

M i n e H e a l t h & S a f e t y I n s p e c t o r a t e



Guideline for the compilation of a mandatory code
of practice for an occupational health programme
on personal exposure to
AIRBORNE POLLUTANTS



DEPARTMENT OF MINERALS AND ENERGY

REFERENCE NUMBER :16/3/2/4-A1

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DEPARTMENT OF MINERALS AND ENERGY
REPUBLIC OF SOUTH AFRICA

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)

On
PERSONAL EXPOSURE TO AIRBORNE POLLUTANTS


Chief Inspector of Mines

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PART A: The Guideline

1. FOREWORD

- 1.1 The Commission of Inquiry into Safety and Health in the Mining Industry chaired by the Honourable Mr. Justice R N Leon identified occupational health as one of the four major issues affecting occupational health and safety in the 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 airborne pollutants be drafted.
- 1.3 The Mine Health and Safety Council, in order to address occupational health, instructed the DME to establish an Occupational Hygiene Database. Information submitted to the DME in terms of this guideline will be used by the DME to establish this database.
- 1.4 Significant risks to health exist in mining. In order to protect, monitor and promote employees' health status, an occupational health programme is indicated where exposure to such significant risks occur. MOHAC considered it appropriate to prepare a guideline covering both occupational hygiene and medical surveillance to ensure compliance and uniform standards.
- 1.5 Where the employer's risk assessment indicates a need to establish and maintain either a system of occupational hygiene measurements or a system of medical surveillance, or where either such system is required by regulation, the employer must prepare and implement a COP based on this guideline.
- 1.6 When determining the HEGs as required in paragraph 8.1.2 of the guideline, regard must be had to the SAMOHP issued by the DME.

- 1.7 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 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.
- 1.8 The occupational hygiene programme section in this guideline replaces the existing "GUIDELINES FOR THE GRAVIMETRIC SAMPLING OF AIRBORNE PARTICULATES FOR RISK ASSESSMENT IN TERMS OF THE OCCUPATIONAL DISEASES IN MINES AND WORKS ACT NO 78 OF 1973".

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 Chief Inspector of Mines requires it. These COPs must comply with any relevant guidelines issued by the Chief Inspector of Mines [section 9(3)].
- 2.2 Failure by the employer to prepare or implement a COP in compliance with this guideline is a breach of the MHSA. Any contravention of, or failure to comply with, a COP is not, in itself, a breach of the MHSA, except a contravention or failure by an employer that also constitutes a failure to implement the COP. Since the DME does not approve COPs, its focus is not to enforce them either. The focus of the DME is to ensure that employers provide healthy and safe working environments at mines, i.e. focusing on system failures and compliance with the MHSA, rather than enforcing compliance with COPs.
- 2.3 The fact that a contravention of, or failure to comply with, a COP is not a breach of the MHSA does not mean that such breaches will have no legal implications. As far as the employer is concerned, there are numerous specific and general obligations on the employer in the MHSA aimed at ensuring the health and safety of all employees and all persons who are not employees but who may be directly affected by the activities at the mine. Where any failure to comply with a COP also constitutes a breach of any of the employer's obligations under the MHSA, the employer could be liable to an administrative fine for such breach. An inspector could also issue various instructions to the employer and employees in terms of section 54 to protect the health or safety of persons at the mine. Failure by an employer to comply with such an instruction could render the employer liable to an administrative fine.
- 2.4 As far as employees are concerned, section 22 places a number of obligations on employees, including that they must take reasonable care to protect their own health and

safety and the health and safety of other persons who may be affected by their conduct. Where a failure by an employee to comply with a COP would also constitute a breach of the employee's duties in terms of section 22 (or a breach of section 84, 86(1) or 88), the employee could be criminally charged for such breach. As is the case with employers, the inspectorate could issue instructions to employees in terms of section 54 and failure to comply with such an instruction constitutes a criminal offence.

- 2.5 Employers should deal with breaches by employees of COPs in terms of the mine's standard instructions and the employer's disciplinary procedures. This is not the responsibility of the State.

3. OBJECTIVE 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 protect and improve the health of employees at the mine by monitoring and reducing their exposure to airborne pollutants. It 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.

