RIO TINTO

Rio Tinto Safety Standards

"Don't Let Up and Do the Next Right Thing!"

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2. RIO TINTO SAFETY STANDARD A. MANAGEMENT SYSTEMS

A1. GENERAL SAFETY SYSTEMS

1.0 Scope

1.1 In order to satisfy this standard, a system must be:

(a) Documented in a clear and auditable form;
(b) Practical; and
(c) Working effectively.

And it must also:

(d) Include procedures for periodic review and revision.

1.2 **Manager** means any person with the authority to assign work to another person.

2.0 Minimum requirements: performance management system

2.1 As part of the annual plan, every business, site and department must have in place a safety improvement action plan for eliminating all injuries in its operations.

2.2 Every employee must have:

(a) Targets setting out how they are expected to contribute to the safety improvement action plan.

(b) A formal meeting at least once a year with their managers in which these targets are agreed and documented; and,

(c) A formal meeting at least once a year with their managers in which their performance against targets is reviewed and an appropriate action plan agreed and documented.

2.3 Safety work behavior must form part of an employee's performance review. If there is a variable compensation scheme in place, it must be designed so that safety cannot be compromised in order to maximize the financial reward.

2.4 There must be in place a fair and rigorous system for identifying and correcting inadequate safety performance.

3.0 Minimum requirements: safe work systems

3.1 There must be a system, based on risk assessment, for ensuring that effective controls and safe work procedures exist for all hazardous activities, including the safe handling and storage of hazardous substances and including emergency procedures.

3.2 There must be a system for ensuring that employees are trained and equipped to carry out their work according to the applicable safe work procedures, and that their competence has been tested.

3.3 There must be a system for ensuring that activities requiring technical certification are carried out only by suitably certified people.

3.4 There must be a system for practicing emergency procedures.

3.5 There must be a system of first-party auditing carried out by line management, which verifies that all employees:

(a) Are competent, trained, equipped and, if required certified, to carry out their work in compliance with safe work procedures; and,

(b) Do in fact carry out their work in accordance with the applicable safe work procedures.

3.6 The first-party audit system must include:

(a) The collection, monitoring and analysis of audit data;

(b) The identification of the causes of unsafe acts and conditions; and,

(c) The implementation of actions to correct these causes.

4.0 Minimum requirements: safety incident investigation

4.1 A safety incident is an event or act, which results in an occupational injury, or illness or damage to physical assets or which might have done so. These safety incidents must be reported on the shift on which they occur.

4.2 There must be a system for risk evaluation of all safety incidents. Subsequent investigation of incidents must ensure that:

(a) A manager responsible for the activity or area in which the incident occurred carries out the investigation. S/he will involve other employees to ensure that all causal factors have been identified.

(b) The root causes of the incident are identified.

(c) The controllable causes are corrected so as to prevent recurrence.

(d) Details of the incident and the lessons from it are communicated and learnt.

(e) There is a process to confirm that (c) and (d) have been carried out.

5.0 Minimum requirements: safety organization and communication system

5.1 There must be a safety organization structure with the following elements:

(a) A safety committee which supports line management in developing and overseeing the safety improvement action plans.

(b) A structure of divisional and/or departmental safety committees which ensure coverage of all areas of the operation; and,

(c) A system to promote safety awareness and general communication such as a pre-shift safety briefing/huddle.

5.2 There must be a system for encouraging, collecting, evaluating, documenting, archiving and (as appropriate) implementing safety suggestions.

5.3 There must be a system for ensuring that relevant incidents, which have been reported by other operations on the Rio Tinto Safety Web Site, are communicated internally.

A2. CHANGE MANAGEMENT

1.0 Scope

1.1 Every business must have in place a system for ensuring that change does not cause injury to people or damage to physical assets. The business must define areas of high potential risk with respect to change, having regard to the fact that the change may be:

(a) Planned or unplanned; and,
(b) Sudden or gradual.

1.2 The system will include changes to:

(a) Plant and equipment.
(b) Processes.
(c) Operating procedures.
(d) Design and construction.
(e) Maintenance procedures.
(f) Materials used, their composition and properties.
(g) Feedstock used.
(h) Organization structures and responsibilities.
(i) Personnel training or competency requirements.
(j) Programmable Electronic System software.
(k) Layout/architecture of mines/pits.
(l) Individual roles and responsibilities.
(m) Mine planning and ground control.
(n) Departure of contractors and hand over to Rio Tinto.

2.0 Identifying change

2.1 All employees and contractors must be trained and competent to identify what constitutes a change and how to initiate the change management procedure.

3.0 Proposals for change

3.1 There must be a system for approving proposed changes at the appropriate level in the organization (see 4.1.(a))

3.2 All proposals for change must clearly identify:

(a) The current situation;
(b) The purpose of the change;
(c) The expected outcome from the change;
(d) The system to be used to test results of the change.

4.0 Assessment of proposals

4.1 All proposals for change must be assessed by a process including:

(a) Authorization of the change by at least the same level of authority as authorized the original procedure;
(b) An appropriate level of technical expertise; and,
(c) The involvement of the workforce impacted by the proposed change.

4.2 The assessment must identify:

(a) All hazards associated with the proposed change;
(b) Control mechanisms to eliminate or minimize the risks;
(c) Standards to be used;
(d) Controls to be required;
(e) Further studies to be carried out, (e.g., hazard studies);
(f) Regulatory requirements that must be met; and,
(g) If a change is subject to trial the duration and measures for the trial.

5.0 Implementation of change

5.1 Appropriate information on the change should be released and training provided related to the change to all those effected.

5.2 Prior to handing over a physical change for normal use, an acceptance check shall be carried out to ensure:

(a) The changes have been carried out in accordance with the authorized change proposal;
(b) All actions from the review process, including any studies called for have been satisfactorily completed and all outcomes included; and,
(c) The physical change has not introduced any unforeseen risks.

