

B1 - Particulate and gas/vapour exposures

1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies to dust, fibres, mist and fume (ie particulates), and gas and vapour exposures in the workplace, with emphasis on inhalation as the prime route of exposure. It covers particulate and gas/vapour hazard evaluation, control programme design and control programme evaluation (medical surveillance), to ensure that employees and contractors will not suffer adverse health effects from particulates or gas/vapours, either used or generated by the Business.

2 Programme design

2.1 Deleted.

2.2 Designated areas will be created where:

- a) it is likely that 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, PAH, fluorides, lead, mercury, asbestos or non-asbestos fibrous materials, exceeds the relevant OEL; or

b) agents with an acute effect, such as particulate hazards, or gases (eg CO, SO₂, NH₃, HF, etc), or vapours exceed 50 per cent of the relevant OEL.

2.3 Designated areas must:

a) be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Signposting, where necessary, must use appropriate wording or symbols on signs to identify the hazard;

b) have a documented respiratory protection programme based on suitable risk assessment and standards, which is applied to employees, contractors and visitors;

c) have regular monitoring of SEGs working in the area; and

d) 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.

- 2.4 Particulate and gas/vapour monitoring must be appropriate to the exposure conditions and toxicants, and based on the use of equipment approved by local regulatory authorities, as per documented methods.
- 2.5 There must be a special consideration given to the sampling of hot/volatile/ pressurised toxic process streams where they occur.
- 2.6 For known human carcinogens, mutagenic and reproductive toxicants, exposure data must be statistically valid on an annual basis. Time-weighted average (TWA) measurements over several shifts, and consistent with the work-day period, must be used. 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.
- 2.7 For progressive chronic conditions with a known cause (requiring long-term exposure for an effect to manifest) and suspected carcinogens, mutagenic and reproductive toxicants, exposure data must be statistically valid on an annual basis. TWA measurements over several shifts, and consistent with the work-day period, must be used. If three or more years statistically significant data are less than 50 per cent of the OEL, then monitoring periodicity can go out to once every three years, provided the process or work organisation (including maintenance) remains unchanged.

- 2.8 Where risk assessment indicates the possible presence of levels of gas or vapour sufficient to cause health effects in less than one shift (eg confined space entry), continuous monitoring is required as long as the potential for harm exists.

3 Medical surveillance

- 3.1 Employees and Category 1 contractors must be covered by a medical surveillance programme when:

a) their SEG TWA mean exposure to respirable crystalline silica, total inhalable dust, respirable dust, lead or asbestos is greater than 50 per cent of the relevant OEL; or

b) the medical adviser considers that it is advisable; or

c) there is a legal requirement for medical monitoring.

- 3.2 Where risk assessment indicates a risk of a respiratory condition, assessment programmes must include chest x-rays and/or lung function tests. The test or tests chosen must enable the earliest detection of adverse effects from the exposure of concern. Where indicated, they must meet the following standards:

a) high quality chest x-rays will be taken every five years, unless local legislation requires these to be more frequent;

b) all chest x-rays for pneumoconiosis surveillance will be read to ILO standards by an ILO B reader, wherever possible, and if not, by a competent radiologist using verifiable quality criteria;

- c) any progression of more than one step on the ILO extended scheme to a reading above 1/0 will be reviewed by a physician;
 - d) any reading suggesting active lung disease will be reviewed by a physician; and
 - e) all spirometry will be performed by trained staff following the American Thoracic Society guidelines or equivalent and be offered at a frequency determined by the likely rate of detectable change in lung function.
- 3.3 All lead monitoring programmes must meet the following standards:
- a) all testing will be of venous blood according to local standards;
 - b) only laboratories using an active quality assurance or quality control scheme will be used for testing;
 - c) females of reproductive capacity with a whole-blood lead above 20µg/dL will be removed from exposure until the physician declares the worker fit for duty, and exposure to lead should cease when pregnancy is notified to the Company; and
 - d) all other workers with a whole-blood lead above 40µg/dL will be removed from exposure until the level has fallen below 30 µg/dL, and until the physician declares the worker fit for duty.

- 3.4 All monitoring programmes for other substances must be documented.

4 Exposure controls

4.1 Deleted.

4.2 Deleted.

4.3 Deleted.

4.4 Controls must be of an adequate standard such that surfaces are adequately cleaned to avoid:

a) dust generation due to material dislodgment (eg wind blown), where practicable; and

b) fume generation from accumulated dust during welding/heating or cutting operations.

4.5 Where risk assessment indicates the need to reduce exposures to toxic substances for employees or their families, good personal hygiene must be enforced. The programme must include:

a) no smoking, eating or drinking in designated hazard areas. Cigarette smoking must also be prohibited in all indoor areas and wherever people are likely to be exposed to second-hand smoke;

- b) washing of hands and face prior to drinking, eating or smoking;
 - c) showering at work post shift or after exposure to 'dirty' conditions; and
 - d) laundering of contaminated clothing by the operation.
- 4.6 Abrasive blast cleaning must be conducted so as to protect worker health and minimise dust emissions. Substitutes must be used whenever practicable for abrasives containing crystalline silica. However, if such abrasives are used, workers must be aware of the hazards and exposure monitoring conducted. The hazardous properties of alternative materials must be considered before use.
- 4.7 Fixed station monitors and alarms must be installed where appropriate to warn against accidental or periodic releases of toxic gases/vapours (eg HCN, CO, Cl₂, SO₂). Such monitors must only be installed after training all affected personnel on the capabilities and limitations of the monitors.
- 4.8 All fixed station monitors/alarms must be identified, listed and included in a periodic schedule of preventive maintenance and testing, including calibration of detectors. Periodic drills with regard to response to sounding of the alarm must be conducted. Periodicity should be based on level of risk.
- 4.9 Where required, training in the recognition of signs and symptoms of hazardous particulate and gas/vapour exposure,

emergency procedures and preventative measures must be provided.

