

**MANDATORY CODE OF PRACTICE FOR AN
OCCUPATIONAL HEALTH PROGRAMME ON
PERSONAL EXPOSURE TO AIRBORNE
POLLUTANTS**

1. TITLE PAGE

- 1.1 Mandatory Code of Practice for an Occupational Health Programme on Personal exposure to airborne pollutants for silica quartz particulate
- 1.2 Name of mine:
- 1.3 Mine Reference Number:
- 1.4 Effective Date:
- 1.5 Revision dates

- 1.6 Policy statement: This code of practice was drawn up in accordance with the guideline from the Department of Minerals and Energy, reference number DME 16/3/2/4-A1 issued by the Chief Inspector of Mines.

2. Table of contents

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3. List of definitions and abbreviations used in the COP

COP	Code of Practice
MHSA	Mine Health and Safety Act
AQI	Air quality index for the pollutant
DME	Department of Minerals and Energy
OEL	Occupational Exposure limit
HEG	Homologous Exposure Groups
The Mine	
Airborne Pollutant	Airborne dust particulate containing all potential health risk substances
PNOC	Particulate not otherwise classified
Silica quartz	Silica quartz fractions of airborne pollutant
SAIOH	South African Institute of Occupational Health
SAMOHP	South African Mines Occupational Health Programme
Risk Assessment	Determination of the extent of a real or perceived risk to the health of a worker
SABS	South African Bureau of Standards
NIOSH	US National Institute for Occupational Safety and Health
SANAS	South African National Accreditation System
GME	Government Mining Engineer

4. Status of this Code of Practice

1. This Code of Practice complies with Guideline DME Reference Number "Department of Minerals and Energy Ref. No 16/3/2/4-A1" issued by the Chief Inspector of Mines.
Effective date – 28 February 2003
2. This COP is mandatory in terms of section 9(2) and 9(3) of the Mine Health and Safety Act.
3. This COP may be used in an accident/investigation/enquiry to ascertain compliance and to establish whether this COP is effective and fit for its purpose.
4. This COP supersedes all previous relevant codes of practice.
5. All managerial instructions, recommended procedures and mine standards on relevant topics must comply with this COP and must be reviewed regularly to ensure such compliance.
6. Future changes/alterations to this COP would be subject to the knowledge and approval of the Principal Inspector of Mines.

5. Members of the Drafting Committee

- 4.1 According to section 9(4) of the MHSa the mine management must consult with the health and safety committee on the preparation, implementation and revision of any COP.
- 4.2 The employer should, after consultation with employees in terms of the MHSa, appoint a committee responsible for the drafting of the COP.
- 4.3 The following members of this committee were appointed to draft the COP

6. General information

- 5.1 Name of Mine: Ngqura Brick (Pty) Ltd
PO Box 2308
NORTH END
PORT ELIZABETH
- 5.2 Brief description of Mine: The mine consists of an opencast mining area and a crushing/rolling/extruding plant used solely for the manufacturing of bricks.
- 5.3 Location of mine: **The mine is situated**....
- 5.4 Commodity produced by the mine: Bricks for building purposes
- 5.5 Mining methods used for production process:
- Identification of machinery used: Bull Dozer, loader and forklifts used for clay/brick transportation and handling. Crushers, rollers, conveyor belts, extruder and brick cutters for the manufacturing of bricks.
 - Identification of potential pollution sources: High potential sources and found at the crushing/rolling section. Lower potentials at the extrusion/cutting/packing area as well as transport equipment and product feed bins.
 - Other possible causes of pollutant/exposure scenarios: High winds can spread dust throughout the works from any outside source of dust accumulation.
- 5.6 The existing ventilation/ dust control arrangements: No engineered exhaust ventilation systems are operating as yet on the plant proper. Personal protection is used throughout. Separated crushing/rolling section from extrusion section helps to minimise dust effects, **as well as the addition of water to the clay before transfer points**. This is a fully mechanised plant minimising manual handling of dusty products.
- 5.7 Comments on review of existing COP's to avoid conflict with this document to ensure an integrated system: No previous COP's in place.
- 5.8 Unique mine features affecting the risk assessment conducted: High wind currents affect risk assessments, as well as rainy conditions, because of the open-to-atmospheric-influences nature of the mining process.

7. Risk management

- 7.1 In accordance with section 11 of the MHSA the mine has used a suitably qualified private occupational hygienist to assess the health and safety risks to which employees may be exposed, during the working shift and a record of results is kept on the mine.