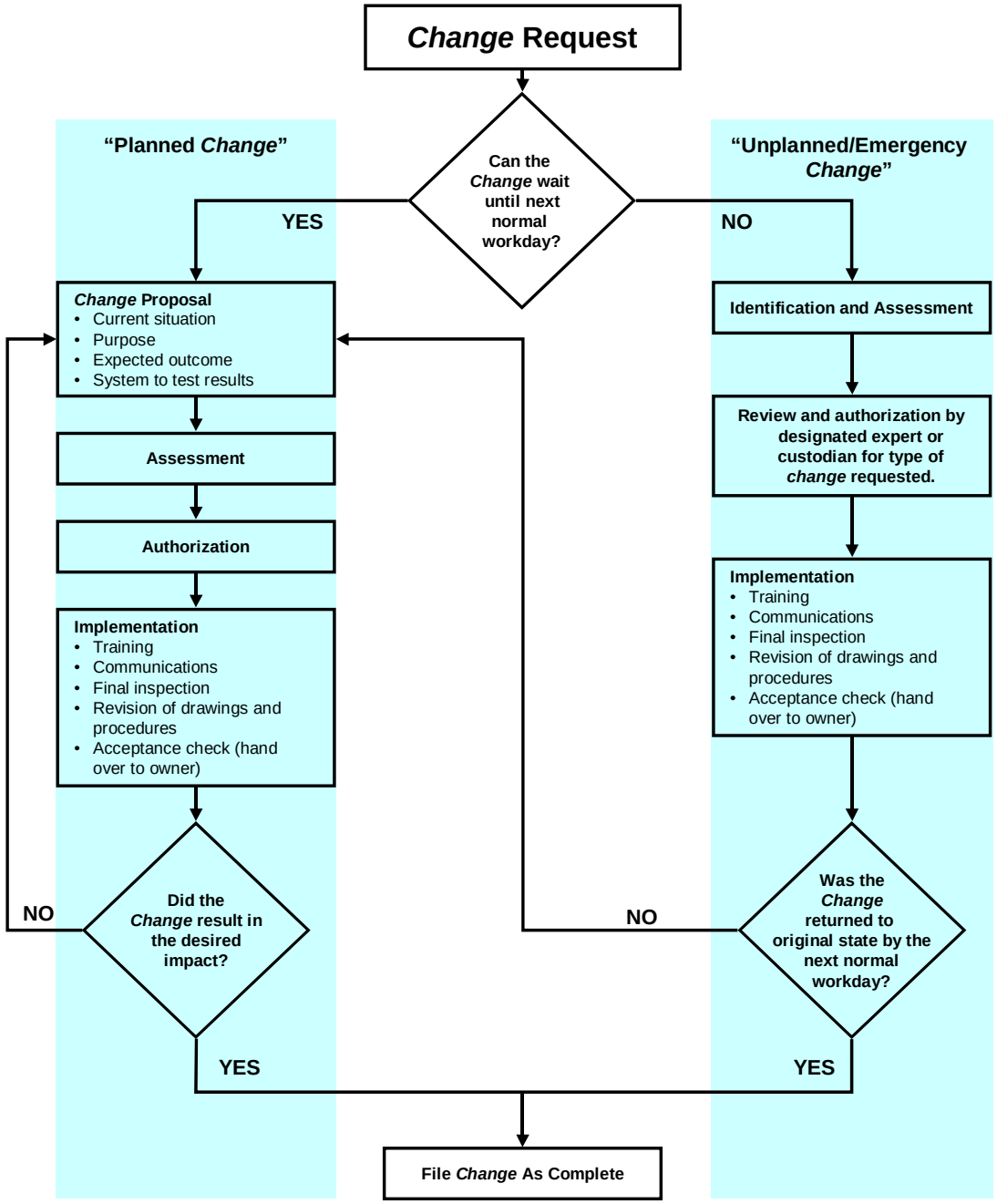
5.3 A formal review should be carried out in order to assess the actual impact of the change against the intended impact and the reasons for any deviation.

5.4 A system exists which allows for the revision of drawings, operating procedures, maintenance and emergency procedures.

6.0 Emergency Change Procedure

6.1 There must also be a contingency procedure to cover situations in which proposed changes cannot be subject to the full procedure. Such a procedure must incorporate the approval of the site manager or his/her designated deputy.

CHANGE FLOW CHART



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A3. CONTRACTOR MANAGEMENT

1.0 Scope

1.1 For the purposes of this standard, contractors fall into three categories:

Cat. 1 Individuals engaged on temporary contracts to work within existing operations.

Cat. 2 Companies or individuals engaged for a discrete project.

Cat. 3 Companies or individuals engaged under contract to carry out specific tasks or provide specified services within existing operations areas.

1.2 In this standard, the company employing the contractor is referred to as the Owner.

2.0 Rules that apply to all contractors

2.1 For all contractors there must be an on site manager who is responsible for ensuring the effectiveness of the contractor safety management system in relation to that contract.

2.2 Before work begins on any contract all contractor personnel must be given appropriate orientation and induction training including emergency procedure drills. It must be confirmed that all tools and equipment to be used are in a safe condition.

3.0 Rules that apply to Category 1 contractors

3.1 Category 1 contractors are to be treated in all aspects of safety as if they were employees.

4.0 Rules that apply to Category 2 contractors

4.1 Category 2 contractors are engaged in projects, which will be carried out in a designated area that is separate from existing operations. Contractors within this category are independent of the Owner and are responsible to the Owner for carrying out their contracted work safely and in compliance with applicable regulatory requirements. They must have in place appropriate systems and supervision. The Owner's responsibility is to ensure that the contractor's safety duties are embedded in the contract and to use an audit process to see that the contractor carries out its safety duties in accordance with the contract and with applicable regulatory requirements.

4.2 For Category 2 contractors, the Owner must have a contractor safety management procedure that contains, as a minimum, provisions for the following elements:

4.2.1 **Pre-qualification of Contractor.** Wherever practical, the Owner should prepare a list of contractors whose safety performance warrants their being placed on a pre-qualified list of suitable contractors.

4.2.2 **Pre-bid Meeting/Discussions.** The Owner must conduct a pre-bid meeting with contractors to inform them of the scope of the project or contract and to discuss the potential HSE hazards it may involve.

4.2.3 **Bid Documents.** Contractors' bid documents must include a site-specific safety plan that identifies and addresses safety hazards.

4.2.4 **Selection.** The bid assessment must include consideration of the contractor's safety plan and its ability to implement the plan. Safety considerations shall receive no less weight than other considerations such as costs and technical capabilities.

