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Appendix C

Minas de Benga Limitada (MBL)

Tete, Mozambique

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Volume 4 of 4

**HEALTH, SAFETY, ENVIRONMENT AND
COMMUNITY (HSEC)**

DOCUMENT

FOR

**SETTING UP OF A TAILING BENEFICIATION PLANT ON
BOO BASIS**

AT THE BENGA MINE

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1. Purpose

The purpose of this Procedure is to define the strategy by which ICVL shall actively minimise the health risks associated with working in the coal mining environment by systematically identifying, evaluating and controlling exposure to workplace health hazards; and also, to comply with national legislation.

2. Scope

This Procedure is applicable to all ICVL Operations including Benga, Exploration, and Coal Transport.

3. CHEMICAL EXPOSURES

3.1 Risk Assessment

A qualitative risk assessment shall be conducted and documented in ICVL Risk Register to determine potential exposure to particulate and gas/ vapour.

Risk assessment shall be reviewed during the design of new workplaces, introduction of new equipment or during process change.

3.2 Exposure Management Plan

Risk assessments shall determine the need to implement the exposure management plan.

An exposure management plan is required when:

- The 95 per cent upper confidence limit of an SEG's mean exposure concentration for agents resulting in chronic effects, such as total inhalable dust, respirable dust, respirable crystalline silica, asbestos or non-asbestos fibrous materials, exceeds the relevant Occupational Exposure Limits (OELs);
or
- Agents with an acute effect, such as particulate hazards, or gases (e.g. carbon monoxide, hydrogen sulphide, ammonia, etc), or vapours exceed 50 per cent of the relevant OEL; or

- There is no quantitative data and the risk assessment indicates a high or critical inherent risk of exposure to the contaminant.

The exposure management plan shall include:

- Designated work areas
- Workplace monitoring
- Medical surveillance
- Exposure controls
- Respiratory protection
- Emergency preparedness

Designated work areas shall:

- Be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Signposting, where necessary, shall use appropriate wording or symbols on signs to identify the hazard;
- Have a documented respiratory protection programme based on suitable risk assessment and standards, which is applied to all personnel working in the areas;
- Conduct exposure monitoring of employees (SEGs) periodically; and
- Have a formal review of the practicality of engineering controls at least every two years, or less where it is a critical control for a significant risk.

Designated work areas shall be documented in ICVL Risk Register.

3.3 Workplace Exposure Monitoring

3.3.1 Personal Monitoring

Personal exposure monitoring of employees and contractors are determined based on ICVL Risk Register.

In the absence of Mozambican legislation, the exposure monitoring methodology, equipment, laboratory analysis and records shall comply with ICVL and/ or internationally recognized standards.

For known human carcinogens (e.g. crystalline silica, asbestos), mutagenic and reproductive toxicants, exposure data shall be statistically valid on an annual basis. If three or more years of statistically significant data are less than 25 per cent of the OEL, or

below the detection limit, then monitoring periodicity can go out to once every three years, provided the process or work organisation (including maintenance) remains unchanged.

3.3.2 Area Monitoring

Area monitoring shall be conducted where risk assessment indicates the possible presence of levels of gas or vapour sufficient to cause health effects or a safety incident in less than one shift (e.g. methane gas in coal drilling, confined space entry). Continuous monitoring is required as long as the potential for harm exists.

Area monitoring can be used to assist the exposure assessment but cannot replace personal monitoring for particulate and gas/ vapour.

3.4 Reporting of Workplace Monitoring Results

Workplace monitoring results shall be provided to the employee or contractor who was monitored. Reporting shall be done in a formal report, memorandum, e-mail or verbally (toolbox talk) but shall be documented.

When the monitoring results exceed the ICVL Occupational Exposure Limit (OEL) with current control measures deemed inadequate it shall be reported as a health incident to ensure mitigation actions are taken. This will ensure that control measures are reviewed, assessed and improved.

3.5 Medical Surveillance

ICVL employees and contractors shall be submitted to a medical surveillance programme when:

- The SEG time weighted average (TWA) mean exposure to respirable/breathable crystalline silica, total inhalable dust, respirable dust, lead or asbestos dust is greater than 50 per cent of the relevant OEL;
- ICVL medical provider considers that it is advisable; or
- There is a legal requirement for medical monitoring.

