116. Thabang Gordon Nkoana - 900605 5799 *** - 140 Block C, MABOPANE, 0190 - *Molefi*
117. Mpho Moima - 960409 0859 *** - 1535 Extension 1, SOSHANGUVE SOUTH, 0152 - *Mthombeni*
118. Petrus Mandla Madonsela - 740627 5454 *** - 8499 Musa Street, Unit F, THOKOZA, 1426 - *Mbatha*
119. Ziphiwo Sabuka - 951027 5025 *** - 28 Beaver Street, Meadow Estate, MIDSTREAM, 0160 - *Ganyile*
120. Given Rantsana - 940906 6094 *** - No E0423, Thononda Lutomboni, NZHELELE, 0993 - *Singo*
121. Lebepe Eunice Lechelele - 861221 0419 *** - Ga-Dikgale, MAROBALA, 0721 - *Ramolotja*
122. Marclin Conrad Majied - 030214 5652 *** - 250 Steyn Street, CALVINIA, 8190 - *Jacobs*
123. Nakedi Maluzani - 030325 1027 *** - 63 Tyrone Avenue, NWAXINYMANI, 2193 - *Lebeya*
124. Refiloe Masangane - 030116 0720 *** - 01 Monakeng Section, KATLEHONG, 1432 - *Manaka*
125. Silindile Calvin Miya - 020226 6209 *** - 1000 Bentswari Street, VILLERIA, 0081 - *Mncube*
126. Nqobile Noluthando Buthelezi - 021020 0547 *** - K312 Umlazi Township, UMLAZI, 4066 - *Memela*
127. Kutloano Tshepo Sekhoto - 011219 6293 *** - 26 Plataan Street, Brackendown, ALBERTON, 1448 - *Phake*
128. Malekapele Shadrack Moshwaneng - 830823 6092 *** - 8093/14 Or Tambo Street, Vosman, WITBANK, 1035 - *Malaka*
129. Thabo Khumalo - 001222 6087 *** - 5410 Extension 6, STANDERTON, 2430 - *Lewele*
130. Mbali Mokgosi - 910722 0813 *** - 5467 Moilwa Street, KAGISO 2, 1739 - *Zukani*
131. Michaela Van Blerk - 920316 0278 *** - 71 Van Der Stel Street, Kabega Park, PORT ELIZABETH, 6025 - *Gardner*
132. Ndzalama Raymond Mohale - 030416 6408 *** - House No 4724, Extension 09, MATSWALE, 0900 - *Mashula*

133. Vincent Katlego Khoza - 890426 5343 *** - 1633 Block R, SOSHANGUVE, 0152 - *Molefi*
134. Sibusiso Jerry Nhlapho - 881031 5339 *** - 30 Chad Street, VOSLOORUS, 1475 - *Motha*
135. Sunlly Choene Mothiba - 891016 5249 *** - 2647-3rd Avenue, Extension 1, Dikole, KATLEHONG, 1431 - *Monyemoratho*
136. Thuthukani Bhengu - 011218 5220 *** - 1041 Mcele Road, Imbali, PIETERMARITZBURG, 3201 - *Makhanya*
137. Zanele Eunice Hlomuka - 810927 0643 *** - Schoeman Area, Driefontein, LADYSMITH, 3370 - *Ngwenya*
138. Ndumiso Lungisani Zuma - 971028 5396 *** - 38 Corbet Crescent, Westgate, PIETERMARITZBURG, 3201 - *Latha*
139. Sizi Justice Mdaka - 681026 5388 *** - 1334 Kamhlushwa, SIDLAMAFA, 1332 - *Mubi*
140. Mandla Stanley Khumalo - 681110 5610 *** - 1068 Kwamakuta Township, KWAMAKUTA, 4126 - *Mtshali*
141. Leshoka Johannes Mosotho - 671024 5228 *** - 1733 Block B, LETLHABILE, 0264 - *Phetla*
142. Thabo Isaac Ncayiyana - 790103 5602 *** - 2715 Adams Road, EVATON, 1984 - *Moloi*
143. Lefalakhe Macholo - 010703 6189 *** - 3091 Phomolong, KROONSTAD, 9499 - *Valashiya*
144. Khanyi Chiloane - 020212 0824 *** - 471 Moteti, RAMAPHOSA, 0477 - *Nonyane*
145. Samkelo Sipiwe Skodana - 010520 6314 *** - 52 Mbusi Street, Katlehong Gardens, KATLEHONG, 1432 - *Maseko*
146. Victor Manthoke Mampa - 021224 5591 *** - 665 Makhwibidung Village, SHILUVANE, 0873 - *Mangena*
147. Nobuhle Slindile Biyela - 030718 0778 *** - Nkolokotho Area, MTUBATUBA, 3935 - *Ncanana*
148. Thapelo Phillimon Tshabalala - 810810 5738 *** - 10102 Mashashane Village, MASHASHANE, 0743 - *Sekhaolelo*
149. Bongekile Viginia Ntozakhe - 901213 1050 *** - 1512-14th Street, CLERMONT, 3610 - *Nhlumayo*
150. Douglas Ephraim Sebetola - 670805 5710 *** - 2209 Ingonyama Street, Extension 4, DIEPSLOOT WEST, 2189 - *Ntsimane*
151. Sello Moyahi Moloi - 970323 6045 *** - 1353 Mkabayi Street, NQUTU, 3135 - *Molefe*
152. Vuyani Ntsako Phakathi - 021019 5716 *** - 5195 Morongwa Street, Extension 2, NELLMAPIUS, 0122 - *Hlongwane*
153. Kanneth Thuso Mnisi - 951019 5894 *** - 1563 Jikeleza Street, Block 16, Mloto, MPUMALANGA, 0458 - *Mahlangu*
154. Ntjane Pontsho Malatji - 900817 5750 *** - Ga-Selepe Village, ATOK, 0749 - *Mohuba*
155. Butubuti Rodney Mashinye - 730403 5891 *** - P O Box 1696, HOEDSPRUIT, 1380 - *Matene*
156. Malusi Goodwill Ndlovu - 851215 5804 *** - 5094 New Stands, Lakeside, VRYHEID, 3100 - *Nkosi*
157. Kenosi John Marumola - 830304 6264 *** - 40026 Leagajang Section, MODDERKUIL, 0352 - *Mmokele*
158. Lesiba Moses Sedibeng - 680121 5720 *** - Ga-Magophong Village, ZEBEDIELA, 0631 - *Malapela*
159. Zamani Luthuli - 030428 6068 *** - Ntuskweni Area, CATO –RIDGE, 3800 - *Mncwabe*
160. Kagisho Choche - 030331 6146 *** - 23469 Extension 3, ALABANA, 2570 - *Kobue*
161. Ntokozo Princess Dhlamini - 030924 1088 *** - House No 3033, VOLKSRUST, 2470 - *Binda*
162. Nomathemba Regina Mhlongo - 680628 0698 *** - 63 Kenyon Howden Road, MONTCLAIR, 4004 - *Ndawo*
163. Ebrahim Patel - 791023 5086 *** - 7a/28 Sangeeta Apartments, Juhu, MUMBAI, 400049 - *Janibabu Sayyed*
164. Mia Nandalall - 950103 0222 *** - 119 Richardson Street, Bailie Park, POTCHEFSTROOM, 2531 - *Mangaroo-Pillay*
165. Thokozani Mlungisi Mabaso - 760212 5966 *** - 11 East Road, Cowies Hill, PINETOWN, 3900 - *Mlotshwa*
166. Yonwaba Mazula - 030507 0492 *** - 35 Nyanda Street, Lingelihle, CRADOCK, 5881 - *Bottoman*

167. Irven Mokgobi Mahlase - 941013 5761 *** - Stand No 359, Vlaakplas, MARISHANE, 1064 - *Masemola*
168. Nqoba Wiseman Mabaso - 800623 5339 *** - F1966 Ntuzuma Township, KWA-MASHU, 4359 - *Phewa*
169. Siyanda Sduduzo Mthethwa - 790908 6085 *** - U 2101, Umlazi Township, UMLAZI, 4001 - *Khuzwayo*
170. Sifiso Bayeni - 730730 5632 *** - D 1504 Ntabamhlophe Road, KWA MASHU, 4020 - *Tsolo*
171. Al-Hadiya Mohammad - 000926 0227 *** - 185 Earel Haig Road, Morningside, DURBAN, 4001 - *King*
172. Grace Nompumelelo Mpongwana - 740915 0997 *** - V 1193 Emakholweni Circle, UMLAZI, 4001 - *Dlamini*
173. Joel Khulekani Masondo - 911001 5343 *** - 3706 Dlamini Street, Phomolong Section, TEMBISA, 1632 - *Mahlangu*
174. Tsetsi Aaron Mabizela - 660328 5433 *** - 72 Section C, EKANGALA, 1021 - *Sibeko*
175. Thabang Robert Mokoena - 960513 5375 *** - 1909 Mtshali Street, WITBANK, 2230 - *Fakude*
176. Kahlolo Patrick Matseletsele - 860225 5327 *** - 8051 Extension 3, ORANGE FARM, 1700 - *Mofokeng*
177. Khomotjo Lizzy Ramara - 830816 0826 *** - 10849 Mamphuro Village, GAMATLALA, 0710 - *Komape*
178. Abel Vusi Mokone - 990608 5896 *** - No 6501, Watervaal, SIYABUSWA, 0472 - *Ndala*
179. Tiamo Enock Mlangeni - 851123 5384 *** - No 2506, Maphanga, SIYABUSWA, 0472 - *Visagie*
180. Bob Thato Ntese - 961219 5422 *** - 108 Mokoena Section, KATLEHONG, 1432 - *Dibakoane*
181. Sihle Mamba - 020215 5566 *** - 50 Makula Section, KATLEHONG, 1431 - *Nhlapo*
182. Kabelo Patrick Olifant - 740620 5771 *** - 1390 Aurferm Street, Huhudi, VRYBURG, 8600 - *Mbangula*
183. Itumeleng Mofokeng - 790402 5522 *** - 172 Nhlapo Section, KATLEHONG, 1400 - *Rapodile*
184. Elphus Jongintaba Ranala - 930327 5341 *** - 194 Ramokonupi East, KATLEHONG, 1432 - *Njube*
185. Ncebakazi Abrahams - 950723 0344 *** - 1879 Freestone, BATHURST, 6166 - *Melani*
186. Sewela Leah Mokwena - 830516 0486 *** - 14 Pitso, ATTERIDGEVILLE, 0100 - *Maiwashe*
187. Keabetswe Richard Letebele - 810515 5476 *** - 11036 Makgobistad Village, MAHIKENG, 2700 - *Madito*
188. Bongani Obed Mabasa - 890507 5262 *** - 11744 Extension 7, ORANGE FARM, 1900 - *Maseko*
189. Simphiwe Mzikabani Buthelezi - 720206 5529 *** - 1109 Van Lingen Street, Dukathole, GERMISTON, 1401 - *Majola*
190. Mario Erich Fasondini - 871110 5155 *** - 13 Godde + Roy Street, SECUNDA, 2302 - *Facondini*
191. Eric Mduduzi Gumede - 660508 5815 *** - 63303 Bava Street, Makhaza, KHAYELITSHA, 7784 - *Sibuta*
192. Oscar Hopane - 771216 5840 *** - 31 Molotlegi Street, ATTERIDGEVILLE, 0010 - *Rapao*
193. Harry Donald Baloyi - 870409 5851 *** - 911 Block R, SOSHANGUVE, 0152 - *Tshabalala*
194. Thuto Malodi - 950711 5319 *** - 16049 Wiehman Crescent, Extension 2, DAVEYTON, 1501 - *Khumalo*
195. Tebogo Rutlokoane - 820716 5400 *** - 6 Bennet Jacobson Drive, Groenewiede, GERMISTON, 1401 - *Dibakwane*
196. Israel Mojaki - 860705 5298 *** - 4028 Phuduhutswane, Ikageng, POTCHEFSTROOM, 2531 - *Lekome*
197. Lipson Selepe - 000621 5715 *** - Zzz 249, Vergenoeg, ATTERIDGEVILLE, 0100 - *Kekana*
198. Lynnette Gugu Mbonani - 010603 0575 *** - 210 Extension 1, WITBANK, 0100 - *Mashabela*
199. Given Thabang Mlangeni - 001004 5261 *** - 2434 Extension 6, Mandela Street, MASHISHING, 1123 - *Mmotla*

200. Tshepo Gift Mlangeni - 970604 5699 *** - 2434 Extension 6, Mandela Street, MASHISHING, 1120 - *Mmotla*
201. Lakios Lawrence Mnisi - 990304 5498 *** - Kgautswana, OHRIGSTAD, 1122 - *Maluka*
202. Ofentse Neil Dube - 980205 5317 *** - 345 Nkone Street, Kagiso I, KRUGERSDORP, 1754 - *Motsamai*
203. Mpho Innocent Soke - 900107 5282 *** - 1349 Maluleke Street, Extension 2, VOSLOORUS, 1475 - *Mokoena*
204. Khotso David Motloung - 770601 5489 *** - 394 Mosamo Street, KIMBERLEY, 8301 - *Potsane*
205. Gift Phooko - 010904 5781 *** - P O Box 525, PAULUSWEG, 0814 - *Rallele*
206. Christopher Charles Van Dyk - 900822 5228 *** - 10 Blakes Cave, HERMANUS, 7200 - *De Villiers*
207. Sibusiso Aubrey Ngwane - 800721 5082 *** - Ntshanini Area, KWADUKUZA, 4480 - *Mbatha*
208. Shiya Sarafinah Masanabo - 970311 0342 *** - 8 – 10th Avenue, Welgedacht, SPRINGS, 1400 - *Moiane*
209. Sphiwe Philemon Mthembu - 870707 5732 *** - 4142 Majaneng, HAMMANSKRAAL, 0402 - *Radebe*
210. Masipa Kabelo Derek Kekana - 801111 5351 *** - 168 Hardekool Street, The Hills, MOOIKLOOF, 0081 - *Mashabela*
211. Dorah Mponeng Legobane - 850305 0659 *** - 5010 Magogang Village, TAUNG, 8584 - *Odisang*
212. Mathews Thabo Maile - 830711 5362 *** - 3787 Extension 5, REFILWE, 1001 - *Mabuza*
213. Donaven Nhlanhla Masina - 720528 5868 *** - 10 Louis Trichardt Street, VOLKSRUST, 2470 - *Mavimbela*
214. Samuel Motsepe - 800119 5345 *** - 618 Zone 25, GA-RANKUWA, 0208 - *Mabena*
215. Akani Sekgobela - 960803 0841 *** - 1001 B Next To Sassa, LULEKANI, 1392 - *Mabasa*
216. Ally Montsheng Mashaba - 720402 5537 *** - 2337 Zone 3, Mountain View, KWAMHLANGA, 1022 - *Mohlala*
217. Lesiba Justice Mathabathe - 930107 5739 *** - House No 38 A, Basogadi Village, BAKENBERG, 0611 - *Langa*
218. Mahlatse Johannes Matshingane - 020907 6323 *** - 1239 Mamphokgo, MARBLE HALL, 0400 - *Digomo*
219. Ntuthuko Dube - 980522 6210 *** - Endlaveleni Area, SWAYIMANE, 3201 - *Mnduna*
220. Suprice Kabelo Lebjane - 021022 5841 *** - 127 No, MOTETI, 0471 - *Mmaledi*
221. Lomcebo Patricia Maziya - 870922 0710 *** - Stand No 010920, MSOGWABA, 1200 - *Sambo*
222. Nkanyiso Mbele - 990813 5020 *** - Nygane, LOSKOP, 3300 - *Khumalo*
223. Mbali Mdadane - 020814 0404 *** - P O Box 261, UMKOMAAS, 4170 - *Thusi*
224. Leonard Velly Nkgoleng - 871114 5389 *** - 211 Kgwasha Stand, WINTERVELDT, 0198 - *Mabena*
225. Mmakole Precious Leshabane - 011214 1243 *** - P O Box 4309, GA-KGAPANE, 0838 - *Malatji*
226. Abel Ratswana - 831129 5481 *** - 77 / 7 No, SOSHANGUVE, 0152 - *Mogalanyane*
227. Delisile Ubisi - 000804 0481 *** - Extension 5 Block A, Unit 7, Marishane Street, MAMELODI EAST, 0100 - *Chauke*
228. Kgomoiso Joel Ramothibe - 780505 5635 *** - 7262 Extension 5, DELMAS, 2210 - *Mohapi*
229. Katlego Fortunate Phahladira - 991107 0234 *** - 4180 Extension 11, DIEPSLOOT, 2100 - *Majadibodu*
230. Tshepo Raphesu - 850824 5267 *** - 1330 Nigeria Street, KLIPFONTEIN, 1685 - *Mmonegi*
231. Ayanda Fezile Mthethwa - 961002 0329 *** - 89 Grayston Street, SANDTON, 2146 - *Buthlezi*
232. Kayla Skye Malaise - 000309 0698 *** - 20545 Marshall Street, Ap + 1 Castro Valley, CA 94546, 0000 - *Scott*
233. Mpho Benedict Malepe - 780221 5362 *** - 17454 Zone 1, MEADOWLANDS, 1700 - *Motsoaledi*

234. Mbalenhle Amy Ncube - 011101 0084 *** - 3531 Agama Street, RIVERSIDE, 2100 - *Ndhlovu*
235. Nonhlanhla Eunice Ledwaba - 900911 0425 *** - 132 – 16th Avenue, ALEXANDRA, 2090 - *Hlatshwayo*
236. Teola Tarin - 990211 0190 *** - 110 Karavas Court, Lewisham Road, NORTHCLIFF, 2100 - *Canham*
237. Tohia Ntuli - 911029 0732 *** - Kapata Location, Unit H, PIETERMARITZBURG, 3200 - *Shabalala*
238. Keromamang Elisa Ncango - 780807 0647 *** - 37676 Thabong, WELKOM, 9460 - *Pitso*
239. Nkululeko Mhlongo - 990613 5869 *** - Ekwazini, MAPHUMULO, 4400 - *Sithole*
240. Khayaletu Lordwin Mokoena - 820209 5330 *** - Stand No 932, Mabhoko Village, MKOBOLA, 0400 - *Gxekwa*
241. Rufaro Fanuel Tsagae - 841129 5382 *** - 14 Margriet Avenue, Geelhoutpark Extension 6, RUSTENBURG, 0299 - *Darare*
242. Edumile Benedict Kgabage - 600104 5892 *** - 46 B Nhole Village, TAUNG, 8584 - *Moepeng*
243. Wessly Motsai - 011018 5580 *** - Mohadi, BOCHUM, 0790 - *Tauatswala*
244. Faeza Samsodien - 890509 0310 *** - 90 Queen Victoria Street, Unit 21, Montrea, CAPE TOWN, 8001 - *Mackay*
245. Princecharles Tumelo Masango - 921013 5320 *** - 58 Joy Street, KWAMHLANGA, 1022 - *Phaahla*
246. Mataemane Francinah Mphaki - 921023 0509 *** - 286 Zone 6, Extension 5, SEBOKENG, 1984 - *Lengana*
247. Sipho Alfred Kekana - 950716 5641 *** - Matjatji, MOLETLANE, 0697 - *Marema*
248. Joy Lehlohonolo Matloga - 900810 5527 *** - 181 Modupi Street, SOSHANGUVE, 0152 - *Baloyi*
249. Raymond Baloyi - 970912 5990 *** - 911 Block R, SOSHANGUVE, 0152 - *Tshabalala*
250. Jabulile Princess Sibiya - 951127 0744 *** - Esgodini Area, EMONDLO, 3101 - *Gabela*
251. Bridget Gugu Siboza - 950813 0617 *** - 1567 Kotlolo, WINTERVELDT, 0198 - *Sibanyoni*
252. Tshepiso Mdluli - 000828 5149 *** - 19265 Extension 10, SOSHANGUVE, 0152 - *Mosuma*
253. Sihle Basil Ngcebele - 841109 5547 *** - Esibonvini Location, IXOPO, 3276 - *Sosibo*
254. Kwanele Kevin Dlamini - 950608 5952 *** - 2138 Dlomo Road, Unit 3, IMBALI, 3201 - *Mngadi*
255. Nonhle Sithabile Prellude Zuma - 020116 0352 *** - Q 1226 Mangee Road, UMLAZI, 4031 - *Mkhize*
256. Isaac Peteke Magagula - 980211 5306 *** - 2844 Mokhele Street, Extension 1, VOSLOORUS, 1475 - *Mogashoa*
257. Barend Christoffel Erasmus - 010330 5063 *** - 11 Liefste Maryncres, Pellissier, BLOEMFONTEIN, 9300 - *Voigt*
258. Lindani Khayalakhe Sithole - 010101 6678 *** - Nhlungwana Area, MAHLABATHINI, 3845 - *Xulu*
259. Kabelo Frederick Motsusi - 840731 5660 *** - 7330 Phase 2, FREEDOM PARK, 0301 - *Mokgatlhe*
260. Thobeka Debra Khumalo - 951030 0581 *** - 3 Aloe Loop, Velde Vlei, RICHMOND, 3901 - *Nxele*
261. Tshogofatso Berthwell Selahle - 890415 5607 *** - Nokaneng, STEELPOORT, 1120 - *Choma*
262. Manuel Chauke - 930629 5796 *** - House No 2740, MALAMULELE, 0900 - *Mahlale*
263. Bhambatha Luyolo Mali - 960119 5427 *** - 256 Rosanne Street, Grootfontein Est, PRETORIA EAST, 0100 - *Moreku*
264. Evelyn Masilela - 740910 1096 *** - No 2606, KWAGGAFONTEIN, 0450 - *Sibeko*
265. Lerato Michael Mthombeni - 930123 5684 *** - 7707 Sisulu Section, PARYS, 9585 - *Lephekola*
266. Nomzekelo Nokulunga Betty Mkize - 990504 0925 *** - 153 Tokoloho Street, IVORY PARK, 0100 - *Buhlungu*

267. Ellah Mosomane - 880313 0745 *** - Stand No 587, MMAMETLHABE, 0400 - *Lefoka*
268. Jafta Pogiso Kgekwané - 880921 5509 *** - House No 20048, Sekgwamathe Section, BAPONG, 0338 - *Monau*
269. Edwin Thabiso Makhasane - 810909 5633 *** - 1900 F Section, BOTSHABELO, 9781 - *Monaheng*
270. Orphan Tsholofelo Kgobane - 810712 5362 *** - House No 53, RUSTENBURG, 0300 - *Mogotsi*
271. Samuel Bapaletswe Noge - 830202 5534 *** - House No A11a, Rasimone, MOGWASE, 0314 - *Sedumedi*
272. Tyler Justin Gielis - 910922 5094 *** - 1 Henda Hof, 140 Raglan, BELLVILLE, 7600 - *Shapiro*
273. Sbusiso Vincent Mtshweni - 890727 5734 *** - 19924 Mbovana Street, ETWATWA, 1519 - *Radebe*
274. Kamogelo Matabane - 970627 0279 *** - 4241 Kunupi Street, KAGISO II, 1700 - *Masebe*
275. Kyla Kraukamp - 991013 0069 *** - 15 Connel Road, BLAIRGOWRIE, 2100 - *Roux*
276. Sello David Tefu - 910130 5881 *** - K 509, Extension 1, DIEPSLOOT, 2120 - *Maropola*
277. Nonjabulo Masondo - 020619 0780 *** - 5 – 19th Avenue, ALEXANDRA, 2010 - *Magagula*
278. Mothusi Gift Mabunda - 020512 5390 *** - 8410 Skuurlik, BELA-BELA, 0480 - *Molekwa*
279. Sello January Soetsang - 770119 5386 *** - 763 Bonamello Street, Metsimaholo, ORANJEVILLE, 1900 - *Khalo*
280. Isiah Samuel Reabetswe Thulare - 970916 5331 *** - 258 Joe Modise, LOTUS GARDENS, 0008 - *Ngwepe*
281. Mthokozisi Goodwill Peter Mahlangu - 901201 5840 *** - 27 Brooks Street, BROOKLYN, 1600 - *Lekalakala*
282. College Clement Absalom Dladla - 551001 5730 *** - 883 Cow Village, BETHAL, 2310 - *Mvakali*
283. Nolwazi Sheila Maqinyana - 930612 0200 *** - Machubeni Area, LADY FRERE, 5400 - *Ngxiya*
284. Cynthia Sindisiwe Mdadane - 810920 0459 *** - A 325 Engonyameni, UMLAZI, 4066 - *Mseleku*
285. Phindile Sithole - 920517 0730 *** - B 1351 Folweni Township, UMBUMBULU, 4105 - *Mbili*
286. Thebe Cleophus Mashego - 970225 5238 *** - 1955 Dithabaneng Section, PHOKENG, 0300 - *Rangaka*
287. Karabo Mashile - 940919 5759 *** - 34637 Mongana Street, Extension 6, MAMELODI, 0510 - *Mosuma*
288. Tshagofatso Matthews Mathopa - 950202 5313 *** - 17 Barcelona Complex, Cnr Mulder & Botha, THE REEDS, 0100 - *Nkambule*
289. Salome Mmakhunoane Madiba - 930319 0639 *** - 392 Betrut, Block 1, MABOPANE, 0190 - *Khumalo*
290. Nduduzo Lemwell Mkhize - 930511 5404 *** - Watersmeet, LADYSMITH, 3370 - *Shabalala*
291. Falakhe Mazibuko - 940814 5682 *** - P O Box 3348, MTUBATUBA, 3935 - *Zikhali*
292. Goodman Tsietsi Seerane - 800330 5372 *** - 3761 Extension 6, Phomolong, MAMELODI EAST, 1600 - *Pako*
293. Phuti Phineas Pihlela - 990419 5313 *** - 11061 Extension 26, Nkuna Village, TEMBISA, 1600 - *Madimabe*
294. Bongile Sunduza - 990901 0496 *** - 1791 Hlophe Street, Phomolong Section, TEMBISA, 1600 - *Nxumalo*
295. Mpho Ellen Banda - 980306 0598 *** - 4907 Masedi Street, Kagiso II, KRUGERSDORP, 1754 - *Motshagwa*
296. Mathabathe Beauty Nkadimeng - 600429 0453 *** - 313 Mamphokgo, MARBLE HALL, 0450 - *Masemola*
297. Ramatsobane Maria Madisha - 600411 0796 *** - Lenting, MPHAPHELE, 0736 - *Mogoale*
298. Macezi John Mawelela - 520705 5226 *** - 1179 Los My Cherrie, MATLA, 0407 - *Chauke*
299. Tsholofelo Linah Gwebu - 870604 1275 *** - 172 Block M, SOSHANGUVE, 0152 - *Mosia*
300. Hector Mmangako Maluleke - 020616 5805 *** - 7281 Cyril Ramaphosa Drive, Ratanda, Extension 3, HEIDELBERG, 1439 - *Maphoto*

301. Muzikayise Aaron Ndlangamandla - 831202 5619 *** - Belgrade Area, PONGOLA, 3170 - *Msibi*
302. Zamokuhle Khethukhutha Jonas Thlapi - 010806 5732 *** - Stand No 662, Extension 3, MIDDELBURG, 1050 - *Mabena*
303. Yanga Vuyisa Mngweba - 910623 5871 *** - Slovo Park, UMTATA, 5099 - *Mqikela*
304. Sive Njokweni - 891225 5975 *** - P O Box 18, Rance Farm, STUTTERHEIM, 4930 - *Yakophu*
305. Mashudu Edward Moeng - 970613 5223 *** - 1013 Aces Street, Extension 3, NELLMAPIUS, 0100 - *Malange*
306. Thabo Patrick Kwenda - 820923 5860 *** - 1353 Nhlapo Section, KATLEHONG, 1432 - *Motaung*
307. Mashao Sydwell Serakwane - 751024 5496 *** - 1082 / 53 Teal Close Street, Extension 2, RABIE RIDGE, 1680 - *Moshoma*
308. Kelello Maboate - 980807 5462 *** - 124 Motsamai Street, Mohube Valley, PRETORIA, 0001 - *Dladla*
309. Nancy Tebogo Mokoena - 801020 0469 *** - 12155 Kutlwanong, Danhouse, HAMMANSKRAAL, 0400 - *Mabena*
310. Sabelo Mfanafuthi Ndhlovu - 001202 5526 *** - Kingsley Area, VRYHEID, 3100 - *Ngcobo*
311. Nomthandazo Mhlongo - 000408 0660 *** - East Mine Area, VRYHEID, 3100 - *Sibiya*
312. Tibane William Sethebe - 740130 5434 *** - 11 Komati Street, LOTUS GARDENS, 0008 - *Kgoale*
313. Keegan Stuart Peters - 980703 5038 *** - 133 Von Hagen Street, PRETORIA, 0100 - *Geringer*
314. Boitumelo Candy Maroga - 990622 0398 *** - 2811 Mokgatle Street, GA-RANIKUWA, 0100 - *Moraba*
315. Robert Ian Kruger - 950517 5060 *** - 14 El Sol, 16 Yulle Street, DUNDEE, 3001 - *Johnson*
316. Tlhapiso Dominic Modise - 781031 5417 *** - 3964 Extension 1, MERITING, 3964 - *Leithonyane*
317. Jacobus Johannes Muller - 000417 6222 *** - 762 10 Avenue, Flat No 1, Wonderboom South, PRETORIA, 0084 - *Doubell*
318. Sibusiso Thabiso Mthembu - 020809 6305 *** - Mangidini Area, NKANDLA, 3855 - *Majozi*
319. Simphiwe Gwaqubana - 970912 6554 *** - No 764 Hostel 3, Block D, SEBOKENG, 1983 - *Makwetyane*
320. Mbali Vilakazi - 011025 1021 *** - Matimatolo, GREYTOWN, 3250 - *Mhlongo*
321. Said Jiyane - 030609 6187 *** - Stand No 6922, Extension 17, LESLIE, 2265 - *Hlatshwayo*
322. Natasha Matavel - 030615 0948 *** - 6132 Creise Street, MOSSEL BAY, 6506 - *Msengeni*
323. Chantell Mmathapelo Morobane - 030327 1228 *** - 10 Masango Street, BELFAST, 1100 - *Mgiba*
324. Sibongokuhle Gwadiso - 021024 6085 *** - Bhongweni Location, MTHATHA, 5099 - *Nohiya*
325. Inathi Mbangiswano - 001005 5805 *** - Bongweni Location, MTHATHA, 5099 - *Dluthu*
326. Nkosinathi Sithembiso Zikhali - 990104 6427 *** - Mazibombu, MBAZWANA, 3974 - *Gumede*
327. Siphenathi Mditshwa - 981030 6033 *** - Lower Ntafufu, LUSIKISIKI, 4820 - *Nakani*
328. Akhona Mpumelelo Mthini - 030326 0110 *** - 1271 Masoka Street, JABULANI, 1868 - *Dhlamini*
329. Johannes Shimane Maredi - 980319 6232 *** - 1066 Keerom, SEHLAKWANE, 1047 - *Monama*
330. Paballo Phillemon Phalani - 020120 6084 *** - 1182 Uitvlugt, MARBLE HALL, 0450 - *Aphane*
331. William Skosana - 010228 6191 *** - 320 Sehlakwane Village, NEBO, 1059 - *Mathibela*
332. Jason Daron Brauns - 030612 5194 *** - 16 Burgraaf Street, ATHLONE, 7764 - *Hendricks*
333. Lwando Landelo - 010207 6033 *** - 44665 Lilian Goyi Street, Samora Machel, PHILLIPP, 7785 - *Ngcengane*

334. Lwazi Lungani Buthelezi - 031226 5512 *** - Madwaleni, MTUBATUBA, 3935 - *Mnguni*
335. Olerato Koitsiwe - 040106 0691 *** - House 20112, Mosidi Section, MABESKRAAL, 0313 - *Motsisi*
336. Cebelihle Memela - 020502 6442 *** - 8518 Zone 3, Mphela, KOKSTAD, 4700 - *Dlamini*
337. Sibusiso Dhladhla - 010518 6123 *** - 8765 Bambatha Street, Langaville, Extension6, TSAKANE, 1550 - *Nguenze*
338. Bonginkosi Plaatjie - 030703 5543 *** - 10625 Sejake Rockland, BLOEMFONTEIN, 0300 - *Mcingane*
339. Ramodamudi Kingsley Mashau - 961025 5200 *** - Stand No 265, Sereni Village, MASHAMBA, 0941 - *Mohloding*
340. Senzo Khoza - 010323 6118 *** - Hlathikhulu Area, OZWATHINI, 3242 - *Ntuli*
341. Ndhlaleni Miriam Bembe - 470303 0798 *** - 3046 Poelano Street, NELMAPIUS, 0122 - *Buhali*
342. Phutiana Marothi Peter Letsoalo - 020610 5235 *** - 141 Paledi Village, MANKWENG, 0727 - *Ramakgolo*
343. Matimu Trevor Tshabalala - 000313 6378 *** - Rotterdam, SEKGOSSE, 0931 - *Mapfumari*
344. Abongiwe Machi - 011018 6112 *** - Gwebela Location, Ward 04, HARDING, 4680 - *Ndabezimbi*
345. Zanoxolo Mlotywa - 011016 6134 *** - Lambasi Area, LUSIKISIKI, 0820 - *Zimba*
346. Yonwaba Sihlobo - 000727 6094 *** - Imizizi Area, BIZANA, 4800 - *Qumba*
347. Nzimeni George Seilane - 740325 5625 *** - 3242 Extension 3, JOUBERTON, 2574 - *Mdhlanga*
348. Itumeleng Spear Rathugwe - 840117 5832 *** - 2754 Strydom Street, VRYBURG, 8601 - *Langa*
349. Freddy Hlongwane - 900223 6093 *** - 16 Kliprivier, Aerorand, MIDDELBURG, 1055 - *Mosoma*
350. Frank Hlongwane - 900223 6092 *** - 16 Kliprivier, Aerorand, MIDDELBURG, 1055 - *Mosoma*
351. Olwethu Phango - 010503 6344 *** - 31695 Usasazo Street, DUNOON, 7441 - *Ngedle*
352. Busisiwe Mthembu - 011005 1104 *** - 3691 One Maplain Street, THABA NCHU, 9760 - *Zwane*
353. Sibongakonke Ndimiso Msimango - 020603 5908 *** - 5 Fyfe Road, Pioneer Park, NEWCASTLE, 2940 - *Mbele*
354. Amogelang Nnana Angelica Hlongwane - 020604 0939 *** - 20116 Moshate Voltyn, MOKOPANE, 0626 - *Mokiti*
355. Oratile Aubrey Marman - 020504 6107 *** - 1170 Sethuntsa Street, JAN KEMPDORP, 8550 - *Matlhakoane*
356. Tsikwane Jan Skatz - 021208 5990 *** - 6004 Extension 10, JOUBERTON, 2574 - *Nche*
357. Fundile Thobile Chiloane - 021130 0150 *** - 388 Block F F, SOSHANGUVE, 0152 - *Mokoena*
358. Siphesihle Shabalala - 020324 6055 *** - Mondweni, Section 5, NQUTU, 3135j - *Mkhize*
359. Thanduxolo Minenhle Ngidi - 000422 6083 *** - Kwadindi Location, Taylors Halt, PIETERMARITZBURG, 3201 - *Thabethe*
360. Kwanele Dlamini - 030117 5764 *** - Kwampane Location, PIETERMARITZBURG, 3201 - *Mtolo*
361. Elias Zakhele Mavimbela - 930320 5479 *** - Mndozo, OSIZWENI, 2952 - *Khumalo*
362. Rudzani Nape Precious Ramohlale - 031111 0592 *** - 6th Avenue Koch Street, SALVOKOP, 0002 - *Mokgohlwa*
363. Letlhogonolo Percy Mabena - 020123 6244 *** - 2465 Teak Crescent, Extension 5, Ebony Park, MIDRAND, 1685 - *Komane*
364. Linda Lusanda Ntuli - 010510 5090 *** - 140161 Oakford, VERULAM, 4339 - *Mthiyane*
365. Rebaone Mmatshoko Ngobeni - 950926 1065 *** - 36 Birdplum Street, HARTBEESPOORT, 0216 - *Phale*
366. Simthandile Dilesi - 010112 6020*** - Khambi Area, MTHATA, 5099 - *Nkukwana*
367. Tshagofatso Segodi Maphopa - 021122 0423*** - House No 209, Tshepo Section, TEMBISA, 1632 - *Mampuru*

368. Micaela Teresa Morkel – 020524 0150*** - No 107, Nowemone Singu, UPINGTON, 8801 - *Plaatjies*
369. Maurice Michael Ramoshaba – 021213 5958*** - Lephepane Village, Lenyenye, TZANEEN, 0850 - *Mailula*
370. Zandile Sinothile Mngomezulu – 901019 1078 - Mahlabashana Area, INGWAUMA, 3968 - *Gina*
371. Nelson Magolego – 890822 5784*** - Ga-Moretoele, JANE FURSE, 1085 - *Makgoga*
372. Thuleleni Sarah Radebe – 660206 0281*** - No U10, Bambatha Road, PIETERMARITZBURG, 3201 - *Matiti*
373. Sylvia Masondo – 990215 1234*** - Stand No 8443, Drieziek 5, ORANGE FARM, 1841 - *Mokanyane*
374. Joel Moloisi – 770227 5358*** - House 270, Zone 7, Lebowakgomo, POLOKWANE, 0737 - *Malahlela*
375. Nametso Mahlako Mthimunya – 981008 0479*** - House No 19, 1st Street, Melville, JOHANNESBURG, 2109 - *Ratlou*
376. Geraldine Booysen – 020425 0257*** - No 96, Vygile Street, Nieuwoudtville, CALVINIA, 8180 - *Schippers*
377. Ofentse Matshatsha – 981213 5082*** - No 11348/33, Hinza Street, KAGISO, 1754 - *Pabe*
378. Solomon Molefe Ledwaba - 910912 5869*** - House No 11233, Ext 6, Mamelodi, PRETORIA, 0122 - *Tlala*
379. Nkanyiso Praiseworthy Cele – 980906 5570*** - Mgangezi, Ward 7, UMZINTO, 4200 - *Mkize*
380. Sibusiso Prince Mngomezulu – 860527 6204 - Enkungwini Area, Ingwavuma, BHAMBANANI, 3968 - *Mathenjwa*
381. Oluhla Nkele – 020910 5605*** - No 15, Wildebees Street, Madgra, QUEENSTOWN, 5320 - *Doda*
382. Bandile Sakhile Ngcobo – 011030 6214*** - No 276, Dijon Street, Lotus Garden, PRETORIA, 0084 - *Mnguni*
383. Josiah Swazi Tlou – 580214 5390*** - No 119, Ext 5, Luthuli, KWAMHLANGA, 1022 - *Mabuma*
384. Vuyisile Bridget Sithole – 971218 0215*** - No 37, Melville Street, Booyens, JOHANNESBURG, 2091 - *Ngomane*
385. Isaac Thatayaone Boitsho – 750707 6503*** - No 11111, Police Station Section, GANYESA, 8613 - *Bareki*
386. Ntombifuthi Mangcangula – 020115 1577*** - No H1753, Nelson Mandela Road, Gamalakhe Location, PORT SHEPSTONE, 4249 - *Mncwango*
387. Lovely Thabo Chokwe – 021227 5796*** - House No 2168, Zone I, Mahwelereng, MOKOPANE, 0626 - *Semenya*
388. Pricilla Thandi Makhoba – 000705 1266*** - No 3127, Petsana, REITZ, 9810 - *Masangane*
389. Mapula Alecia Mamadi – 991130 1169 - Alldays Village, ALLDAYS, 0909 - *Mafela*
390. Sabelo Tsotetsi – 000811 6330*** - No 283, Phillip Street, Block 1, GRASMERE, 1828 - *Xaba*
391. Spokuhle Cynthia Mvangeli – 000227 1265*** - No 1, Bignolia Circle, Protea Park, ATLANTIS, 7349 - *Nyila*
392. Shane Lungile Nkoana – 020709 6314*** - House 757, Bosplaas East, TEMBA, 0407 - *Phelembe*
393. Sabelo Kenneth Zwane – 840511 5798*** - No 235, Heeren Stuct, VRYHEID, 3100 - *Nyembe*
394. Luvuyo Samuel – 001016 6095*** - No 19, Mvemve Street, Kwanobuhle, UITGENHAGE, 6242 - *Langbooi*
395. Nonhlanhla Soty – 000912 1623*** - No 274, Ramaphosa, BOKSBURG, 1460 - *Soto*
396. Siyanda Dlamini – 000714 6153*** - Cb 360, Ecabazini, Maqongqo Location, CAMPERDOWN, 3720 - *Ngidi*
397. Khanyisile Makgato – 000808 0090*** - No 33 Villa Marina, Glen Ave, Glenanda, JOHANNESBURG, 2091 - *Nkosi*
398. Sihle Ngejane – 000626 6178*** - House 8331, Moholodi Street, Unit F, THOKOZA, 1426 - *Vamba*
399. Olwethu Nodada – 960705 6021*** - Ext 4, NGQELANI, 5140 - *Masina*
400. Mlondolozu Dladla – 980501 5976*** - No D1017, Nomnganga Section, Swayimane Area, PIETERMARITZBURG, 3200 - *Msomi*

401. Khanya Boy-Boy Khamanga – 001010 6765*** - Siyathuthuka Are, RICHMOND, 3780 - *Mfengu*
402. Ubenathi Sipheuxolo Sihwayi – 010310 6286*** - Moyeni Area, BERVILLE, 3350 - *Dlamini*
403. Lwazi Makabongwe Zuma – 990518 6112*** - Landskop Location, PIETERMARITZBURG, 3201 - *Mshengu*
404. Yamkela Varhoyi – 010112 6274*** - Nomlacu Area, BIZANA, 4800 - *Msebenzi*
405. Emmanuel Mokgwadi – 010715 6015*** - Stand No 986, Motetema, GROBLERSDAL, 0473 - *Maduane*
406. Eunice Mahlare – 850609 0629*** - No C43, Pelepele Park, Geln Wowie, GROBLERSDAL, 1061 - *Masemola*
407. Njabulo Innocent Khulu – 010201 6453*** - No 3471, Ext 2, Mzinoni, BETHAL, 2300 - *Tsoane*
408. Nontokozo Duze – 020311 1335*** - Eziphosheni Area, Ndumo, INGWAVUMA, 3996 - *Gumede*
409. Boitumelo Salma Abdul-Karim – 030623 0705*** - No 407 Foskor, Zone D, Namakgale, PHALABORWA, 1391 - *Mamorobela*
410. Thabiso Alfred Mokwena – 020820 5347*** - Stand No 2209, Siyabuswa A, Siyabuswa, MPUMALANGA, 0472 - *Mokgoshing*
411. Zakhele Shoji – 011013 6013*** - House No 4229, Ghost Fisher Street, TEMBISA, 1685 - *Ngema*
412. Malwande Simphiwe Mngomezulu – 010128 5989*** - Qakwini Area, MTUBATUBA, 3900 - *Piseka*
413. Nomalayisi Mtshokotshe – 390611 5469*** - Gangatha Area, LUSIKISIKI, 4820 - *Mpinga*
414. Sphesihle Thabethe – 011121 5882*** - Stand No 774418, D 1011, TAFELKOP, 3610 - *Jingela*
415. Ayabulela Ntshonga – 010611 5791*** - Barracks Area, CENTANE, 5400 - *Apleni*
416. Gift Mabunda – 010526 5794*** - Chigalo Area, MALAMULELE, 0982 - *Shirinda*
417. Simon Titus Mokoena – 970822 5564*** - No 20023, Motsweding Village, LEPHALALE, 0608 - *Modise*
418. Otsile Bees – 811008 5932*** - H/N 2356, Block 450, Bankhara, KURUMAN, 8460 - *Phakela*
419. Sibusiso Mphiliseni Buthelezi – 861008 6210*** - No 18900, Ext 9, Palmridge, ALBERTON, 1458 - *Ntombela*
420. Sifiso Jack Hadebe – 000711 5221*** - Stand No 846, Mountain View, Zone 6, KWAMHLANGA, 1022 - *Mazibuko*
421. Mahlogonolo Komana – 020704 0254*** - Stand No 514, Shikwane Village, Maruleng, TZANEEN, 0890 - *Shai*
422. Asavela Mbuzaywe – 030214 0556*** - Rwayeni Area, NTABANKULU, 5130 - *Myeki*
423. Sambeso Lukhanyiso Mshumi – 021111 1408*** - No 05, Winchester Road, Observatory, CAPE TOWN, 7925 - *Ntshingwa*
424. Ruben Gaffley – 000105 6616*** - House 24, Duiker Drive, KOMMETJIE, 7975 - *Weitsz*
425. Thabo Macdonald Thontsi – 831002 5402*** - House No 106, Nooitgedacht, MAFIKENG, 2745 - *Manoto*
426. Owen Darlington Machete – 020919 5804*** - House 32, Mamplagi, MULIMA, 0817 - *Rabopape*
427. Thokozani Godfrey Shezi – 861017 5902*** - House No 1312, Thango Road, Bester Area, IMANDA, 4310 - *Mapumulo*
428. Lungisani Dlamini – 000915 5996*** - Stepmore Area, UNDERBERG, 3257 - *Mjwara*
429. Siphesihle Sibiya – 980104 5896*** - Njengabantu Area, Ozwathini, OZWATHINI, 3242 - *Myaka*
430. Mbekezeli Abednego Ndlangamandla, - 000618 6097 - No 5324, Phola Park, Mkhondo, PIET RETIEF, 2380 - *Khumalo*
431. Duduetsang Boikgantsho Rakau – 020727 0700*** - No 13, Acacia Avenue, The Orchards, PRETORIA, 0182 - *Mothake*
432. Masixole Nkosinathi Nyembe – 990730 6125*** - House No 3447, Sobabiyi, VOLKSRUST, 2470 - *Mbatha*
433. Sibusiso Eddy Mazibuko – 000601 6309 - House 15201, Mbubu Location, PIETERMARITZBURG, 3201 - *Ngwenya*
434. Siphesihle Maseha – 030418 6069*** - House No 996, Meso Street, Rethabiseng, 1026 - *Mahlangu*