4.2.5 **Contract Terms.** The contract document must contain provisions covering safety including such provisions as the contractor's responsibility to comply with the owner's safety policy, rules and procedures, all applicable laws, demonstration of adequate levels of insurance for worker's compensation and general liability, indemnification agreement and termination clause or penalties for lack of performance in safety.

4.2.6 **Pre-job Conference.** The Owner must conduct a pre-job conference with the successful bidder to review safety expectations and other requirements based on the site-specific HSE plan including the reporting of injuries or incidents.

4.2.7 **Monitoring and Evaluation.** The Owner must monitor the contractors' work and carry out formal reviews with them that include safety performance. Action plans will be agreed and documented to correct areas of under-performance.

4.2.8 **Feedback.** Safety performance records must be kept and used in future selection processes. The on going validity of the retained data needs to be assessed before it is used.

5.0 Rules that Apply to Category 3 Contractors

5.1 The tasks or services carried out by Category 3 contractors involve working in existing operations areas. The responsibility of the Owner varies according to the nature of the work and its location. Consequently, the Owner must apply the rules set out in section 4.0 as appropriate. In addition, where the contractor(s) are carrying out hazardous work or working in hazardous areas, there must be a permit to work system.

5.2 The permit to work must:

(a) Set out the work to be done, the hazards identified and the required safe work procedures;
(b) Be reviewed every shift and reissued if a change in conditions or work scope has occurred;
(c) Be signed by a designated manager for the current shift who is the person with responsibility for the geographical area or task in which the contractors are to work and/or by a designated competent authority if in a specialized field such as CO gas management**.**

5.3 The designated manager must:

(a) Ensure that, where practical, the contractor's work area is clearly demarcated;
(b) Ensure that the permit to work is available for inspection at the workplace;
(c) Monitor the contractors' work to check compliance with the permit conditions;
(d) Record and report any safety incidents as for employees in the area; and,
(d) Capture and act on safety improvement ideas.

2. RIO TINTO SAFETY STANDARD B. RECORDING AND REPORTING

B1. INJURY AND INCIDENT RECORDING AND REPORTING

1.0 Scope

1.1 This standard sets out:

- The Rio Tinto definitions of injuries, injury rates and incidents; and,
- Requirements for recording and reporting of injuries or incidents involving employees (permanent and temporary) and contractors.

2.0 Rio Tinto Definitions

2.1 **Lost time injuries** (LTIs) are the sum of lost day injuries and restricted work duty injuries.

(a) **A lost day injury** (LDI) is an occupational injury that results in one or more days away from work. A fatal injury is counted as a lost day injury.

(b) **A restricted work duty injury** (RWDI) is an occupational injury where, as a result, (1) the employee was assigned to another job on a temporary basis, or (2) the employee worked at a permanent job less than full time, or (3) the employee worked at his or her permanently assigned job but could not perform all the duties normally connected with it.

Restricted work activity occurs when the employee, because of the job-related injury, is physically or mentally unable to perform all or any **part** of his or her normal assignment during **all or any part** of the normal workday or shift.

2.2 **A medical treatment case** (MTC) is an occupational injury which is not classified as a lost time injury, but which results in loss of consciousness or medical treatment other than first aid.

2.3 **All injuries** (AI) are the sum of lost time injuries and medical treatment cases.

2.4 **Shifts/days lost** are the ACTUAL number of shifts/days a person was unable to work due to an occupational injury i.e. the sum of days away from work (DAW) and those on restricted work duties (RWD). If a person is unable to return to his normal job after two years, the injury is considered a permanent injury and no further "shifts/days lost" are recorded. The injury is reclassified as Permanent Damage Injury (PDI). There will be no shifts/days lost accumulated for a fatality or PDI.

2.5 A **Permanent Damage Injury (PDI)** is any occupational injury:

(a) From which there has not been, or is not expected to be, full recovery after two years.

(b) Which has substantial negative consequences for the individual e.g. prolonged hospitalization, prolonged inability to work, loss of ability to continue normal social and home life, major damage to body or body function. All amputations are PDIs.

2.6 The **Hours of Exposure** is the total number of hours worked by all employees (permanent or temporary) and contractors in the reporting period.

2.7 **Lost Time Injury Frequency Rate (LTIFR)** is the rate of occurrence of LTIs per 200,000 hours worked:

$$\frac{\text{Number of LTIs x 200,000}}{\text{Hours of exposure}}$$

2.8 **Lost Time Injury Severity Rate (LTISR)** is the rate at which normal rostered workdays or shifts are lost as a consequence of LTIs per 200,000 hours worked:

$$\frac{\text{Number of lost shifts x 200,000}}{\text{Hours of exposure}}$$

2.9 **All Injury Frequency Rate (AIR)** is the rate of occurrence of All Injuries per 200,000 hours worked:

$$\frac{\text{Number of All Injuries x 200,000}}{\text{Hours of exposure}}$$

2.10 A **Significant Incident** is any incident which has actual or potential health, safety (or environmental) consequences that are of a serious nature and have the possibility to cause actual or potential material or reputational damage to the operation or to Rio Tinto.

2.11 **Rio Tinto Injury Statistics** are the monthly returns of:

(a) Fatalities
(b) Lost Time Injuries
(c) Medical Treatment Cases
(d) Permanent Damage Injuries
(e) Shifts Lost
(f) Severity

for all contractors and employees.

3.0 Injury and Incident Reporting and Recording

3.1 There must be in place a system whereby:

(a) All injuries are reported to the line manager responsible immediately.

(b) The line manager must record all material details of the injury or incident as required by local regulation, in a timely manner, in an appropriate log and ensure that the person responsible for HSE record keeping is informed.

(c) The HSE record-keeper must ensure that all internal and external reporting requirements are satisfied and that the injury or incident is correctly classified for internal and external purposes.

(d) Significant incidents are reported to the senior site manager as soon as possible and certainly within 12 hours of the occurrence.

3.2 There must be a system for ensuring that **Rio Tinto Injury Statistics** are supplied to Rio Tinto on the forms, in the manner and by the deadline prescribed from time to time.

3.3 There must be in place a system for recording and reporting all incidents involving injury, damage to property or damage to the environment or the potential for such injury or damage. This system must satisfy applicable regulatory requirements.