Results of health risks due to exposure to pollutants are reported under the following definitions:

- Significant risk > 0.1 AQI
- Pollutant Action level > 0.5-0.9 AQI
- Legal occupational exposure limit > 1.0 AQI

The mine, in conjunction with the occupational hygienist will determine the manner/method/equipment/strategy to be used to

- Eliminate; and/or
- Control, and/or
- Minimise the risk

And to provide personal protective equipment insofar as the risk remains and/or install and maintain engineered dust/gas control systems.

- 7.2 To assist management with the risk assessment the occupational hygienist will obtain and use all relevant information such as previous reports, research reports, manufacturing specifications, approvals, instrument calibration certificates and Chamber of Mines guidelines for the correct assessment of the risk.
- 7.3 In addition to the periodic review required by section 11(4) of the MHSA, further COP reviews will be performed and updated after every serious incident related to air pollutants – also when significant dangers are introduced to procedures, mining processes and ventilation layouts, where applicable.

The following table refers and will be kept up to date.

Review no.	Date of review	Reasons for review	Results of review

7.4 Risk management record

The mine shall keep a record of action taken to manage an identified/classified health risk and this record should at least contain the information tabled below:

Where a significant risk to health prevails:

Action to be considered	Description of action taken
a. Eliminate risk	
b. Control risk at source	
c. Minimise risk	
d. Protective equipment issued	

8. The Occupational Health Programme

Where health risk assessments results indicate the need for the institution of an occupational health programme, the main feature must be the marriage of results/corrective actions of both the following systems:

- occupational hygiene measurements; and
- medical surveillance procedures.

The legal system also requires the establishment of such a programme. Key elements of the programme shall include:

- a. Risk assessment and control.
- b. Personal exposure monitoring.
- c. Hierarchy of controls
- d. Medical surveillance
- e. Reporting and reviewing.

The figure below demonstrates a flow chart issued by the Department of Minerals and Energy as the governing example:

8.1 The occupational health programme (from the chart)

The following steps will be included in the programme:

- Step 1 - Risk assessment and control
- Step 2 - Determination of Homologous exposure groups
- Step 3 - Sampling and analyses methodology and quality control
- Step 4 - Personal exposure monitoring
- Step 5 - Reporting

8.1.1 **Risk assessment and control**

8.1.1.1 **Description of risk assessment process – for silica quartz dust**

The risk assessment procedures will adhere strictly to the following specifications:

- a. The book "Measurements in Mine Environmental Control" published by the Chamber of Mines.
- b. SABS recommended method for the sampling of airborne particulate numbered SABS 1164.
- c. Specifications issued by the Inspector of Mines and MHS.
- d. Other International Standards where required.

The risk assessment takes place as follows:

- GILLIAN gravimetric sampling pumps are calibrated (incorporated into a typical sampling train with attached cyclones and cassettes) to a flow rate of 2.2 litres per minute, using a calibrated GILBRATOR flow rate calibrator.
- Cellulose Ester filter papers, fitted into airtight cassettes are used for dust collection over an extended time period. (Where possible, a full working shift should be covered)
- The pre-weighed filter papers are then weighed with the sampled dust loads and the masses of dusts are determined by subtraction.
- The collected dust mass is divided by the total air volume sampled to obtain the dust concentration in the air for every filter paper used.
- The collected (and weighed) samples are then sent to an approved laboratory where the percentage of silica quartz in the dust is determined.
- The silica quartz fraction of the total sample is used in conjunction with the OEL for silica quartz (0.1 mg/m^3) to calculate the AQI for silica quartz only.
- The concentration of residual PNOC's is used with the OEL for PNOC (5 mg/m^3) to calculate the AQI for PNOC's. The two AQI's are then added together to give the true AQI to which workers are exposed.
- The health risk is then classified according to the calculated AQI's, as per legal requirements.
- The dust sampling strategy used will be 'personal sampling' which measures a worker's personal exposure to the health hazard during the working shift.
- Area sampling strategies will be followed where the exact magnitude of a dust source needs to be known to allow for the correct design of a dust extraction system to control dust from such a source.
- The frequency of hazard sampling is governed by the hazard Band classification.

8.1.1.2 **Areas of activity**

The areas of mine activities are mainly described as 'crushing' i.e. activity area code 20 with an 'occupation code list' identification of 36710, i.e. 'brick maker'.