It sets out the two components of an Occupational Health programme namely:

- i Occupational Hygiene
- ii Medical Surveillance

- 3.2 Where an employer is required, in terms of regulation 9.2(2) or in terms of risk assessment, to establish and maintain a system of occupational hygiene measurements in respect of airborne pollutants, this guideline should assist the employer in doing so.

4. DEFINITIONS AND ACRONYMS

"airborne pollutant" means any substance in the air that is harmful to health, including dust, fumes, aerosols, gases, fibres, vapours or mists;

"analysis methodology" means analysis techniques used to quantify a pollutant collected on or in sampling media (e.g. gas chromatography/mass spectrometry);

"COP" means Code of Practice;

"DME" means the Department of Minerals and Energy;

"dose" means the amount of a pollutant to which a person is exposed;



"exposure" means the subjection of a person to an airborne pollutant in the course of employment through any route of entry (e.g. inhalation, ingestion, skin contact, or absorption);

"HEG" means a homogeneous exposure group;

"homogeneous exposure group" means a group of employees who experience pollutant exposures similar enough that monitoring exposures of any representative sub group of employees in the group provides data useful for predicting exposures of the remaining employees;

"MOHAC" means Mining Occupational Health Advisory Committee;

"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;

"MHSA" means Mine Health and Safety Act, 1996 (Act No.29 of 1996);

"NIOSH" means the United States National Institute for Occupational Safety and Health;

"SAMOHP" means the South African Mines Occupational Hygiene Programme Codebook;

"significant airborne pollutant" means any airborne pollutant to which any employee is exposed in concentrations equal to or exceeding the hazard limits contemplated in regulation 9.2.1;

"90th percentile" means the value which must be used to determine when HEG's need to be re-classified. This value can be calculated by:

(a) using Microsoft Excel programme (percentile function); or

(b) first placing all sample results in order from the lowest concentration to the highest concentration (i.e., concentration of specific contaminants). Next, assign each sample result a number, starting with the number 1 for the lowest concentration result up to the highest concentration being given the number equal to the total number of samples collected in that HEG. Multiply the total number of samples collected by 0.9. The sample result with the number corresponding to this calculated value is the 90th percentile.



5. SCOPE

- 5.1 A COP for an occupational health programme on personal exposure to airborne pollutants must be prepared, in compliance with this guideline, and implemented in terms of Regulation 9.2(2), which requires that a system of occupational hygiene measurements on personal exposure to airborne pollutants must be prepared and implemented when the results of the risk assessment conducted has identified that the following hazard limits prevail:
- Particulates $\geq 1/10$ of the occupation exposure limit
 - Gases $\geq 1/2$ of the occupation exposure limit
- 5.2 In terms of Section 9.3 of the MHSA a COP must comply with the guideline issued by the Chief Inspector of Mines, therefore the COP prepared by the employer must comply with this guideline.
- 5.3 This guideline covers a basic Occupational Health Programme for the purpose of measuring occupational exposures to airborne pollutants and the linking of these exposures to employee medical records.
- 5.4 The Occupational Health Programme should through monitoring identify employees with significant exposures and, where necessary, provide for the implementation of control measures. This guideline does not stipulate the control measures but only the hierarchy to be followed to control exposures.
- 5.5 Formal data returns on exposure levels will be used to establish and maintain an industry exposure database.

6. MEMBERS OF THE TASK GROUP

The following members of the Sub Committees have prepared this document.

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EMPLOYERS

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H Moorcroft
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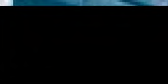
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PART B: Author's Guide

- 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 annex to the COP whether-
 - (a) the annex 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 annex is merely attached as information for consideration in the preparation of the COP (i.e. compliance is discretionary).
- 3 When annexes are used the numbering should be preceded by the letter allocated to that particular annex 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 sidenotes as well as in a separate bibliography.





PART C: Format and Content of the Mandatory COP

1. TITLE PAGE

The COP should have a title page reflecting at least the following -

- 1.1 name of mine;
- 1.2 the heading: "Mandatory Code of Practice for an Occupational Health Programme on Personal Exposure to Airborne Pollutants";
- 1.3 a statement to the effect that the COP was drawn up in accordance with guideline Department of Minerals and Energy Reference Number DME 16/3/2/4-A1 issued by the Chief Inspector of Mines;
- 1.4 the mine reference number for the COP;
- 1.5 the effective date; and
- 1.6 revision dates (if applicable).