435. Falou Gueye – 030424 6164*** - No 706, Mthombothi Road, PIETERMARITZBURG, 3201 - *Mdlalose*
436. Sibongakonke Lesego Maila – 040206 5583*** - No 41, Zandspruit, Ext 9, HONEYDEW, 0122 - *Ndhlovu*
437. Tshepiso Lungelo Nsila – 030526 5222*** - No 2/34, Kiepersol Street, Ext 1, TASBETPARK, 1040 - *Matsiela*
438. Hector Sonny Ayanda Mbangata – 020927 6050*** - House No 1629, Magalies Street, Wedela, CARLETONVILLE, 0295 - *Sere*
439. Bongi Bekwa - 780625 5515 *** - V1386 Umlazi township, UMLAZI, 4031 - *Mbeki*
440. Zimasa Qoyi- 970320 5215 *** -Heritage Heights, 14 Height Street, Pinehaven, KRUGERSDORP, 1739 - *Madubane*
441. Tieho Piet Maponya- 950624 5534 *** -347 B Section, BOTSHABELO, 9781 - *Maseli*
442. Sibusiso Stephen Chilongo- 930126 5507 *** -378 Fred Mlaba, Zulu Section, VOSLOORUS, 1475 - *Tshanga*
443. Makubu Abigail Molepo- 820428 0790 *** -House No 6574 A & B, Extension 9, ALEXANDRA, 2090 - *Mogodi*
444. Arethabeng Pulumo- 970320 5781 *** -2729 Kepadisa Street, MOHLAKENG, 1735 - *Lennon*
445. Gift Masemola- 950103 5532 *** -1252 Vezinyao, DENNILTON, 1030 - *Kgaphola*
446. Teboho Peter Botsane- 801103 5884 *** -223 Nhlapo Section, KATLEHONG, 1431 - *Gayiza*
447. Joey Ramadimetsa Lamola- 970307 0681 *** -Makotse, LEBOWAKGOMO, 0737 - *Shogole*
448. Wilson Skosana- 730218 5543 *** -330 Block G, Letlhabile, LETLHABILE, 0264 - *Musekwa*
449. Desigan Moonsamy- 950125 5157 *** -7 Charente Close, Port Kennedy, WESTERN AUSTRALIA, 6172 - *De Sa*
450. Simphiwe Bonginkosi Tshabalala- 980510 5217 *** -913 Craig Street, Moreleta Park, PRETORIA, 0044 - *Buthelezi*
451. Learners Khobololo Mahlangu- 010109 6093 *** -6723 Tawule Street, Zone 9, Thembaletu, GEORGE, 1629 – *Mogoro*
452. Johannes Phuti Lamola – 820216 5337 *** - Plot 31 Kalkfontein, POLOKWANE, 0699 – *Mahapa*
453. Bongai Charmaine Masango – 020824 0722 *** - Stand No 758, KWAGGAFONTEIN, 0455 – *Sebopa*
454. Nomthandazo Suzan Mkhombo – 000130 0321 *** - 51 Oppie-hoek, 845 Delfi Street, Extension 15, GARSFONTEIN, 0081 - *Hlongwane*
455. Bongumusa Richard Ntombela – 790714 5714 *** - your wife – Angel Jabulile Ntombela – 820827 0463 *** - and three minor Children – Lusanda Ndumiso Ntombela – 071209 5418 *** - Sukoluhle Sinazo Ngcobo – 150326 0881 *** - Khanyisa Amukela Ntombela – 180516 6353 *** - 5 Bongindlela High School, UMBUMBULU, 4105 - *Mkhize*
456. Siphon Agrippa Msani – 570719 5703 *** - your wife – Pinkie Patience Nompumelelo Msani – 620528 0487 *** - 22 Buller Road, MONTCLAIR, 4004 - *Hlongwa*
457. Dineo Nthute – 930614 0323 *** - and three minor children – Amohelang Nthute – 161023 0835 *** - Bohlale Nthute – 210209 6222 *** - Thapelo Nthute – 130331 5195 *** - 13064 Khuthang Street, Extension 8, PALM RIDGE, 1458 - *Mokgeseng*
458. Vumile Magquntulu – 730101 7882 *** - your wife – Primrose Magquntulu – 740811 0628 *** - 2062 Mthathi, PORT ALFRED, 6170 - *Ntantsi*
459. Zibuyile Princess Madonsela – 840623 0728 *** - and three minor children – Lehlohonolo Kgotso Junior Mzimela – 141127 5560 *** - Nosipho Hope Mzimela – 070228 0553 *** - Sfsio Khayaletu Mzimela – 091010 5491 *** - E389 B Ntokwezwani Area, Koffie Farm, KWANDENGEZI, 3601 - *Molefe*
460. Leon Baloyi – 820103 5210 *** - your wife – Lerato Portia Baloyi – 830731 0886 *** - 57 Moroemetsi Street, RICHIE, 8701 - *Jafta*
461. Lesetsa Johannes Rammala – 540316 5768 *** - your wife – Mmamarutle Johanah Rammala – 540808 0278 *** - Gee-Gee Village, MATHABATHA, 0733 - *Maponya*
462. Quinton Carl Pietersen – 900320 5487 *** - your wife – Sandra Pietersen – 901015 0304 *** - and three minor children – Shannon Shanhay Louw – 140531 0543 *** - Carlo Clinton Louw – 101015 5314 *** - Sandy Quinique Pietersen – 201009 0592 *** - Normandi Farm, Brandwag, WORCESTER, 6800 - *Pieterse*

463. Neo Gift Mothibantwa – 730518 5749 *** - your wife – Cholelofelo Lacreevy Mothibantwa – 770113 0621 *** - and two minor children – Tshwanelo Mothibantwa – 070213 0279 *** - Motheo Gusty Mothibantwa – 080313 5122 *** - Maruping Village, KURUMAN, 8460 - *Gaseediwe*
464. Kelebogile Lizbeth Dikwetla – 931227 0346 *** - and a minor child – Tshimologo Magnificent Dikwetla – 170522 5400 *** - 89 Tuin Street, RUSTENBURG, 0299 - *Magodiele*
465. Jacob Shiko Modiba – 600504 5775 *** - your wife – Emma Mantwa Modiba – 621213 0390 *** - 16689 Moshele Crescent, DAVEYTON, 1520 - *Monyelo*
466. Sibonelo Remegius Lionel Mkhize – 770409 5521 *** - your wife – Nobuhle Marvelous Mkhize – 880401 1304 *** - and two minor children – Lungelo Martin Chonco – 091121 5833 *** - Sbahle Levert Chonco – 141203 0545 *** - 10 Mohau Road, Malabar Hills, ISIPINGO RAILS, 4133 - *Ogle*
467. Beshofo Hendrick Leqheku – 711017 5380 *** - your wife – Lydia Sibongile Leqheku – 731130 0309 *** - and a minor child – Karabo Maseru King Leoheku – 100225 5378 *** - 7139 Sam Skwati Street, Extension 9, VOSLOORUS, 1475 - *Sethunya*
468. Happiness Phumelele Maphumulo – 760919 0214 *** - and two minor children – Siphallengenkosi Nomcebo Maphumulo – 050927 0081 *** - Sbusiso Philani Maphumulo – 131001 5645 *** - 644 Mount Moriah, PHOENIX, 4068 -
469. Nomonde Patience Magida – 830923 1815 *** - and two minor children – Onele Simanye Magida – 031006 0913 *** - Mark Magida – 170913 6311 *** - Manzana Area, NGCOBO, 5050 - *Xuma*
470. Relloy Philangenkosi Cele – 910906 5676 *** - and two minor children – Landokuhle Iyanelisa Cele – 130319 5725 *** - Nkanyezi Sgcinosenkosi Another Cele – 140405 5624 *** - K1303 Kwa-Mashu
471. , DURBAN, 4359 - *Zulu*
472. Mthembeni Jerome Mbatha – 780202 7418 *** - your wife – Thobekile Fortunate Mbatha – 830607 0971 *** - and three minor children – Amanda Magadla – 170919 0387 *** - Nomvelo Nokukhanya Magadla – 120914 0216 *** - Njabulo Magadla – 111021 5218 *** - 419059 Esikebheni, Ward 3 Area, INANDA, 4310 - *Mthethwa*
473. Dipho John Nyathe – 740906 5536 *** - your wife – Keorapetse Sylvia Nyathe – 811027 0535 *** - and two minor children – Johannes Nkululeko Nyathe – 060401 5115 *** - Lesley Bonginkosi Nyathe – 151021 5239 *** - 2838 Graveside, BARKLY WEST, 8375 - *Nyathi*
474. Thato Petrus Mofokeng – 870609 5774 *** - and a minor child – Neo Mofokeng – 170605 1066 *** - 2435 Zanzibah Street, KATLEHONG SOUTH, 1431 - *Mashiloane*
475. Refiloe Noluthando Mafungo – 850724 0807 *** - and a minor child – Kaboentle Oeno Phindile Mafungo – 181011 5893 *** - 610 Khama Street, Galeshewe, KIMBERLEY, 8345 - *Matsane*
476. Kekeletso Morakabi – 960630 0761 *** - and a minor child – Yadah Kganya Morakabi – 200116 5243 *** - 7158 Constantia, KROONSTAD, 9499 - *Mosia*
477. David Sello Mohapi – 740507 5843 *** - your wife – Petronella Kedibone Mohapi – 851008 1095 *** - and two minor children – Rethabile Gamoga – 071205 0422 *** - Tiholo Granny Gamoga – 131015 0104 *** - 10343 Koekoe Village, KROONSTAD, 9499 - *Kumalo*
478. Professor Sandile Langa – 820805 5771 *** - your wife – Zinhle Happiness Langa – 851225 0632 *** - and a minor child – Cebo Langa – 150818 6190 *** - A204 Etafuleni Area, INANDA, 4309 - *Chonco*
479. Tshwarelo Lawrence Matlokwane – 801001 5343 *** - your wife – Malebogo Mildred Matlokwane – 830826 0411 *** - and two minor children – Ofentse Matlokwane – 120225 5184 *** - Thuto Matlokwane – 060422 5614 *** - 3 Secomo Street, Warrenvale, WARRENTON, 8530 - *Pheko*
480. Dumisani Eugene Mngomezulu – 900603 5212 *** - your wife – Zinhle Innocentia Mngomezulu – 920929 0279 *** - 512 Khoza Street, Sakhile, STANDERTON, 2431 - *Dhlamini*
481. Babalwa Mary Ncindi – 821208 0520 *** - and a minor child – Ndamkele Akahlulwa Ncindi – 180707 0940 *** - Umlamli Village, STERKSPRUIT, 9762 - *Ntantiso*
482. Mduduzi Aaron Mdluli – 810120 5776 *** - and three minor children – Siyathokoza Asimbonge Hlatshwayo – 180609 5725 080 – Siyamthanda Abongwe Mdluli – 100305 0577 082 – Amkelani Mthokozisi Mdluli – 040705 5503 *** - E1953 Ezakheni Village, EZAKHENI, 3381 - *Mdletshe*
483. Nonsikelelo Sannah Mandlwana – 621128 0696 *** - and a minor child – Olwethu Monde Ntando Mandlwana – 021217 5141 *** - Z496 Khonto Circle, UMLAZI, 4066 - *Madonsela*
484. Zolile Mbono – 690813 5812 *** - your wife – Lumka Mbono – 750204 0991 *** - Balasi Area, FLAGSTAFF, 4810 - *Mbiko*
485. Fortune Sithole – 740305 5318 *** - your wife – Hleliwe Princess Sithole – 790513 0456 *** - and four minor children – Somuhle Aphelele Sithole – 150506 5870 *** - Phiwokuhle Sithole – 080823 5740 *** - Sipehelele Sinoluhle Sithole – 180815 0962 *** - Amahle Nhlanhla Sithole – 021127 1036 *** - 7 Keurboom Close, Glen Anil, DURBAN, 4001 - *Kheswa*

486. Cebolenkosi Nkwanyana – 790914 5450 *** - your wife – Queen Nomusa Nkwanyana – 870627 0617 *** - and two minor children – Dineo Nozibusiso Bella Nkwanyana – 180426 1334 *** – Mongezi Yandisa Mpho Nkwanyana – 120510 6120 *** - E501 Timoni Road, KWAMASHU, 4359 - *Sigwebela*
487. Thulani Proffesor Mhlongo – 690319 5635 *** - your wife – Philisiwe Isabel Mhlongo – 710112 0601 *** - 8 Vaalrivier Road, Extension 4, Norkem Park, KEMPTON PARK, 1618 - *Lungwazi*
488. Gordon Lucky Thwala - 720526 5476 *** - and two minor children – Uyathandwa Norma Thwala 090507 0351 *** - Oratile Thandolwethu Thwala – 031009 1275 *** - 438 Legwabe Street, Mabuya Park, VOSLOORUS, 1475 - *Vilakazi*
489. Mthembeni Jerome Mbatha - 780202 7418 *** - your wife – Thobekile Fortunate Mbatha – 830607 0971 *** - and three minor children – Amanda Magadla – 170919 0387 *** - Nomvelo Nokukhanya Magadla – 120914 0216 *** - Njabulo Magadla – 111021 5218 *** - 419059 Esikebheni, Ward 3 Area, INANDA, 4310r - *Mthethwa*
490. Johan Christiaan Bothma - 911230 5024 *** - your wife – Jacqueline Bothma – 921017 0056 *** and a monor child – Ivanka Bothma – 190125 0144 *** - 1 Hendrik Street, Unit 3, LEPHALALE, 0555 - *Harmse*
491. Senate Siyabulela Nyeleka - 760505 5544 *** - your wife – Nomgcobo Cynthia Nyeleka – 771015 0331 *** – and three minor children – Sisipho Nyeleka 050702 0713 *** - Sesethu Nyeleka – 050702 0712 *** - Yonela Nyeleka – 080615 1467 *** - 186187 Mpozolo Street, Browns Farm, PHILLIPI, 7750 - *Moyakhe*
492. Victoria Mhlala - 971105 0538 *** - and a minor child – Kemishetso Mhlala – 151124 5521 *** - Maila Mmapitsane, Gamaila, SEKHUKHUNE, 1124 - *Phahlamohlaka*
493. Joseph Sanyana Mabuza - 610906 5395 *** - and your wife – Magdalena Phoza Mabuza – 680201 0084 *** - 19950 Khutsong, MAMELODI EAST, 0122 - *Nkosi*
494. Geoffery Joblin Damon - 751122 5163 *** - and your wife – Audrey Elaine Damon – 791102 0139 *** - Angelierstraat 413, BUFFELS RIVIER, 8251 - *Miggel*

DEPARTMENT OF HOME AFFAIRS

NO. 1753

11 February 2022

ALTERATION OF FORENAMES IN TERMS OF SECTION 24 OF THE BIRTHS AND DEATHS REGISTRATION ACT, 1992 (ACT NO. 51 OF 1992)

The Director-General has authorized the following persons to assume the forename printed in *italics*:

1. Mcingeni Ndumbini - 800120 5590*** - House 2, High Street, West Bank, EAST LONDON, 5200 - *Mcingeni Peace*
2. Boitumelo Rachidi - 030417 0633*** - House 20042, Strydkraal B, APEL, 0739 - *Boitumelo Kgabalo*
3. George Drew Drew - 710428 5435*** - 60 Gannet Street, Nina Park, PRETORIA, 0156 - *George Richard*
4. Swiringene Asnath Chabalala - 010830 0479*** - Makumeke Village, MALAMULELE, 0982 - *Swiringene Zanele*
5. Moleke Tema - 940709 5680*** - 734 Park Street, Unicadia Flat, Arcadia, PRETORIA, 0002 - *Abel Mokhuenyane*
6. Nyadzani Virginia Tshamano - 870823 0646*** - 422 Heuwel Flat, Lievaart Street, Proclamation Hill, PRETORIA, 0183 - *Virginia*
7. Nuraan Abrahams - 910924 0354*** - 68 Hockey Crescent, Beacon Valley, MICHELLS PLAIN, 7785 - *Tracey Sofia*
8. Joshua Squire - 991215 6285*** - 118 Irving Road, York, Pa, NEW YORK, 17403 - *Sibongiseni Pierre Joshua*
9. Alexa Giulia De Pinto Anniciello - 990811 0215*** - 10 Fir Road, Morningside, SANDTON, 2196 - *Alexa Giulia*
10. Phanuel Rakuambo - 851222 5522*** - 161 M Okwerekwere Street, Lotus Gardens, PRETORIA, 0008 - *Ntakadzeni Phanuel*
11. Philani Skosana - 980228 5378*** - 3662 Kamogelo Street, Nellmapius, Ext 4, PRETORIA, 0122 - *Philani Wiseman*
12. Andisiwe Poswa - 010309 0674*** - 301 Fasser House, 520 Paul Kruger Street, PRETORIA, 0002 - *Iminkosi*
13. Ntubuta Giladile - 711224 1320*** - Mqwanqweni Area, Ngqeleni, UMTATA, 5140 - *Nokhanyile*
14. Molebong Moumakwe - 991004 0222*** - 308 Gigandra Street, Annlin, WONDERBOOM, 0182 - *Molebogeng*
15. Winifred Ziegler Letsiki - 970519 0052*** - House No 22, Kroniet Avenue, VEREENIGING, 1939 - *Kgantshe Winifred*
16. Vezubuhle Diane Moatshe - 881112 0360*** - Unit 67, 10th Avenue, BOKSBURG, 1459 - *Esther*
17. Ongeziwe Gunundu - 000515 0045*** - No 1118, Park Street, Hatfield, PRETORIA, 0028 - *Ongeziwe Pearl*
18. Makabongwe Peter - 960910 1092*** - Nkumandeni Area, Ngqeleni, UMTATA, 5140 - *Makabongwe Asive*
19. Dikeledi Ephenia Matlaila - 751121 0731*** - Stand No 857, Notwaneng Section, Diloppe, MORETELE, 0424 - *Kgopotso Joy*
20. Stephina Mathipa - 880821 0432 *** - Stand No 25, Tanley Road, Ext 2a, BENONI, 1501 - *Stephina Mosima*
21. Mogamad Wasfie Davids - 020827 6134*** - 1 Maylands Drive, Sidcup, Kent Da, DA, 1445B - *Wasfie*
22. Lilene Pelser - 671105 0007*** - 211 Welgelegen, 47 Beach Road, STRAND, 7140 - *Starr Shaye*
23. Linos Wylson Roets - 740329 5082*** - 12 Jetty Street, Hype Park Apartment, Foreshore, CAPE TOWN, 8001 - *Louw*
24. Petrus Johannes Scheepers - 720731 5172*** - Residential Estate, KRAAIFONTEIN, 7570 - *Abdul Lateef*
25. Somaganthie Somiah - 711221 0038 *** - 42 Kingsley Gardens, Kingsley Terrace, DOONSIDE, 4126 - *Tina*
26. Veuswa Gladys Ntando - 660202 1283*** - Magutywa Area, TSOLO, 5170 - *Veliswa Gladys*
27. Quelim Barbah Raboteng - 680619 0415*** - 134 Kenton Court, 90 Pixleykaseme, DURBAN, 4001 - *Quelim Bhabha*
28. Letladi Ken Mohale - 010624 5385*** - 132 Itumeleng, Botlokwa, POLOKWANE, 0812 - *Thabang Allister*
29. James Ivan Daly - 630930 5060*** - 5092 Imperial Reserve, Ext 38, MAFIKENG, 2745 - *Irfaan*

30. Dikgope Diale - 980409 0022*** - 2418 Unit B, Lebowakgomo, POLOKWANE, 0237 - *Dikgope Basetsana*
31. Minkateko Mbungele - 950119 0874*** - House No 629, Section C, NKOWANKOWA, 0870 - *Minkateko Angelica*
32. Bonakele Ngcanga - 750208 5700*** - House 184, Block AA, SOSHANGUVE, 0152 - *Bonakele Nduma*
33. Krikie Sizane Mahlangu - 961004 5146*** - Stand No 1022, Verubuhle, KWAMHLANGA, 1022 - *Mxolisi Sizane*
34. Lettie Mdawe Mnguni - 800620 0741*** - 840 Voyiser Street, Ratanda, HEIDELBERG, 1441 - *Lethincebo Mdawe*
35. Porcia Nape Molatudi - 910901 0613*** - 9I 300, Seshego, POLOKWANE, 0700 - *Portia Masegele*
36. Mokhutsoane Anna Motlhankane - 801023 0589*** - Borakalalo Village, LEHURUTSHE, 2870 - *Mokhutsoane Anna Ratanang*
37. Rizqa De Jongh - 981221 0703*** - No 2, Mauritius Road, Burbanville, CAPE TOWN, 7550 - *Rizqah*
38. Shamane Maxongo - 010604 0750*** - 13 Von Brandis Street, Langlaagte, JOHANNESBURG, 2000 - *Charmaine Kgalalelo*
39. Mathebe Maite Bopape - 981023 0222*** - House 414, Zone 4, Seshego, POLOKWANE, 0742 - *Mathebe*
40. Athini Nogwaba - 870320 0687*** - House 74, Eaton Road, Henley On Klip, VEREENIGING, 1962 - *Athini Nangamso*
41. Charlie Elisha Pobe - 901101 5318*** - House No 248, Block T, Kutloanong, ODENDAALSRUS, 9483 - *Tjale Elisha*
42. Mmatele Ginnys Mashiloane - 870411 0744*** - Unit K 414, Bohlabela, ALEXANDRA, 2090 - *Matswele Ginnys*
43. Master Replay Magagule - 910109 6015*** - Mkhuhlu Area, Calcutta, MPUMALANGA, 1246 - *Master Lungelo*
44. Ntuthuko Peter Khethukuthula Philani Mtambo - 930203 5439*** - Kwamachuene Area, VRYHEID, 3100 - *Ntuthuko Peter Andrew*
45. Sibekezelo Biyela - 000818 0269*** - No 285, Hlobane Street, VRYHEID, 3100 - *Angela Seraphina*
46. Nestar Teni Mbatha - 710424 0730*** - Ophuzane Area, Edumbe, VRYHEID, 3180 - *Nestar Teni Mntomkhulu*
47. Hrysovalantis Nicolas Lazarides - 881210 5176*** - 118 Basement Flat, Victoria Rise, London, UNITED KINGDOM, Sw40nw - *Chrysovalantis Nicholas*
48. Bianca Willmott - 920411 0068*** - 85 Marina Point, West Dock, Head Rd, CHATHAM KENT, Me442f - *Bianca Sarah*
49. Norma Tabby Odhiambo Ogana - 910115 6559*** - No 20, De-Rouwe Street, Beyerspark, BOKSBURG, 1459 - *Norman Tabby*
50. Sibusiso Petrus Motlhamnie - 850508 5309*** - 18a Giraffe, Elandsfontein, GERMISTON, 1601 - *Sibusiso Gibson*
51. Shela Paulina Boshie - 710226 0473*** - Stand No 4, Munnik Street, Sterpark, POLOKWANE, 0699 - *Shela Polly*
52. Le-Che Likita Williams - 961223 0173*** - Stand No 80, Knobwood Street, CAPE TOWN, 7785 - *Layaan*
53. Iemeraan Simmins - 750115 5163*** - C/O Sa Embassy, Berlin, Tiergarten Street 18, GERMANY, 10785 - *Imran*
54. Andrew Liam Abel - 780607 5181*** - Stand No 72a, Tachbrook Street, London, UK, Swiv2na - *Liam Andrew*
55. Amogelang Maffa - 980926 0344*** - No 1322, Section, Dan-House, TEMBA, 0407 - *Amogelang Lettah*
56. Farzana Bibi Mahomed Haniff - 660828 0282*** - Scorpio Street, Woodhurst, CHATSWORTH, 4092 - *Farzana*
57. Lameez Conlan - 000122 0066*** - 31 Stromboli Road, Tafelsig, MITCHELLS PLAIN, 1285 - *Amirah*
58. Natasha Schöultz - 800127 0016*** - Na Urbance 1680, Roudnice Nad Labem, CEECH REPUBLIC, 41301 - *Yael Natasha*
59. Lili Hélène De Fleuriot De La Colinière - 020612 1379*** - No 56, Miller Road, Claremont, CAPE TOWN, 7708 - *Ren*
60. Nicho M Moela - 860620 5886*** - Sehunyane Area, Praktiseer, MOROKE, 1154 - *Nicho Bodikwa*

61. Mhelisi Eric Duze - 940731 5340*** - Block 29/2, Jabulanihostel, SOWETO, 1868 - *Mnelisi Eric*
62. Tebatso Tshwane - 950121 5688*** - Mehlareng Area, Gompies, LEBOWAKGOMO, 0631 - *Daniel Tebatso*
63. Juanita Lucruasa Mesley Mcklaglin - 931202 0127*** - Stand 75, Rolbar Crescent, Beacon Valley, MITCHELLS PLAIN, 7789 - *Nuraan*
64. Mpho Motthatlhedi - 940108 0305*** - No 10a, Lovedale Street, LICHTENBURG, 2746 - *Moshadiki Mpho*
65. Chante Kim Butler - 961215 0188*** - House 183, Bietou Road, MITCHELLS PLAIN, 7785 - *Almaz*
66. Joël Mosima - 980218 5243*** - Stand No 55211, Isithalando, Bochabela Location, BLOEMFONTEIN, 9323 - *Thato Joël*
67. Keabetswe Sekete - 890518 0315*** - House 946, Lesedi Street, Phiri, SOWETO, 1818 - *Keabetswe Charity*
68. Nkopane Vandross Mathibela - 920128 5415*** - House No 2, Glycol Crescent, Elandsridge, CARLETONVILLE, 2499 - *Buyaj Min*
69. Sithembile Portia Tyers - 810927 0539*** - House 7549, Bophelong Crescent, Roodekop, GERMISTON, 1401 - *Sarah*
70. Alice Nkepeng Lipholo - 950308 0560*** - No 5934, Peter Swarts, BLOEMFONTEIN, 9306 - *Mahlonolo Boitshwaro*
71. Edalia Mbongekile Khumalo - 020314 0969*** - No 14263, Ext 3, Ivory Park, TEMBISA, 1685 - *Dali Bongekile*
72. Lekokotla Maremane - 990201 6281*** - House No 7924, Stone Street, Ext 8, IVORY PARK, 1685 - *Lekokotla Koketso*
73. Godelieve Delmotte - 001128 0646*** - No 11, Main Road, Fish Hoek, CAPE TOWN, 7975 - *Skye*
74. Buhle Ndlamla - 940101 1034*** - Gcuda Area, Mazinkini Loc, LUSIKISIKI, 4820 - *Andisiwe*
75. Vhuhwavho Phophi - 010814 0407*** - House 2211, Sunrise Street, Doornkop, SOWETO, 1784 - *Vhuhwavho Jayden*
76. Nozazithini Loliwe - 991004 0217*** - Tshatshu Location, LADY FRERE, 5410 - *Cawekazi Natania*
77. Pontsho Dolly Serage - 941102 0360*** - Praktiseer Area, TUBATSE, 1150 - *Pontsho Sebatane*
78. Albert Nkanyiso Radebe - 891112 5372*** - House 14429, Stratford Street, Ext 8a, ORANGE FARM, 1841 - *Nkanyiso*
79. Emile Fortuin - 790630 5394*** - Stand No 124, Loerie Road, Bridgetown, ATHLONE, 7764 - *Imraan*
80. Stefanus Jack - 850617 5727*** - No 1201, Meriting Street, Chris Hani Park, KOFFIEFONTEIN, 9986 - *Fikile Stephen*
81. Keenen Sheradin Bernksen - 870829 5182*** - No 27, Saleno Way, Strandfontein, CAPE TOWN, 7798 - *Keenan Sheradin*
82. Temosho Permister Seabela - 040712 5411*** - Mogatladi Village, Atok, JANE FURSE, 0749 - *Temosho*
83. Ongi Neli - 031117 1143*** - Maiden Farm, UMTATA, 5099 - *Ongeziwe*
84. Joyce Makhanda - 841118 0641*** - No 9563, Ext 11, Evaton West, EVATON, 1984 - *Nomasonto Joyce*
85. Anisha Dawood Mulla - 780717 0600*** - No 3551, Dekalb Avenue, Apt 3J, BRONXNY, 10u67 - *Anisha Hamza*
86. Ongeziwe Tshangela - 990323 0985*** - Mxopo Arfea, FLAGSTAFF, 4810 - *Ongeziwe Sive*
87. Dumisani Ndimiso Mdlangathi - 000229 6252*** - House 2114, Kwa-Pata Location, PIETERMARITZBURG, 3201 - *Ndimiso Dumisani*
88. Tshhele Paris Disoloane - 690711 5641*** - Thabampshe Village, Ga-Masemola, JANE FURSE, 1060 - *Paris Tapite*
89. Nokvbonga Cordelia Njokweni - 840908 0225*** - House 65270, Phendle Street, New Brighton, PORT ELIZABETH, 6200 - *Nokubonga*
90. Raymond Sibiya - 000711 6256*** - House 8667, Ruvuma Street, ALBERTON, 1458 - *Raymond Muhammad*

91. Ambrosia Mosia - 021116 0235*** - House 207, Mofokeng Street, Moroka North, SOWETO, 1818 - *Ambrosia Palesa*
92. Mitholia Dorey Morobeng - 910403 0548*** - House No 36, Matsobane Street, Boichoko, POSTMASBURG, 8420 - *Keitumetse Mitholia*
93. Siyabonga Hopeless Nkabinde - 020324 6054*** - House No 946, Mahala Park, STANDERTON, 2430 - *Siyabonga Hopewell*
94. Seapei Mogoane - 840828 0988*** - House 1, Pelican Street, Florida Lake, ROODEPOORT, 1709 - *Seapei Nozimbali*
95. Leslene Ingrid Solomons - 821029 0185*** - No 174, Ashbrook Crescent, MITCHELLS PLAIN, 7785 - *Laeegah*
96. Sidney Magobotla - 490219 5111*** - House 35, Galant Street, Promosa, POTCHEFSTROOM, 2531 - *Sidney Michael*
97. Motheo Llukie Lucas Mphahlele - 020928 5266*** - No 2480, Block Lkk, Ga-Rankua, PRETORIA, 0152 - *Motheo Katlego Junior*
98. Dia Nombula - 990604 1443*** - House No 2678, Section I, EKANGALA, 1021 - *Lydia Nongcebo*
99. Kyla Serfontein - 000314 1455*** - No 198, George Road, WILDERNESS, 6560 - *Kamala Kyla*
100. Leané Joubert - 970120 0063*** - No 357, Parsley Avenue, Annlin, PRETORIA, 0066 - *Leané Helena*
101. Thabang Hlakanipha Mbatha - 800407 5911*** - No 29, Teleblanch Bardene, BOKSBURG, 1459 - *Thabani*
102. Nkateko Chauke - 020408 0191*** - No 245, Pylgras Street, Ext 03, DANVILLE, 0183 - *Nkateko Onicca*
103. Nuyo Blessing Mokoena - 020702 5518*** - Stand No 107, Mkhulhu, MPUMALANGA, 1246 - *Vuyo Blessing*
104. Justine Y2k Susan Stoffberg - 991211 0115*** - No 33, 13th Street, Kensington, CAPE TOWN, 7405 - *Justine*
105. Didimalo Brine Monareng - 960316 5075*** - No 521, Mampuru Street, TEMBISA, 1632 - *Didimalo Brian*
106. Nicole Sharné Pretorius - 970708 0184*** - No 19, Narbada Road, Merebank, DURBAN, 4052 - *Nazneen*
107. Monamoleli Edward Lekala - 911002 6034*** - Stand No 217, Section K, Sleutelfontein, MPUMALANGA, 0465 - *Chele Edward*
108. Nontlupheko Regina Nzipo - 620630 0698*** - No 321, Sikhulu Street, Lingalihle, CRADOCK, 5881 - *Nokhanyo Regina*
109. Daniel James Thain Smith - 920330 1470*** - No 2, Buchner Crescent, Lonehill, JOHANNESBURG, 2191 - *Danielle Jamie Thain*
110. Wenzile Clement Thwala - 960717 1339*** - House No 347, Ehlanzeni Section, TEMBISA, 1632 - *Wenzile Clementine*
111. Michael Kruger - 950331 1176*** - House No 51, Patro Street, Kensington, JOHANNESBURG, 2094 - *Hazel*
112. Leandre Lara Kleynhans - 961106 6334*** - No 5, Hof Van Holland, Muifenberg, CAPE TOWN, 7945 - *Lee*
113. Grace Mmapula Maloka - 750127 0448 *** - R 1067 Newstand, KLIPGAT, 0204 - *Grace Mmapula Ruthcyrus*
114. Raksha Hanuman - 991221 0238 *** - 16 Tilegreen Place Greenbury, GREYVILLE, 4023 - *Inayaat*
115. Martha Maria Van Der Walt - 770708 0019 *** - 94 Wamboin Street, Gilgandra N S W, AUSTRALIA, 2827 - *Mia Maria*
116. Susan Elizabeth Marks - 491219 0632 *** - Anne Frank Straat 45, Amsterdam, NETHERLANDS, 1018dm - *Susan Collin*
117. Buzakona Hlatshwayo - 920303 6206 *** - 128 B Zone 11, Meadowlands, SOWETO, 1852 - *Buzakoni Gugu*
118. Potlako Mashiloane - 950108 5572 *** - 22 Century Boulevard, RIVERSANDS, 1684 - *Sephure Potlako*
119. Bia Johannah Ngobeni - 601228 0464 *** - 372 Morapala Village, TZANEEN, 0850 - *Mbali Johanah*
120. Sindisiwe Gloria Sithole - 840227 6192 *** - 1 Stubbs Lane, Bisley, PIETERMARITZBURG, 5201 - *Sizwesamajobe Gcinizwi*

121. Mmapula Jane Putlela - 821129 0849 *** - 861 Block Xx, SOSHANGUVE, 0152 - *Mapekwa*
122. Sbongile Mlotshwa - 020619 6042 *** - Shoba Area, VRYHEID, 3100 - *Sbongokuhle*
123. Lavhelesani Veronica Cebekulu - 760826 0348 *** - J.G. Strydom Road, Meyersig Lifestyle Estate, Albertsdal, ALBERTON, 1448 - *Bukelwa Veronica*
124. Ngwakoana Francina Sethe - 020608 1029 *** - 33 Pherekhong Street, ATTERIDGEVILLE, 0125 - *Ngwakoana Princess*
125. Bukiwe Eucaristar Gumede - 960911 0729 *** - St Catherine Location, BULWER, 3244 - *Nondumiso Bukiwe*
126. Chantel Micheala Kamedien - 960920 0273 *** - 4 St Alxes Road, Montague Village, WYNBERG, 7824 - *Ameerah*
127. Nokthula Londeka Zondi - 920422 0587 *** - 1731 Nyamazane Location, PIETERMARITZBURG, 3201 - *Londeka Nokuthula*
128. Dumiso Mmakwena Mokobodi - 011126 0345 *** - 2133 Winnie Mandela, Zone 9, TEMBISA, 1632 - *Tumiso Mmakwena*
129. Bhongoletu Lelethu Khaphayi - 010903 6314 *** - Kubusie Village, STUYRTHEIM, 4930 - *Lelethu*
130. Rapelane Shai - 000929 6169 *** - Modubeng, BURGERSFORT, 1150 - *Rapelang Clement*
131. S'phokazi Nosipho Mtshali - 010907 0942 *** - 6 Lancashire Road, LADYSMITH, 3370 - *Siphokazi Nosipho*
132. Rose Pepeteni - 010301 1419 *** - 9313 Zithande Street, HERMANUS, 7200 - *Talitha Rose*
133. Norman Adam Sivhasa - 010414 5988 *** - 870 Eikenhof, JOHANNESBURG, 2000 - *Tshedza Norman*
134. Kamogelo Makofane - 011208 6001 *** - 8738 Extension 9, Kwa Guqa, WITBANK, 1050 - *Makopole Kamogelo*
135. Lethabo Koketso Makofana - 020327 0884 *** - 10030 Vierfontein, NEBO, 1059 - *Koketso Mokgabudi*
136. Abel Matjie - 010728 6054 *** - 29753 Extension 10, Nqaqu Street, MAMELODI EAST, 0122 - *Buang Abel*
137. Karabo Mpahleni - 000622 1291 *** - 2 Chetshwayo Street, Panyenville, SPRINGS, 1559 - *Amanda*
138. Haggrieves Dlamini - 011009 1366 *** - 2972 Landoff Road, Mayville, DURBAN, 4091 - *Monica*
139. Mduduzi Moloi - 020528 5905 *** - 3726 Intabazwe, HARRISMITH, 9880 - *Lebohlang*
140. Lerato Junior Lebuso - 020723 5805 *** - 2440 W Section, BOTSHABELO, 9781 - *Lerato Junior*
141. Bokamoso Mokaeya Manyaka - 021010 5970 **** - Po Box 358, DRIEKOP, 1129 - *Setemere Bokamoso*
142. Yanga Ntoyabo - 021025 0778 *** - Mkhathazo Area, ELLIOTDALE, 5070 - *Yanga Mihle*
143. Anele Sisana Hinana - 020227 0991 *** - 8 Wongalethu Street, Garden City, MTULENI, 7100 - *Anele Sisanda*
144. Tebogo Dennis Phele - 900314 6211 *** - P O Box 284, SOVENGA, 0727 - *Siyabonga Dennis*
145. Rochell Eyvonne Maphutha - 991228 1062 *** - 5330 Nevada Close, Extension 5, Cosmo City, RANDBURG, 2188 - *Keamogetswe Mukondeleli*
146. Avile Stulweni - 020818 5305 *** - Vaalbank Area, LADY FRERE, 5410 - *Aviwe*
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DEPARTMENT OF MINERAL RESOURCES AND ENERGY

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MINE HEALTH AND SAFETY ACT, 1996 (ACT NO 29 OF 1996)**GUIDELINE FOR A MANDATORY CODE OF PRACTICE FOR AN OCCUPATIONAL
HEALTH PROGRAMME ON THERMAL STRESS**

I **DAVID MSIZA**, Chief Inspector of Mines, under section 49 (6) of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) and after consultation with the Council, hereby issues the guideline for an occupational health programme on thermal stress in terms of the Mine Health and Safety Act, as set out in the Schedule.



DAVID MSIZA
CHIEF INSPECTOR OF MINES

SCHEDULE

Guideline for the Compilation of a
Mandatory Code of Practice for
an Occupational Health Programme on

T h e r m a l S t r e s s

MINE HEALTH AND SAFETY INSPECTORATE

2022



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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 ON
THERMAL STRESS**



CHIEF INSPECTOR OF MINES

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

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OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

PART A: THE GUIDELINE**1. FOREWORD**

- 1.1 In an attempt to address matters affecting the health and safety of workers in the South African mining industry, the **MHSC** established a tripartite sub-committee under the auspices of the **MOHAC**. The **MOHAC** found it necessary, in order to address these matters, to draft a guideline for a mandatory **COP** on thermal stress.
- 1.2 Significant risks to the health of employees in the mining industry exist. In order to protect, monitor and promote the health status of employees, an occupational health programme is required where exposure to such significant risks occurs. The **MOHAC** considered it appropriate to prepare a guideline covering both occupational hygiene and medical surveillance, to ensure compliance to the requirements of the **MHSA** and to bring about uniformity of health standards in the South African mining industry.
- 1.3 Where the risk assessment of employers indicates a need to establish and maintain either a system of occupational hygiene measurements or a system of medical surveillance, or where regulation(s) required either of the systems, the employer must prepare and implement a **COP** based on this guideline.
- 1.4 Thermal stress management is a multifaceted approach to promote worker health and safety through minimizing human thermal stress and the incidence of heat or cold disorders.
- 1.5 Occupational thermal exposure is a health and safety hazard of no uncertain dimensions and typically has to be dealt with through strategies that embrace environmental engineering, administrative controls and personal protection. This scenario finds application in most South African mines and associated surface operations. The fundamental perspective to retain is that source control through engineering means it represents the primary strategy, irrespective of the hazard in question (refer to Part C, paragraph 7.1). Conversely, personal protection is not a convenient alternative to source control. At best, it merely serves as an interim cost effective expedient.
- 1.6 This guideline assists employers with the establishment of an occupational health programme, but does not stipulate specific requirements for specific circumstances. It sets out a basic system for managing the risks to health. The first component of any management system is finding out what the situation is, and secondly deciding what to do about it.

2. LEGAL STATUS OF THE GUIDELINE AND COP

- 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 mines, if the **CIOM** requires it. These **COPs** must comply with any relevant guidelines issued by the **CIOM** in accordance with section 9(3) of the **MHSA**.

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3. THE OBJECTIVES OF THE GUIDELINE

- 3.1. The objective of this guideline is to enable the employer of every mine to compile a **COP**, which, if properly implemented and complied with, would protect and improve the health of employees at the mine through monitoring and by reducing their exposure to thermal stress. It provides guidance of a general nature on the required format and content for the **COP** and it details the sufficient technical background to enable the drafting committee at the mine to prepare a comprehensive and practical **COP** for their mine.
- 3.2. It sets out the two components of an occupational health programme, namely:
- 3.2.1. Occupational hygiene; and
- 3.2.2. Occupational medicine.
- 3.3. Where an employer is required in terms of regulation 9.2(2) of the **MHSA** or in terms of risk assessment, to establish and maintain a system of occupational hygiene measurements in respect of thermal stress, this guideline should assist the employer in doing so.

4. DEFINITIONS AND ACRONYMS

- 4.1. **Abnormally hot environment** means any environment where **DB** $\geq 37.0^{\circ}\text{C}$, **GT** $\geq 37.0^{\circ}\text{C}$ and/or **WB** $\geq 32.5^{\circ}\text{C}$, and **WBGT index** ≥ 34 .
- 4.2. **Abnormally cold environment** means any environment where **WCET** $\leq -30.0^{\circ}\text{C}$.
- 4.3. **ACGIH** means American Conference of Governmental Industrial Hygienists.
- 4.4. **BEI** means Biological Exposure Index.
- 4.5. **BMI** means body mass index.
- 4.6. **CIOM** means Chief Inspector of Mines.
- 4.7. **Cold environment** means any environment where **WCET** $\leq 5.0^{\circ}\text{C}$ but $> -30.0^{\circ}\text{C}$.
- 4.8. **COP** means Code of Practice.
- 4.9. **CSIR** means Council for Scientific and Industrial Research.
- 4.10. **CSM** means cold stress management.
- 4.11. **DMRE** means the Department of Mineral Resources and Energy.
- 4.12. **DB** means dry-bulb temperature.
- 4.13. **DI** means discomfort index.
- 4.14. **ECT** means equivalent chill temperature.

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- 4.15. **EHSI** means Emergency Heat Stress Index.
- 4.16. **GT** means globe temperature (**radiant heat**).
- 4.17. **Hot environment** means any environment where **DB** $\geq 32.5^{\circ}\text{C}$ - $< 37.0^{\circ}\text{C}$, **GT** $\geq 32.5^{\circ}\text{C}$ - $< 37.0^{\circ}\text{C}$ and **WB** range of $\geq 27.5^{\circ}\text{C}$ - $< 32.5^{\circ}\text{C}$ and/or the time weighted average **WBGT index**, determined over a period of one hour, ≥ 30 - < 34 in the environment in which an employee works.
- 4.18. **HSM** means heat stress management.
- 4.19. **HTS** means heat tolerance screening.
- 4.20. **HTT** means heat tolerance test.
- 4.21. **MHSA** means the Mine Health and Safety Act, 1996 (Act 29 of 1996) as amended.
- 4.22. **MHSC** means Mine Health and Safety Council.
- 4.23. **MOHAC** means Mining Occupational Health Advisory Committee.
- 4.24. **OEL** means occupational exposure limit.
- 4.25. **OEL for thermal stress** means **WB** ($^{\circ}\text{C}$) 32.5°C , **DB** ($^{\circ}\text{C}$) 37°C , mean radiant temperature ($^{\circ}\text{C}$) 37°C , and **WCET** ($^{\circ}\text{C}$) 4°C .
- 4.26. **OMP** means Occupational Medical Practitioner.
- 4.27. **Percentile** means the value of a variable below which a certain percent of observations falls.
- 4.28. **PPE** means personal protective equipment.
- 4.29. **Radiant heat** means the electromagnetic transfer of heat energy without direct contact.
- 4.30. **SIMRAC** means Safety in Mines Research Advisory Committee.
- 4.31. **Thermal environment** means occupational exposure to hot and cold environments.
- 4.32. **TLV** means Threshold limit value.
- 4.33. **WB** means wet-bulb temperature.
- 4.34. **WBGT** means wet-bulb globe temperature.
- 4.35. **WBGT index** means a standard that offers a useful, first-order index of the environmental contribution to heat stress influenced by air temperature, **radiant heat** and humidity.

