

Department of Mineral Resources

Guideline for the compilation of a mandatory code of practice for an occupational health programme on personal exposure to airborne Pollutants – Amendments

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Heading

1. Background
2. Contents of the guideline
3. Amendments
 - 3.1 Occupational Hygiene
 - 3.2 Occupational Medicine
4. Risk Assessments
5. HEG's Determination and Reclassification
6. Sampling Analysis and Quality Control
7. Reporting
8. Conclusion



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Outline

- The revision was initiated in 2006, first draft finalised in 2010 and with the request of an operational manual;
- The operational manual was developed through MHSC by a service provider;
- MOHAC task team was established to ensure that the guideline incorporates the information in the SAMOHP code book;
- The reporting forms were also reviewed;
- The guideline together with the reporting forms has been gazetted in April 2018; and
- Planned workshop to be held in all the regions.



Occupational Hygiene Amendments

5. Scope – New insertion

5.2 Where there is no statutory determined OEL for a particular airborne pollutant: The risk assessment conducted should determine how the pollutant must be addressed in the COP.

8.3. Occupational Hygiene Programme

8.3.1 Risk assessment

Old guideline	Revised guideline
None	Baseline risk assessment 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.
Significant airborne pollutants	8.3.1.2 Any airborne pollutants
None	8.3.1.4 Post risk assessment



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Occupational Hygiene Amendments

Occupational Hygiene Programme cont.

8.3.2 Determination of HEG'S

Old guideline	Revised guideline
This re-classification must only be done if results are proven and consistent.	At the end of each sampling cycle (annually – end of calendar year) sampling results for each HEG must be statistically analysed and re-classified when required.

8.3.3 Sampling, analysis and quality control

Determination of the sample size in line with SAMHOP code	New – Category D – No sampling plan for this category. Measurement results that are below 10% of the OEL will be reported under this category.
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A minimum of 5% or five samples (whichever is the greater) per HEG should be taken as per classification bands in Annexure C as per the following:

- ✓ **Category A – samples per quarter;**
- ✓ **Category B – six monthly to be evenly spread bi-annually and**

Occupational Hygiene Amendments

Occupational Hygiene Programme cont.

8.3.3.4 Chemical analysis methodology

Old guideline	Revised guideline
None	<p>A minimum number of samples taken as determined in accordance with 8.3.3.1(a) of this guideline must each be individually analysed.</p> <p>All samples taken should be sent for analysis</p>
None	<p>Note : The results from the analysis obtained in a HEG will be averaged and allocated to the specific HEG in which the samples were taken.</p>



Occupational Hygiene Amendments

3. Occupational Hygiene Programme	3.5 Mandatory Reporting
Old guideline	Revised guideline
A Classification – Quarterly B Classification – Bi-annually C Classification – Annually	D Classification has been added. Reporting to the DMR must be done on a quarterly basis for all categories, that is A, B, C and D.
None	Note 1: For all categories A, B and C, the measurements results on the samples taken at that time must be reported at the end of each quarter. The rolling average results must be reported at the end of each sampling cycle. Note 2: The results in a HEG of which 90th percentile equates to less than 10% of the OEL will be classified under “D” category.

Occupational Medicine Amendments

Methodological standards for test techniques forming part of medical surveillance

Old guideline

8.2.2.1

The employer must ensure that chest X-Rays (35X43cm) or (35x35cm) :

(a) Should be 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.

Revised guideline

8.4.2.1

The **COP** should set out measures to ensure that chest X-RAYS :

(a) Are at least 35X43cm in size, **even when digital;**

(b) Are of a suitable quality for proper identification and classification of Pneumoconiosis; and

(c) Show the date , name of individual and any unique form of personal identification used by the mine **(e.g. identity number, personnel number, passport number, company number, etc.).**



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Occupational Medicine Amendments

Medical surveillance according to health hazard	Inclusive medical surveillance system
Old guideline	Revised guideline
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 OMP	
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	8.4.3.1 The COP should set out measurements to ensure that the system of medical surveillance is designed in consultation with the Occupational Medical Practitioner to avoid duplication where employees are exposed to more than one hazard.

Conclusion

- The Effective date of the guideline was in April 2018, the Implementation date starts in November 2018.
- The mines are requested to review their COP's and systems in line with the current guideline.
- Workshops are planned for all regions.
- We also note that change is a process, we therefore urge all of us to work together in order to achieve to prevent occupational disease.