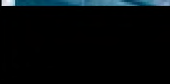
2. TABLE OF CONTENTS

The COP must have a comprehensive table of contents.

3. STATUS OF COP

This section must contain statements to the effect that-

- 3.1 the COP was drawn up in accordance with Guideline DME Reference Number Department of Minerals and Energy 16/3/2/4-A1 issued by the Chief Inspector of Mines;



- 3.2 this is a mandatory COP in terms of section 9(2) and (3) of the MHSA;
- 3.3 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;
- 3.4 the COP supersedes all previous relevant COPs; and
- 3.5 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 DRAFTING COMMITTEE

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

5. GENERAL INFORMATION

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 a brief description of the mine and its location;
- 5.2 the commodities produced;
- 5.3 the mining method or combination of methods used at the mine must be listed. This section must discuss the degree of mechanisation, taking care to identify the potential sources of pollutants, and all possible pathways of exposure and also all possible exposure scenarios;
- 5.4 the general ventilation arrangements;

- 5.5 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; and
- 5.6 the unique features of the mine that have a bearing on this COP and cross-reference them to the risk assessment conducted.

6. TERMS AND DEFINITIONS

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 while they are at work, record the significant hazards identified and risk assessed. The employer must determine how the significant risks identified in the risk assessment process must be dealt with, having regard to the requirement of section 11(2) and (3) that, as far as reasonably practicable, attempts should first be made to eliminate the risk, thereafter to control the risk at source, thereafter to minimise the risk and thereafter, insofar as the risk remains, to provide personal protective equipment and to 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, 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 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, plant or equipment and material.

8. ASPECTS TO BE ADDRESSED IN THE COP

Where the employer's risk assessment indicates a need to establish and maintain either a system of occupational hygiene measurements or a system of medical surveillance, or where either such system is required by regulation, the following key elements must be addressed in the COP:

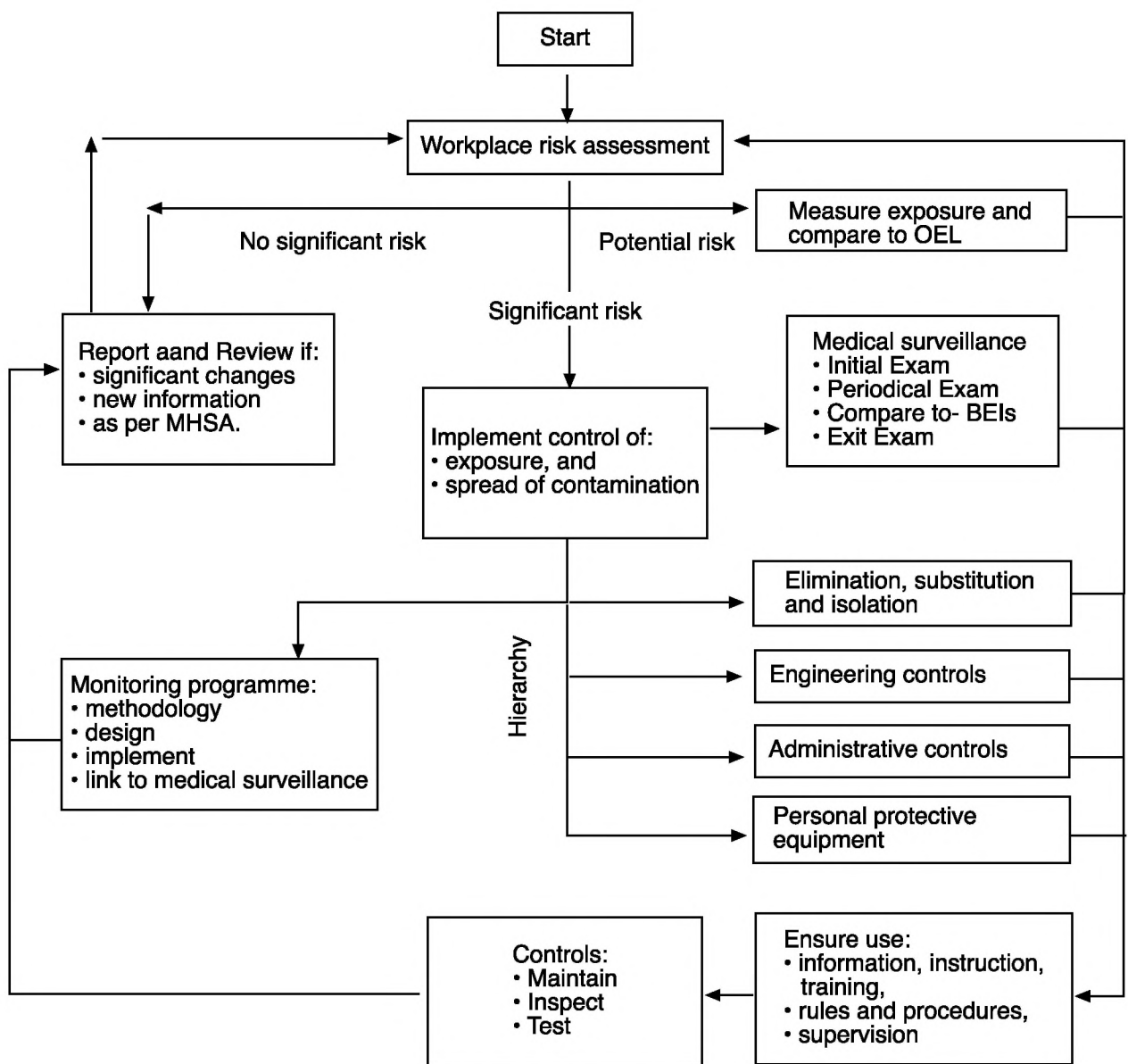


- Risk assessment and control
- Personal exposure monitoring
- Hierarchy of controls
- Medical surveillance
- Reporting and reviewing

These key elements are shown in Figure 1 below.

The Occupational Health Programme to be implemented on the mine must be summarised in the COP in a flow chart similar to Figure 1.

Figure 1 OCCUPATIONAL HEALTH PROGRAMME



The Occupational Health Programme has two components namely:

- Occupational Hygiene; and
- Medical Surveillance

8.1 OCCUPATIONAL HYGIENE PROGRAMME

The employer must ensure that when undertaking an Occupational Hygiene Programme the following steps are included:

- Step 1 - Risk Assessment and Control
- Step 2 - Determination of HEG
- Step 3 - Sampling and Analysis Methodology and Quality Control
- Step 4 - Personal Exposure Monitoring
- Step 5 - Reporting

8.1.1 RISK ASSESSMENT AND CONTROL

The COP must address the following points:

8.1.1.1 The risk assessment process must be described.

Note: Where the available historical data is insufficient to enable professional judgement regarding the extent of any risk, acceptable methodologies eg. such as stipulated by NIOSH or British Standard BS EN 689 should be used.

8.1.1.2 The activity areas must be described (see SAMOHP, Part A, section 2.1.2, Step 2) with reference to:

- (a) the significant airborne pollutants to which employees are being exposed to;
- (b) the route of entry (where applicable i.e. inhalation, absorption, ingestion etc.) and health effects that these significant airborne pollutants can have on employees;
- (c) where such pollutants may be present, e.g. welding bay, spray painting booth, battery charging stations, stoep face, development end etc.;
- (d) the airborne nature of those pollutants identified, e.g. gases, fumes, vapour mists, fibres, dusts etc.;
- (e) the nature of the key workplace operations and activities that pose the greatest potential for exposure to the significant airborne pollutants;



- (f) the occupations and number of employees who are being exposed to significant airborne pollutants;
- (g) the pattern, i.e. intermittent, continuous etc., duration and frequency of employee exposure to the significant airborne pollutants identified;
- (h) the actual exposure levels measured compared to occupational exposure limits;
- (i) the control measures in place, i.e. substitution, engineering, administration, personal protective equipment etc., the additional control measures required to be instituted in order to reduce or maintain exposures to below the occupational exposure limits, and if applicable the planned programme of implementation;
- (j) the frequency of any ongoing monitoring to assess the effectiveness of the controls mentioned above; and
- (k) the relevant material safety data sheets as contemplated in section 21(4) (a), (b) and (c) of the MSHA.