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4.36. **WCET** means wind chill equivalent temperature.

5. SCOPE

- 5.1. A **COP** for an occupational health programme on thermal stress must be prepared, in compliance with this guideline, and implemented in terms of regulation 9.2(2) of the **MHSA**, which requires that a system of occupational hygiene measurements on thermal stress must be prepared and implemented when the results of the risk assessment conducted has identified that the following limits prevail:
- Heat $\geq 25.0^{\circ}\text{C}$ **WB** and/or $\geq 32.0^{\circ}\text{C}$ **DB** and/or $\geq 32.0^{\circ}\text{C}$ **GT**.
 - Cold $< 10^{\circ}\text{C}$ **ECT**
- 5.2. This guideline covers a basic occupational health programme for the purpose of measuring occupational exposures to thermal stress, and linking these exposures to employee medical records.
- 5.3. Formal data returns on exposure levels will be used to establish and maintain an industry exposure database.
- 5.4. This guideline covers a basic occupational health programme for the purpose of measuring occupational exposures to thermal stress and the linking of these exposures to employee medical records.
- 5.5. The occupational health programme should identify employees with significant exposures and should provide control measures to mitigate the risk. This guideline does not stipulate the control measures, only the hierarchy to be followed to control exposures.

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PART B: AUTHOR'S GUIDE

1. The **COP** must follow the sequence laid out in Part C: Format and content of the **COP** where possible. 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:
 - a) 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**; or
 - b) The annexure is merely attached as information for consideration in the preparation of the **COP** (i.e. compliance is discretionary).
3. When annexures are used, the numbering should be preceded by the letter allocated to that annexure, and the numbering should start at one again. (e.g. 1, 2, 3, A1, A2, A3, etc.).
4. Whenever possible, illustrations, tables, graphs and the like should be used to avoid long descriptions and/or explanations.
5. When reference is made in the text to publications or reports, the references to these sources must be included in the text as footnotes or side notes, as well as in a separate bibliography.

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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 on thermal stress*".
- 1.1.3. A statement to the effect that the **COP** was drawn up in accordance with **DMRE** guideline with reference number **DMRE 16/3/2/4-B6** issued by the **CIOM**.
- 1.1.4. The mine reference number for the **COP**.
- 1.1.5. The effective date of the **COP** of the mine.
- 1.1.6. Revision dates of the mine's **COP** (previous if applicable and next revision).
- 1.1.7. The mine code number.

2. TABLE OF CONTENTS

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

3. STATUS OF COP

3.1. This section must contain statements to the effect that:

- 3.1.1. The **COP** was drawn up in accordance with the **DMRE** guideline with the reference number **DMRE 16/3/2/4-B6** 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 or inquiry to ascertain compliance and 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 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. The employer must appoint a committee responsible for the drafting of the **COP** after consultation with the health and safety committee in terms of the **MHSA**.

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- 4.3. The members of the drafting committee assisting the employer in drafting the **COP** should be listed in the **COP** giving their full names, designations, affiliations and experience. This committee must include competent persons, sufficient in number, to draft the **COP** effectively.

5. GENERAL INFORMATION

- 5.1. General relevant information relating to the mine must be stated in this section of the **COP**. The following minimum information must be provided:

- 5.1.1. A brief description of the mine and its location.
- 5.1.2. The commodities produced.
- 5.1.3. A list of the mining method or combination of methods used at the mine. This section must discuss the degree of mechanisation, taking care to identify the potential sources of thermal stress.
- 5.1.4. The general ventilation arrangements and/or cooling arrangements.
- 5.1.5. 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.
- 5.1.6. The unique features of the mine that have a bearing on this **COP** and cross-referencing them to the risk assessment conducted.

6. TERMS AND DEFINITIONS

- 6.1. Any word, phrase or term of which the meaning is not 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.
- 6.2. The drafting committee should avoid jargon and abbreviations that are not in common use, or those 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; and

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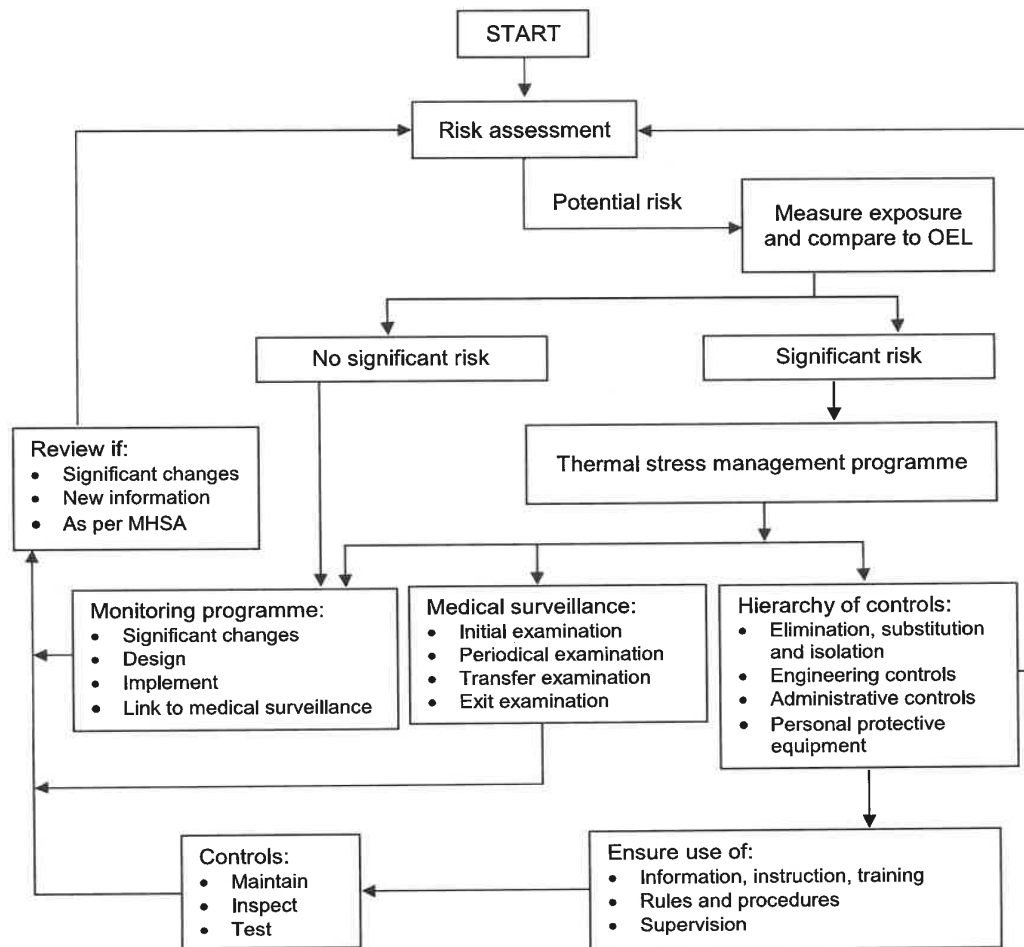
- Thereafter, insofar as the risk remains, provide **PPE** and institute a programme to monitor the risk.
- 7.2. To assist the employer with the risk assessment all possible relevant information such as accident statistics, ergonomic studies, research reports, manufacturer specifications, approvals, design criteria and performance figures 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 every serious incident relating to the topic covered in the **COP**, or if significant changes are introduced to procedures, mining and ventilation layouts, mining methods, plants or equipment, and material.
8. **KEY ELEMENTS TO BE ADDRESSED IN THE COP**

Where the employer's risk assessment indicates a need to establish and maintain a system of occupational hygiene measurements and a system of medical surveillance, or where such systems are required by regulations, the aspects of the occupational health programme and the thermal stress management programme as set out in sections 8.1 and 8.2 below, must be addressed in the **COP**.

These key elements are shown in Figure 1: Occupational health programme below.

The occupational health programme to be implemented on the mine should be summarised in the **COP** in a flow chart similar to Figure 1: Occupational health programme. The occupational health programme has two components i.e. occupational hygiene and occupational medicine.

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FIGURE 1: Occupational health programme**8.1. Aspects of an occupational health programme****8.1.1. Risk assessment**

8.1.1.1. The **COP** should set out measures to ensure that a qualitative and quantitative risk assessment process is followed, and takes into account all the factors influencing the health of employees. Where the available historical data is not sufficient to enable professional judgement, acceptable risk assessment methodologies should be used.

8.1.1.2. The risk assessment must be described with reference to:

- a) The significant sources of thermal stress which would influence the environmental thermal load to which employees may be exposed, and which have been identified, in the activity area, such as:

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- Rock temperature due to geothermal gradient.
 - Machinery.
 - High humidity.
 - High **radiant heat** (see Annexure 3: Radiant temperature for information only).
 - Auto compression.
 - Rate of work (strenuous work).
 - Restricted and inclined work areas.
 - Ambient temperature.
 - Wind velocity.
 - Refrigerator rooms, etc.
- b) Health effects associated with exposure to thermal stress (high environmental heat loads and radiant temperature).
- c) The limits for each relevant parameter of the environmental thermal load on the mine e.g.:
- (i) **WB** in °C.
 - (ii) **DB** in °C.
 - (iii) Radiant temperature (**GT**) in °C.
 - (iv) Velocity in metre per second (m/s) i.e. stoping and general ventilation.
 - (v) Air volume per cubic metre per second per square metre (m³/s/m²) of the face (development end).
 - (vi) Indices (**DI**, effective temperature, **WBGT**, etc.).
 - (vii) **WCET** in °C.
 - (viii) **WBGT index**.
- d) The nature of the key workplace operations and activities that pose the greatest potential for exposure to thermal stress.
- e) Occupations and the number of employees exposed to thermal stress.
- f) The exposure pattern, i.e. intermittent and continuous.

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- g) The duration and frequency of employee exposure to heat stress.
- h) The actual exposure levels measured compared to the **OEL**.
- i) Control measures that are in place e.g. substitution, engineering controls, administrative controls, **PPE** etc.
- j) The additional control measures required to be instituted in order to reduce or maintain exposures to below the **OELs**.
- k) The frequency of any ongoing monitoring to assess the effectiveness of the controls mentioned above.

NOTE:

- For the purpose of the risk assessment, the commodity codes, activity codes and occupational codes as set out in Annexure 1 (Mandatory codes list) should be used.

8.1.1.3. The **COP** must indicate the type(s) of risk assessment to be undertaken for thermal stress monitoring considering the following:

- a) Baseline risk assessment.
- b) Issue-based risk assessment.
- c) Continuous risk assessment.

NOTE:

- Chapter 3 of the handbook published by the **SIMRAC**, "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.

8.1.1.4. Review of risk assessment

The **COP** must address the review of the risk assessment annually (based on the thermal stress monitoring data of the previous cycle) and whenever there is change at the mine that could have an impact on the original assessments, and/or at least in the following instances:

- a) Outcomes of medical surveillance programmes indicate the need for it.
- b) A **MHSA** section 11(5) investigation indicates the need for it.
- c) The introduction of new or revised legislation.
- d) The introduction of new mining methods.
- e) Process changes are introduced (e.g. in process plants).
- f) The introduction of new types of machinery.
- g) The modification of current machinery affecting the heat load and operation.

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8.1.2. Parameters for the identification of thermal stress risk

The employer must apply the following parameters to identify thermal stress risks.

8.1.2.1. Non-significant risk

- a) **WB** < 25.0°C and
- b) **DB** < 32.0°C and/or
- c) **GT** < 32.0°C and/or
- d) **WBGT index** < 25.0°C.
- e) **WCET** ≥ 10.0°C should be applied to define a non-significant cold risk.

8.1.2.2. Significant risk

- a) **WB** ≥ 25.0°C - < 27.5°C.
- b) **DB** ≥ 32.0°C - < 37.0°C.
- c) **GT** ≥ 32.0°C - < 37.0°C.
- d) **WBGT index** ≥ 25 - < 30 determined over a period of one hour.
- e) **WCET** < 10.0°C should be applied to define a significant cold risk.

8.2. Thermal stress management

8.2.1. Non-significant risk

A monitoring programme is not required, but the employer must keep a portfolio of evidence.

8.2.2. Significant risk

The **COP** should put measures in place to ensure that a thermal stress management programme is established and maintained for all workplaces with a significant risk.

The thermal stress management programme should address the following aspects:

- a) The thermal stress management structure (*see section 8.2.2.1*).
- b) Risk assessment (*see section 8.2.2.2*).
- c) The determination of **thermal environments** (*see section 8.2.2.3*).
- d) The thermal stress monitoring strategy (*see section 8.2.2.4*).

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- e) Quality control (*see section 8.2.2.5*).
- f) Hierarchy of controls (*see section 8.2.2.6*).
- g) **HSM** (*see section 8.2.2.7*).
- h) **CSM** (*see section 8.2.2.8*).
- i) Medical surveillance programmes (*see section 8.2.2.9*).
- j) Fitness to perform work (*see section 8.2.2.10*).
- k) Immediate incident management (*see section 8.2.2.11*).
- l) Reporting and recording (*see section 8.2.2.12*).

The **COP** must address the following points.

8.2.2.1. Thermal stress management structure

The **COP** must make provisions for the employer to put measures in place for the establishment of a thermal stress management committee whose members are appointed in writing, and have defined roles, responsibilities and authority to manage thermal stress, including but not limited to the following:

- a) Employer designated representative as the chairperson.
- b) A **MHSA** section 12(1) appointee.
- c) An engineer as contemplated in regulation 2.13.1 of the **MHSA** (for the purpose of thermal stress control).
- d) **OMP**.
- e) Human Resource representative.
- f) Human Resource Development representative (education and training).
- g) Full-time health and safety representatives.

8.2.2.2. Risk assessment

The outcomes of the risk assessment as in section 8.1.1 above will be utilised as inputs into the thermal stress management programme.

NOTE:

- Where the available historical data is insufficient to enable a professional judgement regarding the extent of any risk, acceptable methodologies for the identification or the determination of thermal stress should be used.

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8.2.2.3. Determination of **thermal environments**

The employer must identify the **thermal environment** as per the following:

Step 1

The sub-division of the mine into measurement areas e.g.:

- Measurement area 1 = surface.
- Measurement area 2 = underground section A.
- Measurement area 3 = underground section B.
- Measurement area 4 = underground section C etc.

NOTE:

- *Surface operations proceed to step 3.*
- *Underground operations proceed to step 2.*

Step 2

Measurement areas for underground mines should be sub-divided into ventilation districts.

NOTE:

- In order for an area to be classified as a ventilation district it:*
1. *Must be ventilated independently from other areas.*
 2. *Must have independent intake and return airways.*
 3. *Does not contaminate other areas.*

Step 3

Measurement areas for surface operations must be sub-divided into activity areas as per the activity area code list found in Annexure 1: Mandatory codes list.

Ventilation districts must be sub-divided into activity areas as per the activity area code list found in Annexure 1: Mandatory codes list.

Step 4

The employer must categorise (as per Table 1: The classification system for heat stress and Table 2: The classification system for cold stress below) the activity areas based on the historical thermal environmental data.

Step 5

Conduct a statistical analysis to ensure that **thermal environments** are correctly classified. The results of the thermal environmental parameters (as per Table 1: The classification system for heat stress and Table 2: The classification system for cold stress below) used, from either historical data or measured data should be compared to the respective **OEL/standard**.

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Step 6

Once the thermal environmental parameters (as per Table 1: The classification system for heat stress and Table 2: The classification system for cold stress below) within each activity area have been compared to the respective OEL/standard, each activity area can now be categorised into classification bands. For classification purposes, use the 90th **percentile** value for heat stress (the classification for heat stress should be based on the worst measured parameter) and the 10th **percentile** value for cold stress.

NOTE:

The employer must ensure that in defining any **thermal environment**, the precautions listed below are heeded to:

- Care should be exercised to detect trends where the **thermal environment** changes, especially from 'cool' to 'hot', or from 'hot' to 'abnormally hot'.
- Regular monitoring is clearly indicated, even if only on a random basis, and 'cool' environments should not be excluded, especially when marginal.
- The specific protocol would be dictated by prevailing circumstances, and therefore cannot be stipulated or prescribed.
- Seasonal drifts could be crucial and to rely on winter temperatures may lead to an underestimation of the risk and vice versa. Environmental monitoring should consider this.

NOTE:

- Using mean values for the purpose of categorisation may underestimate the risk if a significant number of exposed employees have to enter environments close to, or at the upper end of the range of recorded values.

The classification bands for a **thermal environment** are tabled below and these tables form part of this guideline and must be complied with.

TABLE 1: The classification system for heat stress

CLASSIFICATION	TEMPERATURE RANGE (FOR CATEGORISATION)	INTERPRETATION	GENERAL ACTION
A	WB ≥ 32.5°C or DB ≥ 37.0°C or GT ≥ 37.0°C or WBGT index ≥ 34	Abnormally hot environment	<ul style="list-style-type: none"> ▪ No normal work should be undertaken except work to rectify the condition(s). ▪ Work to rectify the condition(s) must be undertaken only on a basis of risk assessment, supervision and protocols.
B	WB ≥ 27.5°C - < 32.5°C and/or DB ≥ 32.0°C - < 37.0°C, and/or GT ≥ 32.0°C - < 37.0°C and/or WBGT index ≥ 30 - < 34	Hot environment	<ul style="list-style-type: none"> ▪ HSM mandatory.

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CLASSIFICATION	TEMPERATURE RANGE (FOR CATEGORISATION)	INTERPRETATION	GENERAL ACTION
C	WB ≥ 25.0°C - < 27.5°C and/or DB ≥ 32.0°C < 37.0°C and/or GT ≥ 32.0°C - < 37.0°C and/or WBGT index ≥ 25 - < 30	Significant risk	<ul style="list-style-type: none"> ▪ HSM mandatory.
D	WB < 25.0°C and/or DB < 32.0°C and/or GT < 32.0°C and/or WBGT index < 25	Non-significant risk	<ul style="list-style-type: none"> ▪ No special precautions. ▪ Environmental monitoring must be sufficiently sensitive to detect critical upward drifts in the environmental heat load. ▪ The monitoring programme to satisfy this requirement should be specified.

TABLE 2: The classification system for **cold stress**

CLASSIFICATION	TEMPERATURE RANGE (FOR CATEGORISATION)	INTERPRETATION	GENERAL ACTION
A	≤ -30.0°C (≤ minus 30°C)	Abnormally cold environment	<ul style="list-style-type: none"> ▪ No normal work should be undertaken except work to rectify the condition(s). ▪ Work to rectify the condition(s) must be undertaken only on a basis of risk assessment, supervision and protocols.
B	≤ 5.0°C but > -30.0°C (≤ minus 30°C)	Cold environment	<ul style="list-style-type: none"> ▪ Implement formal CSM.
C	> 5°C but < 10.0°C	Significant risk	<ul style="list-style-type: none"> ▪ Implement formal CSM.
D	≥ 10.0°C	Non-significant risk	<ul style="list-style-type: none"> ▪ No special precautions. ▪ Monitor ECT.

Step 7

Reclassification of **thermal environments** should be considered when any of the following events occurs:

- Exposure levels change due to controls being initiated, and likewise, when controls deteriorate.
- Employee complaints are received.

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- c) Processes are changed (e.g. change in procedures, mining and ventilation layouts, mining methods, plant, equipment or material).
- d) Occupational illness related to the **thermal environment** occurs.
- e) Change in exposure category occurs.
- f) Other events warranting re-evaluation e.g. new regulatory initiatives.

NOTE:

- *The previous cycle for surface operations refers to the data from a similar monitoring period for the previous year.*
- *The previous cycle for underground operations refers to the data from the previous quarter.*

8.2.2.4. Thermal stress monitoring strategy

The employer must implement a thermal stress monitoring strategy and clearly describe the following in the **COP**:

- a) Identify internationally or nationally acceptable measurement methodology used for thermal stress monitoring.
- b) Describe the acceptable measurement methodology used for thermal stress monitoring.
- c) The record keeping system used by the mine to record the thermal stress data.
- d) The instrument(s) used to assess thermal stress (heat and cold).
- e) The frequency of maintenance and the calibration of measuring instruments.
- f) The monitoring period for heat and cold stress must be determined by the risk assessment and the identified thermal stress measurement methodology.

NOTE:

- *Thermal monitoring for heat stress is to be conducted on an annual basis during the warmest period of the year, and cold stress during the coldest period of the year, as determined by the risk assessment.*
- *Care should be exercised to detect trends in the **thermal environment** changes, especially from 'cool' to 'cold'.*
- *Regular monitoring is clearly indicated, even if only on a random basis, and 'cool' environments should not be excluded, especially when marginal.*
- *The specific protocol would be dictated by prevailing circumstances, and therefore, cannot be stipulated or prescribed.*

g) Monitoring frequency

The monitoring frequency must be defined in the **COP** as per Table 3: Heat stress classification and monitoring frequency and Table 4: Cold stress classification and monitoring frequency below or as determined by

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the risk assessment, whichever is the higher standard.

TABLE 3: Heat stress classification and monitoring frequency

CLASSIFICATION	TEMPERATURE RANGE (FOR CATEGORISATION)	MONITORING FREQUENCY
A	WB ≥ 32.5°C or DB ≥ 37.0°C or GT ≥ 37.0°C or WBGT index ≥ 34	<ul style="list-style-type: none"> Continuously monitor until the environmental conditions have improved to acceptable limit(s).
B	WB ≥ 27.5°C - < 32.5°C and/or DB ≥ 32.0°C - < 37.0°C and/or GT ≥ 32.0°C - < 37.0°C and/or WBGT index ≥ 30 - < 34	<ul style="list-style-type: none"> Monitoring must be conducted within every 30 days.
C	WB ≥ 25.0°C - < 27.5°C and/or DB ≥ 32.0°C - < 37.0°C and/or GT ≥ 32.0°C - < 37.0°C and/or WBGT index ≥ 25 - < 30	<ul style="list-style-type: none"> Monitoring must be conducted within every 45 days.
D	WB < 25.0°C and/or DB < 32.0°C and/or GT < 32.0°C and/or WBGT index < 25	<ul style="list-style-type: none"> As determined by the risk assessment.

TABLE 4: Cold stress classification and monitoring frequency

CLASSIFICATION	ECT RANGE (FOR CATEGORISATION)	MONITORING FREQUENCY
A	≤ -30.0°C (≤ minus 30°C)	<ul style="list-style-type: none"> Continuously monitor until the environmental conditions improved to acceptable limit(s).
B	≤ 5.0°C - > -30.0°C (≤ minus 30°C)	<ul style="list-style-type: none"> Monitoring must be conducted within 30 days.
C	> 5.0°C - < 10.0°C	<ul style="list-style-type: none"> Monitoring must be conducted within 90 days.
D	≥ 10.0°C	<ul style="list-style-type: none"> As determined by the risk assessment

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h) Monitoring programme

In developing the monitoring programme the following should be considered:

(i) Routine monitoring

All working places should be monitored in terms of the most relevant parameter of the prevailing **thermal environment** (e.g. **WB**, **DB** and velocity) that is periodically done as per the monitoring frequency.

(ii) Adjusted monitoring

Where prevailing conditions are closer to the upper limits of the category or where trends are discernible, the frequency of monitoring must be increased in accordance to the risk in order to manage the risk on a day-to-day basis.

8.2.2.5. Quality control

The **COP** must describe a quality control programme taking into account, but not limited to, the following:

- a) Maintenance and calibration of instruments used for thermal stress monitoring.
- b) Measurement methods to assess thermal stress.
- c) **HTS**.
- d) Competency of people assessing thermal stress.
- e) Reporting on thermal stress conditions and measurements.

8.2.2.6. Hierarchy of controls

The **COP** should address the hierarchy of controls, which are going to be implemented to mitigate the risk of exposure to thermal stress. The following hierarchy of controls should be taken into consideration:

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

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8.2.2.7. **HSM**

HSM must be implemented by the employer where the risk assessment determines a significant risk. The following aspects must be addressed in the thermal stress **COP** and where applicable, cross-reference to the standard operating procedures of the mine:

- a) Medical or physical examinations (see Annexure 6: Medical/physical examinations).
- b) **HTS** (see Annexure 7: Heat tolerance screening).
- c) Work practices for surface, opencast and underground operations (see Annexure 8: Work practices: Surface, opencast and underground operations).
- d) Absenteeism from routine work in **hot environments** (see Annexure 9: Absenteeism from routine work in **hot environments**).
- e) Water and nutritional requirements during work in heat (see Annexure 10: Water and nutritional requirements during work in heat).
- f) Emergency work in **abnormally hot environments** - underground (see Annexure 11: Emergency work in **abnormally hot environments** - underground).

8.2.2.8. **CSM**

The **COP** requires a **CSM** programme to be implemented where the risk assessment determines a significant risk.

The following points must be addressed in the **CSM** programme:

- a) Medical or physical examinations.
- b) Safe work practices and supervision (strategy for dealing with **cold environments**).
- c) Precautions to prevent cold stress e.g. **PPE**.
- d) Emergency work.

NOTE:

- Annexure 4: Cold stress management should be consulted when drawing up the **CSM** programme.

8.2.2.9. Medical surveillance programme

The **COP** must address the following points:

- 8.2.2.9.1. The medical surveillance programme as it relates to thermal stress must be described in the **COP** (see Annexure 6: Medical/physical examination).

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- 8.2.2.9.2. The method used to link the thermal stress exposure measurements to the employee's records of medical surveillance as required in terms of section 12(3) of the **MHSA**, must be described in the **COP**.

NOTE:

- A manual or computerised system could be utilised to link this information.
- These systems may have to be customised in accordance with the operations specific needs.
- Effective communication between the 12(1) appointee of the **MHSA** and the **OMP** is required to ensure that linking employees' exposure history and medical surveillance information is meaningful.

- 8.2.2.9.3. A procedure must be described in the **COP** on how the thermal stress medical surveillance (initial, periodic and exit examinations) will be conducted. The medical surveillance done must exclude the presence of any abnormality that may compromise physical work in **thermal environments**. This must include, but is not limited to, the following:

- a) The general medical examination:
- (i) History (occupational, medical, family and social) and thermal-related disorders (cramps, exhaustion, stroke and hypothermia) must be obtained.
 - (ii) Urinalysis must be done to exclude the presence of haematuria, proteinuria and glycosuria.
 - (iii) The examination must be done to exclude any presence of jaundice, anaemia, cyanosis, clubbing, oedema, abnormal lymph nodes and febrile disease.
 - (iv) The blood pressure must be checked and if uncontrolled hypertension (>160/95) and gross cardiovascular abnormalities are present, these require a full investigation and obtaining a specialist opinion regarding the fitness for physically demanding work in a **hot environment**.
 - (v) A skin examination must be done to determine that it is intact with no infections such as advanced athlete's foot, cellulitis, scabies, etc.
 - (vi) A cardio-respiratory examination including a chest x-ray and spirometry, must be done to exclude any abnormalities.
 - (vii) Ear, nose and throat examinations must be done to exclude inflammation or infection (tonsillitis, pharyngitis, chronic suppurative otitis media, etc.).
 - (viii) An abdominal examination must be performed to exclude the presence of organomegaly or hernias.
 - (ix) A screening neurological examination must be done to exclude

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any gross abnormalities.

b) Physical evaluation

The following physical evaluation must be performed to assess the medical and physical fitness of an individual to undergo **HTS** (see Annexure 6: Medical/physical examinations).

- (i) Age.
- (ii) General physical appearance.
- (iii) Body dimensions.

- 8.2.2.9.4. Methodological standards for test techniques forming part of medical surveillance.
- 8.2.2.9.5. The methodology used to comply with the legal requirements in respect of medical surveillance for thermal stress as contemplated in section 13(2) of the **MHSA**, must be described in the **COP**.
- 8.2.2.9.6. The employer must ensure that for routine work, the anticipated work environment takes into cognisance the categories A, B, C and D as referenced in section 8.2.3.3 above, Table 1: The classification system for heat stress and Table 2: The classification system for cold stress, to assist the **OMP** in making an informed decision in terms of fitness to work.
- 8.2.2.9.7. The **COP** must provide that the employer make the thermal environmental classification available to the **OMP** for medical surveillance.
- 8.2.2.9.8. Heat (heat cramps, heat exhaustion and heat stroke) and cold disorders (frostbite and hypothermia) can occur and do occur in **thermal environments**. Whenever such incidents occur, immediate and full investigations should take place with the primary purpose being to:
 - a) Prevent the recurrence of such incidents and by collating such data.
 - b) Provide input to **HSM** or **CSM** programme reviews (for clinical signs and symptoms of heat-related illnesses refer to Annexure 12: Addendum for the thermal stress guideline on the criteria for heat-related illnesses).
- 8.2.2.9.9. A procedure where work in **abnormally hot and cold environments** is to be undertaken must be developed. Any adverse consequences, as a result of such exposures, should be entered in the medical surveillance record of employees (see Annexure 11: Emergency work in **abnormally hot environments**).

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8.2.2.10. Fitness to perform work

The employer must develop and implement a **HTS** procedure to monitor employees, taking into consideration the following (see Annexure 7: Heat tolerance screening):

- a) Fitness of employees to work should be based on the individual's merits. If, however, an employee who has been working in a hot environment for years without any manifestation of heat related illness; fails **HTS**, further assessment should be done to exclude any other medical condition(s) that may render the employee unfit to work in a hot environment. Such an employee may not be declared medical incapacitated based on the failure of **HTS** only, but a holistic approach needs to be undertaken to determine fitness to continue with work in a hot environment. If, however, the same employee is transferred to a hotter environment a risk-based medical surveillance will be conducted.
- b) The medical and work history of the employee prior to finalising fitness to work in a hot environment.
- c) **HTS** failure does not automatically translate to incapacity or unfitness to work in a **hot environment** unless there is a proven underlying medical condition.

NOTE:

- While the **BMI** provides a better predictor of disease risk, the **OMP** should use professional discretion in determining employees' fitness to work in **hot environments** especially amongst employees who might be competitive athletes or body builders.

8.2.2.11. Immediate incident management

Whenever there is an unexplained incident of an employee collapsing whilst working in an **abnormally hot environment**, such incident should be treated as a possible case of heatstroke.

The core body temperature should be taken and there must be rapid cooling of the affected employee as suggested in Annexure 12: Addendum for the thermal stress guideline on the criteria for heat-related illnesses (heat exhaustion and heat stroke).

8.2.2.12. Reporting and recording

The **COP** must address the following:

- a) Reporting on a quarterly basis for all classifications, that is A, B and C (refer to Annexure 2: Mandatory occupational hygiene thermal stress reporting forms).
- b) A record keeping system, which records the exposure history of each **thermal environment** at the mine and any other thermal stress monitoring records e.g. calibration certificates, sampling sheets, etc. This should be kept and be readily available at the mine, including any reasons for deviation on sample results such as:

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

- (i) Controls not operating effectively.
- (ii) Events or factors which influenced the results, e.g. excessive wind speeds, etc.
- c) Occupational hygiene measurement records linked to the medical surveillance records, must be kept by the employer.
- d) Quarterly re-classification that must be conducted if results are proven and consistent.
- e) Any incident of unconsciousness and incapacitation from heatstroke or heat exhaustion must be reported to the **DMRE** as stated in chapter 23 of the **MHSA** regulations.

Historical data is to be maintained as provided for in section 15(2)(a) and (b) of the **MHSA**.

NOTE:

- For all categories A, B and C, the thermal stress measurement results must be reported within 60 days at the end of each quarter.
- For category D, no reporting is required; however, a portfolio of evidence should be kept at the mine.

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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).
- 1.2. Information may be graphically represented to facilitate easy interpretation of the data and to highlight trends for the purposes of risk assessment.

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 (describe the process).
- 3.2. The employer must ensure that a registered trade union with members at the mine or where there is no such union, a health and safety representative on the mine, or if there is no health and safety representative, an employee representing the employees on the mine, is 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.

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ANNEXURE 1: Mandatory codes list
(This annexure forms part of the guideline and must be complied with)

1. MAIN COMMODITY CODE LIST

The main commodities produced by the mines.

COMMODITY	CODE	COMMODITY	CODE
Asbestos	AS	Malmesbury Hornfels	MH
Attapulgit	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	FI	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		

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

NOTE:

- Where the above broad descriptions do not define an activity area exactly, select the "best fit".

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3. OCCUPATION CODE LIST

Alphabetical index of the occupational codes.

OCCUPATION	CODE
Acclimatisation supervisor	70301
Acclimatisation worker	70302
Accommodation worker (other accommodation) [n.e.c.]	80699
Accommodation worker (residential) [n.e.c.]	80599
Accountant [n.e.c.]	10206
Accounting / financial management	10200
Accounting / financial worker [n.e.c.]	10299
Acid plant official	30402
Acid plant worker	30404
Administration / secretarial management	10900
Administrative officer	10903
Administrative / financial management (multi-disciplinary)	10000
Administrative / financial management [n.e.c.]	10099
Administrative / financial / business worker [n.e.c.]	19999
Advocate / barrister	60601
Agricultural management (multi-disciplinary)	90000
Agricultural management [n.e.c.]	90099
Agricultural worker [n.e.c.]	99999
Air conditioning / refrigeration engineer	40412
Air conditioning / refrigeration mechanic	40413
Air transport management	81100
Air transport officer	81101
Air transport worker [n.e.c.]	81199
Air and water services team leader/supervisor	21507
Air and water services worker	21508
Airport controller	81102
Amalgamator	30110
Ambulance officer	70803
Anaesthetist	70101
Aptitude tester	60106
Aptitude testing supervisor	60105
Aqua-jet operator	21406
Architect	50901
Architectural assistant	50902
Architectural management	50900
Architectural worker [n.e.c.]	50999
Armature winder	40320
Assay / chemistry / laboratory worker [n.e.c.]	50499
Assay technician	50403
Assayer	50401
Assistant driller (ocean)	29909
Assessor	10511
Assopulp worker	35910
Attorney / solicitor / conveyancer	60602

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OCCUPATION	CODE
Audio visual tester	70303
Audiologist/speech therapist	70322
Audiometrist	70323
Auditing management	10100
Auditing worker [n.e.c.]	10199
Auditor (computer / systems)	10102
Auditor (internal and external)	10101
Auto electrician	40319
Backfill worker	20805
Baker	35020
Banking officer	11114
Banking / investment management	11100
Banking / investment worker [n.e.c.]	11199
Banksman / onsetter	21304
Bargemaster (ocean)	81202
Barber / hairdresser	80803
Barman	80706
Barrister / advocate	60601
Beer maker	35110
Beerhall supervisor	80705
Bell signaller	21305
Beltsman	30205
Bio-medical engineer	70304
Biokineticist	70102
Blacksmith	40422
Blacksmith: apprentice	40424
Blacksmith: chargehand	40421
Blacksmith: foreman	40420
Blacksmith: operative	40423
Blacksmith: worker [n.e.c.]	40425
Blaster (supervisory)	20306
Blaster: opencast / quarry (non-supervisory)	20502
Blaster: surface works (non-supervisory e.g. smelter)	20503
Blaster: underground metal (non-supervisory)	20501
Blasting worker [n.e.c.]	20599
Boiler attendant	40803
Boilermaker: operative (grade 1)	40450
Boilermaker: operative (aide) (grade 2)	40451
Book binder	36015
Bosun (ocean)	81202
Bookkeeper	10208
Box / orepass controller	21404
Brick maker	36710
Bricklayer	40614
Bricklayer: aide	40617
Builder	40615
Building service worker [n.e.c.]	80499
Building services management	80400

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Building worker [n.e.c.]	40618
Building worker: operative	40616
Business analyst (computers)	50503
Business management	10001
Butcher	35010
Buyer / purchaser	10312
Cable joiner	40343
Calcinating worker	30508
Canteen supervisor	80701
Canteen worker	80703
Caretaker / housekeeper	80501
Carpenter	40621
Carpenter and joiner	40622
Carpenter and joiner: apprentice	40623
Carpenter and joiner: chargehand	40620
Carpenter and joiner: foreman	40619
Carpenter: aide	40624
Carpenter: worker [n.e.c.]	40625
Cashier	10209
Caster	30507
Catering management	80700
Cementer (ocean)	21699
Catering worker [n.e.c.]	80799
Cementation driller / injector	21602
Cementation supervisor	21601
Cementation worker [n.e.c.]	21699
Chairlift operator	21307
Chairman (group)	00000
Change house team leader / supervisor	80604
Change house worker	80605
Checker	10395
Chef / cook	80702
Chemical engineer	40701
Chemical engineering management	40700
Chemical engineering worker [n.e.c.]	40799
Chemical process worker [n.e.c.]	30499
Chemist	50402
Chemist technician	50404
Chief executive	00000
Child minder	80802
Chiropodist / podiatrist	70320
Cinema / video operator	60805
Civil engineer	40601
Civil engineering management	40600
Civil engineering technician	40610
Civil engineering worker [n.e.c.]	40699
Civil / building chargehand (other) [n.e.c.]	40651
Civil / building foreman (other) [n.e.c.]	40650

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Civil / building tradesman (other) [n.e.c.]	40652
Cleaner (office) / tea maker	80402
Clerk of works	40611
Clerk (accounts / finance)	10295
Clerk (agriculture) [n.e.c.]	99995
Clerk (air transport)	81195
Clerk (architectural)	50995
Clerk (auditing)	10195
Clerk (banking / investment)	11195
Clerk (catering)	80795
Clerk (club)	80695
Clerk (creative arts)	60995
Clerk (economics)	10795
Clerk (engineering planning)	40195
Clerk (engineering)	49995
Clerk (environmental)	51095
Clerk (estate / township)	80395
Clerk (first aid)	70895
Clerk (general e.g. filing) [n.e.c.]	10995
Clerk (geology)	50195
Clerk (hostel / quarters)	80595
Clerk (industrial engineering)	50795
Clerk (industrial relations)	60295
Clerk (insurance)	10595
Clerk (legal)	60695
Clerk (library)	60795
Clerk (marketing / sales)	10895
Clerk (medical)	79995
Clerk (metallurgical plant)	39995
Clerk (mining planning)	20195
Clerk (mining) [n.e.c.]	29995
Clerk (payroll / timekeeping)	10495
Clerk (personnel)	60195
Clerk (printing)	36095
Clerk (property / mining rights)	10695
Clerk (public relations)	60895
Clerk (rail transport)	81095
Clerk (road transport)	80995
Clerk (rock mechanics)	50395
Clerk (safety / loss control)	50895
Clerk (school)	60495
Clerk (security)	80195
Clerk (sports / recreation)	61095
Clerk (statistics)	50695
Clerk (stores)	10395
Clerk (strategic planning)	00295
Clerk (survey)	50295
Clerk (tax)	11295

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Clerk (training)	60395
Clerk (welfare)	60595
Clinical assistant	70202
Club management	80600
Club secretary	80601
Club team leader	80602
Club worker	80603
Coal auger operator	20604
Coal cutter operator	20601
Coal plough operator	20605
Coal preparation worker	30211
Coking plant attendant	30509
Collator	36014
Commissionaire (offices)	80401
Commissionaire (residential accommodation)	80502
Company secretary (administrative)	10900
Compressor attendant	40804
Computer operator	50508
Computer programmer	50505
Concentration / flotation worker [n.e.c.]	30399
Consultant (administrative / financial) [n.e.c.]	19996
Consultant (agriculture) [n.e.c.]	99996
Consultant (engineering) [n.e.c.]	49996
Consultant (general management) [n.e.c.]	09996
Consultant (humanities) [n.e.c.]	69996
Consultant (medical) [n.e.c.]	79996
Consultant (metallurgy / beneficiation / manufacturing) [n.e.c.]	39996
Consultant (mining production) [n.e.c.]	29996
Consultant (scientific / technical) [n.e.c.]	59996
Consultant (service occupation) [n.e.c.]	89996
Consultant (tax)	11296
Consulting engineer (engineering support)	40000
Consulting engineer (mining)	20000
Consulting metallurgist	30003
Continuous miner driver	20602
Contractor (outside)	49902
Control room operator	30202
Conveyancer / attorney / solicitor	60602
Conveyer worker [n.e.c.]	20299
Conveyer belt attendant	21202
Conveyer belt team leader / supervisor	21201
Cook / chef	80702
Corporate secretary (administration)	10901
Cost accountant	10205
Cost controller	10205
Crane driver	81301
Crane driver trainer	81398
Creative worker [n.e.c.]	60999

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Credit controller	10207
Critical path scheduler	20103
Crop worker	90499
Crossing attendant	81009
Crusher attendant	30207
Cupola man	30505
Cutter	49903
Cyanidation team leader / supervisor	30403
Cyanidation worker	30405
Data base administrator	50513
Data base technician	50514
Data capture supervisor	50510
Data capture typist	50511
Day pusher (ocean)	29908
Deck attendant (ocean)	29910
Deck leader (ocean)	20313
Data controller (computers)	50509
Dental assistant	70504
Dental mechanic	70503
Dental specialist (e.g. oral pathologist) [n.e.c.]	70499
Dental surgeon / dentist	70401
Dental therapist	70502
Dental worker [n.e.c.]	70599
Dermatologist	70103
Designer (engineering)	40102
Detective	80104
Developer	20303
Development management (hardware)	50501
Development management (software)	50502
Development team leader / supervisor	20310
Development team worker	20701
Diamond drill team leader / supervisor	50111
Diamond drill worker	50112
Diamond driller	50110
Diecaster	40501
Diesel mechanic	40477
Diesel mechanic: apprentice	40478
Diesel mechanic: chargehand	40476
Diesel mechanic: foreman	40475
Dietician	70305
Diplomatic / political liaison officer	60802
Diver (ocean)	29911
Disinfestation worker	40905
Dog handler	80105
Domestic servant	80801
Dragline operator	21102
Dragline supervisor	21101
Drains cleaner	29906

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Draughting technician	49994
Draughtsperson (architectural)	50994
Draughtsperson (chemical engineering)	40794
Draughtsperson (civil engineering)	40694
Draughtsperson (electrical engineering)	40394
Draughtsperson (geological)	50194
Draughtsperson (mechanical engineering)	40594
Draughtsperson (mining production) [n.e.c.]	29994
Draughtsperson [n.e.c.]	49994
Draughtsperson (survey)	50294
Draughtsperson (technical services)	59994
Drill rig operator (jumbo)	20401
Drill sharpener	40528
Driller: hand percussion / jackhammer	20402
Driller: hand (coal)	20403
Driller: opencast / large diameter	20404
Drilling worker [n.e.c.]	20499
Drillsmith	40527
Driver: ambulance (code 08)	80908
Driver: bulldozer	21103
Driver: forklift	80905
Driver: haul truck (underground and opencast)	21109
Driver: heavy articulated motor vehicle (code 13)	80911
Driver: heavy motor vehicle (e.g. bus / ambulance code 10)	80909
Driver: light motor vehicle /car (code 08)	80907
Driver: mobile industrial / agricultural equipment (code 07)	80906
Driver: motorcycle (code 01-04)	80903
Driver: tractor (code 05)	80904
Driving instructor	80998
Dryerman	30406
Dump team leader / supervisor	30702
Dump worker	30703
Dumpsman	30701
Duplicator	10907
Ear, nose and throat specialist	70104
Economics assistant	10703
Economics management	10700
Economics worker [n.e.c.]	10799
Economist [n.e.c.]	10702
Economy controller	10205
Editor	60901
Educational management	60400
Educational / school worker [n.e.c.]	60499
EEG technician	70306
Electrical chargehand (other) [n.e.c.]	40341
Electrical engineer	40301
Electrical engineering management	40300
Electrical engineering worker [n.e.c.]	40399