Where risk assessment indicates a risk of a respiratory condition, assessment programs shall include chest x-rays and lung function tests.

3.6 Exposure Controls

Where the exposure to particulate and gas/ vapour is likely to exceed the Action Level (i.e. the exposure levels above 50 per cent of the relevant OEL), suitable control measures based on the risk assessment shall be implemented. Elimination or substitution controls shall be considered as first priority.

Engineering controls

- Where elimination or substitution is not practicable, engineering controls shall be used to reduce exposure levels.
- The use of dust suppression methods and dust collection devices to minimise particulate emissions shall be considered.
- If the employee is working in an enclosed area, the area shall be well ventilated and/ or ventilation systems (e.g. exhaust ventilation, air conditioning) shall be available to provide protection.
- All engineering control equipment and monitors shall be maintained to operate to design specifications.

Administrative

- Rotation of tasks to minimise exposure.
- Decrease duration of exposure by limiting long work hours and overtime.

Personal Protective Equipment (PPE)

- Implement and maintain the Respiratory Protection Programme.

3.7 Respiratory Protection Programme

A Respiratory Protection Programme for the use of respiratory protective devices (RPDs) such as respirators, dust masks, shall be developed and implemented for the designated work areas.

RPDs shall be used only as the last consideration to control exposure to particulate and gas/ vapour.

The respiratory protection programme shall include:

- Selection of RPDs where factors such as adequacy of protection to hazardous substances, compatibility with the work tasks and comfort and allowance for adequate communication shall be considered;

If respirators are going to be used, a respirator management program shall be developed and implemented.

For air-supplied RPDs, breathing air shall be effectively filtered and/or isolated from plant and instrument air, and isolated from sources of nitrogen and carbon monoxide potential exposure. The quality of the breathing air shall be checked for conformance with national or international standards.

4. HEARING CONSERVATION

4.1 Risk Assessment

Qualitative noise assessment shall be conducted and documented in ICVL Risk Register.

Where noise exposure is identified as a potential health risk hazard further evaluation shall be conducted using quantitative assessment and/or other investigation and monitoring techniques as applicable.

- A quantitative noise assessment shall be conducted for high and critical inherent risk identified in the Risk Register.
- Quantitative assessment shall be conducted through noise surveys and personal noise monitoring (dosimetry).
- Noise from sources producing average levels in excess of 85 dB(A) for a 8-hour time weighted average or its equivalent or peak impulse noise levels in excess of 140 dB(C) shall be designated noise area.
- A hearing conservation programme shall be implemented for the noise protection areas (designated areas).

Noise risk assessment shall be conducted during the design of new operations, introduction of new equipment or changes to process.

4.2 Noise Exposure Management Programme

Quantitative risk assessments shall determine the need to implement hearing conservation programme.

The hearing conservation programme shall include:

- Noise monitoring;

- Designated noise protection areas;
- Noise control plan;
- Exposure controls including training and use of hearing protective devices; and
- Audiometric testing.

4.3 Noise Monitoring

Work Area Noise Surveys

- Noise surveys shall be carried out where the risk assessment has identified high or critical inherent risk or when it likely noise exposure exceeds 85 dB(A).
- Noise surveys shall be conducted as part of baseline monitoring and whenever there is a change in the production process or new equipment is installed or used.
- If peak (impulse) noise exceeds 140 dB(C) during noise surveys employees working in the area will automatically be included in the hearing conservation programme.
- Noise surveys shall be based on the use of a sound level meter (SLM), with 3 dB exchange rate, and A-weighting and impulse noise measurement capability and calibrated as per the manufacturer's method.
- Workplace noise sources shall be identified and characterized by a competent person using a SLM. When risk assessments indicate a need to describe personal noise exposures adequately, a noise integrating dosimeter is required.

Personal Noise Monitoring (Dosimetry)

- Personal noise monitoring will be carried out on identified Similar Exposure Group (SEG) to ascertain noise exposure levels in the designated noise areas.
- Monitoring shall be based on the use of dosimeter with 3 dB exchange rate, the A weighting scale, and impulse noise measurement capability and calibrated as per manufacturer's method.
- When SEG dosimetry indicates that the 95-percentile value of a 8-hour mean exceeds 85 dB (A) (Leq8hr) personnel classified in that SEG shall be included in the hearing conservation programme.