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Guideline for the compilation of a mandatory code of practice for an occupational health programme on personal exposure to airborne Pollutants – Risk Assessment

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Risk Assessment

1. Legislative framework – MSHA Section 11 also noting elements that do not have the OEL(e.g. DPM)
2. Define the Objective of the risk assessment in terms of measurable outcomes.
3. Define assessment process covering the:-
 - Baseline – Considering exposures in line with schedule 22 where HIRA will be undertaken.
 - ✓ Hazard Identification and assessing through measurements;
 - ✓ Risk Rating- Qualitative and Quantitative;
 - ✓ Risk rating - taking into account the classification band.



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Risk Assessment

- Issue based – measurements and monitoring of exposures that are above the OEL- Putting a system in place in terms of section 12.2 and regulation 9.2 of MHSa
- Monitoring is conducted to:-
 - ✓ comply with legislation;
 - ✓ assessment of potential hazards;
 - ✓ evaluation of control measures; and
 - ✓ auditing their ongoing performance.



Risk Assessment

➤ Continuous process – ongoing assessment to verify environmental conditions have remain the same or to identify where changes have occurred and the extent thereof i.e. exposures that are below 10% of the OEL.

✓ Review risk assessment –

- When a section 11.5 investigation indicates the need for it;
- When new or revised legislation is introduced;
- When new mining methods are introduced;
- When process changes are introduced (e.g., in process plants);and
- When new types of machinery are introduced.

✓ Post assessments based on the personal exposure monitoring data of the previous cycle.

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Guideline for the compilation of a mandatory code of practice for an occupational health programme on personal exposure to airborne Pollutants – HEG's Determination

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HEGs Classification & Reclassification

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

Step 1

The sub-division of the mine into sampling areas (e.g. surface = sampling area 1, underground section A = sampling area 2, underground section B = sampling area 3, underground section C = sampling area 4, etc).

NOTE: Surface operations proceed to step 3. Underground operations proceed to step 2.



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HEGs Classification & Reclassification

Step 2

At underground mines sampling areas should be subdivided into ventilation districts which are areas of a mine, ventilated independently from other areas with a common dedicated intake and return airways. Any airborne contaminants released in a ventilation district will only affect that particular district and does not circulate through other areas of the mine where people may be exposed.

- In order for an area to be classified as a ventilation district it must comply with:
 - ✓ Ventilated independently from other areas.
 - ✓ Independent intake and return airways.
 - ✓ Does not contaminate other areas.



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HEGs Classification & Reclassification

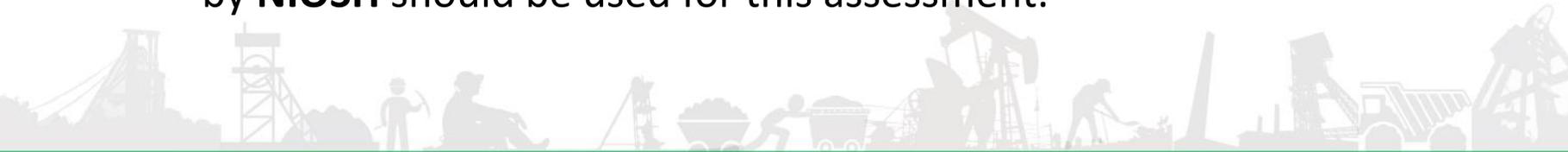
Step 3

The sub-division of the sampling areas into activity areas as per the activity area code list found in Annex A (Mandatory codes). Annex A is mandatory.

Step 4

To ensure that adequate measurements of personal exposures (refer also to paragraph 8.3.4 below) are taken in line with the identified **airborne pollutants** for each activity area. If insufficient historical personal exposure data is not available regarding the extent of the risk, a personal monitoring survey must be undertaken for each identified airborne pollutant.

- ❖ **NOTE:** Acceptable methodologies on personal monitoring as stipulated by **NIOSH** should be used for this assessment.



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HEGs Classification & Reclassification

Step 5

- A statistical analysis should be conducted. Annex B could be consulted in this regard. The results of the identified **airborne pollutants** present, either from historical data or from measured data during the personal sampling strategy, in that particular activity area should be compared to their respective **OEL** values. These **OEL** values and pollutant codes are contained as schedule 22.9(2)(a) in Chapter 22 of the **MHSA** regulations.
- Plot past data over time to determine whether the exposure trends are higher or lower. If the exposure trends exist, the section 12(1) appointee should use only the most recent exposure data in the initial assessment.
- In order to ensure that **HEGs** is correctly allocated a statistical analysis of the results is to be done, an example of such an approach is shown in Annex B.