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Electrical foreman (other) [n.e.c.]	40340
Electrical technician	40310
Electrical tradesman (other) [n.e.c.]	40342
Electrician	40314
Electrician: aide	40317
Electrician: apprentice	40315
Electrician: chargehand	40313
Electrician: foreman	40312
Electrician: underground section	40316
Electrician: worker [n.e.c.]	40318
Electricity generator worker	40802
Electro mechanic / millwright / minewright	40437
Electronic technician	40311
Employee assistance programme management	60500
Encoder	19910
Energy systems management	40800
Energy systems officer	40805
Energy systems team leader / supervisor	40801
Energy systems worker [n.e.c.]	40899
Engineer [n.e.c.]	40201
Engineering assistant [n.e.c.]	40205
Engineering foreman [n.e.c.]	40004
Engineering inspector	40202
Engineering management (multi-disciplinary)	40001
Engineering management [n.e.c.]	40099
Engineering team leader [n.e.c.]	49901
Engineering technical worker [n.e.c.]	40299
Engineering technician [n.e.c.]	40203
Entertainer	60905
Environmental assistant	51004
Environmental construction supervisor	51007
Environmental construction worker	51008
Environmental engineer	51001
Environmental engineering management	51000
Environmental observer	51005
Environmental officer	51003
Environmental superintendent	51002
Environmental worker [n.e.c.]	51099
Equipper	21504
Estate / township management	80300
Estate / township officer	80301
Estate / township team leader / supervisor	80302
Estate / township worker [n.e.c.]	80399
Estimator / calculator	40104
Executive director [n.e.c.]	00000
Explosives issuer	10317
Facilities management (computers)	50506
Fan attendant	40344

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OCCUPATION	CODE
Farm manager	90001
Filing / records officer	10904
Filter operator / worker	30302
Filter team leader / supervisor	30301
Financial accountant	10204
Financial analyst	10201
Financial economist	10701
Financial engineer	10202
Financial/accounting management	10200
Financial/admin management (multi-disciplinary)	10000
Firefighting/rescue officer	80202
Firefighting/rescue team leader/supervisor	80203
Firefighting/rescue trainer	80298
Firefighting/rescue worker [n.e.c.]	80299
Fireman / stoker	81005
Firemaster	80201
First aid attendant	70802
First aid management / medical station superintendent	70800
First aid team leader / supervisor	70801
First aid trainer	70898
First aid training superintendent	70898
First aid worker [n.e.c.]	70899
Fitter and turner	40428
Fitter and turner: apprentice	40429
Fitter and turner: chargehand	40427
Fitter and turner: foreman	40426
Fitter (including machining): apprentice	40433
Fitter (including machining)	40432
Fitter (including machining): chargehand	40431
Fitter (including machining): foreman	40430
Fitter: operative (grade 1)	40434
Fitter: operative aide (grade 2)	40435
Fitter: worker [n.e.c.]	40436
Forester	90301
Forestry engineer	90300
Forestry worker	90399
Forger	40502
Founder	40505
Furnace worker [n.e.c.]	30599
Game ranger	90501
Ganger / plate / tracklayer (main line)	40656
Garage mechanic: aide	40480
Garage serviceman	40481
Garage worker [n.e.c.]	40482
Garden supervisor / groundsman	90102
Garden worker	90199
General engineering supervisor	40002
General engineering worker [n.e.c.]	49999

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
General management [n.e.c.]	00199
General manager (company)	00102
General manager (mine)	00101
General miner	20305
General practitioner	70201
Geochemist	50103
Geological management	50100
Geological observer / field assistant	50109
Geological worker [n.e.c.]	50199
Geologist	50101
Geology technician	50108
Geophysicist	50102
Grab operator	21401
Grade officer	50408
Graphic artist	60904
Grinderman / pulveriser	30210
Groundsman / garden supervisor	90102
Guest house / quarters management	80500
Guillotine operator	36013
Gynaecologist	70105
Hairdresser / barber	80803
Handyman (maintenance)	40654
Handyman (mining)	21504
Haulage team leader/supervisor	21001
Haulage / underground rail transport worker [n.e.c.]	21099
Health / food inspector	70307
Herdsman / stable hand	90502
Hoist driver	21302
Hoisting worker [n.e.c.]	21399
Horticulturist	90101
Hospital cleaner	79901
Hospital secretary	10902
Hospital superintendent	70002
Hospital worker / orderly	70324
Hostel management	80505
Hostel official	80506
Hostel team leader / supervisor	80507
Housekeeper / caretaker	80501
Humanities management (multi-disciplinary)	60000
Humanities management [n.e.c.]	60099
Humanities worker [n.e.c.]	69999
Hydraulic prop team leader / supervisor	20801
Hydraulic prop worker	20802
Hydraulic technician	40411
Hygiene services worker [n.e.c.]	40999
Induna / tribal representative	60203
Industrial engineer	50701
Industrial engineering management	50700

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Industrial engineering officer	50704
Industrial engineering technician	50702
Industrial engineering worker [n.e.c.]	50799
Industrial physician	70106
Industrial relations assistant	60202
Industrial relations management	60200
Industrial relations practitioner	60201
Industrial relations worker [n.e.c.]	60299
Info services / computer worker [n.e.c.]	50599
Information centre management (computers)	50516
Information services management	50500
Instrument engineer	40321
Instrument mechanic (industrial)	40325
Instrument mechanic apprentice (industrial)	40326
Instrument mechanic chargehand (industrial)	40324
Instrument mechanic foreman (industrial)	40323
Instrument technician	40322
Insurance adviser	10596
Insurance management	10500
Insurance worker [n.e.c.]	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 [n.e.c.]	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 [n.e.c.]	29905
Laundry supervisor	80503
Laundry worker	80504
Leaching worker	30407

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Learner miner	20309
Learner official (assay / chemistry)	50409
Learner official (electrical engineering)	40303
Learner official (engineering) [n.e.c.]	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 [n.e.c.]	60699
Librarian	60701
Library assistant	60702
Library management	60700
Library worker [n.e.c.]	60799
Lift operator	21306
Liquor outlet supervisor	80705
Lithographer	36010
Livestock worker [n.e.c.]	90599
Load haul dump driver	21106
Loader driver (rail)	21004
Loader driver (trackless)	21104
Loco driver (main line - SPOORNET)	81003
Loco driver (not main line)	81004
Loco driver (underground)	21002
Loco guard (underground)	21003
Longwall sheerer operator	20603
Magazine master	10317
Magnetometer specialist	50106
Maintenance supervisor	40653
Management accountant	10203
Marketing assistant	10812
Marketing officer	10810
Marketing and sales management	10800
Marketing / sales worker [n.e.c.]	10899
Mason	40626
Mason aide	40627
Masseur / masseuse	70308
Matron / nursing services management	70600
Mechanic (ocean)	40414
Maxillo-facial and oral surgeon	70402
Mechanical charge hand	40521
Mechanical engineer	40401
Mechanical engineering management	40400
Mechanical engineering worker [n.e.c.]	40599
Mechanical foreman (other) [n.e.c.]	40520
Mechanical rockbreaking worker [n.e.c.]	20699

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Mechanical technician	40410
Mechanical tradesman (other) [n.e.c.]	40522
Media technician	60908
Medical advisor	70001
Medical labourer	79901
Medical officer	70201
Medical orthoptist / prosthetist	70309
Medical physicist	70310
Medical specialist [n.e.c.]	70199
Medical station superintendent/first aid management	70800
Medical technician	70311
Medical technologist	70312
Medical worker [n.e.c.]	79999
Medical / health care management (multi-disciplinary)	70000
Medical / health care management [n.e.c.]	70099
Meshing and lacing team leader / supervisor	20803
Meshing and lacing worker	20804
Messenger / postal worker	11010
Metallurgical official [n.e.c.]	30103
Metallurgical worker [n.e.c.]	30199
Metallurgical / plant management	30000
Metallurgical / plant superintendent	30001
Metallurgical / plant supervisor	30002
Metallurgist	30101
Metallurgy technician (extractive)	30102
Microscopist	51006
Milling worker	30208
Millwright / electro mechanic / minewright	40437
Mine construction team leader / supervisor [n.e.c.]	21510
Mine construction worker [n.e.c.]	21599
Mine manager	00101
Mine overseer	20002
Mine planning / valuation engineer	20101
Mine police / security guard	80103
Mine production management [n.e.c.]	20099
Mine production supervisor [n.e.c.]	20399
Mine production worker [n.e.c.]	29999
Mine secretary (administration)	10900
Mine transport worker [n.e.c.]	21499
Miner (general)	20305
Mineralogist	50104
Miner's assistant (cheesa)	20504
Mining engineer [n.e.c.]	20201
Mining technical worker [n.e.c.]	20299
Mining technician [n.e.c.]	20210
Mixed farming worker [n.e.c.]	90699
Model maker	40103
Model maker (survey)	50205

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Money market dealer	11113
Monorail winch operator	21308
Monorope winch operator	21309
Motorman (ocean)	40543
Mortuary attendant	70313
Motor mechanic	40473
Motor mechanic apprentice	40474
Motor mechanic chargehand	40472
Motor mechanic foreman	40471
Motor / diesel mechanic operative	40479
Moulder	40504
Multi task worker (underground production)	20704
Multi task worker (opencast production)	20705
Musician	60905
Network technician (computers)	50515
Neurologist	70108
Night pusher (ocean)	29908
Neurosurgeon	70109
Night shift cleaner	20308
Nurse (charge / senior sister)	70601
Nurse (enrolled / staff)	70603
Nurse (registered all categories) [n.e.c.]	70602
Nursing assistant	70604
Nursing instructor	70698
Nursing services management/matron	70600
Nursing worker [n.e.c.]	70699
Occupational therapist	70314
Occupational health physician	70120
Occupational hygienist	70121
Offshore installation manager (ocean)	00101
Onsetter / banksman	21304
Operations research officer	50703
Operations / network operator (computers)	50507
Ophthalmologist	70110
Optical dispenser	70316
Optician / optometrist	70315
Oral hygienist	70501
Orderly / hospital worker	70324
Orepass / box controller	21404
Orthodontist	70403
Orthopaedic surgeon	70111
Orthoptist	70317
Paediatrician	70113
Painter and decorator / maintenance hand	40637
Painter and decorator (worker) [n.e.c.]	40638
Panel beater	40470
Paper maker	35911
Paper manufacturing management	35900

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Paper tester	35912
Pathologist (medical)	70112
Patternmaker	40503
Paver	40629
Paymaster	10404
Payroll administrator	10402
Payroll controller	10401
Payroll management	10400
Payroll worker [n.e.c.]	10499
PC programmer / product specialist	50517
Performing artist	60905
Periodontist	70404
Personal assistant / secretary	10905
Personal care worker [n.e.c.]	80899
Personnel assistant / masiza	60102
Personnel management	60100
Personnel officer / practitioner	60101
Personnel worker [n.e.c.]	60199
Pharmaceutical worker [n.e.c.]	70799
Pharmacist	70701
Photographer	60906
Physiologist	70318
Physiotherapist	70319
Pilot (aircraft)	81103
Pipes and tracks team leader / supervisor	21505
Pipes and tracks worker	21506
Pit worker	20703
Planned maintenance foreman	40003
Planning management (engineering)	40100
Planning management (mining)	20100
Planning observer	20104
Planning officer	20102
Planning officer (engineering)	40101
Planning worker (engineering) [n.e.c.]	40199
Planning worker (mining) [n.e.c.]	20199
Plant team leader / supervisor	30204
Plant worker [n.e.c.]	30299
Plant / reduction official	30201
Plasterer	40628
Plastic surgeon	70114
Plater	40448
Plater / boilermaker	40447
Plater / boilermaker apprentice	40449
Plater / boilermaker chargehand	40446
Plater / boilermaker foreman	40445
Plater / boilermaker worker [n.e.c.]	40452
Plater / welder	40455
Plater / welder apprentice	40457

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Plater / welder chargehand	40454
Plater / welder foreman	40453
Plater / welder worker [n.e.c.]	40458
Plate / track layer/ganger (main line)	40656
Play school supervisor	60404
Plumber	40632
Plumber aide	40635
Plumber apprentice	40633
Plumber chargehand	40631
Plumber foreman	40630
Plumber operative	40634
Plumber worker [n.e.c.]	40636
Podiatrist/chiropractist	70320
Pool gang worker	09801
Postal worker / messenger	11010
Power hammer operator	40530
Press operator	40529
Pre-primary school assistant	60405
Printer [n.e.c.]	36011
Printing machine operator	36012
Printing management	36000
Printing supervisor	36001
Printing worker [n.e.c.]	36099
Process controller	30203
Producer / director (creative arts)	60900
Production / section / underground manager	20001
Productivity officer	50705
Project manager (administration / financial) [n.e.c.]	19992
Project manager / officer (agriculture) [n.e.c.]	99992
Project manager / officer (engineering) [n.e.c.]	49992
Project manager / officer (general management) [n.e.c.]	09992
Project manager / officer (humanities) [n.e.c.]	69992
Project manager/officer (medical/health) [n.e.c.]	79992
Project manager/officer (mining) [n.e.c.]	29992
Project manager / officer (reduction / beneficiation / manufacturing)	39992
Project manager / officer (scientific / technical) [n.e.c.]	59992
Project manager / officer (services) [n.e.c.]	89992
Property broker	10601
Property / mining rights management	10600
Property / mining rights officer	10602
Property / mining rights worker [n.e.c.]	10699
Prospector	50107
Prosthetist / Orthotist	70309
Prosthodontist	70405
Psychiatrist	70115
Psychologist (clinical)	60501
Psychologist (industrial)	60104
Public relations assistant	60803

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Public relations management	60800
Public relations officer	60801
Public relations worker [n.e.c.]	60899
Pulveriser / grinderman	30210
Pump team leader / supervisor	40531
Pump worker	40532
Pupil metallurgist	30104
Purchaser / buyer	10312
Purchasing / stores management	10300
Quantity surveyor	40613
Quarryman	20307
Radio / medic (ocean)	79999
Radio mechanician	40327
Radio operator	11012
Radiographer	70321
Radiologist	70116
Rail transport management	81000
Rail transport officer	81001
Rail transport team leader	81002
Rail transport worker [n.e.c.]	81099
Raise / tunnel borer operator	20607
Raise / tunnel borer supervisor	20606
Receiver (stores)	10313
Receptionist/typist/word processor operator	10906
Records / filing officer	10904
Reduction / beneficiation / manufacturing management [n.e.c.]	30099
Reduction / beneficiation / manufacturing worker [n.e.c.]	39999
Reduction / plant official	30201
Reeler	21403
Refiner	30601
Refining worker [n.e.c.]	30699
Refrigeration plant operator	40415
Refrigeration plant team leader / supervisor	40414
Refrigeration / air conditioning engineer	40412
Refrigeration / air conditioning mechanic	40413
Refuse collector	40906
Registrar (medical)	70202
Rescue training service management	80200
Rescue / firefighting officer	80202
Rescue / firefighting team leader/supervisor	80203
Rescue / firefighting trainer	80298
Rescue / firefighting worker [n.e.c.]	80299
Researcher (agriculture) [n.e.c.]	99997
Researcher (engineering) [n.e.c.]	49997
Researcher (general management) [n.e.c.]	09997
Researcher (humanities) [n.e.c.]	69997
Researcher (medical) [n.e.c.]	79997
Researcher (metallurgy / beneficiation / manufacturing) [n.e.c.]	39997

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Researcher (mining production) [n.e.c.]	29997
Researcher (rock mechanics)	50397
Researcher (scientific / technical) [n.e.c.]	59997
Researcher (service occupation) [n.e.c.]	89997
Rigger and ropeman	40508
Rigger and ropeman apprentice	40509
Rigger and ropeman chargehand	40507
Rigger and ropeman foreman	40506
Rigger and ropeman worker [n.e.c.]	40511
Rigger aide	40510
Road builder	40655
Road transport management	80900
Road transport officer	80901
Road transport team leader	80902
Road transport worker [n.e.c.]	80999
Rock breaking worker [n.e.c.]	20799
Rock mechanics engineer	50301
Rock mechanics management	50300
Rock mechanics officer	50302
Rock mechanics worker [n.e.c.]	50399
Rock support worker [n.e.c.]	20899
Roof bolt machine operator	20806
Roof bolt worker	20807
Roughneck (ocean)	29909
Roustabout (ocean)	81201
Rubber reliner	40523
Safety / loss control auditor	50802
Safety / loss control management	50800
Safety / loss control observer assistant	50803
Safety / loss control officer	50801
Safety / loss control worker [n.e.c.]	50899
Sales representative	10811
Salvage yard aide	10319
Salvage and reclamation worker (surface)	10320
Salvage and reclamation worker (underground)	29907
Sample worker	50204
Sampler	50203
Sanitation worker	40904
Saw doctor	40540
Saw sharpener	40542
Sawmill mechanic	40541
Sawyer	35710
School principal	60401
Scientific / technical management (multi-disciplinary)	50000
Scientific / technical management [n.e.c.]	50099
Scientific / technical worker [n.e.c.]	59999
Scraper winch bell operator	20902
Scraper winch driver	20901

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Scraping worker [n.e.c.]	20999
Screensman	30209
Sea transport worker [n.e.c.]	81299
Secretarial / administrative worker [n.e.c.]	10999
Secretarial / administration management	10900
Secretary / personal assistant	10905
Section leader	29901
Section / production/underground manager	20001
Securities officer	11112
Security guard / mine police	80103
Security inspector / officer	80101
Security management	80100
Security supervisor (e.g. sergeant)	80102
Security worker [n.e.c.]	80199
Sedimentologist	50105
Seismic network technician	50306
Seismologist	50305
Self-propelled machine driver [n.e.c.]	21107
Service worker [n.e.c.]	89999
Services management (multi-disciplinary)	80000
Services management [n.e.c.]	80099
Sewage plant operator	40903
Shaft foreman	20301
Shaft sinker	21501
Shaft timberman worker	21503
Shaft timberman/timberman	21502
Shakerhand (ocean)	29909
Share transfer officer	11111
Sheetmetal worker	40459
Shift boss	20302
Shot blast operator	40526
Shotcrete worker	20804
Shovel operator	21105
Shunter	81007
Shuttlecar driver	21108
Signaller	81008
Signwriter	40639
Skipman	21303
Slimes dam team leader / supervisor	30704
Slimes dam worker	30705
Slimes dam / dump worker [n.e.c.]	30799
Smelter	30501
Smelter team leader/supervisor	30502
Smelter worker	30503
Social worker	60502
Solicitor/attorney/conveyancer	60602
Sorter	30206
Spannerman / driller's assistant	20405

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Spectrographer	50407
Speech therapist/audiologist	70322
Sports worker [n.e.c.]	61099
Sports / recreation assistant	61002
Sports / recreation management	61000
Sports / recreation officer	61001
Stable hand / herdsman	90502
Stacker operator	21402
Stage worker	21509
Standards officer	10311
Statistical officer	50602
Statistical worker [n.e.c.]	50699
Statistician	50601
Statistics management	50600
Stevedore	81201
Stockbroker	11110
Stoker / fireman	81005
Stone packer	29904
Stope team leader / supervisor	20311
Stope team worker	20702
Stoper	20304
Storekeeper	10314
Stores controller	10310
Stores issuer (non-explosive)	10316
Stores receiver	10313
Stores worker [n.e.c.]	10399
Stores / purchasing management	10300
Strata control observer	50304
Strata control officer	50303
Strategic planning analyst	00201
Strategic planning management	00200
Strategic planning worker [n.e.c.]	00299
Stripper operator	30408
Student (administrative / financial) [n.e.c.]	19993
Student (agriculture) [n.e.c.]	99993
Student (engineering) [n.e.c.]	49993
Student (geology)	50193
Student (humanities) [n.e.c.]	69993
Student (medical)	79993
Student (metallurgy / beneficiation / manufacturing) [n.e.c.]	39993
Student (mining production) [n.e.c.]	29993
Student (scientific / technical) [n.e.c.]	59993
Student (service occupation) [n.e.c.]	89993
Supervisor's assistant (underground)	29902
Supplementary medical worker [n.e.c.]	70399
Surgeon (general)	70117
Survey management	50200
Survey worker [n.e.c.]	50299

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Surveyor (land)	50201
Surveyor (mine)	50202
Sweeper / vamber	29903
Systems accountant	10203
Systems analyst	50504
Systems/network programmer	50512
Tailor	34510
Tea maker / office cleaner	80402
Teacher (nursery education)	60404
Teacher (primary education)	60403
Teacher (secondary education)	60402
Team leader / supervisor (other mining production work)	20312
Technical assistant engineering [n.e.c.]	40204
Technical assistant mining [n.e.c.]	20211
Technical services management	50001
Technical services department (TSD) officer [n.e.c.]	59901
Telecommunications worker [n.e.c.]	11099
Telephonist	11011
Television cameraman	60907
Thoracic surgeon	70118
Timber, pulp and paper worker [n.e.c.]	35999
Timekeeper	10403
Tip team leader / supervisor	21405
Tip worker	21406
Toolmaker	40512
Toolpusher (ocean)	20312
Tour guide	60804
Town planner	40612
Tracer [n.e.c.]	49994
Trackless machine team leader / supervisor	21101
Trackless machine trainer (e.g. dragline)	21198
Trackless machine worker [n.e.c.]	21199
Track/plate layer / ganger (main line)	40656
Train guard	81006
Trainer (administrative / financial) [n.e.c.]	19998
Trainer (agriculture) [n.e.c.]	99998
Trainer (chemical engineering)	40798
Trainer (civil engineering)	40698
Trainer (computers)	50598
Trainer (crane driving)	81398
Trainer (electrical engineering)	40398
Trainer (firefighting / rescue)	80298
Trainer (first aid)	70898
Trainer (general engineering) [n.e.c.]	49998
Trainer (general management) [n.e.c.]	09998
Trainer (humanities) [n.e.c.]	69998
Trainer (mechanical engineering)	40598
Trainer (medical) [n.e.c.]	79998

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

OCCUPATION	CODE
Trainer (metallurgy / beneficiation / manufacturing) [n.e.c.]	39998
Trainer (mining production) [n.e.c.]	29998
Trainer (nursing)	70698
Trainer (road driving)	80998
Trainer (safety / loss control)	50898
Trainer (scientific / technical) [n.e.c.]	59998
Trainer (security)	80198
Trainer (service occupation) [n.e.c.]	89998
Trainer / instructor [n.e.c.]	60398
Training assistant	60302
Training management	60300
Training officer [n.e.c.]	60301
Training worker [n.e.c.]	60399
Translator	60903
Transport worker [n.e.c.]	81399
Tribal representative/induna	60203
Typist / word processor operator / receptionist	10906
Unclassified occupation (unknown / no specific skill)	09999
Typist / word processor operator / receptionist	10906
Underground / production/section manager	20001
Uranium plant official	30401
Urologist	70119
User support (computers)	50518
Valuator	10510
Waiter / waitress	80704
Water, effluent and sanitation management	40900
Water, effluent and sanitation officer	40907
Water, effluent and sanitation team leader / supervisor	40901
Water treatment operator	40902
Weighbridge attendant	10395
Welder	40456
Welfare assistant	60504
Welfare officer	60503
Welfare worker [n.e.c.]	60599
Winch operator \ driver	40526
Winch transporter team leader	40525
Winch transporter / erector	40524
Winding engine driver (licensed)	21301
Wireline operators (ocean)	20406
Word processor operator / typist / receptionist	10906
Work study observer/assistant	50707
Work study officer	50706
Wrapper	35913
Writer / journalist	60902
Yard supervisor	10318
Yard worker [n.e.c.]	10321

* [n.e.c.] is used to indicate 'not elsewhere classified'

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

ANNEXURE 2: Mandatory occupational hygiene thermal stress reporting forms**HEAT STRESS EXPOSURE REPORT FORM 21.9(2)(C)**

Main commodity code:		Surface		Underground		DMRE mine code:	
Sampling/measurement area:		<input type="checkbox"/>		<input type="checkbox"/>		Sub-mine code:	
Activity area:		Activity area name:		Activity area code:		Reporting period:	
		Q1		Q2		Q3	
Heat environment classification: (based on the 90 th percentile of the most significant parameter)						Start: End:	

THERMAL: HEAT ENVIRONMENT			Parameter	Number of measurements taken per parameter	Mean dose allocated to medical records (for each parameter)	90 th percentile of each parameter (for heat environment classification)	Occupational exposure limit/Standard (for each parameter)	Significant parameter used for classification (tick relevant parameter)
Occupation codes	Occupation descriptions	Number of persons per occupation						
			Wet bulb (WB) °C					
			Dry bulb (DB) °C					
			Globe (GT) °C					
			WBGT index					
COMMENTS ON:								
Reasons for over-exposures								
Corrective measures that will be implemented to prevent/mitigate over-exposure								

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

COLD STRESS EXPOSURE REPORT FORM 21.9(2)(D)

Main commodity code:			
Sampling/measurement area:	Surface <input type="checkbox"/>	Underground <input type="checkbox"/>	
Activity area:	Activity area name:		
	Activity area code:		
	Q1	Q2	Q3 Q4
Cold environmental classification: (based on 10 th percentile of the most significant param)			

DMRE mine code:	
Sub-mine code:	
Reporting period:	
Start:	End:

THERMAL: COLD ENVIRONMENT				10 th percentile cold environment classification	Mean dose allocated to medical records	Occupational exposure limit
Occupation codes	Occupation descriptions	Number of persons per occupation	Cold stress parameter	Number of measurements taken		
			Wind chill equivalent temperature °C			
COMMENTS ON:						
Reasons for over-exposures						
Corrective measures that will be implemented to prevent/mitigate over-exposure						

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

ANNEXURE 3: Radiant temperature
(For information only)**1. RADIANT TEMPERATURE**

Radiation is the electromagnetic transfer of heat energy without direct contact. **Radiant heating** from the sun provides the best illustration. Despite the vacuum of space, sunlight strikes the surface of the earth and is both absorbed and reflected, producing heat. Workers in **hot environments** exposed to high radiant loads will benefit from shielding. This, of course, explains the appeal of shade to those labouring in the sun. It is important to recognise that all objects radiate to other objects, thus the total thermal radiation to which a worker is exposed is the sum of all direct and indirect (reflected) radiation, minus the worker's radiation to cooler objects. For simplicity, when the radiant temperature is above about 35°C (a common skin temperature during work in **hot environments**), the body will gain heat, whereas below 35°C, the body loses heat through radiation.

Where **radiant heat** poses a potential problem, assessments must be conducted by means of a globe thermometer. Temperatures in excess of 37°C should be regarded as an upper limit for sustained physical work and engineering controls must be invoked at this stage. Examples of how to control **radiant heat** include:

- **Radiant heat** shielding.
- Reduction of the temperature of the primary radiating surfaces.
- Protective garments.
- General design features.

For most people the pain threshold for an elevated skin temperature is 45°C.

Finally, while most heat stress indices embrace radiant temperature, such indices must not be implemented unless under the direction of a recognised and experienced occupational hygienist.

1.1. WBGT

The **WBGT index** requires knowledge of the natural **WB** (t_{nwb}), the **GT** (t_g), and the **DB** air temperature (t_a). The **WBGT** is calculated for indoor exposure, or for outdoor exposure, with no solar or **radiant heat** source.

For exposure without a **radiant heat** source:

$$\text{WBGT} = 0.7t_{nwb} + 0.3t_g$$

For exposure with a **radiant heat** source:

$$\text{WBGT} = 0.7t_{nwb} + 0.2t_g + 0.1t_a$$

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OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

1.2. Calculating the **WBGT**

Where the employee is continuously exposed to a **hot environment**, the environmental heat exposure is considered as a series of hourly time-weighted averages. Where the employee's exposure is intermittent (interrupted at least each 15 minutes by breaks spent in cool areas), the time weighting should be performance for periods of two hours.

For jobs in which heat exposure and effort are intermittent, the time-weighted average must be derived by recording the time spent at each task including rest periods and the corresponding times spent in hot locations and in cooler locations during recovery.

The two-hour time-weighted average is calculated by the following equation:

$$\text{Average WBGT} = \frac{(\text{WBGT}_1) \times (T_1) + (\text{WBGT}_2) \times (T_2) + \dots + (\text{WBGT}_n) \times (T_n)}{(T_1) + (T_2) + \dots + (T_n)}$$

In the above equation, **WBGT₁**, **WBGT₂** and **WBGT_n** are measured values of **WBGT** for the various work and rest intervals during the total time period. **T₁**, **T₂** and **T_n**, is the duration of the respective intervals in minutes.

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ANNEXURE 4: Cold stress management
(For information only, abstract from **ACGIH** booklet)

Definitions and acronyms

- *Frostbite* means the actual freezing of tissue. Any exposed skin is subject to frostbite when the air temperature is below zero or when wind speeds are high. Frostbite can lead to scarring, tissue damage and possible amputation and may cause permanent disability. Symptoms of frostbite vary from swelling of the skin accompanied by slight pain in mild cases to tissue damage without pain or with burning pain, or prickling in severe cases. Frostbitten skin is subject to infection and therefore must not be treated lightly. The affected area should be warmed slowly to normal temperatures. Medical attention should be received for severe cases.
- *Hypothermia* means when the deep body or “core” temperature drops below 35°C. At this point the body loses its ability to prevent heat loss. The onset of hypothermia is a gradual process. Initially the victim has a sensation of cold, followed by pain. As exposure time or cold increase, the sensation of pain is reduced and overall numbness develops. Additional symptoms include a decrease or absence of shivering, reduced memory and confusion, drowsiness, slurred speech, irritability, impaired co-ordination, dexterity and general muscular weakness. Hypothermia is a serious condition and can lead to a coma and death if not treated quickly. Victims with mild hypothermia should be rewarmed in a warm bed or bath, or with warming packs and blankets. Victims with severe hypothermia must receive immediate medical care from experienced medical personnel.
- W/m^2 means work rate in watts expressed in terms of body surface area in square metres.

1. INTRODUCTION

Fatal exposures to cold among workers have usually resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1: Progressive clinical presentation of hypothermia below. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C. Lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision-making or the loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C. This must be taken as a sign of danger to the workers, and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, and whole body protection must be

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provided.

- a) Adequate insulating dry clothing to maintain core temperatures above 36°C must be provided to workers if work is performed in air temperatures below 4°C. Wind chill cooling rate and the cooling power of air are critical factors. Wind chill cooling rate is defined as heat loss from a body expressed in watts per meter squared (W/m^2), which is a function of the air temperature and wind velocity upon the exposed body.

A greater insulation value of the protective clothing is required when the wind speed is higher and the temperature in the work area is lower. An **ECT** chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2: Cooling power of wind on exposed flesh as equivalent temperature below. The **ECT** should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

- b) Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet and the head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions will depend on the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

TABLE 1: Progressive clinical presentation of hypothermia

CORE TEMPERATURE °C	CLINICAL SIGNS
37.6	"Normal" rectal temperature.
37	"Normal" oral temperature.
36	Metabolic rate increases in an attempt to compensate for heat loss.
35	Maximum shivering.
34	Victim conscious and responsive, with normal blood pressure.
33	Severe hypothermia below this temperature.
{ 32 31 }	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases.
{ 30 29 }	Progressive loss of consciousness; muscular rigidity increase; pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	Ventricular fibrillation possible with myocardial irritability.
27	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent.
26	Victim seldom conscious.
25	Ventricular fibrillation may occur spontaneously.
24	Pulmonary edema.
{ 22 21 }	Maximum risk of ventricular fibrillation.
20	Cardiac standstill.
18	Lowest accidental hypothermia victim to recover.
17	Isoelectric electroencephalogram.

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CORE TEMPERATURE °C	CLINICAL SIGNS
9	Lowest artificially cooled hypothermia patient to recover.

- Presentations approximately related to the core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.

TABLE 2: Cooling power of wind on exposed flesh as equivalent temperature (under calm conditions)

ESTIMATED WIND SPEED (in kp/h)	ACTUAL TEMPERATURE (°C)								
	4	- 1	- 7	- 12	- 18	- 23	- 29	- 34	- 40
0	4	- 1	- 7	- 12	- 18	- 23	- 29	- 34	- 40
8	3	- 3	- 9	- 14	- 21	- 26	- 32	- 38	- 44
16	- 2	- 9	- 16	- 23	- 30	- 35	- 43	- 50	- 57
24	- 6	- 13	- 20	- 28	- 36	- 43	- 50	- 58	- 65
32	- 8	- 16	- 23	- 32	- 39	- 47	- 55	- 63	- 71
40	- 9	- 18	- 26	- 34	- 42	- 51	- 59	- 67	- 76
48	- 16	- 19	- 22	- 36	- 44	- 53	- 62	- 70	- 78
56	- 11	- 20	- 29	- 37	- 46	- 55	- 63	- 72	- 81
64	- 12	- 21	- 29	- 38	- 47	- 56	- 65	- 73	- 82
Wind speed greater than 64 kph have little additional effect	LITTLE DANGER In < 1 hr with dry skin. Maximum danger of false sense of security			INCREASING DANGER Danger from freezing of exposed skin within 1 minute.			GREAT DANGER Flesh may freeze within 30 seconds.		

- Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

ECT requiring dry clothing to maintain core body temperature above 36°C per cold stress **TLV**

2. EVALUATION AND CONTROL

For exposed skin, continuous exposure should not be permitted when the air speed and the temperature results in an **ECT** of -32°C. Superficial or deep local tissue freezing will occur at temperatures below -1°C regardless of wind speed.

At an air temperature of 2°C or less, it is imperative that workers who are immersed in water, or whose clothing becomes wet, be provided with a change of clothing and be treated for hypothermia immediately.

TLVs recommended for properly clothed workers for periods of work at temperatures

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below freezing are shown in Table 3: **TLVs** work / warm-up schedule for four-hour shifts.

Special protection for hands is required to maintain manual dexterity for the prevention of accidents:

- (a) If fine work is to be performed with bare hands for more than 10-20 minutes in an environment below 16°C, special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, **radiant heaters** (fuel burner or electric radiator) or contact warm plates may be utilised. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below -1°C.
- (b) If the air temperature falls below 16°C for sedentary, 4°C for light and -7°C for moderate work and fine manual dexterity is not required, then gloves should be used by the workers.

2.1. To prevent contact frostbite, the workers should wear anti-contact gloves.

- (a) When cold surfaces below -7°C are within reach, a warning should be given to each worker to prevent inadvertent contact by bare skin.
- (b) If the air temperature is -17.5°C or less, the hands should be protected by mittens.

Machine controls and tools for use in cold conditions should be designed so that it can be handled without removing the mittens.

2.2. Provisions for additional total body protection are required if work is performed in an environment at or below 4°C. The workers should wear cold protective clothing appropriate for the level of cold and physical activity:

- (a) If the air velocity at the job site increased by wind, draft or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
- (b) If only light work is involved and the clothing of the worker may become wet on the job site, the outer layer of the clothing may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outerwear should be changed, as it becomes wet. The outer garments should include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a **hot environment** before entering the cold area, the employee should make sure that clothing is not wet as a consequence of sweating. If clothing is wet, the employee should change into dry clothes before entering the cold area. The workers should change socks and any removable felt insoles at regular daily intervals or use vapour barrier boots. The optimal frequency of change should be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.

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- (c) If exposed areas of the body cannot be protected sufficiently to prevent sensation of excessive cold or frostbite, protective items should be supplied in auxiliary heated versions.
- (d) If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available, or until the weather conditions improve.
- (e) Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 4°C should take special precautions to avoid soaking clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.

3. WORK-WARMING REGIMEN

If work is performed continuously in the cold at an **ECT** or at a temperature below -7°C, heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals. The frequency will depend on the severity of the environmental exposure. The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability or euphoria are indications for immediate return to the shelter.

When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided to prevent workers from returning to work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the **cold environment**. It may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below -12°C **ECT**, the following should apply:

- (a) The worker should be under constant protective observation (buddy system or supervision).
- (b) The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
- (c) New employees should not be required to work full-time in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
- (d) The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.

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- (e) The work should be arranged in such a way that sitting still or standing still for long periods is minimised. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
- (f) The workers should be instructed in the safety and health procedures.

The training programme should include as a minimum, instruction on:

- Proper rewarming procedures and appropriate first aid treatment.
- Proper clothing practices.
- Proper eating and drinking habits.
- Recognition of impending frostbite.
- Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
- Safe work practices.

TABLE 3: TLVs work / warm-up schedule for four-hour shift

Air temperature °C (sunny skies)	No noticeable wind		8 kp/h wind		16 kp/h wind		24 kp/h wind		32 kp/h wind	
	Maximum work period	Number of breaks	Maximum work period	Number of breaks	Maximum work period	Number of breaks	Maximum work period	Number of breaks	Maximum work period	Number of breaks
-26 to -28	Normal	1	Normal	1	75 mins	2	55 mins	3	40 mins	4
-29 to -31	Normal	1	75 mins	2	55 mins	3	40 mins	4	30 mins	5
-32 to -34	75 mins	2	55 mins	3	40 mins	4	30 mins	5		
-35 to -37	55 mins	3	40 mins	4	30 mins	5				
-38 to -39	40 mins		30 mins	5						
-40 to -42	30 mins	5								
-43 and below										

Notes for TABLE 3:

- (i) The schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten minutes in a warm location and with an extended break (e.g. lunch) at the end of the 4-hour work period in a warm location. For light- to moderate work (limited physical movement), apply

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the schedule one-step lower. For example, at -35°C with no noticeable wind (step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (step 5).

- (ii) If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be:

- (1) Special warm-up breaks should be initiated at a wind chill cooling rate of about $1\,750\text{ W/m}^2$.
- (2) All non-emergency work should have ceased at, or before a wind chill of $2\,250\text{ W/m}^2$.

In general, the warm-up schedule provided above slightly under-compensates for the wind at warmer temperatures, assuming acclimatisation and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges because windy conditions rarely prevail at extremely low temperatures.

- (iii) **TLVs** apply only for workers in dry clothing.

4. SPECIAL WORKPLACE RECOMMENDATIONS

4.1. Special design requirements for refrigerator rooms include the following:

- (a) In refrigerator rooms, the air velocity should be minimised as much as possible and should not exceed 1 m/s at the job site. This can be achieved by properly designed air distribution systems.
- (b) Special wind protective clothing should be provided based upon existing air velocities to which workers are exposed.

Special caution should be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect workers against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision), and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

- (a) Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C so that overall compliance with the requirements of the **TLV** can be maintained.
- (b) Whenever the air temperature at a workplace falls below -1°C , the **DB** should be measured and recorded at least every four hours.
- (c) In indoor workplaces, the wind speed should also be recorded at least every four hours whenever the rate of air movement exceeds 2 m/s .
- (d) In outdoor work situations, the wind speed should be measured and recorded

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together with the air temperature, whenever the air temperature is below -1°C .

- (e) The **ECT** should be obtained from Table 2: Cooling power of wind on exposed flesh as equivalent temperature, in all cases where air movement measurements are required. It should be recorded with the other data whenever the **ECT** is below -7°C .

Employees should be excluded from work in cold at -1°C or below if they are suffering from diseases, taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments.

4.2. Medication that may affect thermoregulation

Many classes of drugs, whether prescribed, over-the-counter, recreational, homeopathic, traditional or illicit, can predispose users to heat-related illnesses. Certain medication and/or substances can interfere with normal thermoregulatory functions in multiple ways, mediated through:

- The hypothalamus, which sets normal body temperature.
- Heat perception, leading to behavioural change (heat avoidance).
- Changes in cardiac output or changes in peripheral vasodilatation.
- Changes in sweat rate.
- Changes due to renal function and/or body hydration.

In terms of direct heat effects, the most pharmacological consequence is via the impact on sweat rate. Certain medication and/or substances can act on nerve endings of the sweat glands.

Medical consultation is recommended where a candidate is using drugs or medication including, but not limited to:

- Neuro- and psychotropic drugs, including recreational stimulants such as pseudo-amphetamines (e.g. ecstasy).
- Antihistamines commonly used for colds and flu.
- Diuretics.
- Beta-blockers.
- Anti-epileptics.
- Anti-spasmodic for stomach cramps.

Workers who are routinely exposed to temperatures below -24°C with wind speeds of less than less than 8,05 kilometres per hour, or air temperatures below -18°C with wind speeds

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above 2.2 m/s should be medically certified as suitable for such exposures

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissues in addition to providing for first aid treatment.

5. COLD STRESS MONITORING

5.1. Introduction

For surface operations, it seems likely that the nature and extent of environmental temperature monitoring and the need to initiate/discontinue **HSM** and **CSM** programmes, will in many instances be determined by seasonal drifts.

A possible scenario is outlined below:

SEASON	AUTUMN	WINTER	SPRING	SUMMER
Activity	Discontinue HSM . Monitor DB and air velocity to determine equivalent chill factor.	Implement CSM .	Discontinue CSM . Monitor DB and WB .	Implement HSM .

Although **CSM** and **HSM** are two distinct programmes, they remain linked through ongoing mandatory monitoring of the **thermal environment**. Central co-ordination is therefore essential.

In the interim Occupational Hygienists will be required to implement a monitoring programme in order to assess risk. The parameters in question are **DB** and air speed for the determination of the wind-chill factor (regulation 9.2(2) of the **MHSA** and refer to **ACGIH**). A system of monitoring, including its derivation, is outlined below.

5.2. Basic considerations

The **ACGIH** interpretation of the **ECT**, converted to °C and approximated for convenience, is given below:

- > 5°C (**ECT**) : No risk.
- 5 to -30°C (**ECT**) : Little danger for exposures of less than one hour.
- < -30°C (**ECT**) : Increasing danger, exposed flesh may freeze in one minute.
(final category omitted as being unrealistic for South African conditions)

An air speed of 8km/h (about 2m/s) and above should be regarded as critical in changing the **ECT** from a 'no risk' to a 'risk' category (**ACGIH**). Even at a **DB** of 10°C, an air speed of 16km/h (about 4,5m/s) and above could depress the **ECT** to critical levels. Air speeds on excess of 65km/h have little additional effect.

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Holmer and co-workers (1998) make the following distinctions:

- $< 18^{\circ}\text{C}$ **DB** : 'cold'
- $< -30^{\circ}\text{C}$ (**ECT**) : 'risk'

On the basis of the above considerations, the following monitoring system is proposed:

5.3. Proposed monitoring programme

5.3.1. Routine monitoring:

DB as supplied by the weather bureau (confirm relevance and accuracy), or any other direct measurement if more applicable.

5.3.2. **DB** $< 18^{\circ}\text{C}$ (as per weather bureau):

Measure and record **DB** representative of critical workstations (**ACGIH**: $< 16^{\circ}\text{C}$).

5.3.3. **DB** $< 10^{\circ}\text{C}$:

Measure and record, in addition, air speed and convert to **ECT** (**ACGIH** air speed commences at -1°C)

Actions:

- **ECT** $> 5^{\circ}\text{C}$: No risk; maintain monitoring of **ECT**.
- **ECT** $< 5^{\circ}\text{C}$ but not $< -30^{\circ}\text{C}$: Implement formal **CSM** programme.
- **ECT** $< -30^{\circ}\text{C}$: No-go; stop work/evacuate.

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ANNEXURE 5: Heat stress management
(For information only)**1. INTRODUCTION**

By definition, **HSM** is based on multi-disciplinary inputs and control and it is proposed that overall control cannot be delegated but that it remains a management function. The multi-disciplinary nature of **HSM** does however suggest the need for instituting some form of central co-ordination, a function that certainly can be delegated.

HSM consists of two essential elements, namely:

- The detection of medical and physical contraindications for work in heat, as well as gross or permanent heat intolerance by means of appropriate screening procedures; and
- The natural progression of heat acclimatization based on safe work practices.

An organizational framework for the control of **HSM** is outlined in Figure 1.1. This should be viewed as a general guide, which should be tailored to meet the particular requirements and organisational structure of each mine. The operational principle is that a system of regular review be instituted, for example on an annual basis. However, data acquisition and analysis should be sufficiently sensitive to identify untoward trends or incidents, which would warrant immediate attention.

Establishing a structural organization is seen as an essential first step in the implementation process.