3.4 There must be in place a system for ensuring that a written report of Significant Incidents are submitted to the Chief Executive of Rio Tinto, with a copy to the Product Group Chief Executive, within 24 hours of their occurrence.

3.5 There must be a system for ensuring that safety incidents of relevance to other Group operations are posted on the Rio Tinto safety web site within seven days of their occurrence.

C1. ISOLATION

1.0 Scope

1.1 This standard applies to all sources of hazardous energy and hazardous substances.

1.2 **Hazardous energy**: Electrical, Pneumatic, Hydraulic, Stored (springs, batteries), Potential (by virtue of position), Heat (hot water, steam), Radiation.

1.3 **Hazardous substances**: Gases, Vapors, Liquids, Dusts with the potential to cause injury or illness (e.g., toxic, corrosive, flammable).

1.4 **Isolation Officer**: Whenever a piece of plant or equipment is to be isolated, there must be a person designated to carry out the Isolation Procedure. That person is referred to as the Isolation Officer. No person may be designated as the Isolation Officer for a piece of equipment unless s/he has been trained, tested and certified as competent to carry out the Isolation Procedure for that piece of plant or equipment. Tests for voltage, for example, require competency in electrical work as outlined in the electrical standard.

1.5 **Isolation Procedure**: All designated systems, plant and equipment must have written procedures for isolation (see Rio Tinto Standard A1.3.1). This procedure will set out how the system, plant or equipment is to be made safe and kept safe. It will include, for example: decontamination; venting of stored energy; securing of rotors or fan blades; chocking of vehicles; and disconnecting, blocking or bleeding of equipment, cables, pipes and vessels. It will show any connections to Distributed Control Systems. It will also show the isolation points for lockout and test procedures**.**

2.0 Isolation Officer's Responsibility

2.1 Before any work is begun on or in a system, plant or equipment, the Isolation Officer must first ensure that it is made safe in accordance with the **Isolation Procedure**.

2.2 The Isolation Officer's **Lock** and **Identification Tag** must be the first to be applied and the last to be removed.

2.3 (a) The Isolation Officer's lock must be a master series lock since it will remain on the plant or equipment when handing over to subsequent shifts. Keys to the Isolation Officer's lock must only be held by other designated Isolation Officers for that plant or equipment.

2.3 (b) Where isolation involves only one person on jobs to be completed within a single shift and where it is not appropriate for a master series lock to be utilized, the person must be an Isolation Officer and s/he must apply his/her personal lock and identification tag.

2.4 After locking and tagging, the Isolation Officer must **Clear** the area of personnel before a **Trial** step to ensure that the plant or equipment has been isolated.

2.5 In the case of electrical isolation, a **Test** for voltage must be carried out, after the switching device, to ensure the absence of voltage.

2.6 Where there is a need for work to extend over multiple shifts or where there are large numbers of people involved in the work (such as large maintenance projects) then a project isolation procedure can be implemented. This procedure must, however, have the requirements that personal locks must be used for each person working on the project, an Isolation Officer's control lock is in place and this control lock cannot be unlocked without all personal locks being removed.

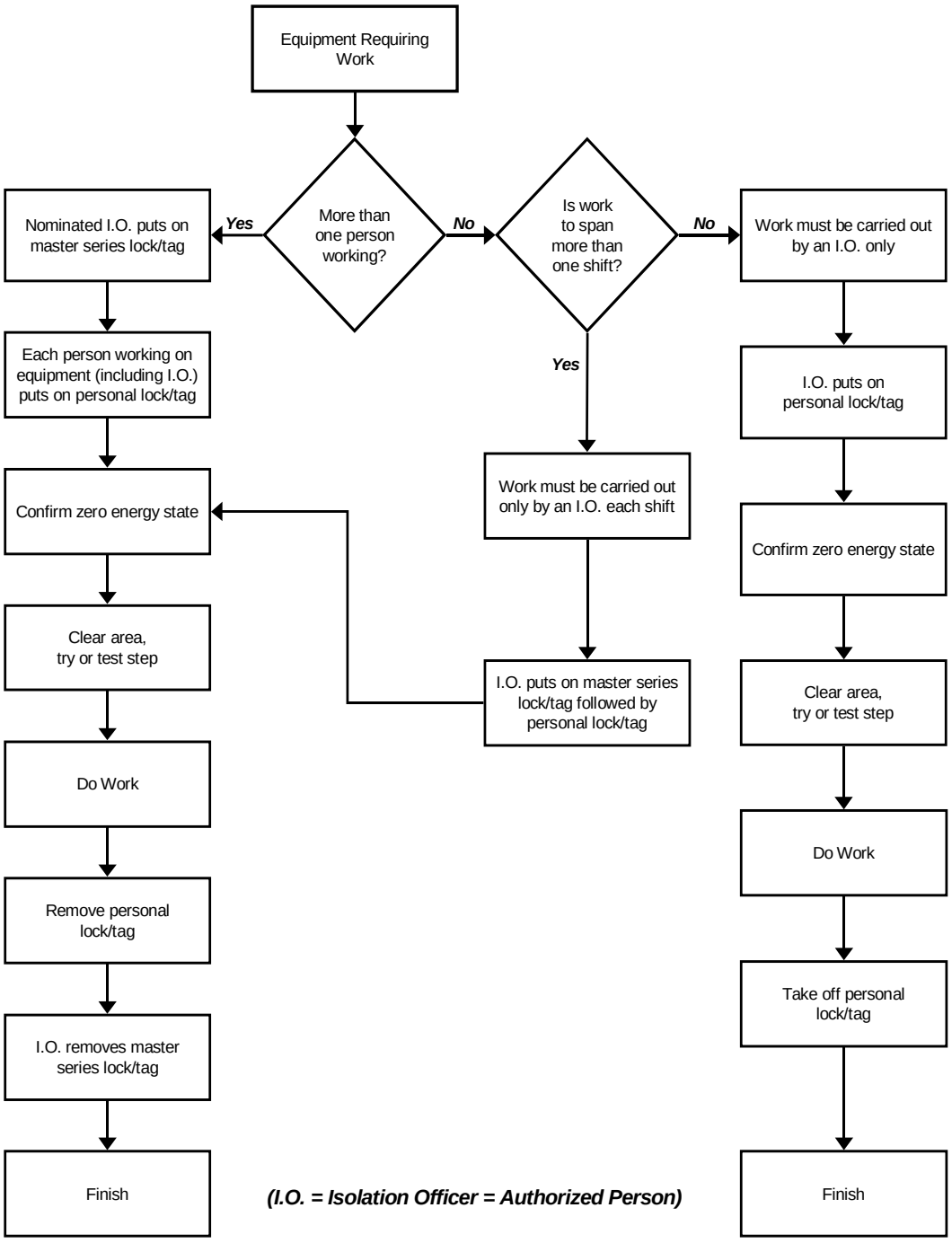
3.0 Everyone's Responsibility

3.1 Everyone, including the Isolation Officer, who has to perform work on the plant, equipment or system, must first apply a personal lock and identification tag in accordance with the Isolation Procedure.