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HEGs Classification & Reclassification

❖ **NOTE:** Annex B (*HEG determination – example of statistical approach*) is attached for information purposes only.

Once the personal exposures within each activity area have been compared to their respective **OEL** values, each activity area can now be categorised into classification bands to determine the various **HEGs** within that activity area. The classification bands for **airborne pollutants** are tabled in Annex C (classification bands) and is mandatory.

❖ **NOTE:** An activity area e.g. stoping, is not a **HEG**. This activity area i.e. stoping, must be subdivided into the classification bands as shown above. These classification bands are the **HEGs** within that particular activity area.

Repeat step 4 for every pollutant identified in the risk assessment process.



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HEGs Classification & Reclassification

Step 6

- In this step where a single pollutant acting independently has been identified in an activity area the following process must be followed:
- Once the personal exposures within each activity area has been compared to the respective **OEL** values of the single pollutant, that activity area can now be categorised into classification bands determined by the various **HEGs** within that activity area. The classification bands for **airborne pollutants** are depicted in Annex C. Annex C is mandatory and must be complied with.
- If an employee is exposed to a number of identified pollutants, which have an additive effect, then Step 7 must be followed.

Repeat step 5 for every such identified pollutant.



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HEGs Classification & Reclassification

Step 7

- When pollutants that have an additive effect have been identified in an activity Area where these effects are additive their combined effects must be used when classifying the Activity Area into their respective **HEGs**, the following formula must be used to assess the combined effect.
- $C_1/L_1 + C_2/L_2 + C_3/L_3 \dots$ for compliance the combined effect should be < 1 where C_1, C_2 etc are the concentrations of constituents in air and L_1, L_2 etc are the corresponding **OELs**.
- ❖ **NOTE:** The **OELs** for pollutants listed in Schedule 22.9(2)(a) of the **MHSA** are for single compounds or for pollutants containing a common entity. Workers are however frequently subjected to mixed exposures. It is therefore necessary to take into account the possible additive or synergistic effects of these pollutants. Due to the difficulty in assessing if the effects of a mixture of pollutants are either additive or synergistic, the requirements of this **COP** will be to treat all such cases as if they are additive. With all types of mixed exposures, it is essential that the classification band category assessment should be based on the concentrations of each of the constituents in air to which workers are exposed.



HEGs Classification & Reclassification

- Table C1 in Annex C (*Classification Bands and reporting forms*) depicts exposures to the various hazards that can be considered as being additive or synergistic. Annex C is mandatory and must be complied with.

❖ **NOTE:** Refer to Annex D (*Supplementary information for determination of HEGs*) with reference to identified pollutants that have an additive effect. Annex D is for information purposes only.



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Guideline for the compilation of a mandatory code of practice for an occupational health programme on personal exposure to airborne Pollutants – Reporting Forms

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Annexure C: Mandatory Forms – Personal Exposure Reporting form 21.9(2)(a): Reporting Single Pollutant for category A,

Mine										
Quarterly Airborne Pollutants Exposure Report form 21.9(2)(a) in terms of Regulation 9.2.7										
Main Commodity Code:						DMR Mine Code:				
Sample Area:						Sub Mine Code:				
Activity Area Code:						Reporting Period:		Jan-March 2016		
HEG reclassification Band (Based on previous annual 90 th Percentile results):										
Number of samples planned for the current sampling cycle		Q1	Q2	Q3	Q4	Annual Results				
Number of samples taken										
Quarterly HEG classification (Based on 90 th percentile measurement results)										
HEG			Pollutant Code	Sample Concentration per Occupation (TWA - 8hr) mg/m ³	Analysis %	Mean Pollutant Concentration Dose Allocated to Medical Record	90 th Percentile HEG Classification	OEL		
Occupations Codes In HEG	Occupations in a HEG	Number of Persons per Occupation						(Tick appropriate box)		
								mg/m ³		
								f/ml		
								ppm		
TOTAL										
COMMENTS ON: REASON/S FOR OVEREXPOSURES										
CORRECTIVE MEASURES THAT WILL BE IMPLEMENTED TO PREVENT/MITIGATE OVEREXPOSURES.										