- Noise monitoring results shall be communicated to the area personnel and management.
- Personal noise monitoring sampling shall be conducted on annual basis for the designated noise protection areas and documented in ICVL Annual Hygiene Monitoring Plan.
- Only trained and competent person(s) shall conduct noise monitoring.

4.4 Designated Noise Protection Areas

All identified noise protection areas shall be documented in ICVL Designated Noise Protection Areas and updated as required.

All designated noise protection areas shall be identified, mapped (where practicable) and clearly communicated to employees who work in the area. Appropriate symbols and wording shall be used.

4.5 Noise Control Plan

Noise control measures shall be incorporated into the planning and design phases for new or modified workplaces, facilities or equipment.

Control measures particularly engineering controls shall be incorporated to annual HSE improvement planning process to ensure control measures are reviewed and improved where practicable.

The noise control plan shall include a description of the area, process and equipment identified and usage. Noise reduction strategies shall incorporate hierarchy of control methodology:

- **Elimination**
- **Substitution**
 - Replace noisy equipment with quieter equipment
- **Engineering**
 - Reduction of noise at source
 - Isolation/ enclosing of noise
 - Isolation/ enclosing of worker
 - Additional noise reduction such as acoustical treatment

- Lessening metal-to-metal contact
 - Reducing escaping high velocity air or steam
 - Muffling motors or air compressors to reduce noise contact
 - Maintenance of equipment to reduce vibrations on bearings or shafts
 - Adding dampening material to thin shell reverberant surfaces on machines
- **Administration**
 - Training
 - Work schedules
 - Rotation to minimise exposure

A documented process shall be developed for inspection, assessment and maintenance of the engineering controls and noisy equipment to ensure that the equipment continues to operate to design specifications.

4.6 Hearing Protection Devices

Hearing Protection Devices (HPD's) shall be provided where other controls are not feasible or as an interim measure while control of noise is being achieved by other means. They shall be selected, fitted and maintained in accordance with local regulatory requirements or to international standards.

HPD's shall align to ICVL approved PPE.

Noise awareness training shall be provided to employees and contractors as part of the hearing conservation programme. Training shall include:

- The proper use of hearing protection devices and their limitations
- Recognition of signs and symptoms of hazardous noise exposure
- Preventative measures to reduce noise exposure
- Audiometric testing requirements; and
- Refresher training provided at least once every three years.

Hearing Conservation training is required for all SEGs working in the Designated Noise Protection Areas and provided by Training Department in alignment with HSE Department.

4.7 Audiometric Testing

Audiograms will be required upon initial hiring and two yearly for all personnel with noise exposure exceeding 85 dB(A) Leq8hr or 140 dB(C) for impulse noise as designated by their SEGs.

Audiometric testing shall be performed to local regulatory requirements.

ICVL Occupational Health Centre is responsible for the management of the audiometry programme.

5. MANUAL HANDLING

5.1 Manual tasks

Healthy work is characterised by dynamic whole-body movements involving low to moderate exertions, comfortable postures, and frequent rest breaks or changes of task. Where the handling of loads is involved, these factors shall be considered:

- Infrequently.
- With light loads or low levels of force.
- With a compact load.
- With the load held close to the body.
- Between mid-thigh and shoulder height.
- With use of both hands.
- Without sudden release of energy (jerking).
- Without twisting movements.
- Without side bending of the trunk.
- With freedom of movement.
- With adequate training.
- With no sharp edges or corners likely to inflict cuts.

- With no risk of impact from moving objects.

5.2 Workplace assessment

The workplace assessment shall consider manual handling tasks, including a consideration of the environmental conditions, working methods as well as organisational and individual factors

5.2.1 Manual handling risk assessment

The manual handling risk assessment requires hazard identification and risk rating. An occupational hygiene approach that utilises similar exposure groups (SEGs) or tasks is recommended.

Hazard identification

Hazard identification shall be carried out using a combination of the following techniques: Design Analysis - All designs of new (or redesigns of existing) plant, equipment and processes shall be analysed (for manual handling risks) by the responsible Project Engineer in conjunction with plant process and engineering personnel prior to acceptance. Consideration shall be given to common process and engineering maintenance functions.