3.2 Personal locks must be such that they can only be unlocked by their owner.

3.3 Personal locks may never be removed other than by the person to whom they belong, other than in the presence of and under the supervision of the Department or Area Manager or his/her appointed nominee, and in accordance with a written procedure.

ISOLATION (LOCKOUT/TAGOUT) FLOW CHART



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C2. ELECTRICAL SAFETY

1.0 Scope

1.1 This standard applies to all electrical work above 110 volts DC or 32 volts AC.

2.0 Competency Standards and Safe Work Procedures

2.1 There shall be electrical competency standards and safe work procedures for all electrical work (i.e., construction, decommissioning and demolition of electrical equipment).

2.2 The competency standards shall specify the frequency for re-certification, which shall be no less than every two years.

2.3 All electrical installation work shall be conducted by competent personnel in accordance with governing regulation, code, design criteria and safe work procedures.

3.0 Electrical Equipment

3.1 Electrical safety devices such as earth leakage and overload protection shall be installed on all final distribution circuits and the settings established by qualified personnel.

3.2 Electrical equipment, grounding continuity and electrical safety devices shall be inspected and/or tested on a suitable schedule and the findings recorded.

3.3 There must be a system for removing electrical equipment unfit or unsafe for purpose.

3.4 There must be a system for maintaining an up-to-date set of single line diagrams. The diagrams will show: system fault calculations; equipment details; electrical protection discrimination curves; and cable ratings.

4.0 Isolation and Access

4.1 Equipment shall be isolated in accordance with the site Isolation Procedure (see Rio Tinto Standard C.1 Isolation). Where it is necessary to work on live equipment for the purposes of troubleshooting or testing, such work must be carried out according to a written safe work procedure.

4.2 Electrical panels, enclosures, control centers, substations and equipment shall be appropriately guarded, labeled, and made inaccessible (except for emergency shut off mechanisms) to unauthorized personnel. Areas containing such equipment are 'controlled areas'.

4.3 Where it is necessary for untrained personnel (e.g., visitors) to enter controlled areas there shall be a system for communicating the hazards and for escorting them with appropriately trained personnel. Contractors must have a permit to work in controlled areas.

4.4 Employees and contractors exposed to electrical hazards shall receive electrical hazard training at the commencement of their employment and thereafter on an annual basis.

C3. VEHICLES AND DRIVING

1.0 Scope

1.1 This standard applies to all vehicles, including mobile mining equipment, owned and operated by Rio Tinto or its contractors, which are used on Rio Tinto sites or off-site for Rio Tinto business purposes.

2.0 Vehicles

2.1 All vehicles used for work purposes must be subject to a risk assessment. The assessment must:

(a) Involve operators and maintainers who will use the equipment; and,
(b) Address all aspects of safe operation including handling, driver vision, brake failure, tyre blow out and access/egress for operators and maintainers.

2.2 All vehicles driven for work purposes must be subject to an appropriate pre-operation safety check based on a risk assessment.

2.3 All vehicles used for work purposes must be fitted with fixed seats and safety belts for driver and all passengers unless the risk assessment specifies otherwise.

2.4 All vehicles used for work purposes that are capable of exceeding the lowest applicable speed limit must be fitted with a speedometer.

3.0 Training and Licensing

3.1 No person may drive a vehicle unless they are trained, competent, tested and licensed to operate that vehicle. The training must address hazards assessed for (a) that vehicle and (b) the tasks for which it is to be used.

3.2 All persons required to drive/operate vehicles on site must have a site license. A state or civil driving license is an approved alternative except where there is a need for a specific set of Company rules/procedures for example, in a pit area where a pit license or permit is required.

Renewal of licenses will be based on an assessment of competency to drive and or operate the equipment. The frequency of assessment will be either annual, or derived from a risk assessment for each vehicle type.

3.3 The Manager shall have a system in place to annually reinforce safe driving/operating techniques for all subordinates required to drive and or operate vehicles for work purposes.

3.4 A system shall be in place that limits the number of people that drive in an open pit. In addition, because of the constant change in conditions, no person shall be licensed to drive in an open pit unless they are required to do so more than once in a two week period.

4.0 Traffic Rules

4.1 The driver and all passengers must wear their seat belts, where fitted, at all times.

4.2 Speed limits and traffic rules must be reviewed regularly and rigorously enforced.

4.3 There must be rules to ensure that:

(a) No vehicle approaches within 50 metres of a shovel, dozer or drag line without first making positive contact with the operator of that equipment.
(b) If site rules permit overtaking in the pit area, then no vehicle will overtake a haul truck or water truck before making positive contact with the driver.
(c) No vehicle tows equipment unless it is engineered to do so.

C4. WORKING AT HEIGHTS

1.0 Scope

1.1 This standard applies to any task where the risk assessment highlights a danger of falling. In any case, fall prevention or protection shall be used for elevated work above 1.8 meters (6 feet).

1.2 **Fall prevention.** Wherever practical, a safe working area must be provided by means of work platforms or scaffolds. Fall Prevention standards are set out below.

1.3 **Fall protection.** In all other cases, Fall Protection must be used. This includes situations in which work is being carried out from an elevating work platform or man-lift. Fall protection standards are set out below.

1.4 **Ladders.** A person may climb or descend a ladder without Fall Protection provided that they are able to use both hands and legs to do so; face the ladder and use one step at a time. Ladders shall be tied off or supported below.

1.5 **Barricades**. Where overhead work is being conducted, barricades must be erected around the work area to protect others below from falling objects.