5 Respiratory protection devices

5.1 Respiratory protection devices (RPDs) must be selected with regard to:

a) the potential particulate size distribution, gas/vapour types, substance toxicity and likely concentrations;

b) compatibility with the work tasks and other PPE; and

c) comfort (as it affects wear-time) and allowance for adequate communication.

Only operation-approved RPDs will be used. The operation must ensure that suitable facilities are available for cleaning and sanitary storage of RPDs, where applicable.

5.2 Half-mask and full-face air-purifying respirators must not be used where:

a) the atmosphere is oxygen deficient (< 19.5 per cent);

b) the atmosphere is immediately dangerous to life or health (eg. in areas where CO concentrations are > 1,500 ppm, HF > 30 ppm or NH₄ > 300 ppm);

- c) gases and vapours are more than ten times their OEL or greater than 1000 ppm for half-mask respirators, or more than 100 times their OEL for full-face respirators; or
 - d) particulates are more than five times their OEL for half-mask respirators, or more than 50 times their OEL for full-face respirators.
- 5.3 For atmospheres that are oxygen deficient, or contain unknown hazards, or have concentrations of gases and vapours that are unknown, or could potentially exceed immediately dangerous to life or health (IDLH) values, an air-supplied type respirator must be worn.
- 5.4 For effective use of negative pressure RPDs (including disposable RPDs), fit testing must be qualitative and documented as a minimum, although quantitative fit testing is preferred. Fit testing must be performed by a competent person when RPDs are first issued and must be repeated periodically according to legal requirements or at a minimum every two years. There must be a policy requiring a clean shaven face when using a negative or neutral pressure RPD for routine tasks, or the use of a positive pressure RPD will be required. A pulmonary function test and medical evaluation may be required to determine whether or not an individual is medically fit to wear a respirator.
- 5.5 For air-supplied RPDs, breathing air must be effectively filtered and/or isolated from plant and instrument air, and isolated from

sources of potential contaminants. The quality of the breathing air must be checked for conformance with national standards.

5.6 The respiratory protection programme must include:

- a) periodic inspection of RPDs, including before each use;
- b) periodic evaluation of cleaning, sanitising, maintenance and storage practices by competent persons;
- c) performance of positive and negative fit checks before each use by RPD wearers to ensure that the respirator is functioning properly; and
- d) training at first issue of a RPD and regular refresher training there after provided according to regulatory requirements or at least once every two years.

6 Asbestos and non-asbestos fibrous silicates

6.1 This section applies to asbestos and bio-persistent non-asbestos fibrous silicates that may display asbestos-like toxicity, related to fibre diameter and length. Local regulations must be followed at a minimum. In any case the following requirements must be met:

- a) a management programme compliant with all relevant requirements of the HSEQ management system or the Health A standards, and other sections of this standard, must be in place and actively pursued;

- b) no new products containing these materials should be purchased;
 - c) installed materials of this type must be identified and assessed annually for current safety. Where 'safe in place', it should not be removed, unless there is an opportunity for removal during renovation or construction of buildings or equipment;
 - d) work areas must be separated by ropes or barriers and signposted to restrict entry; and
 - e) contaminated material must be placed in appropriate marked plastic disposal bags or covered containers promptly for disposal to an approved landfill.
- 6.2 All workers exposed to these materials must be on a register. "Exposed" means working on or near such material that has been disturbed, abraded or cut. The register must contain details of their annual medical examination and the results of occupational hygiene monitoring.
- 6.3 Contractor bid specifications must be reviewed and an individual identified who is responsible for overseeing contractor performance. Asbestos contractors must be competent, registered and have adequate equipment, procedures and monitoring.
- 6.4 Where required, the asbestos/bio-persistent non-asbestos fibrous silicates management programme must cover work

- practices, training, monitoring, medical surveillance, waste handling and disposal, and the above noted detail.
- 6.5 Maintenance operations must be made aware of potential cristobalite exposure hazards when disturbing non-asbestos fibrous silicates that have undergone high temperature conditions.
- 6.6 The potential for occurrence of naturally occurring asbestiform materials in exploration or mining production activities must be assessed, the risk of exposure determined and appropriate control measures implemented where required.

Revision history

Version no.	Effective date	Prepared by	Authorised by	
1	Feb 2003	Richard Gaunt & Ian Firth	ExCo	
Version no.	Revision date	Revised by	Authorised by	Reason for change
5	December 2008	Ian Firth; Adrian van Tonder	Manoel Arruda	Incorporation of suggested changes from operations and alignment with HSEQ management system.