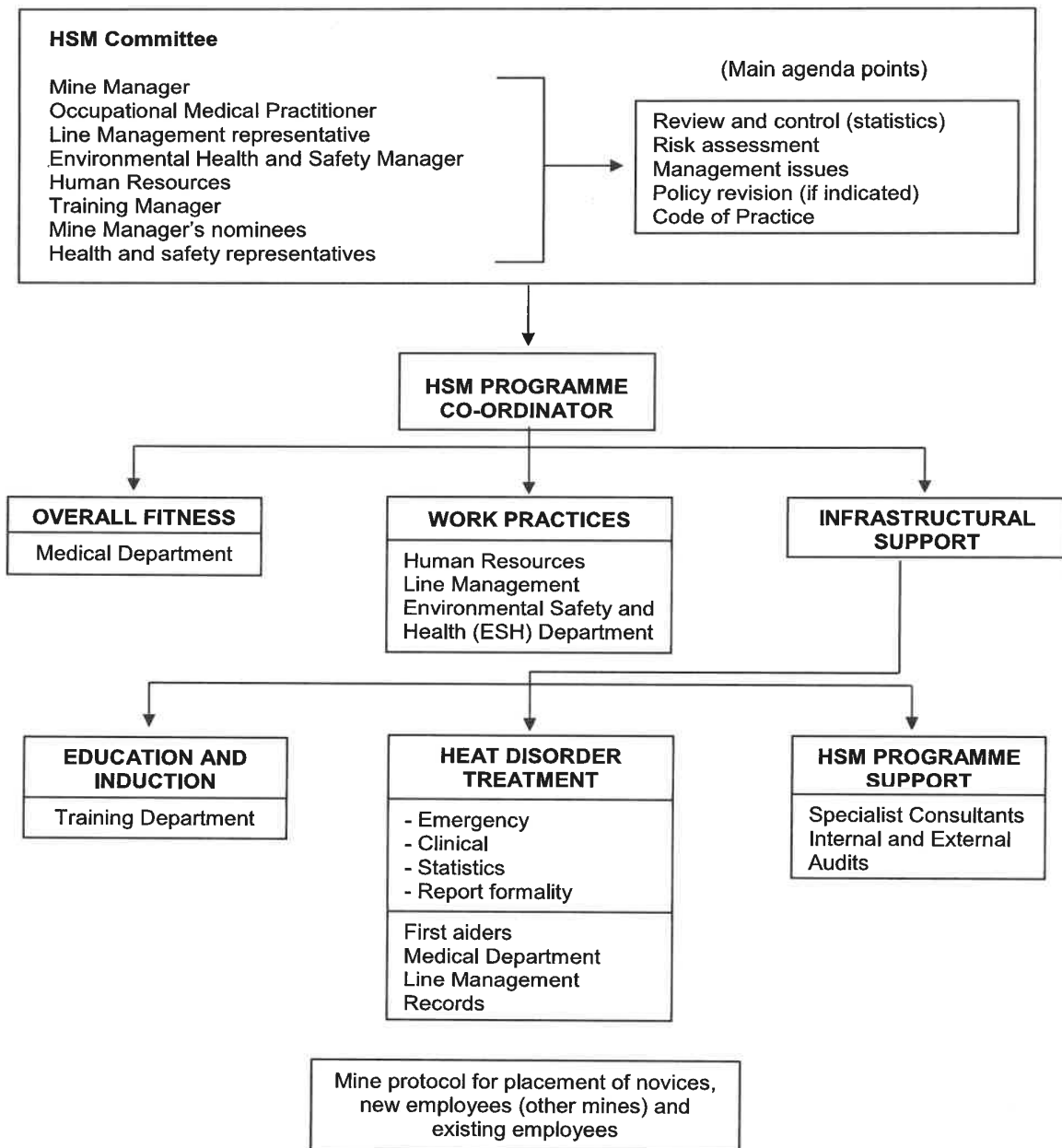
1.1. Functional organisation

An overview of the functional organization of **HSM** is presented in the form of a flow- chart (Figure 1.2). For actual implementation of **HSM** along the lines suggested, it should be clear that the inputs required at various levels become quite specialized. Appropriate disciplines and departments can therefore be identified and their general responsibilities deduced.

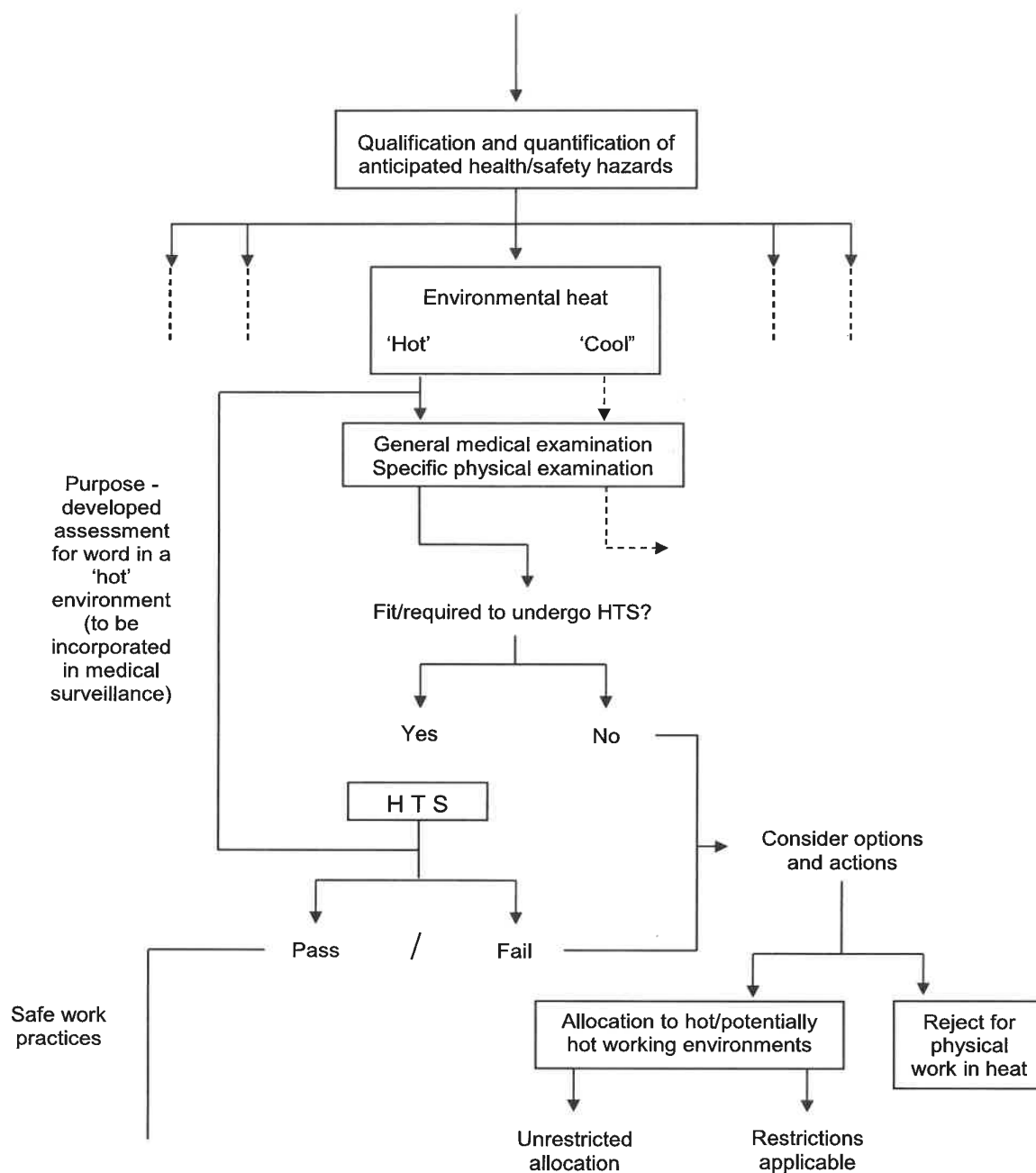
Having established a structural organization, the second step would be to ensure, as indicated above, that responsibilities are defined, and assigned to appropriate personnel and departments, and that effective inter-departmental communication links be established. This is one of the key responsibilities of the 'HSM Programme Co-ordinator' listed in Figure 1.1.

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OVERALL CONTROL OF HSM



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ANNEXURE 6: Medical/physical examinations (overall fitness for work in **hot environments**)
(For information only)

This annexure is an extract from the SIMRAC Project Report GAP 505

Novice means an individual with no prior experience of mining as a career.

Strenuous work means any form of work in **hot environments** where the work rate exceeds 160 W/m²

1. Introduction

The consequences of high environmental heat loads can be expressed in terms of impaired work capacity, errors of judgement with obvious implications for safety, and the occurrence of heat disorders, especially heat stroke that is often associated with severe and irreversible tissue damage and high mortality rates. It follows that overall fitness to undertake physical work in **hot environments** is a prerequisite and should conform to certain minimum standards. However, depending on circumstances, different sets of standards may be applied.

Overall fitness for work in **hot environments** will depend on the outcomes of

- A purpose-developed general medical examination.
- A specific physical evaluation.
- An assessment of heat tolerance.

The above outcomes should be incorporated in the medical surveillance programme, as required in terms of section 13 of the Mine Health and Safety Act. As a general guideline, all employees who enter 'hot' environments in the normal course of their duties, irrespective of whether such work consists of daily full-shift exposures or intermittent or periodic exposures, which may be brief (one hour) or extended (full shift), should be screened for heat intolerance.

1.1 General medical examination

The nature of the general medical examination may well include elements specific to a particular occupation and associated hazards.

In the present context the following listing applies to environmental heat as a health hazard, most notably where physically demanding work is undertaken.

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1.1.1 History

- Occupational.
- Medical, especially where treatment is based on medication which is likely to increase susceptibility to heat disorder significantly.
- Family/social, including alcohol or substance abuse.
- Outcome of previous **HTS** tests.
- Heat disorders (cramps, exhaustion, stroke).

1.1.2 Urinalysis

- Origins of haematuria, proteinuria and glycosuria should be established and assessed.

1.1.3 The examination should exclude

- Jaundice.
- Anaemia.
- Cyanosis.
- Clubbing.
- Oedema.
- Abnormal lymph nodes.
- Febrile disease.

1.1.4 Uncontrolled hypertension (>160/95) and gross cardiovascular abnormalities require a full investigation. So-called 'functional' murmurs should not be considered a problem. Specialist opinion regarding fitness for physically demanding work in heat may be required. Hypertension should be controlled.

1.1.5 The skin should be intact with no infections such as advanced athlete's foot, cellulitis, scabies, etc.

1.1.6 Respiratory function, as determined by spirometry and chest X-ray, should be normal.

1.1.7 Ear, nose and throat examination should exclude inflammation or infection (tonsillitis, pharyngitis, chronic suppurative otitis media, etc.).

1.1.8 No organomegaly or hernias should be present.

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1.1.9 Gross neurological examination should be normal.

1.1.10 No other abnormality that may compromise physical work in heat should be present.

OMPs should develop knowledge such that difficult decisions in 'grey' areas are taken fairly and professionally, bearing in mind the avoidable dangers of heat disorders.

1.2 Physical evaluation

The physical evaluation should be conducted as part of the medical examination but with special emphasis on features, which would rule out physical work or exertion in heat. A specific requirement is to assess an individual's medical and physical fitness to undergo HTS.

1.2.1 Age

A person's age does not have a direct bearing on heat tolerance and should not serve as a contra-indication to work in **hot environments**. Heat intolerance does however decline with reduced physical work capacity which in turn could have cardiovascular origins, that do not necessarily become manifested through routine medical examination. The underlying mechanism is an obligatory age-associated reduction in cutaneous vasodilatation (widening of skin blood vessels) and sweat rate (Yousef, 1987; Nunnely, 1998). A critical age limit of 50 years has been cited (Nunnely, 1998). This view is confirmed by local studies, which show a decided increase in heat stroke susceptibility with advancing years (Kielblock, 1992).

As a general recommendation employees of 50 years and above should only be considered for strenuous work in **hot environments** or placement in work categories where the full-shift physical work demand is regarded as strenuous, provided the complete absence of any other personal risk factor, including a special medical assessment, can be demonstrated. This recommendation also applies to emergency operations, even if only of short duration. As a general reference to categorize work in terms of physical demand, Figures 1 and 2 in Annex 10, should be consulted. Annex 10 is for information only.

1.2.2 General physical appearance

Any apparent physical deformity (e.g. congenitally acquired) or injury (e.g. amputations or joint malfunction) should be recorded. Where, in the opinion of the **OMP**, any such deformity or injury precludes the employee from (a) undergoing HTS or (b) performing his work without undue physical discomfort, this should be stated clearly. The following options exist:

- Fit/unfit to undergo HTS.
- Fit for work in **hot environments** but unfit to undergo HTS and, therefore, exempted.
- Totally unfit for any form of physical work.

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1.2.3 Body dimensions

In this respect, three criteria apply, namely:

- An acceptable body mass to height ratio to rule out both under- and overweight individuals.
- Minimum body mass as a criterion of the capacity to cope with externally imposed work demands. Body mass relative to height is often expressed in terms of the **BMI** (Ross et al, 1988).
- It provides a better predictor of disease risk than weight (mass) alone. (It should not be used to assess competitive athletes or body builders, growing children and/or old and frail elderly individuals.) A high **BMI** leads to an increased risk to develop certain diseases, e.g. hypertension, cardiovascular disease, dyslipidaemia, adult-onset diabetes (type II), sleep apnea, osteoarthritis and other conditions.

The above examples constitute a condition of co-morbidity, i.e. any condition associated with obesity (**BMI** of 30-35). Co-morbidity usually worsens as the degree of obesity increases, and often improves if successfully treated.

BMI can be calculated using the equation:

$$\text{BMI} = \text{body mass (kg)} / \text{height (m)}^2$$

The **BMI** is then expressed in terms of the following classification, the lower limit being based on the anthropometry of local mine workers (Schoeman et al, 1981):

- <15 : emaciated
- 15-19 : underweight
- 20-25 : normal body fat content
- 26-29 : overweight (warning)
- 30-35 : obese (overt risk factor)
- >35 : exclusion

The **BMI** should be used in conjunction with the essentially nude body mass to assess the adequacy of body dimensions relevant to physical work in hot environments. A distinction should be made between prospective or new employees ('novices' to mining) and existing employees. Calculated **BMI** values, for a wide range of body mass and height combinations, appear in Table 1.1 and a protocol for this assessment, in conjunction with a recommended course of action, is given below. A **BMI** of 30 or more constitutes a definitive risk factor.

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TABLE 1: Body dimensions as criteria for physical work in **hot environments**

EMPLOYEE STATUS	CRITERION/STANDARD	INTERPRETATION AND RECOMMENDED COURSE OF ACTION
Prospective (novice ¹)	Body mass <50 kg Body mass 50-55 kg BMI 15-29 BMI 30-35 BMI >35	Unsuitable (BMI irrelevant): reject Suitable but not for strenuous work ² Suitable Suitable with no medical contraindications Unsuitable: reject
Existing	Body mass <45 kg Body mass 45 - 50 kg Body mass 45 - 55 kg BMI <15 BMI 15-19 BMI 20-29 BMI 30-35 BMI >35	Unsuitable (BMI irrelevant): reject Suitable with no medical contraindications or a history of heat disorders No allocation to strenuous work (>160 W/m ²) Unsuitable ³ Suitable with no medical contraindications or history of heat disorders Suitable Suitable provided no medical contraindications or history of heat disorders Unsuitable ³

¹ Novice - see 'glossary' for definition² Strenuous work - see 'glossary' for definition³ 'Unsuitable' implies withdrawal of certificate of fitness unless an acceptable **BMI** can be achieved within a reasonable time.**TABLE 2:** **BMI** as function of body mass and height

		BODY MASS INDEX																											
		Mass (kg)																											
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73					
2.00	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	18				
1.98	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19				
1.96	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19				
1.94	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	18	18	18	18	19	19	19	19	19				
1.92	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20				
1.90	14	14	14	15	15	15	16	16	16	16	17	17	17	17	18	18	18	19	19	19	19	20	20	20	20				
1.88	14	14	15	15	15	16	16	16	16	17	17	17	18	18	18	18	19	19	19	20	20	20	20	21	21				
1.86	14	15	15	15	16	16	16	16	17	17	17	18	18	18	18	19	19	19	20	20	20	20	21	21	21				
1.84	15	15	15	16	16	16	17	17	17	17	18	18	18	19	19	19	19	20	20	20	21	21	21	21	22				
1.82	15	15	16	16	16	17	17	17	18	18	18	19	19	19	19	20	20	20	21	21	21	21	22	22	22				
1.80	15	16	16	16	17	17	17	18	18	18	19	19	19	19	20	20	20	21	21	21	21	22	22	22	23				
1.78	16	16	16	17	17	17	18	18	18	19	19	19	20	20	20	21	21	21	21	22	22	22	23	23	23				
1.76	16	16	17	17	17	18	18	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	24	24				
1.74	17	17	17	18	18	18	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	24	24	24				
1.72	17	17	18	18	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	24	24	24	25	25				
1.70	17	18	18	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	24	24	24	25	25	25				
1.68	18	18	18	19	19	19	20	20	21	21	21	22	22	22	23	23	23	24	24	24	25	25	26	26	26				
1.66	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	24	24	24	25	25	25	26	26	26	27				
1.64	19	19	19	20	20	20	21	21	22	22	22	23	23	23	24	24	25	25	25	26	26	26	27	27	27				
1.62	19	19	20	20	21	21	21	22	22	22	23	23	24	24	24	25	25	26	26	26	27	27	27	28	28				
1.60	20	20	20	21	21	21	22	22	23	23	23	24	24	25	25	26	26	27	27	27	28	28	28	29	29				
1.58	20	20	21	21	22	22	22	23	23	24	24	25	25	26	26	27	27	28	28	28	29	29	29	30	30				
1.56	21	21	21	22	22	23	23	23	24	24	25	25	26	26	27	27	28	28	28	29	29	29	30	31	31				
1.54	21	22	22	22	23	23	24	24	24	25	25	26	26	27	27	28	28	29	29	29	30	30	31	31	31				
1.52	22	22	23	23	23	24	24	25	25	26	26	27	27	28	28	29	29	29	30	30	31	31	32	32	32				
1.50	22	23	23	24	24	24	25	25	26	26	27	27	28	28	29	29	30	30	31	31	32	32	32	32	32				

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BODY MASS INDEX

Mass (kg)

	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
2.00	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
1.98	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25
1.96	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25
1.94	20	20	20	20	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	26	26
1.92	20	20	21	21	21	21	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26
1.90	20	21	21	21	22	22	22	22	23	23	23	24	24	24	24	25	25	25	25	26	26	26	27	27
1.88	21	21	22	22	22	22	23	23	23	23	24	24	24	25	25	25	25	26	26	26	27	27	27	27
1.86	21	22	22	22	23	23	23	23	24	24	24	25	25	25	25	26	26	26	27	27	27	27	28	28
1.84	22	22	22	23	23	23	24	24	24	25	25	25	25	26	26	26	27	27	27	27	28	28	28	29
1.82	22	23	23	23	24	24	24	24	25	25	25	26	26	26	27	27	27	27	28	28	28	29	29	29
1.80	23	23	23	24	24	24	25	25	25	26	26	26	27	27	27	27	28	28	28	29	29	29	30	30
1.78	23	24	24	24	25	25	25	26	26	26	27	27	27	28	28	28	29	29	29	29	30	30	31	31
1.76	24	24	25	25	25	26	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	31
1.74	24	25	25	25	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	31	32	32
1.72	25	25	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	31	32	32	32	33
1.70	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	31	32	32	32	33	33	34
1.68	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	32	32	32	33	33	33	34	34	34
1.66	27	27	28	28	28	29	29	29	30	30	30	31	31	32	32	32	33	33	33	34	34	35	35	35
1.64	28	28	28	29	29	29	30	30	30	31	31	32	32	32	33	33	33	34	34	35	35	35	36	36
1.62	28	29	29	29	30	30	30	31	31	32	32	32	33	33	34	34	34	35	35	35	36	36	37	37
1.60	29	29	30	30	30	31	31	32	32	32	33	33	34	34	34	35	35	36	36	36	37	37	38	38
1.58	30	30	30	31	31	32	32	32	33	33	34	34	34	35	35	36	36	36	37	37	38	38	39	39
1.56	30	31	31	32	32	32	33	33	34	34	35	35	35	36	36	37	37	37	38	38	39	39	40	40
1.54	31	32	32	32	33	33	34	34	35	35	36	36	36	37	37	38	38	39	39	40	40	41	41	41
1.52	32	32	33	33	34	34	35	35	35	36	36	37	37	38	38	39	39	40	40	41	41	42	42	42
1.50	33	33	34	34	35	35	36	36	36	37	37	38	38	39	39	40	40	41	41	42	42	43	43	43

BODY MASS INDEX

Mass (kg)

	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
2.00	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30
1.98	25	25	26	26	26	26	27	27	27	27	28	28	28	29	29	29	29	30	30	30	30	31	31
1.96	26	26	26	26	27	27	27	27	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
1.94	26	26	27	27	27	27	28	28	28	28	29	29	29	30	30	30	31	31	31	31	32	32	32
1.92	27	27	27	27	28	28	28	28	29	29	29	30	30	30	31	31	31	31	32	32	32	33	33
1.90	27	27	28	28	28	29	29	29	30	30	30	31	31	31	31	32	32	32	33	33	33	34	34
1.88	28	28	28	29	29	29	29	30	30	30	31	31	31	31	32	32	32	33	33	33	34	34	34
1.86	28	29	29	29	29	30	30	30	31	31	31	32	32	32	32	33	33	33	34	34	34	35	35
1.84	29	29	30	30	30	30	31	31	31	32	32	32	32	33	33	33	34	34	34	35	35	35	35
1.82	30	30	30	30	31	31	31	32	32	32	33	33	33	34	34	34	34	35	35	35	36	36	36
1.80	30	31	31	31	31	32	32	32	33	33	33	34	34	34	35	35	35	35	36	36	36	37	37
1.78	31	31	32	32	32	33	33	33	33	34	34	34	34	35	35	35	36	36	36	37	37	38	38
1.76	32	32	32	33	33	33	34	34	34	35	35	35	36	36	36	36	37	37	37	38	38	39	39
1.74	32	33	33	33	34	34	34	35	35	35	36	36	36	37	37	37	38	38	38	39	39	40	40
1.72	33	33	34	34	34	35	35	35	36	36	37	37	37	38	38	38	39	39	39	40	40	41	41
1.70	34	34	35	35	35	36	36	36	37	37	37	38	38	38	39	39	39	40	40	41	41	42	42
1.68	35	35	35	36	36	36	37	37	38	38	38	39	39	39	40	40	41	41	41	42	42	43	43
1.66	36	36	36	37	37	37	38	38	38	39	39	40	40	40	41	41	41	42	42	42	43	43	44
1.64	36	37	37	38	38	38	39	39	39	40	40	41	41	41	42	42	42	43	43	44	44	45	45
1.62	37	38	38	38	39	39	40	40	40	41	41	42	42	42	43	43	43	44	44	45	45	46	46
1.60	38	39	39	39	40	40	41	41	41	42	42	43	43	43	44	44	44	45	45	46	46	47	47
1.58	39	40	40	40	41	41	42	42	42	43	43	44	44	44	45	45	46	46	46	47	47	48	48
1.56	40	41	41	42	42	42	43	43	43	44	44	45	45	46	46	46	47	47	48	48	48	49	49
1.54	41	42	42	43	43	43	44	44	44	45	45	46	46	46	47	47	48	48	48	49	49	50	50
1.52	42	43	43	44	44	45	45	45	46	46	47	47	48	48	48	49	49	50	50	51	51	52	52
1.50	44	44	44	45	45	46	46	47	47	48	48	49	49	50	50	51	51	52	52	52	53	53	53

In summary, the above protocol comprises:

- Making a distinction between prospective or new employees (novices) and existing employees.

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- Recording both mass (kg) and height (m rounded to the second decimal, e.g. 1.75), conducting the initial screening using only body mass, i.e. <50 kg for novices and <45 kg for existing employees signifies rejection or withdrawal of certificates of fitness.
- Extending the initial screening to an assessment based on **BMI**.
- Flagging screened employees with a body mass of (55 kg as unsuitable for allocation to strenuous full- shift work in heat.

1.3 Heat as a health and safety hazard: Information base for risk assessment

Heat stroke is widely held to be multifactorial in origin, an observation which is certainly also applicable to the South African mining industry (Kielblock, 1992). However, whereas considerable effort has been devoted in the past to prevent heat disorders, most notably heat stroke, attempts to deal with heat from a safety and productivity point of view have been less focussed. In this respect, the benefits of a systematic reduction in **WB** have been amply demonstrated in the local gold mining context (Smith, 1984). It remains to point out that the converse also holds true: any escalation in the environmental heat load is likely to be associated with an increase in accident frequency rate and a fall in productivity.

In order to assess risk, and to subsequently manage it, a database appropriate to the development of proactive strategies is essential. This section, therefore, provides some guidance with particular reference to a personal (employee) risk profile and heat disorder (heat stroke) incident analysis. It is suggested that safety issues be investigated along similar lines and the findings linked to the same database as proposed here.

1.3.1 Employee risk profile

Based on the preceding sections it is quite feasible to develop a 'risk profile' for any employee destined to enter 'hot' working environments in the execution of their duties and responsibilities. This profile consists of the following elements, namely:

- Medical contraindications, i.e. a particular condition, treatment or even a medical history likely to lead to a critical job-related reduction in heat tolerance.
- Age (50 years) with full-shift exposures to strenuous work in heat.
- Obesity (**BMI** 30).
- Heat intolerance, i.e. a chronic inability to complete **HTS** successfully.
- Strenuous work per se.
- A history of heat disorders.

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Recurring incidents of heat cramps and heat exhaustion should be construed as an inability to develop a satisfactory degree of heat acclimatization for a particular job, exposure time and environmental heat load. Medical surveillance should be sufficiently sensitive to identify such employees and the **OMP** should have no hesitation in reclassifying the employee as 'heat intolerant'. However, it follows that a distinction exists between incidents of heat disorders, which only affect a small number of employees in a chronic manner, thus reflecting possible inherent heat intolerance, and those linked to poor environmental control. To classify an employee as 'heat intolerant' within the latter context is clearly inappropriate.

The above scenario is not applicable to heat stroke. The reason is that heat stroke is generally associated with extensive multi-organ damage, often of an irreversible kind. As a result, heat tolerance is usually severely impaired, irrespective of whether the basic cause is 'inherent heat intolerance' or due to poor environmental control, and persists long after full clinical recovery from the incident (Armstrong et al, 1990; Epstein, 1990; Bricknell, 1996). In fact, heat intolerance has been demonstrated to persist for periods from about three months to as long as five years following heat stroke. There is, therefore, strong evidence to suggest that **heat stroke may well render an employee permanently unfit for physical work in heat.**

In developing an employee risk profile based on the above elements, it is obvious that no hard and fast rules can be set. The estimation of risk will therefore remain somewhat imprecise. A threefold approach is recommended, namely:

- A risk profile, which features only one of the above elements, especially where it can be controlled or brought under control, should be regarded as 'acceptable'.
- The presence of any two factors (elements) should be viewed with concern and should not be condoned unless the situation can be ameliorated, for example through specially developed safe work practices.
- A profile containing more than two undesirable elements will constitute an unacceptable risk.

Combinations of risk factors (elements) which should not be condoned under any circumstances are given in Table 1.2.

FIGURE 1.2: Employee risk profile matrix

PRIMARY RISK FACTOR ¹	SECONDARY RISK FACTOR ¹					
	Medical contra-indication ²	Age >50 plus strenuous work	BMI ≥30	Heat intolerance	Strenuous work	History of heat disorders
Medical contra-indication ²		X	0	0	0	X
Age ≥50 plus strenuous work	X		X	X		X
BMI ≥30	0	X		X	X	X
Heat intolerance	0	X				X
Strenuous work	0		X	X		X

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History of heat disorders	X	X	X	X	X	
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- ¹ See text for full description of respective factors.
- ² Medical contraindications require a good deal of discretion, for example, insulin-dependent diabetes may well constitute an 'unacceptable' risk even in the absence of all other risk factors. The **OMP's** discretion and decisions are therefore paramount.
- ⁰ The specific combination of risk factors can be condoned if considered on individual merit and taking into consideration specific circumstances.
- ^x The combination of risk factors should not be condoned unless under exceptional circumstances.

1.4 Incident analysis

Incidents of heat stroke have been fairly well investigated in the past and considerable emphasis has fallen on the 'multi-factorial' nature of such incidents. Clearly, therefore, any investigation into the occurrence of heat stroke, including other heat disorders, should be conducted in such a way that the major causal factors are identified. This would enable the development of proper strategies and action plans, as well as providing the basis for regular review. The following framework, presented under specific headings, is proposed.

- General information Mine/shaft/business unit operation (e.g. gold) and location/area of work.
- Personal particulars:
 - Name/identification or company number.
 - Country/town of origin.
 - Total mining experience
 - Duration of present contract
 - Personal/employee risk profile.
 - Work category (also rate strenuous/non-strenuous).
- Nature of incident/diagnosis (heat cramps, heat exhaustion/ syncope, heat stroke).
- Temporal information:
 - Date.
 - Day of the week.
 - Time of the day.
 - Duration of shift until incident.

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- Number of days in working area (if less than 12, record information on previous area of work).
- Causal factors:
 - Nature of work (typical / atypical of normal occupation).
 - Environmental heat load (**DB**, **WB**, air velocity, radiant temperature, time and date of assessment).
 - 24-hour history* (eating, drinking, well-being, etc.).
 - Water intake (normally, prior to incident).
 - Water availability.

*(*obtain this history from work or close companions and supervisors)*
- Signs and symptoms:
 - Behavioural.
 - Subjective complaints.
 - Physical signs.
 - Body temperature (oral or rectal, time of first recording).
- Treatment (emergency or initial treatment)
 - Recognition (correct or incorrect).
 - Nature of treatment.
 - Details of further events and recordings (include formal medical assistance).
 - Add clinical or hospital records.

Historical information and trends are of extremely limited value unless the data base enables direct assessments and control virtually on a day-to-day basis. In turn, this will enable the assessment and management of risk, strategy development and, ultimately even, good epidemiology. Reviews should be conducted at regular intervals, say every three months.

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ANNEXURE 7: Heat tolerance screening
(For information only)

Definitions and acronyms

'HTS' means Heat tolerance screening.

'HTT' means heat tolerance test; i.e. a one-hour **HTT** used for the evaluation of rescue brigadesmen.

1. INTRODUCTION

Paragraph 1 considers the objectives, interpretation and protocols associated with **HTS**. The infrastructural and procedural aspects are dealt with in paragraphs 2, 3 and 4 below.

1.1. Objectives

The primary objective of **HTS** is to identify gross or inherent heat intolerance (i.e. individuals with an unacceptable risk of developing excessively high levels of hyperthermia during work in heat). Such levels of heat intolerance could be temporary or permanent (inherent) and, in order to make these distinctions, repetitive **HTS** tests, as detailed in the text, are permitted. The nature of the test is such that it also provides a measure of physical fitness and, as such, serves as a second objective.

HTS should not be confused with or seen as an alternative to the old four-hour **HTT**. With regard to the latter, the purpose was to identify the so-called hyper-heat tolerant (HHT) individual whose inherent level of heat tolerance was such that no conventional heat acclimatization was needed. It should, therefore, be clear that **HTS** has an entirely different purpose, namely it provides an assessment of risk.

1.2. Interpretations

The outcome of the **HTS** provides a classification, which is primarily directed at making a distinction between potentially heat tolerant and inherently/grossly heat intolerant. Classification into either category will depend on:

- Oral temperature responses, as given below.
- The absence of any abnormal response during or at the end of the test, e.g. collapse, vomiting, headache and lack of co-operation.

1.2.1. Potentially heat tolerant

Any person whose oral temperature does not exceed 37.6°C (i.e. should be $\leq 37.6^{\circ}\text{C}$) at the end of the test should be classified as potentially heat tolerant. This implies that that person is fit to undertake physically demanding work in a **hot environment** and that will be able to acclimatise successfully with regular exposure.

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1.2.2. Grossly heat intolerant

Individuals with oral temperatures in excess of 37.6°C (i.e. should be $\leq 37.6^\circ\text{C}$) on completion of the test should be considered to be heat intolerant and not be allocated to work in hot areas, unless under carefully specified circumstances (see section 1.3).

In the event of failure of the **HTS**, candidates may present themselves once more for retesting but not within a period of two days. With the discretion of management, however, and taking into consideration individual merits and medical advice, a second retest is permissible. Repeated failure of the **HTS** would normally disqualify a candidate from work in hot areas. However, each case should be dealt with on individual merit. Section 1.3.3 provides some guidance in this regard.

1.3. Eligibility, frequency of screening and outcome implications associated with **HTS**

In terms of a general protocol for the application of **HTS**, a number of issues can be identified for incorporation into the mine's **COP**. These issues, which therefore require careful consideration, are listed below in conjunction with recommendations and alternatives.

1.3.1. Eligibility

HTS should be seen as one of a number of criteria determining overall fitness for physical or physically demanding work in **hot environments**. For this reason, all employees who enter **hot environments** in the normal execution of their duties or responsibilities should ideally be screened. There should be no distinction between employees who are exposed to **hot environments** on a daily full-shift basis and those who only enter such areas sporadically (once a week or once a month, etc.) or for indeterminate periods (e.g. from a few hours to a full shift).

1.3.2. Frequency of **HTS**

The frequency of **HTS** will be determined by the outcome of the routine medical and physical assessments, as described in sections 1.1 and 1.2 of Annexure 5: Heat stress management. There are two possible scenarios:

- Any employee deemed fit for physical work in a **hot environment** by virtue of the most recent annual assessment, inclusive of successfully passing the **HTS** test, would be required to repeat the **HTS** at an appropriate interval as determined by the medical discretion of the **OMP**. Any medical risk factor identified, especially of circulatory, metabolic or physical origin, as well as any incident associated with heat intolerance, should necessitate the **OMP** to adjust the **HTS** frequency to a more appropriate interval.
- The consequence of failing the routine annual medical and physical examination falls within the powers of discretion of the **OMP**. In this respect, **HTS** could, under certain circumstances, provide an additional option. Therefore, where the medical and/or physical status of an employee is suspect, **HTS** could be conducted on an annual basis as an adjunct to the medical and physical assessments.

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In summary, the frequency of **HTS** could be relaxed provided that the results from annual medical and physical screening examinations fall within acceptable norms.

1.3.3. **HTS** outcome implications

Any individual who passes the **HTS** test can be allocated to work in **hot environments** without any restrictions. The only possible disqualification is a medical history of recurring heat disorders, notably heat exhaustion or heat stroke, even if only a single incident.

With regard to failure of the **HTS**, a distinction should be made between new employees or recruits (novices to mining), and existing employees. New employees who fail should be regarded as unfit for any form of physical work in a **hot environment**, irrespective of medical or physical status.

Where existing employees fail the **HTS**, the following protocol is recommended:

- a) Firstly, a special medical examination should be considered with the express purpose of ruling out the presence of underlying risk factors contra-indicating physical work in heat, e.g. a stress electrocardiogram. The medical assessment should also take into consideration the employee's medical history, again with the propensity for heat disorders. Where recurring heat disorders are evident, this should be regarded as a disqualification.
- b) Secondly, all physical parameters (height, age, mass, etc.) must fall within accepted norms.

Based on the favourable outcomes to the above re-assessments, the employee may be allocated to work in **hot environments** provided that:

- Individualised counselling on the relevant risks and precautions is conducted, acknowledged and formalized.
- The employee accepts that the future occurrence of any heat disorder may render him/her unfit for any form of work in **hot environments**.
- The employee is not allocated to strenuous work categories, i.e. those falling within a work rate range of 160 W/m². In this regard, refer to tables 1.1 and 1.2 of Annexure 8: Work practices: Surface, opencast and underground operations to provide guidance.
- No form of emergency or special operations are undertaken in **hot or abnormally hot environments**.
- Routine work is only undertaken under close supervision while also observing safe work practices on a permanent basis, as documented in Annexure 8: Surface, opencast and underground operations for information only.

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- Non-routine work (periodic or intermittent exposure to **hot environments**) is not carried out unless accompanied by, and under direct instruction of, a specially designated and qualified person, which implies dedicated formal supervision.

Full details of formal supervision and safe work practices are provided in Annexure 8: Surface, opencast and underground operations.

2. FACILITIES AND SUPERVISION

2.1. Quality control

HTS should be conducted only in climatic chambers with a satisfactory degree of environmental control, and only under the supervision of qualified personnel. The requirements imply a system of quality control consisting of:

- Regular (monthly) internal audits of climatic chamber temperature control and of the accuracy and calibration status of all instrumentation.
- A comprehensive annual audit of supervision proficiency and of the facility in its entirety (records, instrumentation, referrals, reports, etc.). This audit should be conducted only by an independent accredited occupational hygienist with applicable and relevant experience.
- Independent audits also based on unsatisfactory internal audits.

2.2. Supervisors' credentials

Supervisors should be in possession of a certificate issued by a recognized training authority. In the past these certificates were issued by the Minerals Council South Africa, but this function was subsequently transferred to the Division of Mining Technology of the CSIR. Presenters of such courses should be registered occupational hygienists with extensive and practical experience of **HSM** and all its facets.

Annual audits conducted by independent assessors should include recommendations on supervisors in need of refresher courses.

2.3. Climatic chamber hygiene

The hot humid conditions that prevail in climatic chambers are conducive to the proliferation of micro-organisms. Since faecal and seral contamination in climatic chambers has been documented, it is imperative that a satisfactory standard of hygiene be maintained in order to protect staff and workers.

Diseases which occur sporadically in the mining industry, such as meningitis, typhoid, gastro-enteritis, tuberculosis, cholera, hepatitis-A and -B, as well as numerous others including sexually transmitted diseases, pose a potential threat to the health and well-being of workers and climatic chamber personnel. Vaccines against hepatitis-B and other diseases are available and it is recommended that appropriate measures be taken to safeguard potentially exposed personnel.

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3. PRECAUTIONS DURING SCREENING**3.1. Disinfectants**

It is imperative that a suitable disinfecting agent be used for each of the various applications at the **HTS** centre. No disinfectant solution should be prepared more than 12 hours before use.

3.2. Hand washing

Before entering the climatic chamber all test centre personnel should wash their hands thoroughly with a disinfectant soap on arrival at the centre and again after visiting toilets. Inside the climatic chamber test centre, personnel should wash their hands thoroughly with a disinfectant soap before and after measuring body temperature.

Open containers of disinfectant soap solution should be available for workers to rinse their hands after visiting urinals. In order to encourage the use of the soap solution, attendants should immediately discard and replace any solution, which appears to have become contaminated.

3.3. Footbath

On entering and leaving the climatic chamber each worker should place both feet in a footbath filled with a freshly prepared sodium hypochlorite solution (2 000 parts per million) or potassium permanganate solution (1g per 10ℓ of water).

3.4. Thermometers

Thermometers should be disinfected by total immersion in a container of freshly prepared sodium hypochlorite solution (2 000 parts per million) for at least 30 minutes). Once measurements have been recorded, thermometers should be immersed in a sodium hypochlorite solution for at least 30 minutes before re-use.

Where re-checks are necessary, only freshly disinfected thermometers should be used. At no time should a thermometer be re-used without having remained in a disinfectant solution for at least 30 minutes.

3.5. Stepping boards

Stepping boards should be of a suitable non-porous material. Wooden or hardboard stepping boards are not suitable for use in a climatic chamber. All stepping boards used during a shift should be washed, disinfected and allowed to dry before being returned to storage.

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3.6. Shower facilities

To ensure that workers effectively clean and cool themselves after completion of the test, they should shower, washing themselves thoroughly with soap and water. The temperature of the shower water should preferably be controlled at $35.0^{\circ}\text{C} \pm 5.0^{\circ}\text{C}$ by means of a master mixer. After showering, each employee should be provided with a freshly laundered cotton towel.

3.7. Laundering

Athletic shorts or skirts used during stepping procedures should be disinfected and laundered prior to re-use.

3.8. Disinfection

3.8.1. Climatic chamber

After every test the climatic chamber should be washed out thoroughly with disinfectant and water. Excess water should be removed using squeegees. Finally, a freshly prepared sodium hypochlorite solution (2 000 parts per million) is recommended for disinfecting the floor, concrete stepping beams and walls.

It should be noted that sodium hypochlorite may cause corrosion of metal objects, e.g. urinals and taps. For these applications, disinfectant soap should be used in climatic chambers.

3.8.2. Restroom

Sodium hypochlorite may cause corrosion of metal objects, e.g. urinals and taps. For these applications disinfectant soap should be used in rest rooms.

3.9. General maintenance

3.9.1. Condition of floor and walls

Uneven surfaces and cracks should be repaired as soon as possible. The use of wooden components and materials in a climatic chamber should be avoided, as these are ideal places for the growth of infectious organisms.

3.9.2. Ongoing monitoring

The introduction of the vibrio cholera into climatic chambers has been documented. Faecal contamination of the environment, e.g. via drinking water, floors, air humidifying reservoirs and main sewer lines, may well occur as a result of profuse perspiration flowing across the peri-anal region of carriers undergoing the **HTS**.

Apart from maintaining strict hygiene during and after climatic room procedures, it is recommended that a formal monitoring programme be implemented. When substandard conditions exist, appropriate interventions must be applied.

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4. GENERAL PROCEDURE

The procedures to be followed comprise essentially of the pre-test period and, subsequently, the **HTS** itself. The test should ideally be conducted in the forenoon following a light breakfast taken at least one hour before the test is due. However, if from a logistics point of view it would be preferable to conduct the **HTS** test later in the day, this would be equally acceptable.

4.1. Pre-test procedures

4.1.1. Rest period

A rest period of 30 minutes should be allowed before **HTS** commences. The environment should be comfortable for men wearing only shorts ($27.0^{\circ}\text{C} \pm 2.0^{\circ}\text{C}$ **DB**; $< 20.0^{\circ}\text{C}$ **WB**). During this time, smoking should be prohibited, and no form of liquid refreshment should be taken during the last 20 minutes before the test. During the rest period, supervisors should be alert to detect any apparent signs indicative of alcohol and/or drug abuse, or of illness or sickness.

4.1.2. Induction

In order to foster an understanding on the part of the workers and to elicit their co-operation, every effort should be made to inform them of the reasons and procedures for **HTS**. In addition, the preventive measures and procedures to be followed during the period of natural acclimatization, where applicable, should be detailed so that workers are fully acquainted with the procedures, as well as factors, which may affect their heat tolerance.

4.1.3. Initial body temperature recording

Oral temperatures should be measured only with thermometers checked for accuracy by an accredited institution. This check is carried out against a certified thermometer in a water-bath at temperatures of 37.0°C and 39.0°C , respectively.

Oral temperatures are measured upon completion of the rest period. Care should be exercised to ensure that the thermometers are shaken down properly before measurements are made. The thermometer bulb should be placed under the tongue, with the stem protruding from the corner of a closed mouth for at least three minutes before being read. After recording the reading, the thermometer should be properly sterilized.

Any individual displaying resting oral temperature of more than 37.0°C (37.1°C) should be rejected for **HTS**. Any individual displaying an oral temperature of more than 37.0°C should be referred for medical evaluation as a potential fever case. With the approval of the mine medical officer, such individuals can be re-admitted for testing at a later date. However, under no circumstances may oral temperatures of 37.1°C be condoned.

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4.2. Test procedure

4.2.1. Environmental conditions

The **HTS** test should be carried out at a **DB** of 29.5°C and a **WB** of 28.0°C. Environmental temperatures should be measured and recorded at five-minute intervals at various locations in the climatic chamber.

Ideally, the climatic chamber should be operated at the optimum **WB** of 28.0°C, with a maximum permissible range of 27.7°C to 28.5°C. Corrective action should therefore be initiated as soon as the temperature deviates from 28.0°C **WB**, and not only once the permissible range is exceeded. The optimum difference between the **DB** and **WB** is 1.5°C. The **DB/WB** difference should never be less than 1.0°C or more than 2.0°C.

The test should be discontinued immediately if any deviations from the above range occur. In such an event, these employees could be retested the following day.

In addition to environmental temperatures, the air movement in the climatic chamber must also be controlled within the range of 0.3 to 0.5 m.s⁻¹ in all areas of the chamber where employees step. This should be confirmed during monthly inspections by the environmental control departments on mines. The **HTS** should not be allowed to commence unless prescribed environmental conditions already exist in the climatic chamber.

4.2.2. Work rate, duration and stepping procedure

An external work rate of approximately 80W (positive component) should be maintained by a bench-stepping regimen at a fixed step rate of 24 steps per minute and a fixed stepping height of 30.5 cm. The duration of the test is 30 minutes.

The stepping procedure should be performed in the following manner:

- The upper body should be erect.
- The arms should swing freely.
- The same foot must lead in the upward and downward movement of any given step.
- Both feet should complete the full cycle.
- The upper body may not be supported by hands placed on the thighs.
- The period on the beam should equal the period on the floor.

A fully completed step is defined as the movement of the body from the floor up onto the stepping beam, by using both feet, and back to the original position on the floor, again by using both feet.

4.2.3. Assessment of relative heat tolerance

The assessment of relative heat tolerance is based on oral temperatures, which is recorded at the end of the 30-minute bench-stepping exercise. Thermometers should

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be issued on an individual basis, and sterilized at the conclusion of the assessment.

The thermometer bulb should be placed under the tongue, away from the teeth with the stem protruding from the corner of the closed mouth for a period of at least three minutes before being read. Supervisors should ensure that mouth breathing is not permitted. In fact, in such cases the supervisors should regard the measurements as invalid and, on this basis, refer the person for a retest.

During the three-minute period employees should sit on the stepping beam to minimize post-exertional syncope ('black-out') and to minimize possible injury to themselves should they fall. Supervisors should be alerted to this eventuality.