2.0 Fall Prevention

2.1 Work platforms and scaffolds must have complete floors, guardrails and toe-boards and safe access and egress must be provided.

2.2 A person must be designated to control the work platform, scissor-lift or man-lift ("the basket"), who is trained and competent to do so and qualified as required under local regulations.

2.3 Where practical, the designated person should be in the 'basket'.

2.4 Every person in the 'basket' must be secured at all times with proper Fall Protection equipment and there must be systems in place to prevent tools and equipment from falling.

2.5 There shall be a system for ensuring the design, construction, certification, maintenance and inspection of elevating work platforms and man-lifts.

3.0 Fall Protection

3.1 A person has Fall Protection if s/he is secured with an approved full body harness, shock absorbing lanyard {where the potential to fall is greater than 4 meters (13 feet)} or short restraining lanyards {where the potential to fall is less than 4 meters (13 feet)}, self-locking snap hooks (or carabineer type rings) and secure anchorage points.

3.2 Anchorage points must, where practical, be above the head of the worker, and must ensure that in the event of a fall the worker will neither swing nor touch the ground.

3.3 There must be a system for ensuring that anchorage points are tested and approved by a competent person to ensure that they are secure and can take the required load.

3.4 There must be a system for ensuring that Fall Protection equipment is:

(a) Tested and certified for use;

(b) Inspected by the user before use; and,

(c) Destroyed following a fall or where inspection has shown evidence of excessive wear or mechanical malfunction.

3.5 There must be a system for preparing and testing emergency rescue procedures for fall victims.

C5. CONFINED SPACES

1.0 Scope

1.1 **Confined space** is an enclosed or partially enclosed space that:

(a) Has been identified as such in a risk assessment;
(b) Is not intended or designed primarily as place of work;
(c) May have restricted entry and exit; and,
(d) May:
  (i) Have an atmosphere which contains potentially harmful levels of contaminant;
  (ii) Not have a safe level of oxygen (e.g., following a nitrogen purge); or
  (iii) Cause entrapment or engulfment.

1.2 Confined spaces may include, but are not limited to:

(a) Storage tanks, process vessels, boilers, pressure vessels, tank-like compartments that have only a manhole for entry, ceiling and floor spaces;
(b) Open-topped spaces such as pits, or grease traps, or excavations more than 1.5 meters (5 feet) deep;
(c) Pipes, pumps, sewers, shafts, ducts, drains, tunnels, cellars, basements and similar structures; and,
(d) Abandoned workings and exploration adits.

1.3 **Contaminant** is any dust, fume, mist, vapor, gas, or other substance in liquid or solid form, the presence of which may be harmful to health and safety.

1.4 **Entry to confined space** occurs when a person's whole body, upper body or head is within the confined space. However, this is not intended to prevent a person from inserting their hand or arm while holding a test instrument or probe into a confined space as part of the evaluation procedure provided that this procedure is duly authorized.

2.0 Identification

2.1 Confined spaces must be identified and signs erected at the entry points denoting that a permit is required prior to entry. Where signage is impractical, for example with adits other means of highlighting the dangers need to be used.

3.0 Permit System

3.1 Entry to a confined space must only be allowed after a written approval, in the form of a permit, has been issued by a competent person, whom is authorized to issue such permits.

3.2 The permitting process must include the following elements:

(a) a risk assessment, including the need for a competent person to assess such things as oxygen levels, contaminants, temperature extremes, and concentrations of flammable substances;
(b) isolation procedures for contaminants and other energy sources;
(c) the requirement for breathing apparatus;
(d) the sign-in and sign-out of all persons entering the confined space;
(e) display of the permit;
(f) communication equipment;
(g) safety specification of equipment to be taken into the confined space;
(h) barricading;
(i) rescue plan and equipment;
(j) standby person; and,
(k) a completion procedure.

4.0 Other Requirements

4.1 All persons required to work in a confined space, or to act as a standby person, must be trained, competent and tested.

4.2 Specific safe work procedures must be developed for work activities that are more hazardous when carried out in a confined space than elsewhere. These activities would include hot work (cutting and welding), chemical cleaning, steam cleaning, and abrasive blasting.

4.3 The standby person will have no other duties and is to be positioned outside the confined space entry point at all times while personnel are within the space.

4.4 Where the risk assessment has identified the need for ventilation, then this must be covered by a documented procedure.

2. RIO TINTO SAFETY STANDARD D1. UNDERGROUND STANDARDS

D1.1. GROUND CONTROL

1.0 Scope

1.1 This standard applies to all underground mines.

1.2 All prevailing government regulations must be complied with.

1.3 Each operation must establish a Ground Control Management Plan that consists of three elements: Design, Implementation and Verification.

2.0 Design

2.1 Only suitably qualified and experienced (in-house or external) geotechnical engineers must be used to develop the design rationale, calculations, support systems and specification of materials.

2.2 All underground excavations, drives and stopes must be designed to specified and documented minimum stability criteria for all relevant rock types. The design must ensure that all personnel work in a secure environment.

2.3 The design must take into account local and regional hydrology and hydrogeology to ensure that the potential for major water ingress is understood and prevented.

2.4 The materials used for all support types must be specified.

2.5 Where pillars are required for reasons of safety they must be mathematically derived and clearly marked on all mine plans and sections.

3.0 Implementation

3.1 Management must develop protocols that ensure that no personnel work beneath ground that has been inadequately secured.

3.2 Management must develop and document protocols for all aspects of Ground Control activity. These protocols must specify:

(a) The persons authorised to install support in accordance with approved design and the training they require.
(b) The persons authorised to install additional, unplanned support and the training they require.
(c) The tools and equipment used to install ground support to cater for all sizes of excavation encountered in the mine.

(d) The tools and equipment used for scaling to cater for all sizes of excavation encountered in the mine and, which will allow the removal of loose material without exposing the person performing the work to injury.
(e) The persons authorised to scale and the training they require.
(f) Planned Job Observations of scaling and support practices at a frequency defined by supervisors and senior management.

3.3 The underground work force (miners, supervisors, contractors, management) will be trained in awareness and communication of rockfall hazards. Supervisors will undergo specific training in rockfall hazard identification and mitigation.

3.4 Supervisors will be trained in how to develop Standard Work Practices and carry out Planned Job Observations for key aspects of the mining cycle.