- Injury / Illness Statistics Analysis - All incidents involving strains or sprains shall be investigated and assessed by the appropriate Superintendent to determine whether they were the result of an inherent risk in plant, equipment or work practices.
- Workplace Inspection and Employee Consultation - All workplaces shall be inspected for the presence of manual handling risks arising from the design, construction, and maintenance of any plant, equipment, or processes. In the case of new equipment, inspection shall be done prior to commissioning.
- Environmental considerations - manual handling performed in non-neutral thermal environments (defined by ISO 7730:1995 as temperatures between 19 degrees C and 26 degrees C, 30-70% relative humidity and air velocity less than or equal to 0.2 m/s) is associated with an increase in manual handling risk and shall be subjected to additional risk assessment.

Once a risk has been discovered it shall be treated as any other form of physical risk and included on a physical risk survey form for the plant / site area in question.

5.3 Control of manual handling risks

Once a risk has been established with any manual handling operation the primary objective shall be to redesign the manual handling task to:

- Eliminate the risk; or
- Control the level of risk (utilising the hierarchy of controls); and
- Ensure employees involved receive appropriate training in safe manual handling techniques

Where redesign of the manual handling activity is not possible, or as a temporary measure, the objectives shall be to:

- Provide mechanical aids; and/or
- Arrange for team lifting techniques.
- Ensure employees involved receive appropriate training in safe manual lifting techniques; and
- Provide personal protective equipment

5.4 Organisational and individual measures

Management considerations

- There shall be an effective change management system that prevents rapid and “knee-jerk” changes, provides good communication of the change, allows adequate time for feedback opportunities of those affected by the change and allows time for consolidation of the change.
- Roles, responsibilities and accountabilities need to be clearly defined:
 - **Project Engineers** shall ensure that full risk analysis, including manual handling issues, is carried out on projects under their control. No project shall be incorporated into operating plant until the risk of employees sustaining an injury from manual handling activities has been minimised as part of the final project audit.
 - **Superintendents or Team Leaders** shall:
 - Ensure that a full risk analysis, including manual handling issues, is carried out on existing plant and equipment under their control, and

that a prioritised programme of rectification is established. Risk identification shall encompass both operating and maintenance aspects, and execution shall include employee representatives from both areas of responsibility. Risk identification shall be repeated whenever circumstances change.

- Review all accidents resulting from manual handling activities to determine whether they were the result of an inherent risk in plant, equipment or work practices.
- **Managers** shall ensure that:
 - Plant and equipment used in the workplace is designed to eliminate or minimise manual handling. Where elimination is not practical they shall be designed, constructed, and maintained to be, as far as practical, safe and without risk to health and safety when manual handling is necessary
 - The work practices carried out in the workplace and the working environment are designed to be, as far as workable, safe and without risk to health and safety;
- **Employees:**
 - Shall use safe manual handling techniques.
 - Shall use mechanical aids, personal protective equipment, or team-lifting techniques, where they have been provided, and where they have received appropriate training in their use.
 - Shall report unsafe conditions.
 - Shall be encouraged to keep an adequate level of physical fitness and physical activity at work and at home.

Training

The company shall provide all employees with training and information on correct practices of manual handling.

6. Responsibilities

Role	Responsibility
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**Manager and
Superintendent**

- Ensure the Occupational Exposure Management Procedure is implemented and maintained.
- Ensure adequate resources are available to conduct workplace monitoring.
- Ensure there is documented process for inspection, assessment and maintenance of the engineering controls.
- Ensure equipment and machine including engineering controls continue to operate to design specifications.
- Maintain written administrative controls where required.

Contractors

- To implement Occupational Exposures Management Procedure where required.
 - To comply with the Occupational Exposures Management Procedure requirements.
 - To provide medical surveillance to their employees in accordance with this Procedure.
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**Occupational Hygiene
Advisor**

- Assist Supervisors, Contractors and Management in the risk assessment of Health hazards.
 - Assist Area Supervisors, Contractors and Management with occupational hygiene monitoring and control plans if risk is determined.
 - Ensure regular monitoring is conducted as required by the regulatory entities.
 - Develop and facilitate the implementation of the Occupational Exposures Management Procedure, including training, selection of appropriate protection devices and controls when required.
 - Review of workplace monitoring, respiratory protection, medical surveillance, noise monitoring, hearing conservation and audiometric programmes on periodic basis.
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Supervisors

- Assist employees and contractors in identifying health hazards using risk assessment tools such as Take 5.
- Implement the Occupational Health programmes within their area of supervision when required.
- Ensure personnel working in designated areas are compliant to the use of health protection devices.
- Ensure personnel are afforded the opportunity to participate in the medical surveillance programme.
- Notify and consult personnel of workplace monitoring results.
- Remind workers of health consequences from exposure to airborne contaminants, excessive noise exposures and mitigation controls through toolbox talks, safety meeting, etc.
- Report all health incidents or complaints to HSE Department.