8.1.2 DETERMINATION OF HEGS

The COP must address the following points:

8.1.2.1 HEGs must be identified for purposes of personal exposure monitoring.

Note: Paragraph 2.1.2 of the SAMOHP sets out the sequential methodology to be used for the determination of HEGs. This methodology includes the following:

- (a) step 1 - subdivide the mine into sampling areas;
- (b) step 2 - subdivide the sampling areas into activity areas;
- (c) step 3 - determine the concentration and composition of significant airborne pollutants identified in the activity areas;
- (d) step 4 - compare the results of these pollutants measured in activity areas to their respective occupational exposure limits;
- (e) step 5 (single pollutants) - Categorise each activity area into classification bands;
- (f) step 6 (multiple pollutants, additive effect) - Categorise each activity area into classification bands.

8.1.2.2 HEGs identified in terms of paragraph 8.1.2.1 must be clearly demarcated on a plan/sketch/description.

Note: Where chemical processes are involved a flow chart of the process must be included.

8.1.2.3 HEGs must be reclassified when the 90th percentile indicates the need.

8.1.2.4 HEGs must be re-assessed when inter-alia the following occur:

- (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 and ventilation layouts, mining methods, plant, equipment or material);
- (d) occupational illness occurs;
- (e) a change in exposure category occurs; and
- (f) other events warranting re-evaluation occurs;
 - (i) new technological data; and
 - (ii) new regulatory initiatives.

This re-classification must only be done if results are proven and consistent. The monitoring strategy within a HEG must be adapted when either of the above (i.e. 8.1.2.3 and/or 8.1.2.4) occurs.

8.1.3 PERSONAL EXPOSURE MONITORING

Personal exposure monitoring is to be conducted on an annual cycle period in compliance with regulation 9.2(7).

8.1.3.1 Accurate, meaningful samples, which are representative of all full working shifts for each HEG, must be obtained from personal monitoring.

Note: The exposures measured (dose allocated) for any individual employee within that HEG would be allocated to the Hygiene record/s of that specific employee and to all the other employees within that HEG. For a given HEG samples must be randomly assigned covering all shifts (to different employees on different days over the monitoring time period). All job categories within a HEG must be randomly sampled on each shift.



8.1.3.2 The COP must specify whether additional samples need to be taken in order to increase the confidence that HEGs are appropriately categorised.

Note: The mandatory sampling frequency is stipulated in paragraph 2.1.4 of the SAMOHP codebook.

8.1.4 SAMPLING, ANALYSIS METHODOLOGY AND QUALITY CONTROL

The COP must address the following points:

8.1.4.1 Sampling Strategy

A sampling strategy including a monitoring schedule for each HEG are compiled for the cycle period, and records thereof are kept for a period of two years.

8.1.4.2 Sampling Methodology

- (a) For each significant pollutant identified, an appropriate sampling methodology, which complies with internationally compatible best practice, must be selected and implemented.

Note: The relevant methodology chosen for each significant pollutant identified must be stated in the COP, see example below:

Methodology: for Ammonia, use could be made of the US National Institute for Occupational Safety and Health (NIOSH) Analytical Method 6015.

- (b) A quality control programme for the sampling methodology, compatible with internationally acceptable methodology must be developed and implemented.

8.1.4.3 Analysis Methodology

- (a) For each significant pollutant identified, an appropriate analysis methodology, which complies with internationally compatible best practice, must be selected and implemented.
- (b) A laboratory that is accredited in terms of the South African National Accreditation System (S.A.N.A.S) to do so, must do the sample analysis.



8.1.5 REPORTING AND RECORDING

The COP must address the following points:

8.1.5.1 Activity Area Assessment Records and Reports (Reports to be kept at the mine)

A record keeping system, which records the history of each activity area for a period of at least 5 years, must be kept. This system should inter-alia include information on the following:

(a) Reasons for any deviation of sample results

- (i) Controls not operating effectively
- (ii) Events or factors which have influenced the results
E.g. sampling done on surface after high rainfall or during excessive winds.

(b) Hierarchy of Controls initiated (description of method used e.g.)

(i) Elimination

- Substitution
- Innovation

(ii) Engineering controls

- Dilute with ventilation
- Total or partial enclosure
- Negative pressure
- Exhaust systems
- Filters installed etc.