3.5 Up-to-date mine plans must be maintained in locations that are easily accessible to the workforce. Any potential Ground Control hazards must be clearly identified on these plans.

3.6 Any change to the Ground Control Management Plan must be fully documented and must be authorised by the Mine Manager.

3.7 Management must define the protocols for information flow between shifts and between technical and operations management.

4.0 Verification

4.1 Procedures must be in place that define:

(a) The frequency and responsibility for inspecting, monitoring, evaluating and reporting on ground conditions in:

- Active work places i.e. development ends and stopes, etc.
- Shafts, declines, access ramps, airways, escape ways, etc., and
- Other key sections of the mine i.e. workshops, stores, shaft stations, etc.

(b) The frequency and method of testing rock bolts, cables and other support elements together with the necessary record keeping.

4.2 In addition to these routine inspections, the entire underground operation must be reviewed on a periodic basis to:

(a) Evaluate conformance to the Ground Control Management Plan and local regulatory requirements.

(b) Re-evaluate possible failure modes and up-date risk management studies.

(c) Arrange for peer review of Standard Work Procedures.

(d) Arrange periodic external review of the Ground Control Management Plan.

4.3 Programmes to measure over-break in development drives and stopes, as compared with design, must be in-place and the necessary records maintained.

4.4 Survey accuracy of underground development must be checked against the mine's standards and recorded.

D1.2. EMERGENCY PROCEDURES

1.0 Scope

1.1 This standard applies to all underground mines.

1.2 All prevailing government regulations must be complied with.

1.3 Management must establish an Underground Emergency Response Plan that incorporates the elements in sections 2 through 8.

1.4 The Underground Emergency Response Plan must be incorporated as a section in the Emergency Response Manual that is maintained by all Rio Tinto operations.

2.0 Underground Risk Assessment

2.1 Management must undertake a risk assessment to identify the possible types of emergency situations that might occur within the mine.

2.2 Written procedures must be developed in response to potential emergencies that have been identified and the workforce trained accordingly.

2.3 Where reversible ventilation fans are installed, procedures and responsibility must be established for operating the fans in reverse.

2.4 The risk assessment must be reviewed annually and the procedures updated as necessary.

3.0 Warning System

3.1 Management must determine the minimum acceptable time for an emergency warning to reach all personnel in the mine, including those personnel engaged in non-routine work such as ventilation engineers in return airways, diamond drillers and geologists in remote locations, etc.

3.2 Each underground operation must have an effective system, together with at least one back-up system, to warn all personnel underground, within the determined minimum time period, that an emergency exists.

4.0 Emergency Egress

4.1 Each operation must establish and maintain evacuation routes/secondary egress as close as practicable to existing and planned working areas.

4.2 Management must set a maximum period of time from the moment the emergency warning is activated to the time the last personnel evacuate the mine or are able to reach the safety of an

underground refuge chamber. In setting this period the non-availability of man-hoisting and vehicular access must be considered.

4.3 Clear and highly visible signs must be used to demarcate all evacuation routes.

4.4 All persons who work underground must be instructed in the escape and evacuation plans. Procedures must be in place to advise all miners when a change in the emergency egress takes place.

4.5 Test evacuations must take place such that, as far as reasonably practical, all personnel participate once a year. This test must include, where relevant, the use of safety refuge stations.

5.0 Co-ordination with other Emergency Services

5.1 The Emergency Response Plan must incorporate the involvement of the in-house Mine Rescue Teams, third party Mine Rescue Teams (where available) and the use of local emergency services, as appropriate.

6.0 Personnel Tagging System

6.1 Each operation must have an effective system to identify who is underground.

7.0 Single Entry/Self-contained Refuges

7.1 Management must establish a Safe Working Practice (SWP) for single entry systems (these are working areas with one way in and the same way out). The SWP must state the maximum distance allowed before an alternate secondary means of egress or a refuge chamber is required. The SWP must also quantify the maximum number of personnel allowed in a single entry system and any particular PPE or other precautions that are necessary.

7.2 Each operation must establish the need, location and capacity for self-contained refuge chambers.

8.0 Emergency Training

8.1 All persons who work underground (including all contractors) must be trained in what to do in the event of an emergency. Visitors must receive a short instruction in the use of safety equipment and emergency procedures and must remain with a Company representative at all times while underground.

D1.3. FIRE PRECAUTIONS

1.0 Scope

1.1 This standard applies to all underground operations.

1.2 All prevailing government regulations must be complied with.

1.3 Each operation must carry out a Risk Assessment of all potential fire sources, e.g. fuel and material stores, electrical sub-stations, etc. Specific risk and mitigation measures will be developed for all fresh air intakes. This will include identifying fire hazards adjacent to the intake on surface and within the intake, i.e. mobile equipment entering a ramp, flammable materials being hoisted in a downcast shaft, etc.

1.4 An Underground Fire Risk Register that identifies the potential fire hazard, the location, the mitigation of the risk and the person responsible for ensuring mitigation measures are in place must be kept.

2.0 Mobile Equipment

2.1 No petrol-powered equipment (mobile, stationary or hand-held) must be permitted underground.

2.2 All mobile equipment must be fitted with a hand held extinguisher mounted on the unit in an accessible location. The risk assessment will determine the size and type of extinguisher.

2.3 All underground mobile equipment containing more than 100 litres flammable hydraulic fluid must be fitted with an automatic fire suppression system with suitable manual activation.

3.0 Fuel Storage

3.1 Storage of flammable substances underground must be minimised.

3.2 The use of fire resistant hydraulic fluids will be considered where practical and viable.

3.3 Where fuels and oils are delivered into the mine by pipeline the Risk Assessment must address:

(a) The potential for catastrophic failure of the pipeline and for unobserved leakage.
(b) The requirement for pipelines to run empty at the end of the filling cycle.

4.0 Self Contained Self Rescuers

4.1 All underground personnel must carry Self Contained Self Rescuers (SCSR) with a minimum 30-minute oxygen supply. Compact, robust units are now available.

4.2 The Risk Assessment will determine the need for caches of additional SCSRs.

5.0 Ventilation System

5.1 In the event of a fire all operations must assess, at fixed locations (fuel stores, sub-stations, etc.) and where mobile equipment operate, the air flow in the mine to ensure the safety of personnel downstream of the fire.

