10.6.1 **INTRODUCTION**

10.6.1.1 This Standard applies to dust, fibers, mist and fume (i.e. particulates), and gas and vapor exposures in the workplace, with emphasis on inhalation as the prime route of exposure. It covers particulate and gas / vapor hazard evaluation, control program design and control program evaluation (medical surveillance), to ensure that employees and contractors will not suffer adverse health effects from particulates or gas / vapors, either used or generated by KUCC.

10.6.2 **REQUIREMENTS**

10.6.2.1 Where a risk assessment indicates the need, a workplace air-monitoring program must be in place. The workplace air-monitoring program must:

- Comply with all relevant requirements in the Rio Tinto Standards.
- Adequately describe air quality of the workplace with regard to dust, fiber, mist, fume, gas and vapor emissions.
- Identify and adequately characterized workplace particulate and gas / vapor sources that contribute to the exceedences of OELs (Occupation Exposure Limits).
- Ensure control measures are periodically checked that they minimize emissions and protect employees and contractors from adverse exposure.

10.6.2.2 Where it is likely that the 95 percentile value of a TWA mean concentration for total inhalable dust, respirable dust, respirable crystalline silica, asbestos or non-asbestos fibrous materials exceeds the relevant OEL, the area shall be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Areas where other identifiable particulate hazards (e.g. lead, arsenic, cadmium, respirable crystalline silica, etc), or gases (e.g. CO, SO_2, NH_3, H_2S, etc), or vapors exceed the relevant OEL, shall also be similarly identified and clearly communicated. Signposting, where necessary, shall use appropriate wording or symbols on signs to identify the hazard.

10.6.2.3 These designated areas require the KUCC respiratory protection program, regular monitoring of SEGs working in the area and a formal review of the practicality of engineering controls.

10.6.2.4 Particulate and gas / vapor monitoring shall be based on the use of equipment approved by MSHA / OSHA regulatory authorities, as per documented methods.

10.6.2.5 There shall be a special consideration given to the sampling of hot / volatile / pressurized toxic process streams where they occur.

References:
Rio Tinto Health Standard B1. Particulate and gas / vapor exposures

Signatures					
Original Signed By: Frank Klobchar Standards Committee Chairman	3/12/04 Date	Original Signed By: Bill Williams Vice President Technical Services	3/12/04 Date	Original Signed By: Bill Champion President, KUCC	3/12/04 Date

10.6.2.6 Employees and Category 1 contractors shall be covered by a medical surveillance program when:

- Their Similar Exposure Group (SEG) Time Weighted Average (TWA) mean exposure to respirable crystalline silica, total inhalable dust, respirable dust, lead, arsenic, cadmium, or asbestos dust is greater than 50% of the relevant Occupation Exposure Limit (OEL).
- The medical adviser considers that it is advisable.
- There is a legal requirement for medical monitoring.

10.6.2.7 Where risk assessment indicates a risk of a respiratory condition, assessment programs shall include chest x-rays and / or lung function tests. Where indicated, they shall meet the following standards:

- High quality chest x-rays will be taken every 5 years, unless local legislation requires these to be more frequent.
- All chest x-rays will be read to ILO standards by an ILO B reader, wherever possible.
- A physician will review any progression of more than one step on the ILO extended scheme to a reading above 1/0.
- A physician will review any reading suggesting active lung disease.
- All spirometry will be by trained staff following the American Thoracic Society guidelines or equivalent.

10.6.2.8 All lead biological monitoring programs shall meet the following standards:

- All testing will be of venous blood.
- Only laboratories using an active quality assurance or quality control scheme will be used for testing.
- All male 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.
- 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.

10.6.2.9 All biological monitoring programs for other substances (i.e. arsenic and cadmium) shall be documented.

10.6.2.10 When the risk assessments determine that controls or treatment is needed, the following hierarchy of controls shall be considered:

1. Removal or substitution of the hazard.
2. Isolation.
3. Administrative controls.
4. Personal protective equipment (PPE).