For each Quarter- A-HEG Measurements results will be based on that particular quarter.

Annual 90th rolling percentile based on the 4 quarters measurements results

Annexure C: Mandatory Forms – Personal Exposure Reporting form

21.9(2)(a): Reporting Single Pollutant for category A,

Mine										
Quarterly Airborne Pollutants Exposure Report form 21.9(2)(a) in terms of Regulation 9.2.7										
Main Commodity Code:			DMR Mine Code:							
Sample Area:			Sub Mine Code:							
Activity Area Code:			Reporting Period: Jan-March 2016							
HEG reclassification Band (Based on previous annual 90th Percentile results):										
Number of samples planned for the current sampling cycle			Q1	Q2	Bi - Annual Results	Q3	Q4	Annual Results		
Number of samples taken										
Quarterly HEG classification (Based on 90 th percentile measurement results)										
HEG			Pollutant Code	Sample Concentration per Occupation (TWA - 8hr) mg/m ³	Analysis %	Mean Pollutant Concentration Dose Allocated to Medical Record		90 th Percentile HEG Classification		
Occupations Codes in HEG	Occupations in a HEG	Number of Persons per Occupation				(Tick appropriate box)			(Tick appropriate box)	
						mg/m ³		mg/m ³		
						f/mi		f/mi		
						ppm		ppm		
TOTAL										
COMMENTS ON: ON REGRESSION FROM RESULTS 'B CLASSIFICATION' TO 'A CLASSIFICATION'.										
MEASURES THAT WILL BE IMPLEMENTED TO CORRECT REGRESSION.										

Q1 and Q2: These are results from samples taken during that quarter

Bi-annual results: Rolling percentile results of Q1 and Q2.

Same principle applies to Q3 and Q4 of the results taken during those quarters.

Annual 90th rolling percentile based on the 4 quarters measurements results.

HEG		Pollutant	Sample Concentration	Analysis	Pollutant Concentration	Mean Pollutant Concentration Dose Allocated to	Range of Pollutant Concentration		OEL		Pollutant Index	AQI	
Occupations Codes in HEG	Number of Persons per Occupation	Code	per Occupation (TWA-8hr)	%	mg/m ³	(Tick appropriate box)	90th Percentile HEG Classification	Min	Max	The sum of pollutants having an additive effect e.g. 0.67 + 0.16 = 0.84			
										mg/m ³	f/ml		
						90th percentile determined from pollutant concentrations e.g. =PERCENTILE(Column F10:F14,(C-9))							
		(A)	(B)		(C=Avg A*B%)					(D)	(E=C/D)	(F=SUM E)	
		522	0.27	2.44	0.006588	0.067	0.191	0.00506	0.31404	0.1	0.67	0.84	
		522	1.81	17.35	0.314035								
		522	0.23	2.4	0.00552								
		522	0.27	2.3	0.00621								
		522	0.23	2.2	0.00506								
		459	0.27	97.56	0.263412	0.495	1.003	0.22448	1.49597	3	0.16		
		459	1.81	82.65	1.495965								
		459	0.23	97.6	0.22448								
		459	0.27	97.7	0.26379								
		459	0.23	97.8	0.22494								
Total													

Each pollutant concentration must be calculated from the total sample concentration with its own percentage analysis e.g. 0.27 mg/m³ X (2.44%/100%) = 0.006588

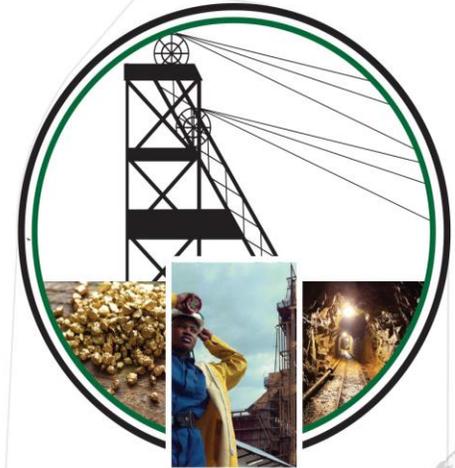
Average determined from pollutant concentrations e.g. AVERAGE(F10:F14)

Max determined from pollutant concentrations e.g. =MAX(F10:F14)

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