5.2 The potential for changes of airflow direction resulting from heat produced by fires must also be assessed.

6.0 Electric Cables

6.1 All new electrical installations must use fire retardant, non-toxic cables.

D1.4. HOISTING

1.0 Scope

1.1 This standard applies to all underground operations that use hoisting equipment in shafts and raises for the transport of men and material and includes "raiseclimbing" equipment. The words "hoist" and "winder" are synonymous.

1.2 All prevailing government regulations must be complied with.

1.3 Each operation must establish a Hoist Register that includes the following key components.

2.0 Safety Devices

2.1 Safety devices and control systems required for each individual hoist must be listed.

2.2 The frequency and method of testing of all safety devices and control systems must be defined.

2.3 Records must be kept of all tests.

3.0 Maintenance and Inspection

3.1 Operations must establish a maintenance and inspection master plan that includes:

(a) Mechanical and electrical components of the hoist.
(b) Hoist rope attachments and all conveyances.
(c) Structural integrity of the hoist, headframe and shaft guides/rails etc.

3.2 Operations must establish the frequency and procedures for non-destructive tests on the rope attachments and structural elements holding the conveyance.

3.3 Records will be kept of all tests.

4.0 Hoist Rope Inspection

4.1 Operations must, in conjunction with the hoist rope supplier, establish hoist rope discard criteria.

4.2 Communication protocols between management and those carrying out the hoist rope inspection must be established to ensure that management is notified immediately of any adverse findings.

4.3 Operations must keep records of:

(a) Hoist operating data including the number of cycles spent man hoisting and rock hoisting.

(b) Hoist rope data including date of installation, maximum admissible legal life, construction and safety factor.

(c) Rope test and inspection results compared with rope discard criteria.

(d) Non-destructive inspections and the results of the testing of rope cuts, etc.

5.0 Medical Examination

5.1 Annual medical examinations of all hoist operators must be carried out to confirm fitness for hoist operation.

6.0 Training

6.1 All persons who operate hoisting machinery and persons who inspect, maintain or test any part of the system must be adequately trained and authorised.

D2. MOLTEN MATERIALS

1.0 Scope

1.1 This standard applies to all activities and equipment involving molten materials.

1.2 Molten Materials are for example, molten metals, slags, matte, electrolyte (bath) and liquid pitch.

2.0 Charge Materials

2.1 There must be a system for the specification, purchase, inspection and storage of materials, including scrap, used to charge furnaces.

2.2 The level of moisture and other materials must be such that it does not lead to an explosion or violent reaction.

2.3 Bottles, cans and other closed liquid or gas containers must not be charged to the furnaces and there must be a system in place to ensure that this does not happen.

3.0 Furnaces, ladles, launders, granulation and casting equipment

3.1 All equipment must be designed to prevent the likelihood and implications of spill, "breakout", "foaming" or splashing of molten material.

3.2 Water sumps, drains, piping and potential water accumulation spots should, as far is practicable, be located in areas where contact with molten materials is not possible. To the extent that this cannot be achieved, they must be protected from contact by molten material by suitable heat resistant barriers and diversions.

3.3 Electrical and control systems, fuel and oxygen systems should, as far as is practicable, be located in areas where contact with molten material is not possible. To the extent that this cannot be achieved, they must be protected from contact by molten materials by suitable heat resistant barriers and diversions.

3.4 The integrity of furnaces, ladles etc must be checked regularly i.e. through the frequent monitoring of surface temperatures and visual checks for wear, cracking and mechanical damage.

3.5 The structural elements of furnaces must be kept within their operating temperature design limits. A system must be in place to ensure that these are known and monitored. The system must also include a means of managing factors that could impact control, such as the accumulation of dust or other insulating material.

3.6 Furnace binding tie rods will be fitted with retention chains.

3.7 All water-cooled casting equipment and water-cooled furnaces must have an assured water supply in the event of power failure, equipment breakdown or other emergency.

3.8 Granulation water supply systems must be designed with automatically acting back up supply in the event of failure of the primary water supply.

3.9 Equipment must be designed to "fail safely" in the event of a power failure.

3.10 Hazard analysis must be used to establish the requirement for explosion containment or vents to allow the controlled release of gases in a low risk direction and to mitigate the effects of explosions.

3.11 Standard operating procedures and adequate indicators and alarms are required for both normal and emergency operations and maintenance. Emergency shutdown procedures shall be reviewed at least once every three years, updated where necessary and operating personnel must conduct drills at least annually.

4.0 Process Management

4.1 Hazard analysis must be used to define standard operating conditions and control measures for all molten material processes and take into account risks due to such things as "hot work" explosions, hazardous fumes, "foaming" and spillage.

4.2 Operating procedures must exist for inspection, cleaning, blasting and other process maintenance activity.

4.3 The operating temperature of molten materials shall be maintained within the defined limits required by the process. Temperature ranges must be established and a system for identifying, recording and managing any deviations must be in place.

4.4 Fuel combustion systems must be designed to prevent the potential to produce explosive gas or gas/solid mixtures.

4.5 All hazardous fumes and gaseous products must be captured/contained and rendered safe.

5.0 Molten Material Transfer

5.1 A risk analysis of molten material transport roads must be carried out to identify and modify design (e.g. turns and bends), maintenance (e.g. road cleanliness and roughness requirements) and operational (e.g. speed and vehicle design requirements) issues that could result in metal spillage or loss of vehicle control.

5.2 Molten material transport vehicles must be kept away from other vehicles and pedestrians on properly marked roadways with defined traffic rules.

5.3 Transport systems, e.g. launders, must be built so that excessive flows will be readily diverted to a designated overflow vessel or receptacle of adequate size to accommodate spills of any size identified during the risk analysis.

5.4 There must be a system for inspecting and maintaining equipment used for lifting molten materials e.g. crane cables, brakes, crane rails, wheels, hooks, blocks and controls. The system must be capable of assuring that this equipment continues to function to its design specification.

6.0 Protective Equipment

6.1 Hazard reviews must be carried out to establish access control and personal protective equipment requirements in areas and for tasks where there is the potential for spillage, emissions of flame or gases, or explosion.

6.2 Vehicle cabs and operating positions exposed to splashes must be protected with transparent screens, made from an appropriate material, e.g. Lexan.