(iii) Administrative controls

- Removal of persons from the hazard
- Safe systems of work
- Reducing exposure time
- Provision of hygiene facilities e.g. changing, washing eating facilities

(iv) Personal protective equipment (PPE)

- Respiratory protective equipment

Note: Regulation 9.2(7) pertains to mandatory annual personal exposure reports which are required to be submitted to the Regional Principal Inspector of Mines.



8.2 OCCUPATIONAL MEDICAL SURVEILLANCE

8.2.1 OCCUPATIONAL MEDICAL SURVEILLANCE PROGRAMME

The COP must address the following points:

8.2.1.1 The medical surveillance programme required either in terms of the hazard identification and risk assessment process or if required in terms of chapter 11 of the MHSA regulations must be described.

8.2.1.2 Linkage between occupational hygiene and medical surveillance

The method used to link personal monitoring and the hygiene register to medical records as contemplated in terms of section 12(3) of the MHSA must be described.

Note: Exposures to individual pollutants as well as additive or synergistic mixtures must be linked to the medical record of employees. A manual or computerised system could be utilised to transfer this information. These systems may have to be customised in accordance with the operations specific needs or commercial programs could be acquired to perform this task.

Effective communication between the Occupational Hygiene Practitioner and the Occupational Medical Practitioner is required to ensure that exposure history and medical manifestation of systems are meaningful.

8.2.1.3 Categories of medical examinations at which medical surveillance must be carried out.

A procedure describing how the following examinations required by the MHSA will be conducted at the mine:

- (a) Initial examination - in terms of section 13(2)(c) of the MHSA.
- (b) Periodic examination - in terms of section 13(2)(c) of the MHSA.
- (c) Exit examination - in terms of section 17 and 19(2) of the MHSA.

8.2.2 METHODOLOGICAL STANDARDS FOR TEST TECHNIQUES FORMING PART OF MEDICAL SURVEILLANCE

8.2.2.1 The employer must ensure that chest x-rays (35x43cm or 35x35cm) should be:

- (a) of a suitable quality for proper classification of pneumoconiosis. ILO 1980, which refers to radiological classification, should be consulted; and



(b) show the date, name of individual and any unique form of personal identification.

8.2.2.2 The COP must set out how lung function testing will be conducted.

Note: The guidance note for occupational medical practitioners could be consulted.

8.2.2.3 Tuberculosis surveillance programmes may include the use of Mass Miniature Radiography (MMR).

8.2.3 MEDICAL SURVEILLANCE ACCORDING TO HEALTH HAZARD

8.2.3.1 A system of medical surveillance that combines the requirements of medical surveillance for different significant hazards in such a way that these requirements are met effectively and efficiently must be developed and implemented in consultation with the Occupational Medical Practitioner.

Note: The mine's system of medical surveillance should be designed to avoid duplication where employees are exposed to more than one hazard requiring medical surveillance. The medical surveillance in respect of each hazard should be done in parallel. A single, similar test could suffice for the medical surveillance of more than one hazard. It could therefore be possible to use the same examination or test for the medical surveillance of more than one hazard, provided that the requirements of medical surveillance for each hazard are achieved.





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

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 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, 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.





ANNEX 1: Reference Documents

(For Information Only)

1. Atmospheric Contaminant Exposure in the Western Australian Mining Industry.
Presented at the Second International Conference on the Health of Miners held in Pittsburgh, 11-13 November 1995
2. Dust sampling Strategy on Coalfaces in relation to modern coalmining methods.
Institute of Occupational Medicine LTD Technical Memorandum Series
3. Guide to conducting an occupational health risk assessment as required in the occupational health and safety act, regulations for hazardous chemical substances - 1995.
Prepared by the Institute of Occupational Hygienists of Southern Africa (IOHSA)
4. Guidelines for the gravimetric sampling of airborne particulates for risk assessment in terms of the Occupational Diseases in Mines and Works act No 78 of 1973.
Reference: GME 16/2/3/2/3
5. Monitoring Strategies for hazardous substances in the workplace.
Including a recommended approach for carrying out the risk assessment and monitoring requirements in the Hazardous Chemical Substances Regulations of the Occupational Health and Safety Act.
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