10.6.2.11 There shall be documented procedures for inspection, assessment and maintenance of the engineering controls to ensure that the equipment continues to operate to design specifications.

10.6.2.12 Controls shall be of an adequate standard such that surfaces are adequately cleaned to avoid:

- Dust generation due to material dislodgment (e.g. wind blown), where practicable; and
- Fume generation from accumulated dust during welding/heating or cutting operations.

10.6.2.13 Employees shall not eat or smoke in areas or jobs with potentially harmful exposures. Cigarette smoking shall be prohibited wherever people are likely to be exposed to harmful levels of smoke.

10.6.2.14 Abrasive blast cleaning shall be conducted so as to protect worker health and minimize dust emissions. Substitutes shall be used whenever practicable for abrasives containing crystalline silica. However, if such abrasives are used, workers shall be aware of the hazards and exposure monitoring conducted. The hazardous properties of alternative materials shall be considered before use.

10.6.2.15 Fixed station monitors and alarms shall be installed where appropriate to warn against accidental or periodic releases of toxic gases/vapors (e.g. HCN, CO, SO_2). Such monitors shall only be installed after training all affected personnel on the capabilities and limitations of the monitors.

10.6.2.16 All fixed station monitors / alarms shall be identified, listed and included in a periodic schedule of preventive maintenance and testing, including written documentation of calibration of detectors. Periodic drills with regard to response to sounding of the alarm shall be conducted. Periodicity should be based on level of risk.

10.6.2.17 Where required, there shall be a documented respiratory protection device (RPD) program based on suitable standards, that provides training in the recognition of signs and symptoms of hazardous particulate and gas / vapor exposure, emergency procedures and preventative measures.

10.6.2.18 Respiratory Protective Devices (RPDs) shall be selected with regard to:

- The potential particulate particles size, gas / vapor types, substance toxicity and likely concentrations.
- Compatibility with the work tasks.
- Comfort (as it affects wear-time) and allowance for adequate communication.

10.6.2.19 Half-face and full-face air-purifying respirators shall not be used where:

- The atmosphere is oxygen deficient (< 19.5%).
- The atmosphere is immediately dangerous to life or health (e.g. in areas where CO concentrations are > 1,500 ppm or NH_4 > 300 ppm).
- Gases and vapors are more than 10 times their OEL or greater than 1000 ppm for half-face respirators, or more than 100 times their OEL for full-face respirators.
- Particulates are more than 10 times their OEL for half-face respirators, or more than 100 times their OEL for full-face respirators.

10.6.2.20 For atmospheres that are oxygen deficient, or contain unknown hazards, or have concentrations of gases and vapors that are unknown, or could potentially exceed Immediately Dangerous to Life or Health (IDLH) values, an air-supplied type respirator shall be worn.

10.6.2.21 For effective use of air-purifying respirators (other than powered air-purifying respirators), fit testing must be qualitative and documented as a minimum, although quantitative fit testing is preferred. There shall 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 is required to determine whether or not an individual is medically fit to wear a respirator.

10.6.2.22 For air-supplied RPDs, breathing air must 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 must be Grade D air and checked for conformance with national standards.

10.6.3 **RESPONSIBILITIES**

10.6.3.1Area Manager is responsible to ensure:

- A Risk Management Team, develops a "Risk Register" and that the hazards in their respective work areas are defined and a hazard inventory is compiled and maintained and risks are controlled.
- Control measures are periodically checked and that they minimize emissions and protect employees and contractors from adverse exposure.
- Signs are posted in areas where particulate hazards exceed the relevant OEL and clearly communicated to employees.
- Procedures are document for inspection, assessment and maintenance of the engineering controls to ensure that the equipment continues to operate to design specifications
- All fixed station monitors / alarms are identified, listed and included in a periodic schedule of preventive maintenance and testing, including calibration of detectors. In addition, periodic drills with regard to response to sounding of the alarm shall be conducted.

10.6.3.2 HSE is responsible to:

- Identify and characterize workplace particulate and gas / vapor sources that contribute to the exceedences of OELs.
- Perform work plan exposure monitoring for job classifications and support the risk management team.