All Employees

- Identify health hazards using Take 5 or Job Hazard Analysis (JHA) where required.
 - Use appropriate health protection devices (dust masks, half-face respirators, ear plugs, ear muffs) in designated work areas for the entire exposure time when required.
 - Participate in the Occupational Health programmes, including medical surveillance and audiometric testing if required.
 - Report any defects in equipment and machine including engineering controls that may result in adverse health effects.
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- Occupational Health Center** – Administer and manage the medical surveillance and audiometric programmes.
- Maintain records of lung function and audiometric testing and follow-up notifications.
 - Report any changes to the individual health conditions to HSE Department, Managers, Superintendents, Supervisors and Employees
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7. Definitions

Term	Definition
Audiometric Testing	Hearing test to evaluate the hearing threshold level measured in decibels as a function of frequency measured in hertz (audiogram).
Decibel (dB)	Unit of measurement of sound level, either A-weighted (A) or C-weighted peak (C).
Dosimetry	Personal monitoring using a dosimeter to measure average personal noise exposure over a period of time, generally expressed as a time weighted average and/ or per cent dose.
Engineering Noise Control	A control measure (not including the use of a personal hearing protector) that reduces the noise to which a person is exposed by the design or modification of the physical working environment.
Hearing Protection Device (HPD)	A device, or pair of devices, worn by a person or inserted in the ears of a person to protect from excessive noise, e.g. ear plugs, ear muffs, etc.
Hearing Conservation Programme	A hearing conservation programme comprises risk assessment, noise monitoring, noise controls and protection, training and audiometric testing.
Noise	Unwanted or excessive sound.
Noise exposure	The amount of sound energy the unprotected ear of a person is exposed to noise.
Noise Induced Hearing Loss	Occupational noise-induced hearing loss means hearing impairment arising from exposure to excessive noise at work.

Noise Surveys	A noise survey is considered area monitoring using a sound level meter (SLM) to measure the noise levels of the work areas by mapping and/ or noise contours.
OEL	Occupational Exposure Limit.
Particulate	Generic term used in this procedure to refer to dusts, mists, smokes and fumes.
Respirable Dust	Inhaled dust particles which can penetrate to the smallest airways of the lungs. Generally considered to be 5 µm or less in aerodynamic diameter.
Respiratory Protection Programme	A programme to manage particulate/ gas/ vapour exposures. It comprises of risk assessment, exposure monitoring, controls and protection, training and health surveillance.
RPDs	Respiratory Protection Devices: dust masks, half-face respirators, full-face respirators and Self-Contained Breathing Apparatus (SCUBA).
Sound Level Meter (SLM)	Sound Level Meter is used to measure noise levels during a noise survey.
Smoke	Carbon or soot particles less than 1.0 micron in size. These small, gas-phase particles created by incomplete combustion consist predominantly of carbon and other combustible materials.
Vapour	Gaseous phase of a substance ordinarily liquid or solid at room temperature (25°C) and atmospheric pressure (760 mmHg).

8. Performance / Monitoring Indicators

Type of Document	Document Title	Frequency	Location
Report	Chemical Exposures Report	Baseline and Annual	Shared Drive

Report	Noise Monitoring Report	Baseline and Annual	Shared Drive
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9. Training / Competencies Required

Designation	Training / Competencies required
Audiometric Testing	Trained, certified or demonstrate competency
Occupational Hygiene Monitoring	Trained, certified or demonstrate competency

10. References

Type of Document	Document Title	Document Number
Mozambique Legislation	General Regulations on Occupational Health and Safety in Industrial Premises:	
Mozambique Legislation	Technical Safety & Health Regulations in Geological Activities and Mining	Decree Nr 61/2006