- a. The mine manufactures brick from clay containing silica quartz, exposing workers to the dust generated by the processes listed below.
 - Scraping and loading clay
 - Crushing clay
 - Extrusion process
 - Packing bricks
 - Transporting and handling bricks
 - Drying bricks inside kilns
- b. Silica quartz presents a health risk by inhalation only and overexposure to significant concentrations over the long term will result in workers' contracting silicosis.
- c. The presence of silica quartz can be found wherever clay is broken, moved or handled – see the processes under a above.
- d. The dangerous silica quartz dusts will be in particulate form, under 5 micron in diameter and will contain silica quartz content of >5%.
- e. Workplaces containing the greatest potential for exposure to significant airborne pollutants are:
 - Crushing the clay
 - Loading clay into bins
 - Transporting clay in dusty areas
 - Sweeping plant floor areas when dry
- f. The following occupations can cause exposure of workers to dust:

Occupation	No of workers exposed
Scraping clay in quarry	0
Loading scraped clay onto truck	0
Tipping clay into bin	0
Operating bin discharge process	0
Crushing & rolling clay & cleaning the area	0
Mixing clay	0
Extrusion process	0
Cutting bricks	0
Packing bricks onto pallets	0
Transporting bricks to storage area	0

- g. Exposure patterns at various processes can be summed up as work taking place continuously over the full working shift, at all processes, as for any normal product manufacturing plant.
- h. Control measures in place entail the following:
 - Workers wear approved breathing protection
 - Substitution of workers take place
 - Engineering control measures are considered adequate.

- i. Ongoing dust monitoring takes place annually to assess the effectiveness of the controls mentioned in (a) above. This assessment interval is subject to instructions from the Inspector of Mines and classification bands.
- j. Relevant silica quartz safety data sheets will be drawn up by the mine and posted where this information would be freely available for scrutiny by all the employees of the mine. Such data sheets should at least contain the following information:
 - Silica quartz effects on the lungs and/or health of workers, including smokers and TB sufferers, i.e. the dangers to health of workers.
 - Legal requirements relating to the safe mining of silica quartz products.
 - Safe methods of mining/handling/storing the silica products.
 - A list of approved personal protective equipment to be issued to and worn by employees, and the detailed description of how, where and when such equipment should be used.
 - Medical surveillance data concerned.

8.1.2 Determination of HEG's

HEG's identified for purposes of personal exposure monitoring can be classified as follows:

- a. A brick manufacturing works have 3 main areas of activity where exposure to dust becomes a relative consideration, i.e.
 - Activities in the quarry
 - Activities in the crushing/screening area
 - Activities in the extrusion/cutting/packing area.
- b. Dust concentrations and compositions are determined in each activity area shown above and then compared to the exposure limits valid for silica quartz and PNOC's. This is followed by classification of results.
- c. An operation plan is submitted with every survey showing the positions of measurements on the drawing.
- d. HEG's as such are not considered as each activity is monitored, thus monitoring almost every individual worker in action, except for the brick packers where only one sample in ten is deemed sufficient.
- e. This method of monitoring will continue and will not be subject to change, except for further follow-up measurements where the Inspector of Mines may require such data.
- f. New technological and/or regulatory initiatives could enforce further measurements.
- g. Classification of areas of activities or personal exposure levels would follow after lower/better results are proven by consistency of results obtained during further measurements.

8.1.3 Personal exposure monitoring

- a. Personal exposure monitoring is calculated on an annual cycle period in compliance with regulation 9.2(7).

- b. The mine ensures that accurate meaningful samples are taken by appointing an approved environmental control/occupational hygiene consultant to monitor silica quartz dust levels in air by means of the personal dust sampling strategy. Approved laboratories are used to determine the silica quartz fraction of the dust sampled. Dose allocated exposures measured for individuals are allocated to Hygiene records of that specific employee, and all other employees within that HEG.

8.1.4 Sampling, Analysis Methodology and Quality control

8.1.4.1 Sampling strategy

The mine's sampling strategy consists of:

- a. Annual monitoring of workers in all areas of activities where dust is an identified hazard to the health of workers;
- b. Annual monitoring of particulate dusts emitted by the stacks of the drying kilns
- c. Conducting follow-up measurements at the request of the Inspector of Mines
- d. Conducting follow-up measurements where improvements to hazardous conditions have been made, to measure the extent of such improvements, and
- e. Where medical results indicate the need for follow-up measurements at any individual after medical tests.

8.1.4.2 Sampling methodology

- a. The measuring procedures and equipment specified for the sampling of silica dusts defined in the book "Measurements in Mine Environmental control" published by the Chamber of Mines of SA will be used at all times.
- b. Stack particulate matter will be sampled gravimetrically using the isokinetic sampling strategy.
- c. The environmental control/occupational hygiene consultant appointed will have in place and will obey the requirements of a quality control programme defined under SABS code 0259 – A quality control management code of practice for occupational hygienists.