4.2.4. Related procedures and precautions

Supervisors should also be on the alert for signs of early heat exhaustion, overt fatigue or imminent collapse and should not hesitate to remove from the chamber any such cases, which, in their opinion, warrant this action. Further action or treatment would depend on specific circumstances. However, all such cases should be referred for medical examination with a formal report of events surrounding the incident.

Any person who stops stepping, except to regain his stride, or who leaves the climatic chamber before the end of the test, can be re-subjected to the **HTS** within a period of 24-hours. If a person who is regarded as fit to undergo **HTS** by virtue of both a medical and physical examination, but is incapable of completing a **HTS** test on two successive attempts, he should be regarded as unfit for any form of work of a physical nature.

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ANNEXURE 8: Work practices: Surface, opencast and underground operations
(For information only)**1. RATIONALE FOR WORK PRACTICES**

Within the context of **HSM**, no form of heat acclimatization will have preceded the allocation of employees to hot areas of work. Workers will have been screened only for gross heat intolerance and will be expected to commence duties without the advantage of acclimatization. Special precautions are indicated with the rationale based on the major causes of heat stroke in mining (Kielblock, 1992). The relevant statistics are, therefore, important to all levels of line management directly responsible for the execution of **HSM** (Table 1.1).

TABLE 1.1: Direct casual factors implicated in development of heat stroke

FACTOR	PREVALANCE	
	n	%
Strenuous work ¹	82	85
▪ Atypical ²	19	20
▪ Lashing	19	19
▪ Drilling	16	17
▪ Transporting	15	15
▪ Pack building	12	12
▪ Winching	2	2
Suspect heat tolerance	50	52
Dehydration	48	50
▪ Alcohol	32	33
▪ No water	13	14
▪ Emetics/laxatives	3	3
Excessive heat	27	28
▪ WB > 32.5°C	21	22
▪ dB > 37.0°C	6	6
TOTAL		215

¹ These categories exhibit the highest mean metabolic rates of mining tasks and on average exceed 160 W/m²

² A typical work is strenuous work not normally associated with a particular work category.

A review of the occurrence of heat stroke over the past decade identifies strenuous work as the single most important causal factor, followed by suspect heat tolerance, dehydration and excessively hot (**DB** >37.0°C, **WB** >32.5°C) thermal conditions.

Figures 1.1 and 1.2 lists the work rates of a number of surface and underground work categories. Investigations over the past decade or so, reveal that the incidence of heat stroke is related mainly to work categories associated with strenuous work (Kielblock 1992). On this basis, it could be argued that any work associated with mean metabolic rates in excess of 160 W/m² constitutes an unacceptable heat stroke risk. In numerous instances strenuous work not normally associated with a particular job description, and therefore regarded as atypical, has been identified as the most critical in terms of heat

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stroke risk.

Suspect heat tolerance refers to instances where the incident could be related to poor health, a history of heat disorders, low work capacity in relation to work demand and, notably, inappropriate exemptions from any form of screening.

Water intake is generally inadequate, through either voluntary restrictions or the non-availability thereof. Moreover, alcohol-induced dehydration has been implicated in more than 30% of heat stroke cases.

Further analysis reveals that excessively hot **thermal environments** constitute the most serious complication in the incidence of heat stroke fatalities. In fact, where such thermal conditions exist, the mortality rate is virtually doubled. An excessively **hot environment** is defined as one where either the **DB** exceeds 37.0°C or the **WB** exceeds 32.5°C.

The origin of heat stroke is multi-factorial. The main causal factors therefore constitute an interaction of strenuous work, suspect heat tolerance, excessively **hot environments** and concurrent dehydration. General complacency is the single most important root cause, an observation substantiated by the fact that the relative incidence of the major causal factor totals 215 percentage points (Table 1.1).

On the basis of the above analysis, a basic framework can be derived for work practices in **hot environments**, irrespective of whether such heat loads are associated with surface, opencast or underground operations. This framework is presented in Table 1.2 below.

2. HEAT ACCLIMATISATION AND ITS RETENTION: IMPLICATIONS FOR HSM WORK PRACTICES

The degree of heat acclimatization ultimately achieved is a function of metabolic work rate, the environmental heat load, exposure time and exposure time repetitions. During this period, susceptibility to heat disorders is inherently higher and formal supervision is an essential element of the acclimatization process in order to ensure that all precautions are in place and observed.

Secondly, under controlled conditions full heat acclimatization can be achieved within less than a week. Conversely, a substantial and critical loss of heat acclimatization can take place within a few days' absence from work in **hot environments**. Therefore, with the introduction of new shift systems or extended surface training, scenarios exist where full heat acclimatization may remain suboptimal. Under such circumstances, or where the slightest risk of incomplete heat acclimatization exists, it follows that recommended work practices should be retained permanently.

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TABLE 1.2: Framework for HSM work practices based on the most important casual factors in the development of heat stroke

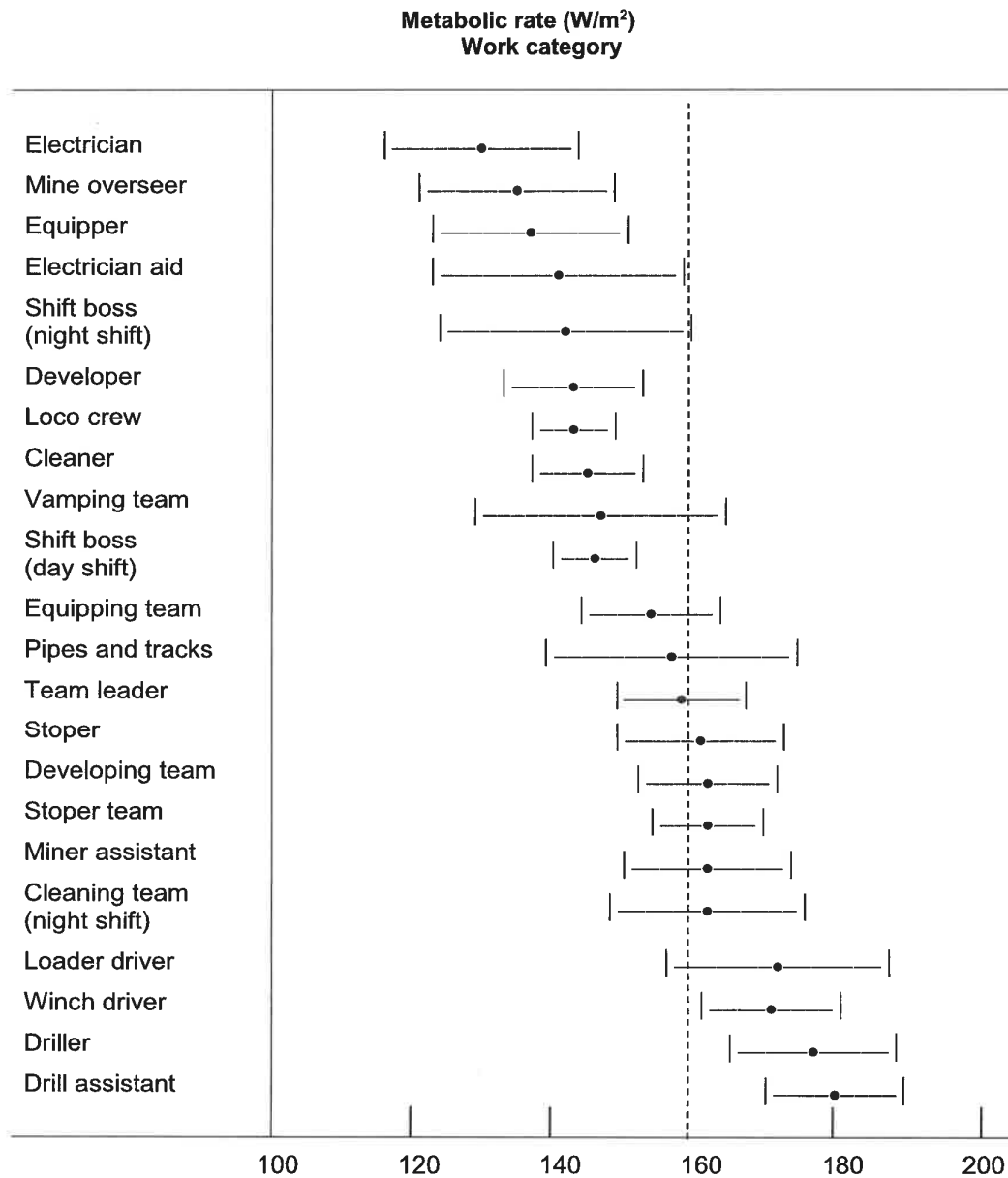
CAUSAL FACTOR	WORK PRACTICE
Strenuous work	<ul style="list-style-type: none"> ▪ Adequate physical work capacity (physical evaluation) ▪ Self-pacing (educational) ▪ Work-rest cycles (administrative and mandatory, if required)
Suspect heat tolerance	<ul style="list-style-type: none"> ▪ Overall fitness for work in hot environments: <ul style="list-style-type: none"> – Medical evaluation – Physical evaluation – Screening for heat intolerance
Dehydration <ul style="list-style-type: none"> ▪ Alcohol-induced ▪ Insufficient fluid replacement 	<ul style="list-style-type: none"> ▪ Education ▪ Provide potable and palatable water at place of work ▪ Introduced water-breaks
Excessively hot environments	<ul style="list-style-type: none"> ▪ Ongoing monitoring and control ▪ Action plans ▪ Emergency planning

A third perspective is that high levels of inherent or acquired heat tolerance do not provide any unequivocal guarantee against the development of heat disorders, including heat stroke, if basic precautions are not observed. In addition, there can be no justification for relaxing work practices simply on the outdated notion that full heat acclimatization confers immunity against heat disorders. Work practices applicable to the formality of heat acclimatization are equally applicable once an adequate degree of heat acclimatization has been achieved.

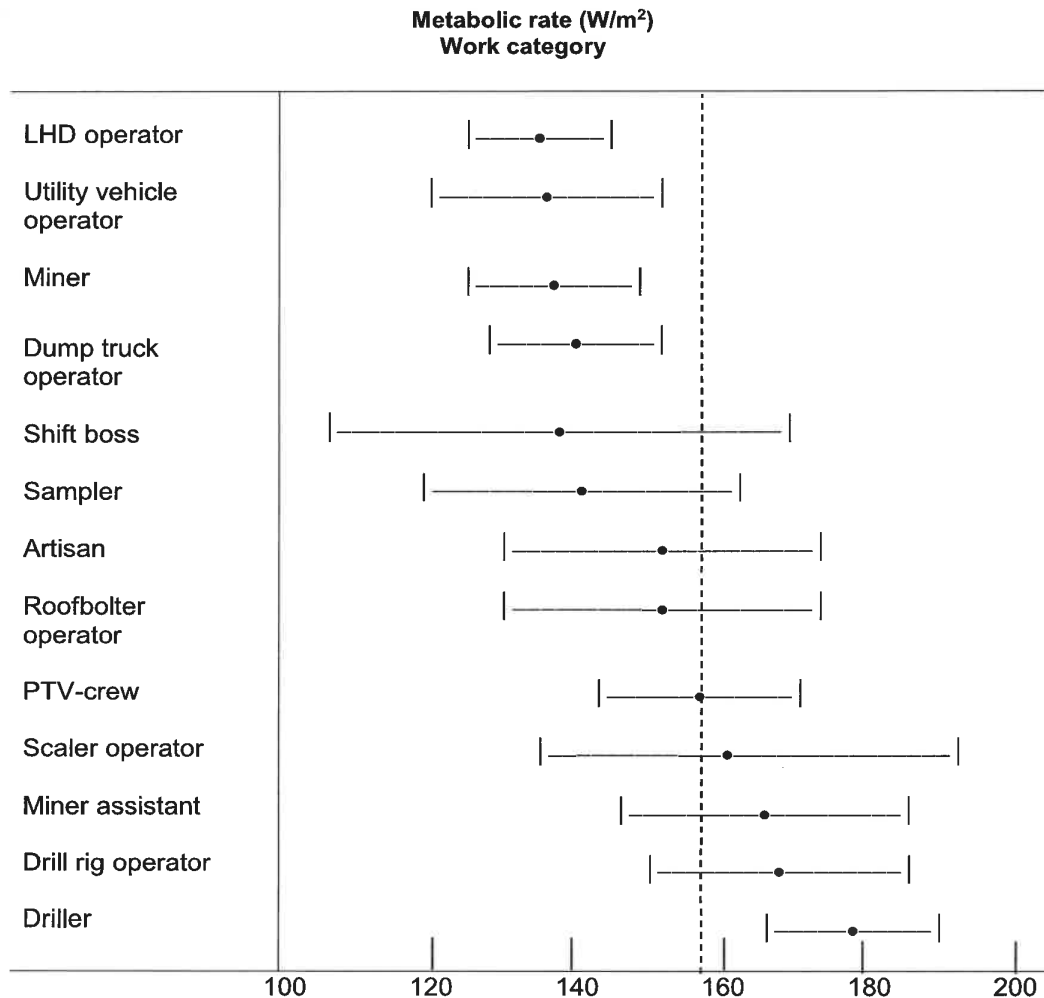
The only dispensation is that the need for close supervision could be lessened and even discontinued for routine work. Informal supervision can be established through good education and awareness retention monitoring, for example through the so-called buddy system and self-care, which is a requirement under the **MHSA**.

Finally, while employees routinely exposed to work in heat on a day-to-day basis, are likely to develop significant levels of heat acclimatization, some will remain unacclimatized by virtue of the intermittent exposures associated with a particular work category. Examples can be drawn from senior management, human resources practitioners, etc. If medically and physically cleared to enter **hot environments** in the execution of their normal duties and responsibilities, such employees, irrespective of their status or seniority, should only be permitted to do so under close supervision and while adhering fully to mine standards or **COPs**.

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FIGURE 1.1: Metabolic work rates with 95% confidence limits related to conventional mining work categories

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3. SAFE WORK PRACTICES AND SUPERVISION

From sections 1 and 2, it should be clear that two main scenarios exist for the application of safe work practices.

- Close supervision implies supervision taking place under the direction of a specially appointed person whose authority in upholding mine health and safety standards should exceed the dictates of production. It follows that such a person should have qualifications in mining, and in health and safety matters, as well as considerable experience. Close supervision applies to:
 - Employees undergoing formal heat acclimatization, irrespective of the precise circumstances necessitating heat acclimatization.
 - Any employee of the company who by virtue of his/her job or position only intermittently and irregularly enters **hot environments** in the routine execution

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of his/her duties, and who has been medically and physically cleared to do so.

- Visitors or company officials who only enter **hot environments** on special occasions and who, as a matter of course, have not been cleared either medically or physically to enter such areas.
- Informal supervision is the responsibility of all levels of line management (mine overseer, shiftboss, team leader, etc.) and applies only to routines where employees have already achieved a satisfactory degree of heat acclimatization, more precisely, it excludes all of the contingencies listed under close supervision.

Safe work practices, irrespective of the level of supervision comprise:

- Monitoring work place **WB** and **DB** on a basis designed to ensure that safe limits are not exceeded, and to detect the development of possible trends. Whirling hygrometers, checked in terms of acceptable standards, or any other suitable instrumentation, may be used.
- Checking employees for overt signs for ill health or substance abuse, and removing such persons from the place of work for attention appropriate to the situation.
- Ensuring that acceptable work rates are maintained in order to avoid the early onset of fatigue. This would be achieved through work-rest cycles (10 to 15 minutes rest in every hour) where work is of necessity strenuous and ongoing (e.g. drilling) or by instilling, through constant reminders, a sense of self-pacing.
- Ensuring that fluid replacement beverages (preferably only water or hypotonic fluids) are available at the place of work and that a fluid replacement regimen of at least two x 250-300ml per hour is observed.
- The detection of early signs and symptoms of heat disorders and instituting proper remedial action depending on the precise set of signs and symptoms.
- Ensuring that emergency treatment and communication facilities are available and fully functional on a daily basis.
- Setting into motion purpose-developed emergency action plans in the event of sudden escalations in environmental temperatures.

The above work practices, which should in any event be adopted as standard routine, are especially relevant to employees who return to work after a period of absence, irrespective of duration or reason. In this regard, it should be noted that some industries, e.g. American nuclear power plants, subscribe to a programme of progressive exposure to achieve heat acclimatization. For example, the permissible exposure on the first day is limited to 50% of a full shift exposure, and on successive days, respectively to 75% and 90% (Bernard et al, 1986).

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ANNEXURE 9: Absenteeism from routine work in hot environments
(For information only)

1. The two categories catering for absenteeism from work in **hot environments** are:
 - Absenteeism associated with any form of vacation leave or the attendance of conferences and training courses, etc.
 - Absenteeism due to illness or injury.

With regard to the former, the general recommendation is that the employee bypasses **HTS** and resumes normal work under close supervision for the designated period. The only exception is where, following annual leave, the outcome of a routine medical/physical examination necessitates **HTS** (see Annexure 6: Medical/physical examination). The period of absenteeism is immaterial provided the employee does not fall ill during this period of absenteeism. Should this occur, the mine medical officer should be consulted. **HTS** may be required at any time at the discretion of the mine medical officer, depending on circumstances. In addition, formal supervision must be in place to accommodate returning employees.

Absenteeism due to illness, especially febrile disease, makes **HTS** mandatory before resuming routine work under close supervision. Following physical injury and prolonged inactivity during recovery, **HTS** should once again be mandatory. However, the mine medical officer may exercise his discretion in the event of minor injuries, which would not influence the overall physical fitness for work in heat.

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ANNEXURE 10: Water and nutritional requirements during work in heat
(For information only)**1. MAINTENANCE OF HYDRATION: FUNDAMENTAL CONSIDERATIONS**

Sweat is produced solely to provide water for evaporative heat dissipation. Despite this thermoregulatory benefit, profuse sweating may lead to dehydration and as such constitutes a potential threat to continued normal body function. The reason is plain: sweat production is ultimately dependent on an adequate intake of water.

Dehydration leads to a reduction in the circulating blood volume. Inasmuch as the circulation is charged with heat transfer from the body core to the skin, thus facilitating convective and radiative heat loss, heat dissipation is compromised also because of inadequate heat transfer. In an effort to maintain an adequate circulation through the skin under these circumstances, the body reduces the flow of blood to non-vital tissues and organs (e.g. the gut) through constriction of blood vessels (vasoconstriction). Blood volume is reinstated, albeit in a relative sense only.

Compensatory vasoconstriction in response to dehydration commences at water deficits of between 1% and 2% of body mass, i.e. at water deficits as low as 0.7ℓ in a 70kg man. Since the gut is the primary organ in which compensatory blood vessel constriction occurs, it follows that water absorption will be reduced most drastically. This implies that dehydration may remain largely uncorrected irrespective of the amount of fluid subsequently ingested. It should be stressed in this context that drinking water according to the dictates of thirst is not sufficient to prevent voluntary dehydration, a finding that suggests that the thirst mechanism is not a reliable and sensitive indicator of the state of hydration. Moreover, the alleviation of thirst and cessation of drinking does not necessarily reflect rehydration but rather the subjective sensation of stomach fullness.

The psychological effects of dehydration are as dramatic as the physiological ones. Discipline is poor and aggressive attitudes become prominent. Such men are morose, and morale is impaired. Fatigue sets in sooner than is normally the case. In short: productivity and safety are in severe jeopardy, because of dehydration.

Under conditions designed to simulate moderate work in a mining environment, typical fluid losses because of sweating could approach 1ℓ within the first hour. It would therefore be advisable to initiate a fluid replacement regimen well in advance of the onset of this critical period. An ideal to strive for seems to be about 500ml every 20 to 30 minutes. The water should be cool (about 15°C), palatable and of good quality (potable).

2. FORM OF FLUID REPLACEMENT

The form of fluid replacement is, and remains a subject of controversy. This is surprising since first principles suggest that the form of replacement should be determined precisely by what is lost, i.e. sweat.

Sweat is watery fluid that contains considerably less solid matter than the body fluids from which it is derived. It is therefore hypotonic with regard to body fluids. Quantitatively the most important constituent is sodium chloride (salt) which varies in concentration from

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about 0.1 g to 0.3 g per 100 ml of sweat, as opposed to a value of about 0,9 g per 100 ml of body fluid.

The two most prevalent misconceptions are:

- 1) Sweat has the same composition as body fluids (i.e. the same tonicity) and fluid replacement should consequently be achieved by so-called isotonic beverages.
- 2) The body loses vast amounts of salt during sweating, hence the practice of salt supplementation through tablets and salted drinks. Thus, considering the composition of sweat as outlined above, it should be patently clear that there is no justification for the use of isotonic fluids or salt tablets.

Of further relevance is to point out that, although some form of salt replacement is indicated following prolonged and profuse sweating, pronounced salt depletion is nevertheless unlikely. The reason is that most adults following western dietary customs consume more than 20 times the requirements of the body on a daily basis. In fact, salt supplementation constitutes a physiological hazard. In countries where salt intake is high, a statistical link exists between it and the incidence of hypertension. Even the immediate effect of salt supplementation in tablet form is manifested in overt circulatory strain.

A study conducted on 400 medically screened recruits to the South African mining industry (Kielblock, 1987) revealed that:

- a) Relative to commercially available hypo-, iso- and hypertonic fluid replacement beverages, water is the preferred form and that the benefits are in terms of significantly lower rectal temperatures after four hours' work in heat.
- b) Increased tonicity has a detrimental effect which, ironically, is curbed by a lower voluntary intake but which is aggravated by force-feeding, an observation ascribed to poor gastric emptying.

3. NUTRITIONAL REQUIREMENTS FOR ENERGY REPLACEMENT

The maintenance of an optimum state of hydration is not the only prerequisite to continued physical effort in hot humid environments. Equally important is the sustained generation of energy, a process achieved by the combustion of the two principal metabolic fuels, namely carbohydrate, in the form of glucose, and fat, in the form of fatty acids.

Considering total body economics, fat has the advantage of being a more compact form of energy and it can be stored in vast quantities e.g. as in obese individuals. In contrast, carbohydrates are poorly stored (about 0.5% to 1.0% of body mass), but have the decided advantage of being able to sustain intense short-term activity. While neither fat nor carbohydrates are inherently inefficient as an energy source, a progressive increase in physical activity is characterised by a concomitant shift from fat to carbohydrate as the predominant source of energy.

Carbohydrate depletion during sustained intense physical effort constitutes a serious limitation to continued activity. This may already become evident within four hours

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following the commencement of the shift, an event considered physiologically deleterious. Impaired work performance is therefore attributed to carbohydrate depletion as a result of a sporadic eating habits.

Against this background, it should be obvious that from a nutritional point of view certain prerequisites exist. These have been enumerated as:

- (a) A generous carbohydrate-rich meal at the end of a shift in order to replenish body stores.
- (b) A light carbohydrate meal immediately prior to the shift, which although in itself inadequate in the absence of the previous night's meal, is much more tolerable when embarking on any form of physical exertion.
- (c) A mid-shift feed comprising an acceptable tasty fluid meal containing mainly carbohydrate. An added benefit of the latter is that it also serves as an additional form of fluid replacement.

In summary: continued physical work in hot humid underground environments is a function of heat dissipation and the availability of an appropriate metabolic fuel.

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ANNEXURE 11: Emergency work in **abnormally hot environments** - underground
(For information only)**1. INTRODUCTION**

Where **WB** exceed 32.5°C, no routine work should be undertaken and only emergency work, essentially directed at re-establishing an acceptable **thermal environment**, should be undertaken.

This annexure is intended to provide a framework for the formulation of guidelines for the protection of employees who, because of an emergency of one kind or another, are likely to be exposed to excessively **hot environments**. Where relevant, some background is given in an effort to provide further guidance and is based on the findings of **SIMRAC** project GAP 045.

2. APPLICATION OF THIS ANNEXURE

Operations normally covered by mines' **COP** dealing with work in conditions conducive to heat stroke are excluded because such work is deemed 'routine' work. These guidelines apply to emergency (non-routine) work only and embrace all mines, including those generally held to be 'cool' (i.e. **WB** of < 27.5°C with the **DB** not exceeding 37.0°C) and where the prescriptions of regulation 9.2(1) of the **MHSA** do not apply.

Secondly, many mines have standards in respect of emergency work in hot environments. These standards are mine-specific and the present guidelines should therefore be viewed as complementary and not necessarily as superseding existing in-house standards or managerial instructions. However, in the absence of any such standards, these guidelines should be interpreted as representing a minimum requirement.

The guidelines presented are based on sound investigation and the data have been subjected to rigorous statistical analysis. The basic approach in establishing tolerance times has been conservative, which permits a degree of flexibility required to translate controlled laboratory simulations into the practical application. Therefore, in the interest of practicability and convenience, slight discrepancies exist between the original experimental findings and the recommendations contained in the guideline.

3. ASSESSMENT OF THE ENVIRONMENT

In the interests of simplicity, it is suggested that action levels be based on **WB** and **DB** using a whirling hygrometer or any other suitable instrumentation. It is accepted that whirling hygrometers have a number of drawbacks (e.g. cumbersome to use, fragile or not always easy to read) but at present there are no alternatives which combine easy read-out capabilities, accuracy and mine-worthiness. Sophisticated instruments, measuring mean radiant temperature and air speed, as well as converting these measurements to various indices, are not required.

The environmental heat load is expressed as the arithmetic mean of the **DB** and **WB**, i.e. an index which has its origins in the Israeli **DI**, but which has been substantially

OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

modified to what is now termed the **EHSI**.

In calculating the **EHSI**, it is recommended that all fractions of a degree be rounded up. For example, if:

$$\begin{aligned}\text{DB} &= 38.2^{\circ}\text{C} \\ \text{WB} &= 34.5^{\circ}\text{C} \\ \text{then} \\ \text{EHSI} &= (39 + 35)/2 \\ &= 37.0^{\circ}\text{C}\end{aligned}$$

4. SPECIAL PRECAUTIONS

4.1. Supervision

Any operation regarded as 'non-routine', or as an emergency, and complicated by heat should be undertaken only under the direct supervision of line management. The responsible person appointed, with whom the responsibility for the implementation of these guidelines and/or the relevant mine standard should be vested, should be assisted in his/her decisions by the environmental control manager or supervisor. He/she should be well versed with respect to the health and safety of employees under his/her control.

An important element is that of observing recommended precautions, as well as the early detection of the onset of fatigue and heat disorders. Proper instruction is therefore indicated during operations.

4.2. Selection of the task force

The task force should consist only of employees who have been screened or tested for heat tolerance or acclimatised to work in heat, by conventional climatic chamber procedures or by natural underground acclimatisation, and who have rested since the previous shift. Apparent signs of alcohol over-indulgence represent a serious contra-indication. This would also apply in the case of incipient illness, or where individuals are under medication, which would increase susceptibility to premature fatigue or heat disorders. Mine medical officers or qualified medical station personnel should be available to assist in the final selection process.

4.3. Assessment of the task and general awareness

Work rates cannot be prescribed or limited where emergency work has to be undertaken, especially where life is at stake. However, in the assessment of the physical demands likely to be imposed, it would be essential to impress on workers the importance of self-pacing to avoid the onset of severe fatigue. Once this happens, it is virtually impossible to recover substantially while still faced with high environmental heat loads. Reinforcing an awareness of the potential hazards associated with a particular task is therefore fundamentally important. Induction appropriate to conditions likely to be encountered is similarly essential.

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A distinction is warranted between non-routine or emergency work undertaken by qualified mine personnel on the one hand and operations which by their very nature can only be undertaken by rescue brigadesmen on the other hand. It is a fallacy to argue that brigadesmen, because of their high selection and training standards are necessarily superior to general workers when exposed to high environmental heat loads. Brigadesmen operations almost invariably require full dress (overalls), which significantly impede heat dissipation, while the relatively heavy and cumbersome breathing apparatus presents a further burden irrespective of its advantage. In addition, with a full mask, brigadesmen may have difficulty in observing water breaks and a prior intake is, therefore, advisable. Although these guidelines are relevant to rescue brigadesmen operations, they are not intended to govern such operations at present.

4.4. Infrastructure

The key infrastructure and organisational requirements are:

- (a) Ensuring drinking water is made available at the place of work and that regular water breaks are observed, e.g. 350 -500 ml of water every 30 minutes.
- (b) The availability of emergency body cooling facilities.
- (c) Standby medical staff.

Any employee showing early signs of heat disorders, notably behavioural changes, but also premature fatigue, muscle cramps, nausea, vertigo or more advanced signs associated with heat exhaustion and heat stroke, should be removed to cool areas immediately and treated accordingly.

4.5. Complicating factors

While the emphasis falls on heat in the present context, cognisance should be taken of other aggravating factors, e.g. carbon monoxide and oxygen deficiency, as well as other gases or toxic fumes. Appropriate gas detection instrumentation should be issued and, in case of very dense smoke, eye protection would be necessary. (It may also be necessary to consider establishing a cache of self-contained self-rescuers). Travelling times could be affected significantly in cases of low visibility or where difficult, or demanding, routes have to be negotiated. Alternate escape routes, where in existence, should be identified beforehand.

5. ACTION LEVELS AND PERMISSIBLE EXPOSURES

5.1. Action levels

At an **EHSI** of above 28°C no emergency work should be undertaken unless by inherently heat tolerant or acclimatised employees. This would apply to mines, or sections of mines where the conditions are not generally conducive to heat stroke. Where conditions are conducive to heat stroke, an action level of 30°C **EHSI** is proposed for emergency operations, the rationale being to introduce better control to cater for unexpected conditions and to take into account cumulative effects.

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The maximum permissible upper limit is set at 45°C (**EHSI** units). Experimental subjects are generally incapable of exerting themselves under these conditions and estimates of tolerance times become too unreliable to make further projections because of the lack of statistically meaningful data.

In summary, the recommended action levels are as listed below:

EHSI ≥ 28°C:

Emergency work to be undertaken only by heat tolerant or heat acclimatised task forces; no time limits are proposed but work should proceed under supervision and with regular water breaks.

EHSI ≥ 30°C:

Special precautions (see section 4) and tolerance times (see Table 1) are to be observed.

EHSI ≥ 45°C:

Maximum permissible upper limit, no work should be undertaken unless whole body cooling is feasible.

5.2. Body cooling garments

The benefit conferred by body cooling garments suggests that, at **EHSI** values of 40°C and below, tolerance times can be extended by about 30 minutes. This reduces quite sharply above and **EHSI** of 40°C and the maximum recommended extended time should not exceed 20-25 minutes.

Although it could be argued that these benefits are not substantial in terms of the investment, the extent of protection may well be crucial from a survival point of view. A further consideration is that the well-being and safety of an entire team could be jeopardised by the premature collapse of any single member.

It is proposed that, where available, body cooling garments be worn in order to provide added protection, especially where conditions cannot be predicted or where conditions change unexpectedly. Mines are advised to confer with the Manager: Occupational Hygiene at the CSIR: Mining Technology with regard to choice.

5.3. Tolerance times

The tolerance times are presented in Table 1: Tolerance times for various **EHSI** levels and benefit of body cooling garments of these guidelines, and from a convenience and practical point of view, presented in 10-minute intervals for 'moderate' and 'hard' work, respectively.

A complication arises when temperatures increase because initial estimates of tolerance times have to be reduced to take into account the added heat load. Inasmuch as exposure up to that particular stage, even if of a lower magnitude cannot be discounted, it is obvious that the new tolerance time has to be adjusted downwards from the limit actually recommended for that **EHSI** level. The following example illustrates a hypothetical case. A moderate work rate is assumed throughout the entire operation.

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At start of operation:

DB	=	32.0°C
WB	=	28.0°C
EHSI	=	(32 + 28)/2
	=	30.0°C

The recommended limit for an **EHSI** level of 30°C is 230 minutes (Table 1: Tolerance times for various **EHSI** levels and benefit of body cooling garments) and this includes travelling time, assuming environmental conditions remain constant.

At point of entry to area of work:

Elapsed travelling time	=	20 minutes
Available operational time	=	230 - total travelling time
	=	230 - (20 x 2)
	=	190 minutes

In other words, if the environmental heat load remains constant following the entry to the area of work, the available operational time is 190 minutes.

Following entry to the area of work, it was established that the environmental heat load had increased:

DB	=	38.0°C
WB	=	34.0°C
EHSI	=	(38 + 34)/2
	=	36.0°C

The recommended time for an **EHSI** level of 36°C is 90 minutes. However, travelling time must be taken into account and an equitable 'penalty' derived. Inasmuch as the respective **EHSI** levels and corresponding tolerance times constitute equivalent 'doses' (i.e. identical risks of $< 10^{-3}$ to reach rectal temperature of 39.5°C), the penalty could be expressed in terms of dose.

In the present example, travelling time to the area of work amounted to 20 minutes. On the assumption that the return journey would also take 20 minutes under identical conditions, the dose from travelling can be estimated as follows:

Dose	=	Actual exposure / permissible exposure
	=	Total travelling time / permissible exposure
	=	40 / 230
	=	0.1739
	=	17%

This implies that the available dose at the higher **EHSI** level of 36.0°C would have to be penalised by the dose incurred as a result of travelling to and from the area of work. This dose amounts to 17% and, consequently the available dose amounts to 83% of the total permissible tolerance time, therefore:

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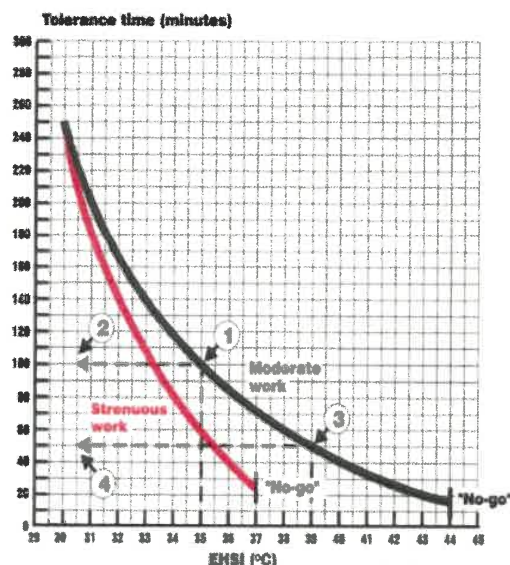
$$\begin{aligned}
 \text{Available operational time} &= \text{Permissible tolerance time} \times 0.83 \\
 &= 90 \times 0.83 \\
 &= 74.7 \\
 &= 75 \text{ minutes}
 \end{aligned}$$

Although the calculation is straightforward, practical problems are likely to be experienced under most emergencies, especially since instrumentation to facilitate rapid calculation is not available at present. To overcome this problem a pocket-sized quick reference chart has been provided. Figure 1: Emergency work schedules without body cooling garments and Figure 2: Emergency work schedules without the use of body cooling garments (facsimile of quick reference card) below give examples of such a reference chart.

FIGURE 1: Emergency work schedules without body cooling garments

EMERGENCY WORK SCHEDULES WITHOUT BODY COOLING GARMENTS

Note: see reverse for instructions



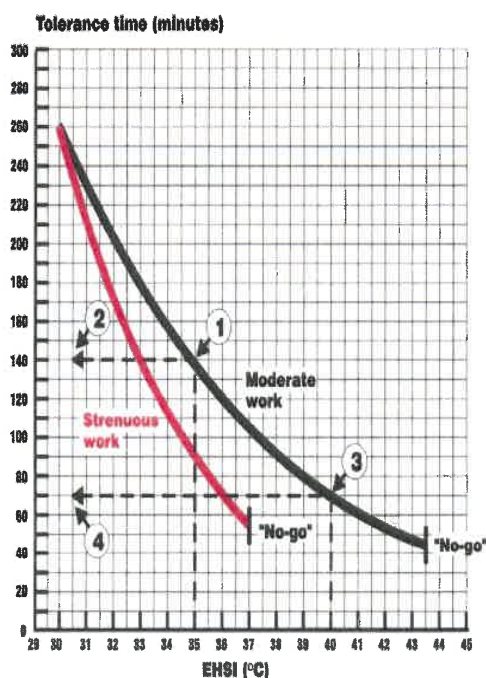
OBVERSE

INSTRUCTIONS

STEP	EXAMPLE	Graph ref.
1 Calculate WBGT $WBGT = (WB + WB_{cl}) / 2$	Dry-bulb (WB) = 40°C Wet-bulb (WB _{cl}) = 30°C WBGT = $(40 + 30) / 2$ = 35°C	1
2 Estimate actual/anticipated work rate: • moderate: self-paced/comfortable • strenuous: conscious effort/difficult	Estimated work rate = moderate	
3 Record corresponding tolerance time from relevant graph	Tolerance time (e.g. for moderate work) = 100 minutes	2
4 Record time at start of operation	Starting time = 1145	
5 Monitor WBGT and work rate	New WBGT = 38°C New tolerance time = 50 minutes	3 4
6 Re-adjust tolerance time if permissible changes occur • Estimate elapsed time = Elapsed time since start* original tolerance time * e.g. 20 minutes • Calculate available dose = 1 - elapsed dose • Calculate available operational time = new tolerance time x available dose	Elapsed time since start = 20 minutes Elapsed dose = $20/100$ = 0.2 Available dose = $1.0 - 0.2$ = 0.8 Available operational time = 50×0.8 tolerance time at new WBGT of 38°C = 40 minutes	
7 Monitor and re-adjust if indicated Steps 1 - 6		

REVERSE

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FIGURE 2: Emergency work schedules without the use of body cooling garments (facsimile of quick reference card)**EMERGENCY WORK SCHEDULES
WITH BODY COOLING GARMENTS****Note:** see reverse for instructions

OBSERVE

INSTRUCTIONS

STEP	EXAMPLE	Graph ref.
1 Calculate EHSI $EHSI = (DB + WB) / 2^{\circ}C$	Dry-bulb (DB) = 40°C Wet-bulb (WB) = 30°C $EHSI = (40 + 30) / 2$ $= (70 / 2)$ $= 35^{\circ}C$	1
2 Estimate actual/unanticipated work rate: - moderate: self-paced/"comfortable" - strenuous: conscious effort/difficult	Estimated work rate = moderate	
3 Record corresponding tolerance time from relevant graph	Tolerance time (e.g. for moderate work) = 140 minutes	2
4 Record time at start of operation	Starting time = 1145	
5 Monitor EHSI and work rate	New EHSI = 40°C New tolerance time = 70 minutes	3 4
6 Re-adjust tolerance time if perceptible changes occur • Estimate elapsed dose = Elapsed time since start* original tolerance time * e.g. 20 minutes • Calculate available dose = 1 - elapsed dose • Calculate available operational time = new tolerance time x available dose	Elapsed time since start = 20 minutes Elapsed dose = $20 / 140$ = 0,16 Available dose = $1,0 - 0,16$ for new EHSI = 0,85 Available operational time = $70 \times 0,85$ tolerance time at new = 60 minutes EHSI of 40°C	
7 Monitor and re-adjust if indicated Steps 5 - 6		

REVERSE

It is equally clear that the mental arithmetic associated with the calculation of 'dose' in order to re-assess tolerance time under conditions where thermal conditions deteriorate, would be even more daunting. Consideration should therefore be given to the 'estimated dose' where convenient fractions are used e.g. 25, 50 and 75%. Using the above example, the following estimates would be obtained.

Elapsed dose	=	40/230	=	20%
Available dose	=	200	=	100-20
			=	80%
Available operational time	=		=	80% of 90 minutes (or 0.8 x 90)
			=	72 minutes

The principle proposed is therefore that any convenient fraction (i.e. single decimal figures) be used when reassessments of tolerance time are indicated.

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TABLE 1: Tolerance times for various **EHSI** levels and benefit of body cooling garments

	TOLERANCE TIME (MINUTES)			
EHSI ¹	EXPERIMENTALLY DETERMINED ²	RECOMMENDED LIMIT ²		BODY COOLING GARMENTS BENEFIT
		MODERATE	STRENUOUS	
28-29,9	-	No limit	No limit	+30
30	227	230	230	
31	200	200	180	
32	174	175	140	
33	150	150	110	
34	128	130	85	
35	108	110	60	
36	91	90	40	
37	75	70	25	
38	61	60	No work	
39	50	50		
40	40	40	Evacuate area	Maximum of 20-25 minutes
41	33	30		
42	27	30		
43	24	20		
44	22	20		
45	21			

¹ **EHSI** = (DB + WB in °C)/2² Recommended limits are based on experimentally determined limits but rounded up in the interests of convenience to cater for respectively, "moderate" (self-paced, i.e. working at a comfortable rate) and "strenuous" work (i.e. where effort is apparent, e.g. transporting heavy materials without a break, climbing up steeply inclined sections).

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ANNEXURE 12: Addendum for the thermal stress guideline on the criteria for heat-related illnesses (heat exhaustion and heat stroke)**1. OVERVIEW**

- 1.1. Heat stroke is the most severe disorder and can result in death if not detected at an early stage. It is caused by a rapid increase in one's core temperature in excess of 40°C from exposure to a hot and humid environment. Heat stroke is accompanied by serious clinical syndromes that damage multiple organ systems. Heat stroke is a medical emergency and rapidly cooling the affected worker is imperative.

Source: Expert consensus on standardized diagnosis and treatment for heat stroke (online).

- 1.2. Heat exhaustion is often considered a precursor to the more serious heat stroke. This disorder has been encountered frequently in experimental assessment of heat tolerance. Usually, it is accompanied by a slightly elevated core body temperature (38°C - 39°C, or 100.4°F - 102.2°F).

Source: Criteria for a recommended standard occupational exposure to heat and hot environments, Department of Health and Human Services, Centres for Disease Control and Prevention, National Institute for Occupational Safety and Health (online).

2. CLINICAL SIGNS AND SYMPTOMS OF HEAT-RELATED ILLNESSES

WHAT TO LOOK FOR	WHAT TO DO
HEAT STROKE	
High body temperature (39°C or higher): <ul style="list-style-type: none"> Hot, red, dry or damp skin. Fast, strong pulse. Headache. Dizziness. Nausea. Confusion. Losing consciousness (passing out). 	Heat stroke is a medical emergency: <ul style="list-style-type: none"> Move the person to a cooler place. Help lower the person's temperature with cool cloths or a cool bath. Do not give the person anything to drink.
HEAT EXHAUSTION	
Heavy sweating: <ul style="list-style-type: none"> Cold, pale, and clammy skin. Fast, weak pulse. Nausea or vomiting. Muscle cramps. Tiredness or weakness. Dizziness. Headache. Fainting (passing out). 	<ul style="list-style-type: none"> Move to a cool place. Loosen your clothes. Put cool, wet clothes on your body or take a cool bath. Sip water. Get medical help right away if: <ul style="list-style-type: none"> You are throwing up. Your symptoms get worse. Your symptoms last longer than one hour.
HEAT CRAMPS	
Heavy sweating during intense exercise. Muscle pain or spasms.	<ul style="list-style-type: none"> Stop physical activity and move to a cool place. Drink water or a sports drink. Wait for cramps to go away before you do any more physical activity.

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WHAT TO LOOK FOR	WHAT TO DO
	Get medical help right away if: <ul style="list-style-type: none"> ▪ Cramps last longer than one hour. ▪ You are on a low-sodium diet. ▪ You have heart problems. ▪
SUNBURN	
Painful, red and warm skin. Blisters on the skin.	<ul style="list-style-type: none"> ▪ Stay out of the sun until your sunburn heals. ▪ Put cool cloths on sunburned areas or take a cool bath. ▪ Put moisturizing lotion on sunburned areas. ▪ Do not break blisters.
HEAT RASH	
Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases).	<ul style="list-style-type: none"> ▪ Stay in a cool, dry place. ▪ Keep the rash dry. ▪ Use powder (like baby powder) to soothe the rash.

Source: https://www.cdc.gov/disasters/extremeheat/pdf/Heat_Related_Illness.pdf

3. ASSESSMENT OF CORE BODY TEMPERATURE

Usually heat exhaustion may manifest as sweaty and clammy extremities and heat stroke may manifest as hot or warm limbs. The actual body temperature needs to be measured at the core.

Usually the thermometer is placed within the mouth, in the groin folds, armpits or rectum to detect the core temperature. A temperature of 40°C (104°F) or above is often a major sign of heat stroke.

Heat stroke however can be diagnosed at lower temperatures and these temperatures are not always indicative of heat stroke as athletes may reach them during physical exercise.

Source: *Diagnosis and treatment of heat stroke (online)*

4. DIAGNOSIS OF HEAT STROKE

4.1. Laboratory tests can confirm the diagnosis, rule out other causes for the symptoms and assess organ damage. These tests include:

- Routine blood work.
- Infection indications.
- Blood biochemistry: electrolytes, renal function, liver function and rhabdomyolysis.
- Coagulation.

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- Arterial blood gas.
- Routine urine testing and urine biochemistry.
- Routine fecal testing.
- Muscle function tests (rhabdomyolysis).

4.2. Other tests

- Electrocardiogram.
- Chest X-ray.
- Cranial Computerized Tomography (CT) examination.
- Cranial Magnetic Resonance Imaging (MRI) examination.