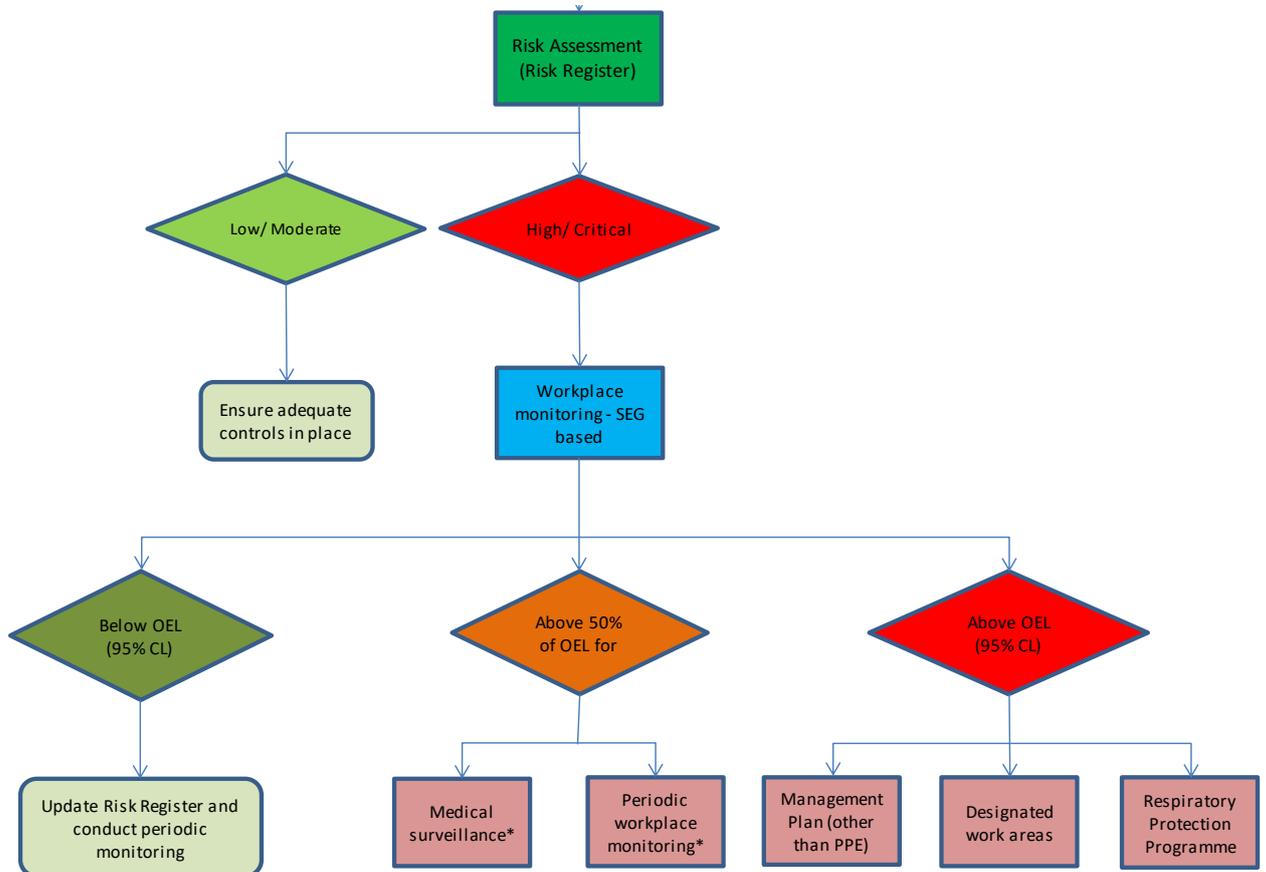
11. Review Criteria

This document shall be reviewed as follows:

- ◆ At least every THREE years;
- ◆ When there is a change of method and/or technology that may affect the accuracy of this document;
- ◆ When there has been a significant event to which this document was relevant;
- ◆ As a result of relevant audit findings.

12. Appendices

Management of Chemical Exposures Process Flowchart



Note: * Both medical surveillance and periodic workplace monitoring will be required when airborne contaminant level exceed the OEL

Hearing Conservation Process Flowchart

(Signature, Name, Designation and Seal)

(Signature, Name, Designation and Seal)