8.1.4.3 Analysis methodology

- a. For silica quartz the appropriate analysis methodology as defined by NIOSH 7602 will be adhered to.
- b. CHEMTECH Laboratories, Pretoria is used for the quartz analysis and they are a SANAS accredited laboratory.

8.1.5 Reporting and recording

Records/Reports are kept at the mine for at least 5 years and record the history of each activity area. The following information will be included:

- a. Reasons for any deviation of sample results:
 - Controls not in place, or ignored
 - Controls not operating effectively
 - Events (or factors) that have influenced results, e.g. High rainfall or excessive winds.
- b. Hierarchy of controls initiated:
 - Workers rotated in high risk areas

- Approved health protection devices in place
 - Changing and washing/eating facilities provided
 - The complete machinery plant under roof as protection against sun, rain and winds.
 - Partial enclosure of machinery, including separate crushing/rolling and extrusion areas.
 - Safe machinery protection devices installed and safety practices documented and adhered to.
- c. Annual personal exposure reports will be submitted to the Regional Principal Inspector of Mines in accordance with regulation 9.2(7)

8.2 Toxic gases and vapours

This COP does not prescribe for hazardous concentrations of toxic gases and vapours because where tunnel kilns are in use workers do not become exposed to the gases normally associated with heat energised drying processes. Gas liberations into atmosphere take place mainly at the top of the kiln and workers do not enter this area during the actual drying procedures.

However, when a gas survey is required for special reasons, the occupational health consultant would use internationally accepted methods of toxic gas/vapour measuring techniques, and in such cases a COP for such gases/vapours would be drawn up by the mine as a separate entity and as per legal guidelines.

9. Occupational medical surveillance

9.1 Medical Surveillance programme

In terms of this COP, the hazard identification and risk assessment process (and as required in terms of section 11 of the MHSa) a medical surveillance programme must be introduced on the mine. Apart from being a legal requirement the purposes would be to have a system in place that ensures that all the mine's employees are:

- a. medically fit to perform the right job in terms of their risk exposure.
- b. Screened at intervals determined by their risk exposure for early signs of occupational illnesses that might arise from the health hazards that they are exposed to at work.
- c. Upon leaving the company, medically examined to see if there is a medical condition present that might have arisen due to health hazards expose to whilst working at the mine.
- d. Medically fit to perform their job following a prolonged period of illness or accident that might have an impact on their health.

9.1.1 Linkage between Occupational Hygiene and Medical Surveillance

As contemplated in terms of section 12(3) of the MHSa, exposures to individual pollutants as well as additive or synergistic mixtures must be linked to the medical record of employees.

The information on pollutant exposure levels as measured during the described monitoring cycle will be transferred between the Occupational Hygienist and the Medical Practitioner either manually or electronically using the initial format as displayed below in Table 1. The format and method of providing information can be upgraded from time to time as the need is identified. Computerised programmes currently in a development stage will be introduced eventually as and when approved.

TABLE 1

Name	Occupation	HEG/Activity area	Single Pollutant	Classification band	Measured concentration

9.1.2 Categories of medical examinations at which medical surveillance must be carried out

Included below is a description of the procedure that will be used to conduct the following examinations as required by the MHSa.

a. **Initial examination (section 13(2) of the MHSa)**

All potential employees who are expected to work for more than 60 shifts, and contractors who are expected to work for more than 15 shifts will undergo the following:-

- Chest X-ray;
- Audiogram;
- Physical examination;
- Urine test;
- Eye test;

- Lung function. This will be repeated after one year if exposed to risk.

b. Periodic examination(section 13(2) of the MHSA)

These examinations will depend on the health hazards employees are exposed to and type of work that they will have to perform.

To determine whether an employee is affected by the hazards that they are exposed to in their job. To pick up early signs of occupational illnesses.

Office staff in Admin Block (If required by I.O.M.)

As these employees are not exposed to any risk work, an initial and Exit Examination is all that is required.

Employees working in Dusty Areas

- Chest X-ray – 2-yearly
- Physical examination – annually
- Urine test – annually
- Eye test – annually
- Lung function test – 1 year after initial test and thereafter annually with physical examination.

Drivers/Operators of Machinery(If required by I.O.M.)

- Annual eye test & field of vision
- Annual physical examination which must include blood pressure
- Annual audiogram if applicable
- Chest X-ray 2-yearly
- Lung function annually

c. Exit Examination (Section 17 and 19(2) of the MHSA)

All employees who have worked more than 60 shifts will undergo an exit medical examination.