5. TREATMENT OF HEAT EXHAUSTION AND HEAT STROKE

Those with heat exhaustion and heat stroke need the following therapy approaches:

- The person needs to be taken to a cool place. Preferably a room with air conditioning or at the most somewhere in the shade.
- If the person is conscious, he or she should have something cold to drink i.e. water or a rehydration drink such as a sports drink.
- Drinks containing alcohol and caffeine should be avoided as it leads to further dehydration.
- In patients with heat exhaustion, the symptoms decrease within an hour or so, and leave no long-term effects.
- The persons clothing should be loosened and excess clothing should be removed.
- There should be adequate ventilation and airflow to allow further cooling. Fanning often helps.
- The person's skin should be cooled by using cool but not cold water (15-18°C). This could be done with a cool shower or bath, or by applying a wet flannel cloths or a facecloth to the skin.
- They may be immersed in cool but not cold water. This last step is best performed under medical supervision as the person may respond with a sudden change in blood pressure especially among those who have heart disease or the elderly.
- Gently massage the skin to ensure blood circulation.

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- In case of fits or seizures, move the person away from objects that may cause injury. Nothing should be forced into the mouth of the patient.
- When the person vomits or is unconscious, they should be placed on their side to avoid choking. In these cases, emergency departments must be notified immediately.
- Those who are vulnerable to heat stroke and its complications (i.e. children below the age of two years, the elderly, or debilitated and long-term ill persons with diabetes, kidney and heart disease) need to be moved to a hospital for better monitoring and care.
- In the hospital will administer fluids and electrolytes as necessary while closely monitoring breathing, airways and the maintenance of blood circulation of the person.
- Apply ice packs to the patient's neck, armpits and groin to cool at a rate of around 0.1°C per minute. Ice-bath immersion has been shown to be the most effective cooling method.
- Cooling is slowed or stopped, once the body temperature is < 38.5°C to avoid overcooling. Iced gastric lavage and peritoneal lavage is attempted in severe cases.
- Medication such as Benzodiazepines and muscle relaxants are given to control shivering and fits.
- A urinary catheter is inserted to measure the exact urine output.
- Complications such as respiratory distress, encephalopathy (brain disorder), rhabdomyolysis, kidney or liver damage is managed according to the severity and the symptoms.

Source: Diagnosis and treatment of heat stroke (online)

6. EPIDEMIOLOGICAL CHARACTERISTICS OF HEAT STROKE

The heat index is a numerical value obtained by a mathematical operation using temperature and humidity levels. The heat index positively correlates with the rate of onset for heat stroke. When the heat index is > 41, the heat stroke onset rate increases. When the heat index is > 54, heat stroke is extremely likely to occur (Figure 1).

FIGURE 1: Heat index correlation with temperature and humidity



OCCUPATIONAL HEALTH PROGRAMME ON THERMAL STRESS

ANNEXURE 13: Reference documents
(For information only)

1. Kielblock AJ and Schutte PC (1998). A Guide to Heat Stress Management. SIMRAC research project report GAP 505. SA Department of Minerals and Energy (Johannesburg).
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4. The American Conference of Governmental Industrial Hygienists (**ACGIH**) booklet. Threshold Limit Values (**TLVs®**) and Biological Exposure Indices (**BEIs®**).
5. The Mine Ventilation Practitioner's Data Book (1992). Section: Heat Stress. Topic: Stress.
6. Mine Ventilation Society of South Africa. Handbook in Environmental Engineering. Chapter 20 (Heat stress: origins and consequences) and Chapter 21 (Heat stress management).

DEPARTMENT OF MINERAL RESOURCES AND ENERGY

NO. 1755

11 February 2022

MINE HEALTH AND SAFETY ACT, 1996 (ACT NO 29 OF 1996)

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

I **DAVID MSIZA**, Chief Inspector of Mines, under section 49 (6) of the Mine Health and Safety Act, 1996 (Act No. 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.

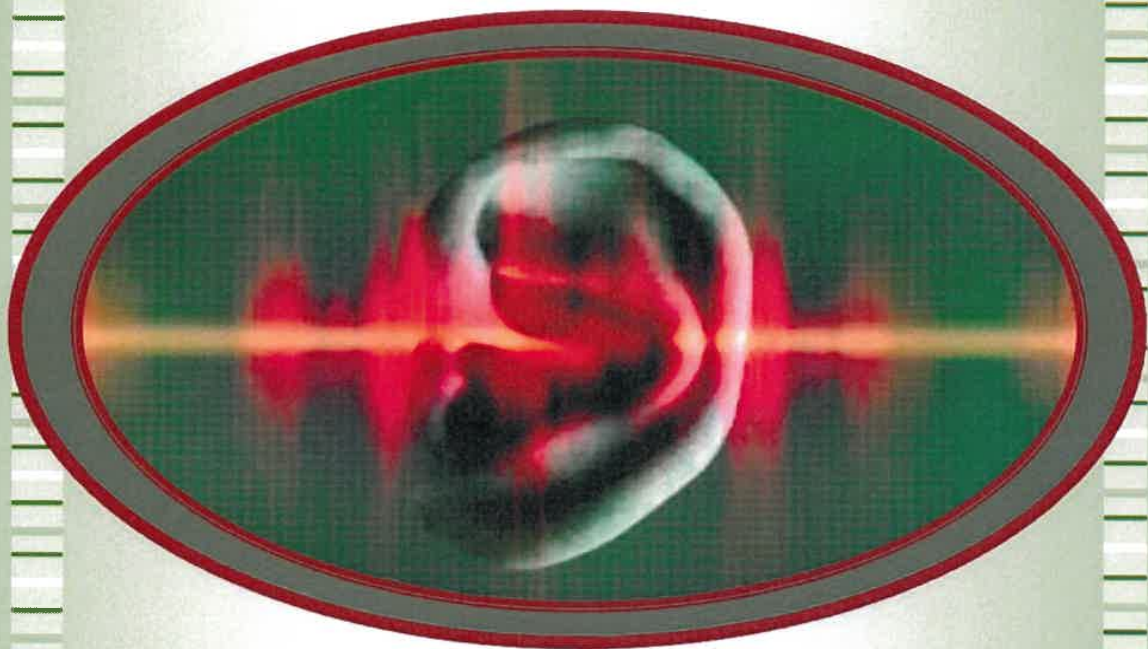


DAVID MSIZA
CHIEF INSPECTOR OF MINES

SCHEDULE

**GUIDELINE FOR THE COMPILATION OF
A MANDATORY CODE OF PRACTICE FOR**

**Occupational Health Programme
(occupational hygiene and medical surveillance)
for
Noise**



MINE HEALTH AND SAFETY INSPECTORATE

2022



**mineral resources
& energy**

Department.
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

Reference number: DMRE 16/3/2/4-B7
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Date First Issued: 01 February 2002
Effective Date: 1 May 2022

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



CHIEF INSPECTOR OF MINES

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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**.

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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 μ 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.

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- 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 10th 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**):

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

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_o is the reference sound pressure level ($p_o = 20 \mu\text{Pa}$).
 - $p_A^{(t)}$ 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.

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- 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 percent of observations fall. For example, the 20th **percentile** is the value (or score) below which 20 percent 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 25th **percentile** is also known as the first quartile (Q_1), the 50th **percentile** as the median or second quartile (Q_2), and the 75th **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.

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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 ≥ 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 ≥ 82 **dB** $L_{Aeq, 8h}$).

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5.4.2. A formal **hearing conservation** programme which includes medical surveillance ($\geq 85 \text{ dB } L_{\text{Aeq, 8h}}$).

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. Deyse
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** (i.e. 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. (e.g. 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.

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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**.

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- 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

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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.

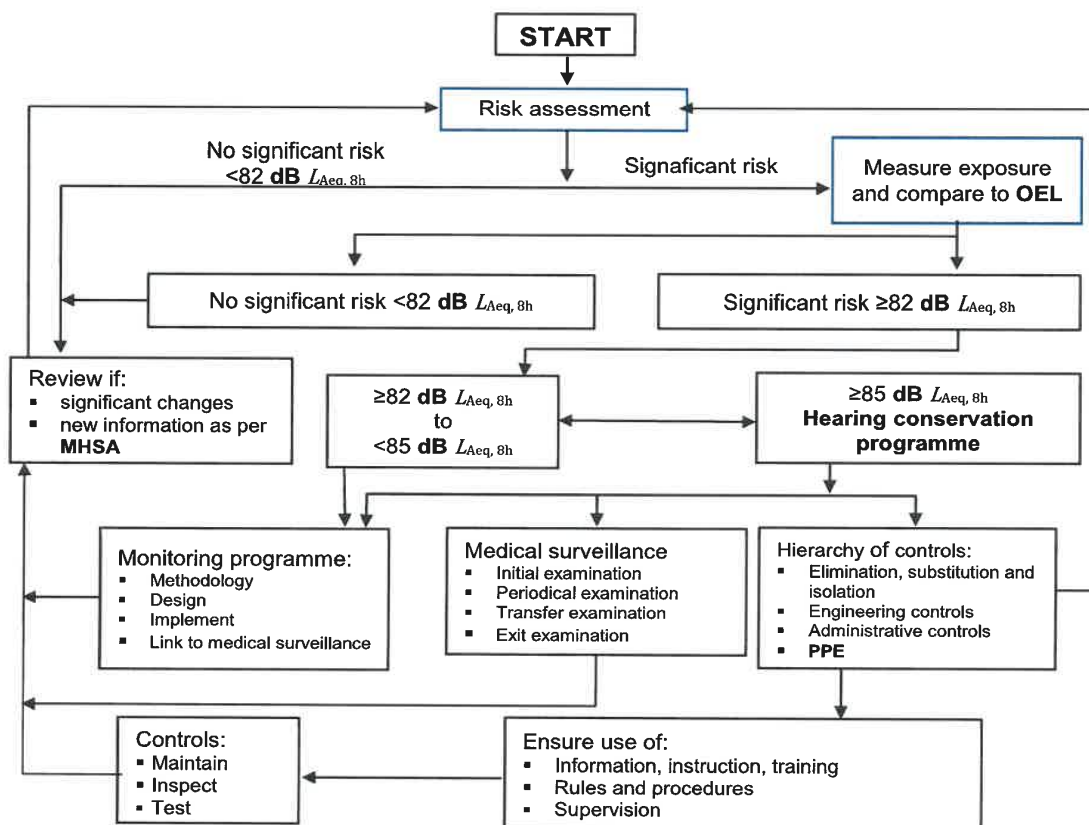
8. ASPECTS TO BE ADDRESSED IN THE COP

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



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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 e.g. 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) Prioritization of the significant **noise** sources i.e. ≥ 82 dBA, 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 i.e. ≥ 82 dB $L_{Aeq, 8h}$.
- f) The pattern, i.e. intermittent, continuous etc., the duration and the frequency of employee exposure to **noise** sources identified.

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- g) The actual exposure levels measured compared to the **OEL** per working shift e.g. 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, i.e. 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 (e.g. 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.

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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 conservation 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:

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Step 1

Sub-divide the mine into sampling areas (i.e. 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 e.g. stoping is not a **HEG**, this activity area i.e. stoping, must be further sub-divided 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 90th **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).

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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 (e.g. 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.

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- (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**.

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- 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: no sampling scheduled for this category. Measurement results that are below 82 **dba** 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.

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- 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:

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

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 e.g. 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:

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- a) Controls not operating effectively.
- b) Events or factors which have influenced the results, e.g. 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, i.e. 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.

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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 ≥ 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 ≥ 85 **dB**. The use of hearing protection devices during this period that comply with the requirements of **SANS 1451** will not satisfy this requirement.

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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.

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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.

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- b) Periodic audiometry shall be used to determine:
 - (i) The occurrence and extent of any **STS** i.e. 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** ≥ 5).
 - (ii) Investigating the reason for the shift (re-testing including otoscopic examinations).
 - (iii) **STS** ≥ 25 **dB**; referral of the employee to an **OMP**.
 - (iv) Compensable hearing loss (intervals of **PLH** ≥ 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.

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- 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** ≥ 5) or **STS** ≥ 25 dB or compensable hearing loss (intervals of **PLH** ≥ 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.
 - h) Oto-acoustic emission testing including transient oto-acoustic emission testing and/or distortion product emission testing (or both), if available.
 - i) Any other audiometric test procedures to determine the degree of hearing loss that could be ascribed to **noise** exposure.
- 8.2.2.4.4. In the final conclusions from the test results, due consideration should be given to the complete medical history, including the information obtained from the employer in terms of legislation. An analysis is required as to the contribution of **noise** exposure to the hearing loss of the employee.
- 8.2.2.4.5. When an employee is referred for diagnostic audiometry, the audiologist should consider the following:
 - a) All the personal details of the employee, i.e. name, address, work reference, age, identity number, etc.

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- b) A complete medical record of the employee.
- c) A complete work record of the employee, also at previous employers, if any [see (e) and (f) below].
- d) All the details of the baseline audiometry, the most recent routine screening test result and, where applicable, the exit audiometric results from the previous employer.
- e) Complete details of all the workplace(s) in which the employee was exposed to **noise** levels \geq the **OEL**, inclusive of the personal **noise** exposure levels determined by the section 12(1) appointee of the **MHSA**.
- f) In the case of potential claims for **PLH** as in the relevant legislation, the details in terms of (e) above should include all previous occupations since the baseline was established. The total duration of exposure to **noise** during such occupations should be obtained where possible.
- g) Full specification of the hearing protectors (including their attenuation values) which were used by the employee. Where available, the actual hearing protection equipment used should be presented.

8.2.2.4.6 Records of each person tested should be kept by the employer.

8.2.2.5. Exit audiometry

- a) The employer must conduct audiometric evaluation for all persons at the conclusion of employment in a **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**.

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- (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) 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) 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 ≥ 82 **dBA** 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.

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- 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).

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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.

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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
Attapulgit	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	FI	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		

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

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3. OCCUPATION CODE LIST

Alphabetical index of the occupational codes.

OCCUPATION	CODE
Acclimatisation supervisor	70301
Acclimatisation worker	70302
Accommodation worker (other accommodation) [n.e.c.]	80699
Accommodation worker (residential) [n.e.c.]	80599
Accountant [n.e.c.]	10206
Accounting / financial management	10200
Accounting / financial worker [n.e.c.]	10299
Acid plant official	30402
Acid plant worker	30404
Administration / secretarial management	10900
Administrative officer	10903
Administrative / financial management (multi-disciplinary)	10000
Administrative / financial management [n.e.c.]	10099
Administrative / financial / business worker [n.e.c.]	19999
Advocate / barrister	60601
Agricultural management (multi-disciplinary)	90000
Agricultural management [n.e.c.]	90099
Agricultural worker [n.e.c.]	99999
Air conditioning / refrigeration engineer	40412
Air conditioning / refrigeration mechanic	40413
Air transport management	81100
Air transport officer	81101
Air transport worker [n.e.c.]	81199
Air and water services team leader/supervisor	21507
Air and water services worker	21508
Airport controller	81102
Amalgamator	30110
Ambulance officer	70803
Anaesthetist	70101
Aptitude tester	60106
Aptitude testing supervisor	60105
Aqua-jet operator	21406
Architect	50901
Architectural assistant	50902
Architectural management	50900
Architectural worker [n.e.c.]	50999
Armature winder	40320
Assay / chemistry / laboratory worker [n.e.c.]	50499
Assay technician	50403
Assayer	50401
Assistant driller (ocean)	29909
Assessor	10511
Assopulp worker	35910
Attorney / solicitor / conveyancer	60602

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OCCUPATION	CODE
Audio visual tester	70303
Audiologist/speech therapist	70322
Audiometrist	70323
Auditing management	10100
Auditing worker [n.e.c.]	10199
Auditor (computer / systems)	10102
Auditor (internal and external)	10101
Auto electrician	40319
Backfill worker	20805
Baker	35020
Banking officer	11114
Banking / investment management	11100
Banking / investment worker [n.e.c.]	11199
Banksman / onsetter	21304
Bargemaster (ocean)	81202
Barber / hairdresser	80803
Barman	80706
Barrister / advocate	60601
Beer maker	35110
Beerhall supervisor	80705
Bell signaller	21305
Beltsman	30205
Bio-medical engineer	70304
Biokineticist	70102
Blacksmith	40422
Blacksmith: apprentice	40424
Blacksmith: chargehand	40421
Blacksmith: foreman	40420
Blacksmith: operative	40423
Blacksmith: worker [n.e.c.]	40425
Blaster (supervisory)	20306
Blaster: opencast / quarry (non-supervisory)	20502
Blaster: surface works (non-supervisory e.g. smelter)	20503
Blaster: underground metal (non-supervisory)	20501
Blasting worker [n.e.c.]	20599
Boiler attendant	40803
Boilermaker: operative (grade 1)	40450
Boilermaker: operative (aide) (grade 2)	40451
Book binder	36015
Bosun (ocean)	81202
Bookkeeper	10208
Box / orepass controller	21404
Brick maker	36710
Bricklayer	40614
Bricklayer: aide	40617
Builder	40615
Building service worker [n.e.c.]	80499
Building services management	80400

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OCCUPATION	CODE
Building worker [n.e.c.]	40618
Building worker: operative	40616
Business analyst (computers)	50503
Business management	10001
Butcher	35010
Buyer / purchaser	10312
Cable joiner	40343
Calcinating worker	30508
Canteen supervisor	80701
Canteen worker	80703
Caretaker / housekeeper	80501
Carpenter	40621
Carpenter and joiner	40622
Carpenter and joiner: apprentice	40623
Carpenter and joiner: chargehand	40620
Carpenter and joiner: foreman	40619
Carpenter: aide	40624
Carpenter: worker [n.e.c.]	40625
Cashier	10209
Caster	30507
Catering management	80700
Cementer (ocean)	21699
Catering worker [n.e.c.]	80799
Cementation driller / injector	21602
Cementation supervisor	21601
Cementation worker [n.e.c.]	21699
Chairlift operator	21307
Chairman (group)	00000
Change house team leader / supervisor	80604
Change house worker	80605
Checker	10395
Chef / cook	80702
Chemical engineer	40701
Chemical engineering management	40700
Chemical engineering worker [n.e.c.]	40799
Chemical process worker [n.e.c.]	30499
Chemist	50402
Chemist technician	50404
Chief executive	00000
Child minder	80802
Chiropodist / podiatrist	70320
Cinema / video operator	60805
Civil engineer	40601
Civil engineering management	40600
Civil engineering technician	40610
Civil engineering worker [n.e.c.]	40699
Civil / building chargehand (other) [n.e.c.]	40651
Civil / building foreman (other) [n.e.c.]	40650

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Civil / building tradesman (other) [n.e.c.]	40652
Cleaner (office) / tea maker	80402
Clerk of works	40611
Clerk (accounts / finance)	10295
Clerk (agriculture) [n.e.c.]	99995
Clerk (air transport)	81195
Clerk (architectural)	50995
Clerk (auditing)	10195
Clerk (banking / investment)	11195
Clerk (catering)	80795
Clerk (club)	80695
Clerk (creative arts)	60995
Clerk (economics)	10795
Clerk (engineering planning)	40195
Clerk (engineering)	49995
Clerk (environmental)	51095
Clerk (estate / township)	80395
Clerk (first aid)	70895
Clerk (general e.g. filing) [n.e.c.]	10995
Clerk (geology)	50195
Clerk (hostel / quarters)	80595
Clerk (industrial engineering)	50795
Clerk (industrial relations)	60295
Clerk (insurance)	10595
Clerk (legal)	60695
Clerk (library)	60795
Clerk (marketing / sales)	10895
Clerk (medical)	79995
Clerk (metallurgical plant)	39995
Clerk (mining planning)	20195
Clerk (mining) [n.e.c.]	29995
Clerk (payroll / timekeeping)	10495
Clerk (personnel)	60195
Clerk (printing)	36095
Clerk (property / mining rights)	10695
Clerk (public relations)	60895
Clerk (rail transport)	81095
Clerk (road transport)	80995
Clerk (rock mechanics)	50395
Clerk (safety / loss control)	50895
Clerk (school)	60495
Clerk (security)	80195
Clerk (sports / recreation)	61095
Clerk (statistics)	50695
Clerk (stores)	10395
Clerk (strategic planning)	00295
Clerk (survey)	50295
Clerk (tax)	11295

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Clerk (training)	60395
Clerk (welfare)	60595
Clinical assistant	70202
Club management	80600
Club secretary	80601
Club team leader	80602
Club worker	80603
Coal auger operator	20604
Coal cutter operator	20601
Coal plough operator	20605
Coal preparation worker	30211
Coking plant attendant	30509
Collator	36014
Commissionaire (offices)	80401
Commissionaire (residential accommodation)	80502
Company secretary (administrative)	10900
Compressor attendant	40804
Computer operator	50508
Computer programmer	50505
Concentration / flotation worker [n.e.c.]	30399
Consultant (administrative / financial) [n.e.c.]	19996
Consultant (agriculture) [n.e.c.]	99996
Consultant (engineering) [n.e.c.]	49996
Consultant (general management) [n.e.c.]	09996
Consultant (humanities) [n.e.c.]	69996
Consultant (medical) [n.e.c.]	79996
Consultant (metallurgy / beneficiation / manufacturing) [n.e.c.]	39996
Consultant (mining production) [n.e.c.]	29996
Consultant (scientific / technical) [n.e.c.]	59996
Consultant (service occupation) [n.e.c.]	89996
Consultant (tax)	11296
Consulting engineer (engineering support)	40000
Consulting engineer (mining)	20000
Consulting metallurgist	30003
Continuous miner driver	20602
Contractor (outside)	49902
Control room operator	30202
Conveyancer / attorney / solicitor	60602
Conveyer worker [n.e.c.]	20299
Conveyer belt attendant	21202
Conveyer belt team leader / supervisor	21201
Cook / chef	80702
Corporate secretary (administration)	10901
Cost accountant	10205
Cost controller	10205
Crane driver	81301
Crane driver trainer	81398
Creative worker [n.e.c.]	60999

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Credit controller	10207
Critical path scheduler	20103
Crop worker	90499
Crossing attendant	81009
Crusher attendant	30207
Cupola man	30505
Cutter	49903
Cyanidation team leader / supervisor	30403
Cyanidation worker	30405
Data base administrator	50513
Data base technician	50514
Data capture supervisor	50510
Data capture typist	50511
Day pusher (ocean)	29908
Deck attendant (ocean)	29910
Deck leader (ocean)	20313
Data controller (computers)	50509
Dental assistant	70504
Dental mechanic	70503
Dental specialist (e.g. oral pathologist) [n.e.c.]	70499
Dental surgeon / dentist	70401
Dental therapist	70502
Dental worker [n.e.c.]	70599
Dermatologist	70103
Designer (engineering)	40102
Detective	80104
Developer	20303
Development management (hardware)	50501
Development management (software)	50502
Development team leader / supervisor	20310
Development team worker	20701
Diamond drill team leader / supervisor	50111
Diamond drill worker	50112
Diamond driller	50110
Diecaster	40501
Diesel mechanic	40477
Diesel mechanic: apprentice	40478
Diesel mechanic: chargehand	40476
Diesel mechanic: foreman	40475
Dietician	70305
Diplomatic / political liaison officer	60802
Diver (ocean)	29911
Disinfestation worker	40905
Dog handler	80105
Domestic servant	80801
Dragline operator	21102
Dragline supervisor	21101
Drains cleaner	29906

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Draughting technician	49994
Draughtsperson (architectural)	50994
Draughtsperson (chemical engineering)	40794
Draughtsperson (civil engineering)	40694
Draughtsperson (electrical engineering)	40394
Draughtsperson (geological)	50194
Draughtsperson (mechanical engineering)	40594
Draughtsperson (mining production) [n.e.c.]	29994
Draughtsperson [n.e.c.]	49994
Draughtsperson (survey)	50294
Draughtsperson (technical services)	59994
Drill rig operator (jumbo)	20401
Drill sharpener	40528
Driller: hand percussion / jackhammer	20402
Driller: hand (coal)	20403
Driller: opencast / large diameter	20404
Drilling worker [n.e.c.]	20499
Drillsmith	40527
Driver: ambulance (code 08)	80908
Driver: bulldozer	21103
Driver: forklift	80905
Driver: haul truck (underground and opencast)	21109
Driver: heavy articulated motor vehicle (code 13)	80911
Driver: heavy motor vehicle (e.g. bus / ambulance code 10)	80909
Driver: light motor vehicle /car (code 08)	80907
Driver: mobile industrial / agricultural equipment (code 07)	80906
Driver: motorcycle (code 01-04)	80903
Driver: tractor (code 05)	80904
Driving instructor	80998
Dryerman	30406
Dump team leader / supervisor	30702
Dump worker	30703
Dumpsman	30701
Duplicator	10907
Ear, nose and throat specialist	70104
Economics assistant	10703
Economics management	10700
Economics worker [n.e.c.]	10799
Economist [n.e.c.]	10702
Economy controller	10205
Editor	60901
Educational management	60400
Educational / school worker [n.e.c.]	60499
EEG technician	70306
Electrical chargehand (other) [n.e.c.]	40341
Electrical engineer	40301
Electrical engineering management	40300
Electrical engineering worker [n.e.c.]	40399

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Electrical foreman (other) [n.e.c.]	40340
Electrical technician	40310
Electrical tradesman (other) [n.e.c.]	40342
Electrician	40314
Electrician: aide	40317
Electrician: apprentice	40315
Electrician: chargehand	40313
Electrician: foreman	40312
Electrician: underground section	40316
Electrician: worker [n.e.c.]	40318
Electricity generator worker	40802
Electro mechanic / millwright / minewright	40437
Electronic technician	40311
Employee assistance programme management	60500
Encoder	19910
Energy systems management	40800
Energy systems officer	40805
Energy systems team leader / supervisor	40801
Energy systems worker [n.e.c.]	40899
Engineer [n.e.c.]	40201
Engineering assistant [n.e.c.]	40205
Engineering foreman [n.e.c.]	40004
Engineering inspector	40202
Engineering management (multi-disciplinary)	40001
Engineering management [n.e.c.]	40099
Engineering team leader [n.e.c.]	49901
Engineering technical worker [n.e.c.]	40299
Engineering technician [n.e.c.]	40203
Entertainer	60905
Environmental assistant	51004
Environmental construction supervisor	51007
Environmental construction worker	51008
Environmental engineer	51001
Environmental engineering management	51000
Environmental observer	51005
Environmental officer	51003
Environmental superintendent	51002
Environmental worker [n.e.c.]	51099
Equipper	21504
Estate / township management	80300
Estate / township officer	80301
Estate / township team leader / supervisor	80302
Estate / township worker [n.e.c.]	80399
Estimator / calculator	40104
Executive director [n.e.c.]	00000
Explosives issuer	10317
Facilities management (computers)	50506
Fan attendant	40344

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Farm manager	90001
Filing / records officer	10904
Filter operator / worker	30302
Filter team leader / supervisor	30301
Financial accountant	10204
Financial analyst	10201
Financial economist	10701
Financial engineer	10202
Financial/accounting management	10200
Financial/admin management (multi-disciplinary)	10000
Firefighting/rescue officer	80202
Firefighting/rescue team leader/supervisor	80203
Firefighting/rescue trainer	80298
Firefighting/rescue worker [n.e.c.]	80299
Fireman / stoker	81005
Firemaster	80201
First aid attendant	70802
First aid management / medical station superintendent	70800
First aid team leader / supervisor	70801
First aid trainer	70898
First aid training superintendent	70898
First aid worker [n.e.c.]	70899
Fitter and turner	40428
Fitter and turner: apprentice	40429
Fitter and turner: chargehand	40427
Fitter and turner: foreman	40426
Fitter (including machining): apprentice	40433
Fitter (including machining)	40432
Fitter (including machining): chargehand	40431
Fitter (including machining): foreman	40430
Fitter: operative (grade 1)	40434
Fitter: operative aide (grade 2)	40435
Fitter: worker [n.e.c.]	40436
Forester	90301
Forestry engineer	90300
Forestry worker	90399
Forger	40502
Founder	40505
Furnace worker [n.e.c.]	30599
Game ranger	90501
Ganger / plate / tracklayer (main line)	40656
Garage mechanic: aide	40480
Garage serviceman	40481
Garage worker [n.e.c.]	40482
Garden supervisor / groundsman	90102
Garden worker	90199
General engineering supervisor	40002
General engineering worker [n.e.c.]	49999

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
General management [n.e.c.]	00199
General manager (company)	00102
General manager (mine)	00101
General miner	20305
General practitioner	70201
Geochemist	50103
Geological management	50100
Geological observer / field assistant	50109
Geological worker [n.e.c.]	50199
Geologist	50101
Geology technician	50108
Geophysicist	50102
Grab operator	21401
Grade officer	50408
Graphic artist	60904
Grinderman / pulveriser	30210
Groundsman / garden supervisor	90102
Guest house / quarters management	80500
Guillotine operator	36013
Gynaecologist	70105
Hairdresser / barber	80803
Handyman (maintenance)	40654
Handyman (mining)	21504
Haulage team leader/supervisor	21001
Haulage / underground rail transport worker [n.e.c.]	21099
Health / food inspector	70307
Herdsman / stable hand	90502
Hoist driver	21302
Hoisting worker [n.e.c.]	21399
Horticulturist	90101
Hospital cleaner	79901
Hospital secretary	10902
Hospital superintendent	70002
Hospital worker / orderly	70324
Hostel management	80505
Hostel official	80506
Hostel team leader / supervisor	80507
Housekeeper / caretaker	80501
Humanities management (multi-disciplinary)	60000
Humanities management [n.e.c.]	60099
Humanities worker [n.e.c.]	69999
Hydraulic prop team leader / supervisor	20801
Hydraulic prop worker	20802
Hydraulic technician	40411
Hygiene services worker [n.e.c.]	40999
Induna / tribal representative	60203
Industrial engineer	50701
Industrial engineering management	50700

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Industrial engineering officer	50704
Industrial engineering technician	50702
Industrial engineering worker [n.e.c.]	50799
Industrial physician	70106
Industrial relations assistant	60202
Industrial relations management	60200
Industrial relations practitioner	60201
Industrial relations worker [n.e.c.]	60299
Info services / computer worker [n.e.c.]	50599
Information centre management (computers)	50516
Information services management	50500
Instrument engineer	40321
Instrument mechanician (industrial)	40325
Instrument mechanician apprentice (industrial)	40326
Instrument mechanician chargehand (industrial)	40324
Instrument mechanician foreman (industrial)	40323
Instrument technician	40322
Insurance adviser	10596
Insurance management	10500
Insurance worker [n.e.c.]	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 [n.e.c.]	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 [n.e.c.]	29905
Laundry supervisor	80503
Laundry worker	80504
Leaching worker	30407

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Learner miner	20309
Learner official (assay / chemistry)	50409
Learner official (electrical engineering)	40303
Learner official (engineering) [n.e.c.]	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 [n.e.c.]	60699
Librarian	60701
Library assistant	60702
Library management	60700
Library worker [n.e.c.]	60799
Lift operator	21306
Liquor outlet supervisor	80705
Lithographer	36010
Livestock worker [n.e.c.]	90599
Load haul dump driver	21106
Loader driver (rail)	21004
Loader driver (trackless)	21104
Loco driver (main line - SPOORNET)	81003
Loco driver (not main line)	81004
Loco driver (underground)	21002
Loco guard (underground)	21003
Longwall sheerer operator	20603
Magazine master	10317
Magnetometer specialist	50106
Maintenance supervisor	40653
Management accountant	10203
Marketing assistant	10812
Marketing officer	10810
Marketing and sales management	10800
Marketing / sales worker [n.e.c.]	10899
Mason	40626
Mason aide	40627
Masseur / masseuse	70308
Matron / nursing services management	70600
Mechanic (ocean)	40414
Maxillo-facial and oral surgeon	70402
Mechanical charge hand	40521
Mechanical engineer	40401
Mechanical engineering management	40400
Mechanical engineering worker [n.e.c.]	40599
Mechanical foreman (other) [n.e.c.]	40520
Mechanical rockbreaking worker [n.e.c.]	20699

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Mechanical technician	40410
Mechanical tradesman (other) [n.e.c.]	40522
Media technician	60908
Medical advisor	70001
Medical labourer	79901
Medical officer	70201
Medical orthoptist / prosthetist	70309
Medical physicist	70310
Medical specialist [n.e.c.]	70199
Medical station superintendent/first aid management	70800
Medical technician	70311
Medical technologist	70312
Medical worker [n.e.c.]	79999
Medical / health care management (multi-disciplinary)	70000
Medical / health care management [n.e.c.]	70099
Meshing and lacing team leader / supervisor	20803
Meshing and lacing worker	20804
Messenger / postal worker	11010
Metallurgical official [n.e.c.]	30103
Metallurgical worker [n.e.c.]	30199
Metallurgical / plant management	30000
Metallurgical / plant superintendent	30001
Metallurgical / plant supervisor	30002
Metallurgist	30101
Metallurgy technician (extractive)	30102
Microscopist	51006
Milling worker	30208
Millwright / electro mechanic / minewright	40437
Mine construction team leader / supervisor [n.e.c.]	21510
Mine construction worker [n.e.c.]	21599
Mine manager	00101
Mine overseer	20002
Mine planning / valuation engineer	20101
Mine police / security guard	80103
Mine production management [n.e.c.]	20099
Mine production supervisor [n.e.c.]	20399
Mine production worker [n.e.c.]	29999
Mine secretary (administration)	10900
Mine transport worker [n.e.c.]	21499
Miner (general)	20305
Mineralogist	50104
Miner's assistant (cheesa)	20504
Mining engineer [n.e.c.]	20201
Mining technical worker [n.e.c.]	20299
Mining technician [n.e.c.]	20210
Mixed farming worker [n.e.c.]	90699
Model maker	40103
Model maker (survey)	50205

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Money market dealer	11113
Monorail winch operator	21308
Monorope winch operator	21309
Motorman (ocean)	40543
Mortuary attendant	70313
Motor mechanic	40473
Motor mechanic apprentice	40474
Motor mechanic chargehand	40472
Motor mechanic foreman	40471
Motor / diesel mechanic operative	40479
Moulder	40504
Multi task worker (underground production)	20704
Multi task worker (opencast production)	20705
Musician	60905
Network technician (computers)	50515
Neurologist	70108
Night pusher (ocean)	29908
Neurosurgeon	70109
Night shift cleaner	20308
Nurse (charge / senior sister)	70601
Nurse (enrolled / staff)	70603
Nurse (registered all categories) [n.e.c.]	70602
Nursing assistant	70604
Nursing instructor	70698
Nursing services management/matron	70600
Nursing worker [n.e.c.]	70699
Occupational therapist	70314
Occupational health physician	70120
Occupational hygienist	70121
Offshore installation manager (ocean)	00101
Onsetter / banksman	21304
Operations research officer	50703
Operations / network operator (computers)	50507
Ophthalmologist	70110
Optical dispenser	70316
Optician / optometrist	70315
Oral hygienist	70501
Orderly / hospital worker	70324
Orepass / box controller	21404
Orthodontist	70403
Orthopaedic surgeon	70111
Orthoptist	70317
Paediatrician	70113
Painter and decorator / maintenance hand	40637
Painter and decorator (worker) [n.e.c.]	40638
Panel beater	40470
Paper maker	35911
Paper manufacturing management	35900

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Paper tester	35912
Pathologist (medical)	70112
Patternmaker	40503
Paver	40629
Paymaster	10404
Payroll administrator	10402
Payroll controller	10401
Payroll management	10400
Payroll worker [n.e.c.]	10499
PC programmer / product specialist	50517
Performing artist	60905
Periodontist	70404
Personal assistant / secretary	10905
Personal care worker [n.e.c.]	80899
Personnel assistant / masiza	60102
Personnel management	60100
Personnel officer / practitioner	60101
Personnel worker [n.e.c.]	60199
Pharmaceutical worker [n.e.c.]	70799
Pharmacist	70701
Photographer	60906
Physiologist	70318
Physiotherapist	70319
Pilot (aircraft)	81103
Pipes and tracks team leader / supervisor	21505
Pipes and tracks worker	21506
Pit worker	20703
Planned maintenance foreman	40003
Planning management (engineering)	40100
Planning management (mining)	20100
Planning observer	20104
Planning officer	20102
Planning officer (engineering)	40101
Planning worker (engineering) [n.e.c.]	40199
Planning worker (mining) [n.e.c.]	20199
Plant team leader / supervisor	30204
Plant worker [n.e.c.]	30299
Plant / reduction official	30201
Plasterer	40628
Plastic surgeon	70114
Plater	40448
Plater / boilermaker	40447
Plater / boilermaker apprentice	40449
Plater / boilermaker chargehand	40446
Plater / boilermaker foreman	40445
Plater / boilermaker worker [n.e.c.]	40452
Plater / welder	40455
Plater / welder apprentice	40457

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Plater / welder chargehand	40454
Plater / welder foreman	40453
Plater / welder worker [n.e.c.]	40458
Plate / track layer/ganger (main line)	40656
Play school supervisor	60404
Plumber	40632
Plumber aide	40635
Plumber apprentice	40633
Plumber chargehand	40631
Plumber foreman	40630
Plumber operative	40634
Plumber worker [n.e.c.]	40636
Podiatrist/chiroprapist	70320
Pool gang worker	09801
Postal worker / messenger	11010
Power hammer operator	40530
Press operator	40529
Pre-primary school assistant	60405
Printer [n.e.c.]	36011
Printing machine operator	36012
Printing management	36000
Printing supervisor	36001
Printing worker [n.e.c.]	36099
Process controller	30203
Producer / director (creative arts)	60900
Production / section / underground manager	20001
Productivity officer	50705
Project manager (administration / financial) [n.e.c.]	19992
Project manager / officer (agriculture) [n.e.c.]	99992
Project manager / officer (engineering) [n.e.c.]	49992
Project manager / officer (general management) [n.e.c.]	09992
Project manager / officer (humanities) [n.e.c.]	69992
Project manager/officer (medical/health) [n.e.c.]	79992
Project manager/officer (mining) [n.e.c.]	29992
Project manager / officer (reduction / beneficiation / manufacturing)	39992
Project manager / officer (scientific / technical) [n.e.c.]	59992
Project manager / officer (services) [n.e.c.]	89992
Property broker	10601
Property / mining rights management	10600
Property / mining rights officer	10602
Property / mining rights worker [n.e.c.]	10699
Prospector	50107
Prosthetist / Orthotist	70309
Prosthodontist	70405
Psychiatrist	70115
Psychologist (clinical)	60501
Psychologist (industrial)	60104
Public relations assistant	60803

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Public relations management	60800
Public relations officer	60801
Public relations worker [n.e.c.]	60899
Pulveriser / grinderman	30210
Pump team leader / supervisor	40531
Pump worker	40532
Pupil metallurgist	30104
Purchaser / buyer	10312
Purchasing / stores management	10300
Quantity surveyor	40613
Quarryman	20307
Radio / medic (ocean)	79999
Radio mechanic	40327
Radio operator	11012
Radiographer	70321
Radiologist	70116
Rail transport management	81000
Rail transport officer	81001
Rail transport team leader	81002
Rail transport worker [n.e.c.]	81099
Raise / tunnel borer operator	20607
Raise / tunnel borer supervisor	20606
Receiver (stores)	10313
Receptionist/typist/word processor operator	10906
Records / filing officer	10904
Reduction / beneficiation / manufacturing management [n.e.c.]	30099
Reduction / beneficiation / manufacturing worker [n.e.c.]	39999
Reduction / plant official	30201
Reeler	21403
Refiner	30601
Refining worker [n.e.c.]	30699
Refrigeration plant operator	40415
Refrigeration plant team leader / supervisor	40414
Refrigeration / air conditioning engineer	40412
Refrigeration / air conditioning mechanic	40413
Refuse collector	40906
Registrar (medical)	70202
Rescue training service management	80200
Rescue / firefighting officer	80202
Rescue / firefighting team leader/supervisor	80203
Rescue / firefighting trainer	80298
Rescue / firefighting worker [n.e.c.]	80299
Researcher (agriculture) [n.e.c.]	99997
Researcher (engineering) [n.e.c.]	49997
Researcher (general management) [n.e.c.]	09997
Researcher (humanities) [n.e.c.]	69997
Researcher (medical) [n.e.c.]	79997
Researcher (metallurgy / beneficiation / manufacturing) [n.e.c.]	39997

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Researcher (mining production) [n.e.c.]	29997
Researcher (rock mechanics)	50397
Researcher (scientific / technical) [n.e.c.]	59997
Researcher (service occupation) [n.e.c.]	89997
Rigger and ropeman	40508
Rigger and ropeman apprentice	40509
Rigger and ropeman chargehand	40507
Rigger and ropeman foreman	40506
Rigger and ropeman worker [n.e.c.]	40511
Rigger aide	40510
Road builder	40655
Road transport management	80900
Road transport officer	80901
Road transport team leader	80902
Road transport worker [n.e.c.]	80999
Rock breaking worker [n.e.c.]	20799
Rock mechanics engineer	50301
Rock mechanics management	50300
Rock mechanics officer	50302
Rock mechanics worker [n.e.c.]	50399
Rock support worker [n.e.c.]	20899
Roof bolt machine operator	20806
Roof bolt worker	20807
Roughneck (ocean)	29909
Roustabout (ocean)	81201
Rubber reliner	40523
Safety / loss control auditor	50802
Safety / loss control management	50800
Safety / loss control observer assistant	50803
Safety / loss control officer	50801
Safety / loss control worker [n.e.c.]	50899
Sales representative	10811
Salvage yard aide	10319
Salvage and reclamation worker (surface)	10320
Salvage and reclamation worker (underground)	29907
Sample worker	50204
Sampler	50203
Sanitation worker	40904
Saw doctor	40540
Saw sharpener	40542
Sawmill mechanic	40541
Sawyer	35710
School principal	60401
Scientific / technical management (multi-disciplinary)	50000
Scientific / technical management [n.e.c.]	50099
Scientific / technical worker [n.e.c.]	59999
Scraper winch bell operator	20902
Scraper winch driver	20901

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Scraping worker [n.e.c.]	20999
Screensman	30209
Sea transport worker [n.e.c.]	81299
Secretarial / administrative worker [n.e.c.]	10999
Secretarial / administration management	10900
Secretary / personal assistant	10905
Section leader	29901
Section / production/underground manager	20001
Securities officer	11112
Security guard / mine police	80103
Security inspector / officer	80101
Security management	80100
Security supervisor (e.g. sergeant)	80102
Security worker [n.e.c.]	80199
Sedimentologist	50105
Seismic network technician	50306
Seismologist	50305
Self-propelled machine driver [n.e.c.]	21107
Service worker [n.e.c.]	89999
Services management (multi-disciplinary)	80000
Services management [n.e.c.]	80099
Sewage plant operator	40903
Shaft foreman	20301
Shaft sinker	21501
Shaft timberman worker	21503
Shaft timberman/timberman	21502
Shakerhand (ocean)	29909
Share transfer officer	11111
Sheetmetal worker	40459
Shift boss	20302
Shot blast operator	40526
Shotcrete worker	20804
Shovel operator	21105
Shunter	81007
Shuttlecar driver	21108
Signaller	81008
Signwriter	40639
Skipman	21303
Slimes dam team leader / supervisor	30704
Slimes dam worker	30705
Slimes dam / dump worker [n.e.c.]	30799
Smelter	30501
Smelter team leader/supervisor	30502
Smelter worker	30503
Social worker	60502
Solicitor/attorney/conveyancer	60602
Sorter	30206
Spannerman / driller's assistant	20405

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Spectrographer	50407
Speech therapist/audiologist	70322
Sports worker [n.e.c.]	61099
Sports / recreation assistant	61002
Sports / recreation management	61000
Sports / recreation officer	61001
Stable hand / herdsman	90502
Stacker operator	21402
Stage worker	21509
Standards officer	10311
Statistical officer	50602
Statistical worker [n.e.c.]	50699
Statistician	50601
Statistics management	50600
Stevedore	81201
Stockbroker	11110
Stoker / fireman	81005
Stone packer	29904
Stope team leader / supervisor	20311
Stope team worker	20702
Stoper	20304
Storekeeper	10314
Stores controller	10310
Stores issuer (non-explosive)	10316
Stores receiver	10313
Stores worker [n.e.c.]	10399
Stores / purchasing management	10300
Strata control observer	50304
Strata control officer	50303
Strategic planning analyst	00201
Strategic planning management	00200
Strategic planning worker [n.e.c.]	00299
Stripper operator	30408
Student (administrative / financial) [n.e.c.]	19993
Student (agriculture) [n.e.c.]	99993
Student (engineering) [n.e.c.]	49993
Student (geology)	50193
Student (humanities) [n.e.c.]	69993
Student (medical)	79993
Student (metallurgy / beneficiation / manufacturing) [n.e.c.]	39993
Student (mining production) [n.e.c.]	29993
Student (scientific / technical) [n.e.c.]	59993
Student (service occupation) [n.e.c.]	89993
Supervisor's assistant (underground)	29902
Supplementary medical worker [n.e.c.]	70399
Surgeon (general)	70117
Survey management	50200
Survey worker [n.e.c.]	50299

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OCCUPATION	CODE
Surveyor (land)	50201
Surveyor (mine)	50202
Sweeper / vamber	29903
Systems accountant	10203
Systems analyst	50504
Systems/network programmer	50512
Tailor	34510
Tea maker / office cleaner	80402
Teacher (nursery education)	60404
Teacher (primary education)	60403
Teacher (secondary education)	60402
Team leader / supervisor (other mining production work)	20312
Technical assistant engineering [n.e.c.]	40204
Technical assistant mining [n.e.c.]	20211
Technical services management	50001
Technical services department (TSD) officer [n.e.c.]	59901
Telecommunications worker [n.e.c.]	11099
Telephonist	11011
Television cameraman	60907
Thoracic surgeon	70118
Timber, pulp and paper worker [n.e.c.]	35999
Timekeeper	10403
Tip team leader / supervisor	21405
Tip worker	21406
Toolmaker	40512
Toolpusher (ocean)	20312
Tour guide	60804
Town planner	40612
Tracer [n.e.c.]	49994
Trackless machine team leader / supervisor	21101
Trackless machine trainer (e.g. dragline)	21198
Trackless machine worker [n.e.c.]	21199
Track/plate layer / ganger (main line)	40656
Train guard	81006
Trainer (administrative / financial) [n.e.c.]	19998
Trainer (agriculture) [n.e.c.]	99998
Trainer (chemical engineering)	40798
Trainer (civil engineering)	40698
Trainer (computers)	50598
Trainer (crane driving)	81398
Trainer (electrical engineering)	40398
Trainer (firefighting / rescue)	80298
Trainer (first aid)	70898
Trainer (general engineering) [n.e.c.]	49998
Trainer (general management) [n.e.c.]	09998
Trainer (humanities) [n.e.c.]	69998
Trainer (mechanical engineering)	40598
Trainer (medical) [n.e.c.]	79998

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

OCCUPATION	CODE
Trainer (metallurgy / beneficiation / manufacturing) [n.e.c.]	39998
Trainer (mining production) [n.e.c.]	29998
Trainer (nursing)	70698
Trainer (road driving)	80998
Trainer (safety / loss control)	50898
Trainer (scientific / technical) [n.e.c.]	59998
Trainer (security)	80198
Trainer (service occupation) [n.e.c.]	89998
Trainer / instructor [n.e.c.]	60398
Training assistant	60302
Training management	60300
Training officer [n.e.c.]	60301
Training worker [n.e.c.]	60399
Translator	60903
Transport worker [n.e.c.]	81399
Tribal representative/induna	60203
Typist / word processor operator / receptionist	10906
Unclassified occupation (unknown / no specific skill)	09999
Typist / word processor operator / receptionist	10906
Underground / production/section manager	20001
Uranium plant official	30401
Urologist	70119
User support (computers)	50518
Valuator	10510
Waiter / waitress	80704
Water, effluent and sanitation management	40900
Water, effluent and sanitation officer	40907
Water, effluent and sanitation team leader / supervisor	40901
Water treatment operator	40902
Weighbridge attendant	10395
Welder	40456
Welfare assistant	60504
Welfare officer	60503
Welfare worker [n.e.c.]	60599
Winch operator \ driver	40526
Winch transporter team leader	40525
Winch transporter / erector	40524
Winding engine driver (licensed)	21301
Wireline operators (ocean)	20406
Word processor operator / typist / receptionist	10906
Work study observer/assistant	50707
Work study officer	50706
Wrapper	35913
Writer / journalist	60902
Yard supervisor	10318
Yard worker [n.e.c.]	10321

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ANNEXURE B: HEG determination - example of statistical approach
(For information only)

1. INTORODUCTORY 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.

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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 (e.g. 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 (e.g. A1 to A40).
- e) Select the **Grouped by Columns** option.
- f) Select the output range (e.g. 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
SD	0.083528
Sample variance	0.006977

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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** e.g. $2 \times 0.0835 = 0.167$
- b) **Mean - 2SD** = **Mean - 2SD** e.g. $0.351 - 0.167 = 0.184$
- c) **Mean + 2SD** = **Mean + 2SD** e.g. $0.351 + 0.167 = 0.518$
- d) **90th percentile** value by utilizing 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 **90th percentile**.