- Chest X-ray (if not done within the past 3 months)
- Full physical examination
- Lung function if worked in a dusty area (if not done within the past 12 months)

An Exit Medical Certificate must be completed and given to the employee. A copy must be kept on the employee's file.

9.2 Methodological standards for test techniques forming part of medical surveillance

9.2.1 Standard of Chest X-rays

The employer must ensure that the chest x-rays (35x43 cm or 35x35 cm) are of a quality suitable for proper classification of pneumoconiosis. ILO 1980, which refers to radiological classification will be consulted and will show the date, name of individual and any unique form of personal identification.

9.2.2 Lung function Testing

The process used to perform Spirometry includes the use of a Spirolite 201(x) instrument. Predicted/Reference values are ITS.

- a. FEV 1: forced expiratory volume in one second.

- b. FVC: forced vital capacity which is the maximum volume of air exhaled with forced effort from a maximal inspiration.
- c. FEV 1 and FVC readings are expressed as a percentage.

Test procedure is explained to the patient, i.e. after a full inspiration, the mouthpiece must be placed inside the mouth, avoiding leaks and the patient must blow forcefully from the beginning until instructed to stop (at least 6 seconds). This procedure is repeated twice and the best result of the 3 attempts is recorded. The patient is standing when doing the test.

The equipment is calibrated with means of a 3-litre syringe (ensuring it remains 3% accurate).

9.2.3 Tuberculosis surveillance (if required)

At this mine tuberculosis awareness training is done during annual medical examinations. When personnel report apparent symptoms as identified through the training programmes, these case findings are then investigated further through analysing sputum samples.

9.3 Medical Surveillance according to Health Hazard

A system of medical surveillance that combines the requirements of medical surveillance for the different significant hazards in such a way that these requirements are met effectively and efficiently have been developed and implemented in consultation with the occupation medical practitioner.

The system of medical surveillance on the mine 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 will be done in parallel. A single, similar test will be performed that will be sufficient for the medical surveillance of more than one hazard, ensuring that the requirements of medical surveillance for each hazard are achieved.

10. IMPLEMENTATION

10.1 Implementation Plan

The implementation of this COP is on schedule for implementation on 28 February 2003. Sampling of contaminants will be done according to a schedule as laid out in the COP. Sampling will be done to comply with the minimum requirements as laid down by the DME guidelines.

The implementation and executing of the programme can best be explained with the following tabulation showing the persons responsible for the relevant responsibilities.

TABLE 2

Functionaries	Responsibilities
Executive management	Oversee implementation and monitor results from sampling programme
Production department/Supervisor	Assist with sampling strategy and sampling programme
Dial Environmental Services	Perform sampling programme and

	manage the analysis of samples taken. Ensure flow of information to executive management of the mine.
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Results of analysis as and when received from the laboratories will be communicated through to management and the DME via the already established programme.

CLASSIFICATION BAND TABLE FOR SILICA QUARTZ PARTICULATES

CATEGORY	PERSONAL EXPOSURE LEVEL	
	FOR O.E.L.	FOR A.Q.I.'S
A	Exposures >the OEL or mixtures of exposures > 1	AQI > 1.0
B	Exposures > 50% of the OEL and <OEL or mixtures of exposures >0.5 and <1.0	AQI > 0.5 but < 1.0
C	Exposures > 10% of the OEL and < 50% of the OEL or mixtures of exposures > 0.1 and <0.5	AQI > 0.1 but < 0.5

Mandatory frequency of sampling:

The mandatory sampling frequency is dependent on the category rating. The following table depicts the relevant frequency per category classification.

POLLUTANTS (EXCLUDING TOXIC GASES AND VAPOURS)

CATEGORY	MINIMUM FREQUENCY
A	Sample 5% of employees within a HEG on a 3-monthly basis with a minimum of 5 samples per HEG, whichever is the greater
B	Sample 5% of employees within a HEG on a 6 monthly basis with a minimum of 5 samples per HEG, whichever is the greater
C	Sample 5% of employees within a HEG on an annual basis with a minimum of 5 samples per HEG, whichever is the greater

QUARTERLY PERSONAL EXPOSURE REPORT – REPORT 1

Report on exposure levels for sampling period _____ to _____

DME Mine Code _____

Operation details

Mine

Address _____ Control group _____
 _____ Minerals _____
 _____ Products _____

Code _____ Production process _____

Manager _____

Tel _____

Fax _____ Tons/ month mined _____

Contact person _____

Tel _____

Fax _____

Directorate _____

	Mine	Contractors	Total Labour
Labour			

Name of appointed occupational hygienist in terms of section 12.1 of the MHSa:

 Manager

 Date