Convert the calculated **RMS** sound pressure (Pa) back to sound pressure level (**dBA**) by utilizing the following Microsoft Excel formula:

=(10*LOG(POWER(SUM(I4/0.00002),2)))

Where:

- "I4" = cell where **RMS** sound pressure (Pa) data is entered in Microsoft Excel spread sheet

CALCULATIONS	
Mean	= 84.90
Mean - 2SD	= 79.30
Mean + 2SD	= 88.27
90 th percentile	= 87.21

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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 90th **percentile** value (87.21) falls within the “B category”. For a **HEG** to be statistically correctly defined, the mean value and 90th **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:

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

Interpretation:

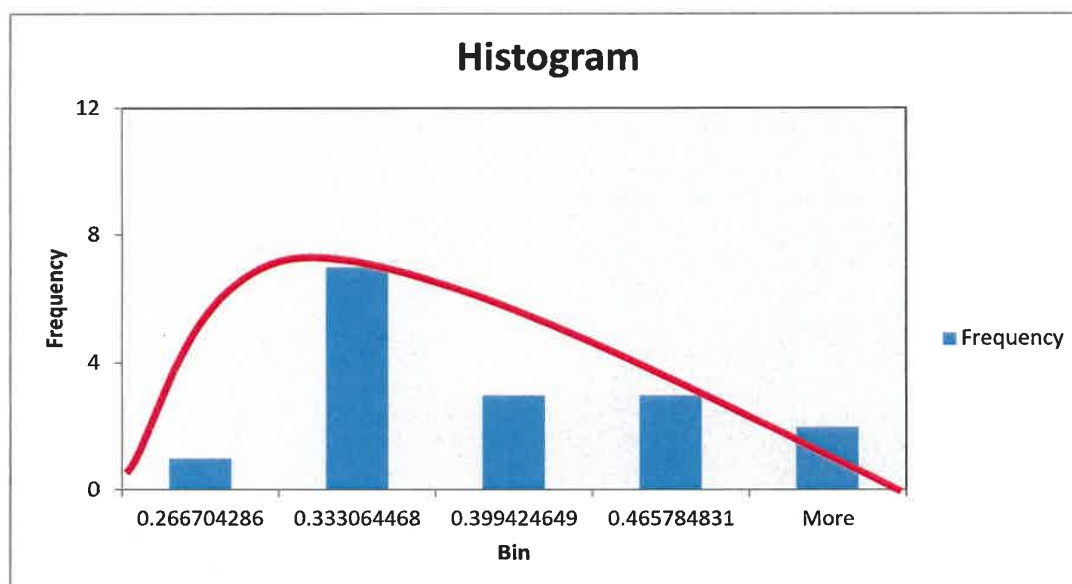
One out of 16 samples falls outside the **2SD** from the mean value, which represents 6.25% of the sample group (i.e. $1/16 \times 100 = 6.25\%$). This is more than the allowable 5% and therefore the **HEG** cannot be seen as statistically correctly defined.

STEP 4*Action to be performed:*

Draw a histogram to graphically indicate the data.

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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:

- 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 90th **percentile** value is reported as an "A category" thus forcing more samples to be taken (5% over 6 months).
- 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**).

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- 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
SD	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 SD	= 0.028
Mean - 2 SD	= 0.255
Mean + 2 SD	= 0.311
90 th percentile	= 0.295

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

CALCULATIONS	
Mean	= 83.01
Mean - 2 SD	= 82.11
Mean + 2 SD	= 83.82
90 th percentile	= 83.38

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 (83.01) falls within the "C category" and the 90th **percentile** value (83.38) also falls within the "C category".

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Interpretation:

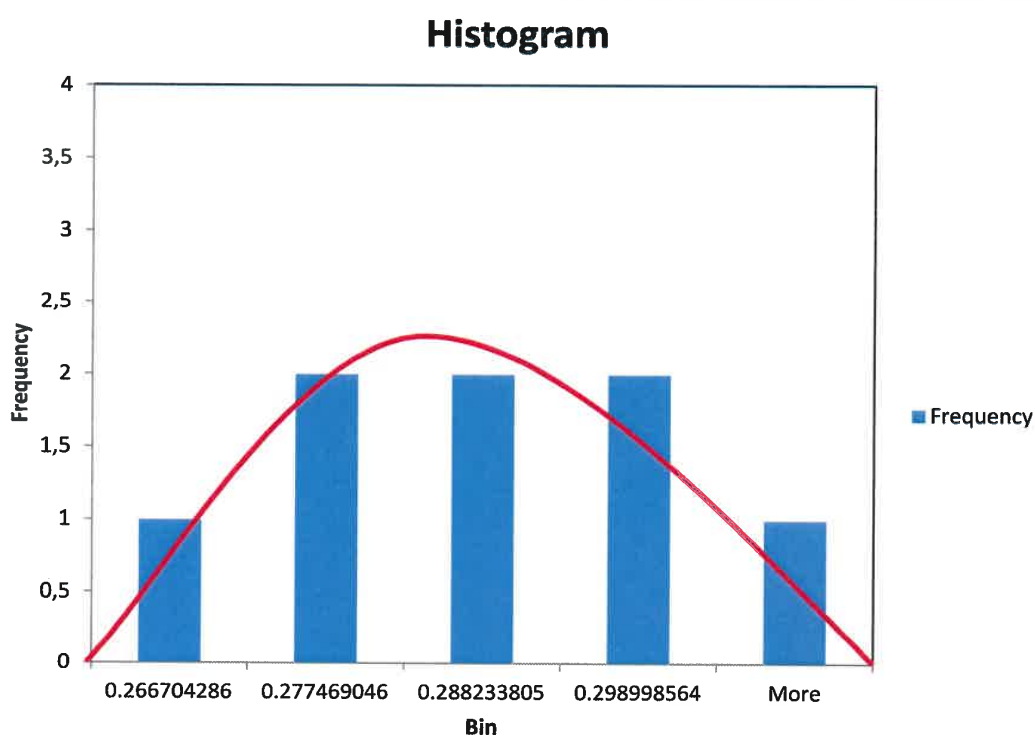
Determine if 95% of the samples taken falls within **2SD** form the mean value.

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

None out of eight samples falls outside the **2SD** form the mean value, which represents 0% of the sample group (i.e. $1/8 \times 100 = 0\%$). 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.



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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
SD	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 SD	= 0.126
Mean - 2SD	= 0.294
Mean + 2SD	= 0.546
90 th percentile	= 0.499

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

CALCULATIONS	
Mean	= 86.45
Mean - 2SD	= 83.34
Mean + 2SD	= 88.73
90 th percentile	= 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".

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Interpretation:

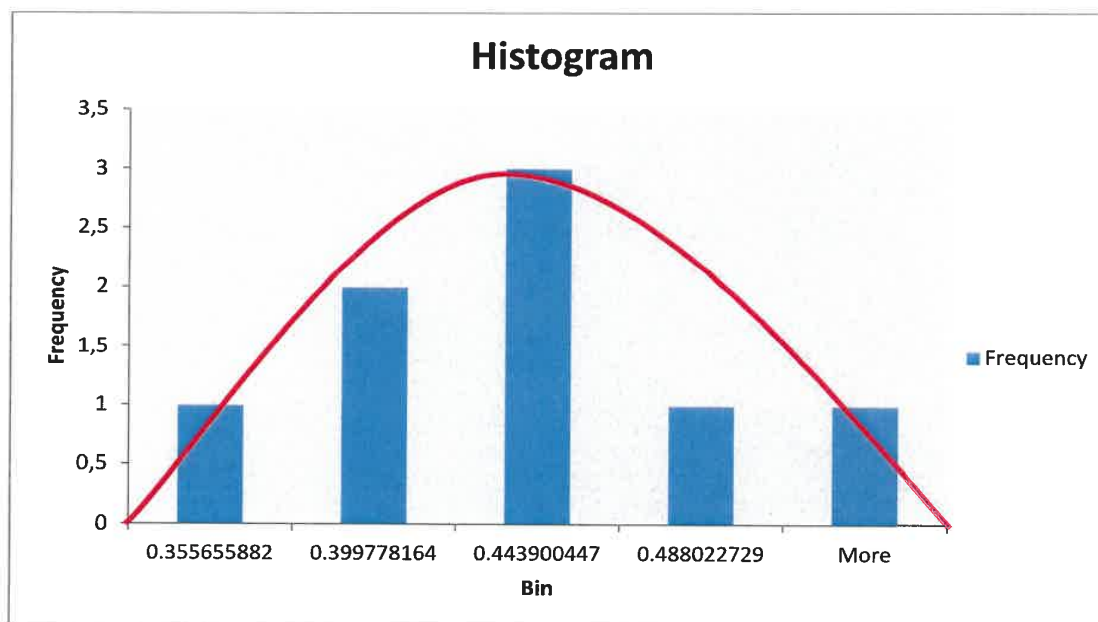
Determine if 95% of the samples taken falls within **2SD** form the mean value.

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

None out of eight samples falls outside the **2SD** form the mean value, which represents 0% of the sample group (i.e. $1/8 \times 100 = 0\%$). 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.



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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 ≥ 105 dB $L_{Aeq, 8h}$
B	Exposures ≥ 85 and < 105 dB $L_{Aeq, 8h}$
C	Exposures ≥ 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

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ANNEXURE D: Reporting forms*(This annexure forms part of the guideline and must be compiled with)***REPORTING FORM**

MINE NAME:						
QUARTERLY NOISE EXPOSURE REPORT FORM 21.9(2)(e) in terms of regulation 9.2.(7)						
MAIN COMMODITY CODE:						
SAMPLE AREA:						
ACTIVITY AREA CODE:						
HEG DESCRIPTION:						
HEG CLASSIFICATION BAND: (based on 90th percentile statistical analysis of the previous annual results)						
ANNUAL 90th PERCENTILE RESULT FOR THE HEG: (based on all individual measurements obtained from all quarters during the previous measurement cycle)						
NUMBER OF EXPOSED EMPLOYEES: (where there are new employees, number of exposed employees reported should be progressive)	Q1	Q2	Q3	Q4	ANNUAL RESULTS	
NUMBER OF SAMPLES PLANNED FOR THE CURRENT SAMPLING CYCLE:						
NUMBER OF SAMPLES TAKEN:						
QUARTERLY HEG CLASSIFICATION: (based in the Log average)						

DMRE MINE CODE:	
SUB MINE CODE:	
REPORTING PERIOD: (e.g. January to March)	

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
			Logarithmic average sound pressure level of the HEG results to be allocated to medical record

Reasons for individual result/s exceeding the annual HEG Classification	
Corrective actions that will be implemented to mitigate the individual result/s exceeding the annual HEG Classification	

ANNEXURE E:

Noise register template
(For information purposes only)

EQUIPMENT NOISE REGISTER	
Commodity:	Mine name:
Shaft / operation:	Date updated:

[illegible]

ANNEXURE F: Guidance note for **noise** measurement of equipment to ensure conformance with **MHSC** milestones
(For information purposes only)

GUIDANCE NOTE FOR NOISE MEASUREMENT OF EQUIPMENT TO ENSURE CONFORMANCE WITH MHSC MILESTONES

BACKGROUND

The **MHSC** has established the following milestones for limiting occupational **noise** exposure and eliminating **NIHL**.

Quietesting of equipment

"By December 2024, the total operational or process **noise** emitted by any equipment must not exceed a milestone sound pressure level of 107 **dBA**."

This milestone of the sound pressure levels will be verified by initiatives under the Centre of Excellence and MOSH, and reviewed in 2016.

For individuals

"By December 2016, no employee's **STS** will exceed 25 **dBA** from the baseline when averaged at 2 000 **Hz**, 3 000 **Hz** and 4 000 **Hz** in one or both ears."

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** (e.g. pneumatic rock drill) or 12 **dBA** for highly impulsive **noise** (e.g. 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}

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OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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 1m 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 **dBA** 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 **dBA**, 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}):

$$L_{Aeq} = 10 \log \frac{(\text{anti log}_{10} L_1^1 + \text{anti log}_{10} L_1^2 + \text{anti log}_{10} L_1^3 + \text{anti log}_{10} L_1^4 + \dots)}{n}$$

Where:

L = the noise levels measured (L_{Aeq}) in **dBA** for equipment.
 n = number of total samples

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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

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

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

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

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)

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

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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:

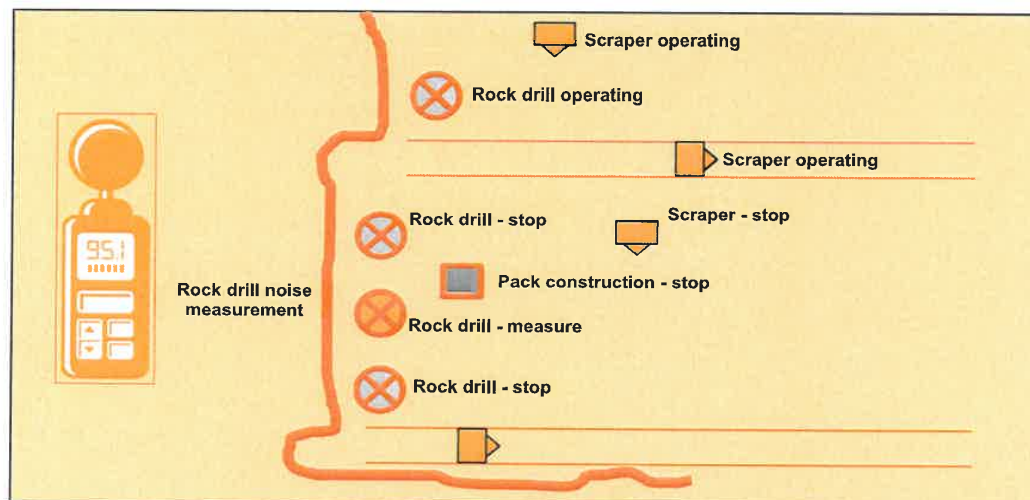
- **Instrument type, serial number (including microphone), calibration data, etc.**
- **Working place, environmental and equipment information such as:**

- Mining company
- Mine / shaft / operation
- Commodity
- Type of mining
- Workplace (use Annexure A: Mandatory codes e.g. stoping, development, etc.)
- Excavation area (m²)
- Type of excavation
- Equipment being measured - name and description
- Model / type
- Serial / equipment number
- Equipment category
- Power source (pneumatic / electric / electro hydraulic / hydro power)
- Manufacturer / supplier
- Activities/processes measured

- Activities - equipment that runs continuously e.g. pump, compressor, etc.
- Process - cyclical operations e.g. rock drill collaring, drilling and extracting, etc.
- Silenced / not silenced.
- Number of pieces of equipment per shaft.
- Noise level (**dBA**) - (log average to be recorded)
- Noise level (**dBA**) - (all scenarios to be recorded).
- Type of ventilation.
- Air velocity.
- List background noise levels and the sources that constitute the background noise.
- Compressed air pressure for pneumatic-driven equipment.
- Date of report.

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.

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 e.g. 6m 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 i.e. 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).



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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.

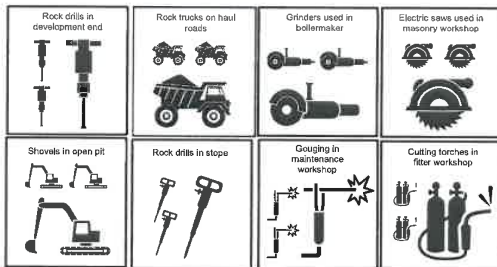
STEP-BY-STEP EQUIPMENT NOISE REPORTING GUIDE



STEP 1:

Group equipment according to the equipment type / model into populations based on the activity area in Annexure A:

Mandatory codes (e.g. 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 (e.g. 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.

$$L_{\text{avg}} = 10 \log \left(\frac{\text{anti log } 10^{105.0} + \text{anti log } 10^{102.2} + \text{anti log } 10^{103.2} + \text{anti log } 10^{104.6}}{n} \right)$$

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



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.

	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

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 dBA.

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

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**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 **dBA**.

*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*

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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 recognized 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, i.e. at least once or twice a day.

Microphone positions

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

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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 1.5m above the floor or ground (as relevant) and at least 1.2m 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: 1.5m above the floor or ground on which the persons are standing.
- b) For seated persons: 0.9m 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

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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 characterize 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 \neq 8-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.

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- 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 ($L_{\text{Req, T}}$).

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

Where:

- $L_{\text{Req, Ti}}$ 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:

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

Where:

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

- Set the meter to A-weighting and select the integrating mode.
- Measure the **equivalent continuous A-weighted sound pressure level** ($L_{\text{Aeq, T}}$) directly, using an appropriate microphone position, during a suitable measurement time interval.
- Select the sound pressure level mode and I-time weighting and note the average maximum reading.
- Select the sound pressure level mode and S-time weighting and note the average maximum reading.
- 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 (G_i).

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

$$(G_i \geq 0)$$

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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 G_i to the reading obtained in (b) above, to obtain the rating level ($L_{Req, T}$) i.e.

$$L_{Req, T} = L_{Aeq, T} + G_i$$
- 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:

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

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 (G_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 (G_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 ($L_{Req, T}$) i.e.

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

Where:

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

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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 ($L_{\text{Req, T}}$).
- e) For composite measurements, use equation:

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

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 ($L_{\text{Req, Ts}}$)

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

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

Where:

- $L_{\text{Req, Ts}}$ is the equivalent continuous rating level, determined for a time interval of the duration of the work shift.
- $L_{\text{Req, Ti}}$ 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 ($L_{\text{Req, Ti}}$).
- T_s is the total duration of the work shift.

NOTE:

$L_{\text{Req, Ts}}$ 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 ($L_{\text{Req, 8h}}$)

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

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

Where:

- $L_{\text{Req, 8h}}$ is the equivalent continuous 8-hour rating level.

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

- L_{Req, T_s} 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 **dBA**.
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 **dBA**. Ensure that every area, or location that can be accessed, where the 8-hour rating level ($L_{Req, 8h}$) equals or exceeds 85 **dBA** 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.

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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 ($L_{\text{Req}, 8\text{h}}$) 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 0.10m 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.

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

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

Where:

- $E_{A, Te}$ 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 normalized to a nominal 8-hour workday are given for illustration in the table below:

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

1	2
$E_{A, Te}$ $Pa^2.s.10^{-3}$	$L_{EX, 8h}$ 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

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1	2
$E_{A,Te}$ $Pa^2.s.10^{-3}$	$L_{ex, 8h}$ 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.

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ANNEXURE H: **Instruction 171**
(For information purposes only)

GOVERNMENT GAZETTE
16 MAY 2001
No. 22296

A61311
A 10/4/3/4

Circular instruction no. 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 e.g. 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.

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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 i.e. 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.

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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).

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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													

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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

No. 1194

Instruction no. 171 (supplement)

Transitional arrangements between instruction no. 168 and no. 171

Introduction

This instruction sets out the procedures to be followed to ensure proper management and implementation of instruction no. 171 as well as a smooth transition from the repealed instruction no. 168 to the new instruction no. 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.

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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 no. 168. Where an employee has occupational hearing loss compensatable in terms of instruction no. 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 no. 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 no. 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, i.e. 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 no. 171.

OCCUPATIONAL HEALTH PROGRAMME (OCCUPATIONAL HYGIENE AND MEDICAL SURVEILLANCE) ON THERMAL STRESS

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.

GENERAL NOTICES • ALGEMENE KENNISGEWINGS**DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES****NOTICE 819 OF 2022****GENERAL NOTICE IN TERMS OF THE RESTITUTION OF LAND RIGHTS ACT 1994, (ACT No. 22 OF 1994) AS AMENDED.**

Notice is hereby given in terms of Section 11 (1) of the Restitution of Land Rights Act 1994 (Act 22 of 1994) as amended, that a Land Claim for Restitution of Land Rights has been lodged by Mr. Gerald Frederick as direct descendant and on behalf of the direct descendant of the Late Mr. Jacob Jacobus Hamman for Erf 3003 Brackenfell situated in the City of Cape Town under Cape Town Metro, Western Cape

Reference Number	:	KRK6/2/2/A/9/0/0/19 (H482)
Dispossessed Party	:	The late Mr. Jacob Jacobus Hamman
Claimant	:	Mr. Gerald Frederick Hamman
Property Description	:	Erf 3003 Brackenfell (Portion 38 a Portion of Portion 1 of the Farm Kruispad No. 1
Extent	:	4382m ²
Capacity	:	Ownership
Deed of Acquisition	:	T9398/1897
Deed of Dispossession	:	T651/1928
Current Owners	:	Transnet LTD
Date Submitted	:	31 December 1998

The Regional Land Claims Commission investigated this claim in terms of provisions of the Act. Any party who has an interest in the above-mentioned land is hereby invited to submit, within 60 days from the publication of this notice, any comments / information to: The Regional Land Claims Commission: Western Cape, Private Bag X9163, Cape Town, 8000, Tel no: (021) 4090300 and Fax no: (021) 424-5146

Mr. L. H. Maphutha
Regional Land Claims Commissioner

APPROVED

DATE 06-01-2022

CHECKED

DATE 03/01/2022

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

NOTICE 820 OF 2022

GENERAL NOTICE IN TERMS OF THE RESTITUTION OF LAND RIGHTS ACT 1994, (ACT No. 22 OF 1994) AS AMENDED.

Notice is hereby given in terms of Section 11 (1) of the Restitution of Land Rights Act 1994 (Act 22 of 1994) as amended, that a Land Claim for Restitution of Land Rights has been lodged by Ms. Jeanette Smith as direct descendant and on behalf of the direct descendant of the Late Mr. Frederick Oosthuizen for Erf 4380 Goodwood situated in the City of Cape Town under Cape Town Metro, Western Cape

Reference Number	:	KRK6/2/2/A/9/0/0/16 (H486)
Dispossessed Party	:	The late Mr. Jacob Jacobus Hamman
Claimant	:	Mr. Gerald Frederick Hamman
Property Description	:	Erf 3007 Brackenfell (Portion 105 Portion of Portion 1 of Farm Kruispad 1) Remainder of Portion 1 of the Farm Kruispad No. 1
Extent	:	68, 15776 H and 119, 89107 H
Capacity	:	Ownership
Deed of Acquisition	:	T9398/1897
Deed of Dispossession	:	T3247/1965 & T11250/1968
Current Owners	:	Transnet LTD Heross INB PTY LTD
Date Submitted	:	31 December 1998

The Regional Land Claims Commission investigated this claim in terms of provisions of the Act. Any party who has an interest in the above-mentioned land is hereby invited to submit, within 60 days from the publication of this notice, any comments / information to: The Regional Land Claims Commission: Western Cape, Private Bag X9163, Cape Town, 8000, Tel no: (021) 4090300 and Fax no: (021) 424-5146

Mr. L. H. Maphutha
Regional Land Claims Commissioner

APPROVED

CHECKED

DATE 06-01-2022

DATE 03/01/2022

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

NOTICE 821 OF 2022



Block A | 4th Floor | Meintjiesplein Building | 536 Francis Baard Street | Arcadia | 0002
Private Bag X935 | Pretoria | 0001
Tel: 012 341 1115 | Fax: 012 341 1811/1911
<http://www.namc.co.za>

**INVITATION TO REGISTER AS A DIRECTLY AFFECTED GROUP IN TERMS OF
THE MARKETING OF AGRICULTURAL PRODUCTS ACT, ACT NO. 47 OF 1996,
(MAP ACT) AS AMENDED**

The National Agricultural Marketing Council (NAMC) keeps a 'Register of Directly Affected Groups' for each commodity listed as an agricultural product in the agricultural sector. A directly affected group means any group of persons, which is party to the production, sale, purchase, processing or consumption of an agricultural product and includes labour employed in the production or processing of such a product.

The register is *inter alia* being used to bring applications for statutory measures (interventions in the agricultural sector in terms of the MAP Act) to the attention of directly affected groups and to invite such directly affected groups to lodge any objections or support relating to such a request to the NAMC within a specified time. The viewpoints of directly affected groups are considered before the NAMC formulate its recommendations to the Minister of Agriculture, Land Reform and Rural Development.

In order for a group to register, please e-mail the following information to the NAMC (lizettem@namc.co.za):

- Name of the organisation/ company/ group
- Agricultural products registered for, eg. maize, red meat, citrus etc.
- Role in value chain, eg. producers, traders, importers, etc.
- Contact person
- Postal address, telephone and fax numbers
- E-mail address and website

All directly affected groups in the agricultural industry that are not yet included in our Register, are kindly requested to register with the NAMC at any time soon, with the above information.

DEPARTMENT OF EMPLOYMENT AND LABOUR**NOTICE 822 OF 2022**

Notice published by the Essential Services Committee ('the Committee') in terms of section 71, read with section 71(8) (a) of the Labour Relations Act, 1995 (Act No 66 of 1995 as amended)

A. Notice is hereby given in terms of section 71(8) of the Labour Relations Act, 1995 (Act No 66 of 1995 as amended), that under section 71(9) the Committee has varied the following designation:

1. Private Health Services, issued on 19 March 2021, under GN 44293, is hereby varied to include the following services:
 - a) Emergency optometry services as essential services.
 - b) The services rendered by laboratory technicians in the treatment and management of vision and eye care health as essential services.

B. Notice is hereby given in terms of section 71(8) of the Labour Relations Act, 1995 (Act No 66 of 1995 as amended), that under section 71(7) the Committee designates the following services as essential:

1. The following services in the nuclear industry:
 - a) Production Operations (This includes the production and or Manufacturing of fluorine – 18 based radiopharmaceuticals; I-131 diagnostics and therapeutic capsules for the treatment and detection of cancers; Novatech Tc-99 generators; and related nuclear medicine);
 - b) Radiation Protection Services;
 - c) Facilities Management and Security services;
 - d) Services rendered by shift managers and heads of the buildings;
 - e) Control room operations;
 - f) Maintenance services; and
 - g) Waste Management
2. General health screening, testing and control of infectious and communicable diseases; as well as port health.
3. The following services in the aviation industry:
 - a) The monitoring and oversight functions performed by the Aviation safety division of the South Africa Civil Aviation Authority (SACAA);
 - b) The services of drawing and preparation of plans dealing with the outbreak of communicable disease, overseeing the implementation and enforcing compliance with the plans and Regulations, monitoring, oversight and training performed by the Aviation Medicine division of SACAA;
 - c) The services performed by Aviation Security Division in setting of standards, oversight and monitoring, compliance and enforcement.
4. The following services performed in coal mining:
 - a) Control Room Services;
 - b) Medical Health and Emergency Services; and
 - c) Security / Protection Services

5. The following services in the manganese industry:
- a) The refining of manganese ore through a continuous electrowinning process; and
 - b) The Treatment and management of contaminated water (leachate and run-off) which is specifically related to the refining of manganese ore through a continuous electrowinning process at the effluent treatment plant.
6. Cleaning Services in public health.
7. Weather services in support of marine and disaster management services.



Adv Luvuyo Bono
ESC Chairperson

NATIONAL TREASURY**NOTICE 823 OF 2022****NOTICE OF INTRODUCTION IN NATIONAL ASSEMBLY OF DIVISION OF REVENUE BILL FOR 2022/23 FINANCIAL YEAR AND PUBLICATION OF EXPLANATORY SUMMARY OF BILL**

In terms of rule 276(1)(b) and (c) of the Rules of the National Assembly—

- (a) notice is hereby given of the introduction by the Minister of Finance of the Division of Revenue Bill for the 2022/23 financial year (“the Bill”) in the National Assembly; and
- (b) the following explanatory summary of the Bill is hereby published:

The Bill provides for—

- the equitable division of revenue raised nationally among the national, provincial and local spheres of government for the 2022/23 financial year;
- the determination of each province’s equitable share of the provincial share of that revenue;
- any other allocations to provinces, local government or municipalities from the national government’s share of that revenue, and for any conditions on which those allocations may be made; and
- matters connected therewith.

A copy of the Bill will be obtainable from the National Treasury’s website at <http://www.treasury.gov.za> after introduction of the Bill, and also by contacting Mr A Hendricks, Parliament, PO Box 15, Cape Town, 8000, Telephone no: 021 403 8223.

NASIONALE TESOURIE**KENNISGEWING 823 VAN 2022****KENNISGEWING VAN INDIENING IN NASIONALE VERGADERING VAN “DIVISION OF REVENUE BILL” VIR 2022/23 FINANSIËLE JAAR EN PUBLIKASIE VAN VERDUIDELIKENDE OPSOMMING VAN WETSONTWERP**

Ingevolge reël 276(1)(b) en (c) van die Reëls van die Nasionale Vergadering word—

- (a) hiermee kennis gegee van die indiening deur die Minister van Finansies van die “Division of Revenue Bill” (“die Wetsontwerp”) vir die 2022/23 finansiële jaar in die Nasionale Vergadering; en
- (b) die volgende verduidelikende opsomming van die Wetsontwerp gepubliseer:

Die Wetsontwerp stel voor om voorsiening te maak vir—

- die billike verdeling tussen die nasionale, provinsiale en die plaaslike regeringsfeer van inkomste wat nasionaal vir die 2022/23 finansiële jaar ingevorder word;
- die bepaling van elke provinsie se billike deel van die provinsiale deel van daardie inkomste;
- enige ander toekennings aan provinsies, plaaslike regering of munisipaliteite uit die nasionale regering se deel van daardie inkomste, en voorwaardes waarop daardie toekennings gedoen kan word; en
- aangeleenthede wat daarmee in verband staan.

‘n Afskrif van die Wetsontwerp kan op die Nasionale Tesourie se webblad by <http://www.treasury.gov.za> na indiening van die Wetsontwerp verkry word, en ook deur die volgende persoon te kontak: Mnr A Hendricks, Parlement, Posbus 15, Kaapstad, 8000, Telefoonnr: 021 403 8223.

NON-GOVERNMENTAL ORGANIZATION**NOTICE 824 OF 2022****WATER USE LICENSE APPLICATION NOTICE**

Notice is given in terms of the National Water Act 1998 that Nendicure (Pty) Ltd (the Applicant) intends to apply with the Department of Water and Sanitation for a Water Use License for Section 21(a) taking and 21(b) storing of groundwater for irrigation purposes on the Remainder of the farm Kaspersnek 481-KT, near to Ohrigstad in Mpumalanga Province. A geo-hydrological assessment was conducted to determine the sustainable use of an additional 178651.44 cubic meter per annum of groundwater for irrigation purposes on this property. Interested or affected parties can request a copy of a Geo-hydrological Report for review purposes upon registration with the Consultant mentioned below. Registered parties must submit written comments on the matter within 30 days from date of this notice to Eco-8 Environmental Planners. Tel: 013-7449468 / email: eco8@vodamail.co.za / P.O. Box 12898, Nelspruit, 1200.

NON-GOVERNMENTAL ORGANIZATION**NOTICE 825 OF 2022****WATER USE LICENSE APPLICATION NOTICE**

Notice is given in terms of the National Water Act 1998 that Nendicure (Pty) Ltd (the Applicant) intends to apply with the Department of Water and Sanitation for a Water Use License for Section 21(a) taking and 21(b) storing of groundwater for irrigation purposes on the Remainder of the farm Doornhoek 451-KT, near to Ohrigstad in Limpopo Province. A geo-hydrological assessment was conducted to determine the sustainable use of an expected 268056 cubic meters per annum of groundwater for irrigation purposes on this property. Interested or affected parties can request a copy of a Geo-hydrological Report for review purposes upon registration with the Consultant mentioned below. Registered parties must submit written comments on the matter within 30 days from date of this notice to Eco-8 Environmental Planners. Tel: 013-7449468 / email: eco8@vodamail.co.za / P.O. Box 12898, Nelspruit, 1200.

NON-GOVERNMENTAL ORGANIZATION**NOTICE 826 OF 2022****ENVIRONMENTAL AUTHORISATION APPLICATION NOTICE**

Notice is given in terms of the 2014 EIA Regulations (as amended) under the National Environmental Management Act (NEMA, 1998 as amended) that Kaspersnek Fruits (Pty) Ltd, (the Applicant) submitted an application for Environmental Authorisation with an Environmental Scoping Report as part of an Environmental Impact Assessment with the Limpopo Department of Economic Development, Environment & Tourism for the clearing of vegetation (Activity 15 GNR325) and activities associated with the excavation and installation of structures within 32m from the edge of a watercourse (Activity 19 GNR327 and Activity 14 GNR324) for the proposed new cultivation of ± 70 ha of land on the Remainder of the farm Doornhoek 451-KT near to Ohrigstad in Limpopo Province. A copy of the Scoping Report is available to interested or affected parties for review and comment and can be requested from the Consultant mentioned below. All written comments must be submitted to Eco-8 Environmental Planners within 30 days from date of this notice. Tel: 013-7449468 / email: eco8@vodamail.co.za / P.O. Box 12898, Nelspruit, 1200.

DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION**NOTICE 827 OF 2022****COMPETITION TRIBUNAL****NOTIFICATION OF COMPLAINT REFERRAL**

The Competition Tribunal gives notice in terms of Section 51(3) & (4) of the Competition Act 89 of 1998 as amended, that it received the c COVCR074Jul20 complaint referrals listed below. The complaint(s) alleges that the respondent(s) engaged in a prohibited practice in contravention of the Competition Act 89 of 1998.

Case No.	Complainant	Respondent	Date received	Sections of the Act
CRP162Jan22	Cape Gate (Pty) Ltd	Emfuleni Local Municipality	12/01/2022	8(1)(a),8(a)
CRP164Jan22	Novus Holdings Ltd	Caxton	13/01/2022	8(1)(d)(i),8(1)(c)
CRP168Jan22	SIGC (Pty) LTD	Discovery Health Medical Scheme	25/01/2022	5(1),8(c)

**The Chairperson
Competition Tribunal**

DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION**NOTICE 828 OF 2022****COMPETITION TRIBUNAL****NOTIFICATION OF DECISION TO APPROVE MERGER**

The Competition Tribunal gives notice in terms of rules 34(b)(ii) and 35(5)(b)(ii) of the "Rules for the conduct of proceedings in the Competition Tribunal" as published in Government Gazette No. 22025 of 01 February 2001 that it approved the following mergers:

Case No.	Acquiring Firm	Target Firm	Date of Order	Decision
LM115Nov21	Raubex (Pty) Ltd	Bauba Resources Ltd	27/01/2022	Approved
LM124Nov21	Daimler Truck Holding AG	Daimler AG	27/01/2022	Approved

**The Chairperson
Competition Tribunal**

DEPARTMENT OF TRANSPORT

NOTICE 829 OF 2022

**AIR SERVICE LICENSING ACT, 1990 (ACT NO.115 OF 1990)
APPLICATION FOR THE GRANT OR AMENDMENT OF DOMESTIC AIR
SERVICE LICENCE**

Pursuant to the provisions of section 15 (1) (b) of Act No. 115 of 1990 and Regulation 8 of the Domestic Air Regulations, 1991, it is hereby notified for general information that the application detail of which appear in the appendix, will be considered by the Air Service Licensing Council. Representation in accordance with section 15 (3) of the Act No. 115 of 1990 in support of, or in position, an application, should reach the Air Service Licensing Council. Private Box X 193, Pretoria, 0001, within 21 days of date of the publication thereof.

APPENDIX I

(A) Full name and trade name of the applicant. (B) Full business or residential address of the applicant. (C) Class of licence applied for. (D) Type of air service to which application applies. (E) Category of aircraft to which application applies

(A) LXNDR Photography (Pty) Ltd. (B) Unit 9 Westridge Centre, Wesport & Park Avenue, Westridge, Mitchells Plain, 7785. (C) Class III. (D) Type G2, G3 & G4. (E) Category H1.

(A) Surphics (Pty) Ltd. (B) 02 Kogel Street, Middelburg. 1050. (C) Class III. (D) Type G3, G4 & G16 (RPAS). (E) Category H1.

APPENDIX II

(A) Full Name and trade name of the applicant. (B) Full business or residential address of the applicant. (C) The Class and number of license in respect of which the amendment is sought (D) Type of air service and the amendment thereto which is being applied for (E) Category of aircraft and the amendment thereto which is being applied for.

(A) Black Eagle Aviation CC. (B) Office 18 Main Terminal Building, Virginia Airport, Durban North, KwaZulu Natal, 4051. (C) Class II & III; N1058D 7 G1059d. (d) Type N1, N2, G2, G3, G4, G5, G6, G7, G8, G10, gG13, G14, G15 & G16 (Ship to Shore). (E) Category A2, A3, H1 & H2. **Changes to the MP:** Segran Govender replaces Jannike Bester as the Accountable Manager, Tjaart Boshoff replaces Jannike Bester as the RP: Aircraft & Jannike Bester replaces Dewdney Drew as the Air Service Safety Officer.

(A) Equilibrium Aviation (Pty) Ltd. (B) 86 Joubert rd, Green Point, Cape Town, 8005. (C) Class II & III; N1282D & G1283D. (D) Type N1, N2, G2, G3, G4, G5, G8 & G10. (E) Category H2. **Changes to the MP:** E. M. Du Toit is appointed as the Air Service Safety Officer & Quality Assurance Manager.

(A) Star Air Cargo (Pty) Ltd. (B) Denel Aviation, R1 Building, 131 Atlas Road, Kempton Park, 2129. (C) Class I & II; S1479D & N451D. (D) Type S2, N1 & N2. (E) Category A1. **Changes to the MP:** Bruce Laing is appointed as the Air Service Safety Officer & Security Manager.

(A) QCK Lezmin 4867 (Pty) Ltd; Heligistix. (B) Lot H82, 2300m East of Hluhluwe-Mkuze RD, p2, 1KM North of Ngweni, River Crossing, Hluhluwe, 1251. (C) Class II & III; N1345D & G1346D. (D) Type N1, N2, G2, G3, G5, G10 & G15. (E) Category H2. **Changes to the MP:** Etienne Gerber replaces Ashley Jon Bell as the RP: Aircraft.

BOARD NOTICES • RAADSKENNISGEWINGS

BOARD NOTICE 201 OF 2022**FINANCIAL SECTOR CONDUCT AUTHORITY****FINANCIAL MARKETS ACT, 2012****PROPOSED AMENDMENTS TO THE JSE EQUITIES RULES****PUBLICATION FOR COMMENT**

The Financial Sector Authority (FSCA) hereby gives notice under section 71(3)(b)(ii) of the Financial Markets Act, 2012 (Act No. 19 of 2012) that the proposed amendments to the JSE Equities Rules have been published on the official website of the FSCA (www.fsca.co.za) for public comment. All interested persons who have any objections to the proposed amendments are hereby called upon to lodge their objections in writing with the FSCA, at the following email address: Queries.Marketinfrastructures@fsca.co.za within a period of fourteen (14) days from the date of publication of this notice.

**Ms. Astrid Ludin****Deputy Commissioner****Financial Sector Conduct Authority**

BOARD NOTICE 202 OF 2022**FINANCIAL SECTOR CONDUCT AUTHORITY****FINANCIAL MARKETS ACT, 2012****PROPOSED AMENDMENTS TO THE JSE LISTING REQUIREMENTS
REGARDING ACTIVELY MANAGED CERTIFICATES****PUBLICATION FOR COMMENT**

The Financial Sector Conduct Authority (FSCA) hereby give notice under section 11(6)(c) of the Financial Markets Act, 2012 (Act No.19 of 2012) that the proposed amendments to the JSE Listings Requirements have been published on the official website of the FSCA (www.fsca.co.za) for public comment. All interested persons who have any objections to the proposed amendments are hereby called upon to lodge their objections in writing with the FSCA, at the following email address: Queries.Marketinfrastructures@fsca.co.za within a period of fourteen (14) days from the date of publication of this notice.



Ms. Astrid Ludin
Deputy Commissioner
Financial Sector Conduct Authority

BOARD NOTICE 203 OF 2022**FINANCIAL SECTOR CONDUCT AUTHORITY****FINANCIAL MARKETS ACT, 2012****PROPOSED AMENDMENTS TO THE JSE LISTINGS REQUIREMENTS IN
RESPECT OF THE CUTTING RED TAPE PROJECT****PUBLICATION FOR COMMENT**

The Financial Sector Authority (FSCA) hereby gives notice under section 11(6)(c) of the Financial Markets Act, 2012 (Act No. 19 of 2012) that the proposed amendments to the JSE Listings Requirements have been published on the official website of the FSCA (www.fsca.co.za) for public comment. All interested persons who have any objections to the proposed amendments are hereby called upon to lodge their objections in writing with the FSCA, at the following email address: Queries.Marketinfrastructures@fsca.co.za within a period of fourteen (14) days from the date of publication of this notice.



Ms Astrid Ludin
Deputy Commissioner
Financial Sector Conduct Authority

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