

## Group Standard

### D6 – Process safety

Group standard	Title: <b>Process safety</b>			
	Function: <b>Health, Safety, Environment and Communities (HSEC)</b>			
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Owner: <b>Global head of Health, Safety, Environment and Communities</b>		Approver: <b>Executive Committee</b>		Target Audience: <b>All Rio Tinto employees and contractors and each Rio Tinto Group business and function</b>
Direct Linkages to other relevant Policies, Standards, Procedures or Guidance notes: <b>Rio Tinto Management system standard.</b> <b>D2 – Molten materials standard.</b> <b>H1 – Chemicals and hazardous substances exposure control standard.</b> <b>Group asset management standard.</b> <b>Group crisis communications plan.</b> <b>Process safety Group procedures on Process safety governance, roles and capability, Process Safety Hazard Identification and Risk Analysis, Process safety operational control and management, Process safety monitoring and improvement.</b>				
Document purpose: <b>To support implementation of the Group HSEC policy. It defines the minimum requirements to support implementation of Rio Tinto management system standard in terms of process safety management.</b>				

## D6 – Process safety

### Intent and scope

This standard is applicable to all Rio Tinto business units and managed operations (including supply chain<sup>1</sup>) and projects.

The intent of this standard is to set minimum expectations for effective process safety management within Rio Tinto and to ensure where we have process safety risks, we focus on process safety in addition to our focus on personal safety.

The standard applies to the activities and equipment where the following process hazards exist:

- a) chemical and physical explosion;
- b) fires involving process material (includes only materials used or stored in relation to the process, i.e. excludes electricity generation facilities and bulk fuels for transportation use);
- c) loss of containment of toxic, asphyxiant, corrosive, reactive, hot materials in bulk, (excluding laboratory materials);
- d) engulfment or physical impact from failure of bulk storage of process material and process tankage (includes only materials used or stored in relation to the process, excluding dams); and
- e) third-party exposure that could have a major or catastrophic HSEC consequence on Rio Tinto managed operations and projects.

The specific types of activities, equipment and materials for which the standard shall be applied are detailed in the appendix.

### Control requirements

Requirements in this standard apply in addition to any defined in the Rio Tinto Management System and legal and other requirements.

The process safety requirements in this standard are sequenced as per Rio Tinto's adopted four component integrated model for process safety.

The detail and level of effort required to demonstrate compliance with this standard is further outlined in the supporting process safety Group Procedures.

Definitions for terms can be found in the HSEC definitions database on the Group HSEC portal.

### Planning

*Our commitment to process safety Organisational resources, accountabilities and responsibilities*

- 1.1 Sites must define the organisational structure, accountabilities and responsibilities as they relate to process safety in accordance with the Group procedure Process safety governance, roles and capability.
- 1.2 Governance, communication and engagement processes must be in place to ensure the management of process safety. This must include the overall accountability up to the site's most senior leader and a nominated manager responsible for the process safety standard.

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<sup>1</sup> To the point of custody transfer, which means the point to which the site has ownership, the boundary of the supply terminal or the point in the supply chain where the HSEC or reputational consequence to the site from an incident could be Major or Catastrophic (regardless of likelihood).

- 1.3 Process safety roles for safe plant operation and maintenance must be defined and allocated.

*Training, competency and awareness*

- 2.1 Induction processes must include an overview of the process and process safety hazards relevant to the individuals exposed.
- 2.2 Sites must have a training, competency and awareness programme for process safety relevant roles (including site management and front-line personnel), including consideration of return to work and periodic refreshment according to the risk, and in accordance with the Group procedure Process safety governance, roles and capability.

*Understanding hazards and risks Process safety information*

- 3.1 Sites must document and maintain current and available process safety information (PSI) pertaining to:
- a) the process safety hazards on site;
  - b) the technology of the processes where the hazards exist; and
  - c) the equipment lists of the processes where the hazards exist.

*Hazard identification*

- 4.1. Sites must undertake a systematic process to identify all process safety hazards and credible risk scenarios (including third party hazards that could potentially impact the site), as outlined in the Group procedure Process safety hazard identification and risk analysis.
- 4.2. Process safety risk scenarios must be reflected in the site's risk register.

*Inherent safety and plant layout*

- 5.1. Sites must have a process in place to ensure that process safety is incorporated in the design of new processes and facilities to align with the six stage hazard study process in the Group procedure Process safety hazard identification and risk analysis.
- 5.2. Sites must conduct a plant layout study for process safety hazards (including impacts to or from third parties and neighbouring facilities) that complies with the minimum requirements and criteria outlined within the Group procedure Process safety hazard identification and risk analysis. The plant layout study must be conducted (or reviewed) for the following circumstances:
- a) where a plant layout study does not exist;
  - b) periodically, not exceeding five years;
  - c) in response to a modification to a process safety relevant process or its operational context; and
  - d) in response to an actual major or catastrophic incident.
- 5.3. Process safety exposures to temporary and permanent occupied buildings must be identified, evaluated and managed to the occupied buildings criteria outlined in the Group procedure Process safety hazard identification and risk analysis.
- 5.4. Site layout plans must be developed and maintained showing the hazard impact range of process safety scenarios, for input into facility siting, plant layout and emergency planning.

- 5.5. Sites must have a documented process to prevent the siting of temporary occupied buildings within intolerable zones as per the occupied buildings criteria outlined in the Group procedure Process safety hazard identification and risk analysis.

#### *Process hazard analysis*

- 6.1. A process hazard analysis must comply with the minimum requirements outlined within the Group procedure Process safety hazard identification and risk analysis. Process hazard analysis must be applied to identified process safety hazards in the following circumstances:
- a) for all new process safety facilities or processes;
  - b) where process hazard analysis does not exist;
  - c) periodically not exceeding five years;
  - d) in response to a modification to a process safety relevant process or its operational context; and
  - e) in response to an actual major or catastrophic incident.
- 6.2. Facilitators of process hazard analysis must be deemed independent and competent in the application of the approach and capable of application in the hazard environment under consideration.
- 6.3. Human factors must be identified, evaluated and treated as part of the management of process safety hazards as specified in the Group procedure Process safety hazard identification and risk analysis.

### **Implementation and operation**

#### *Systems to manage risk Pre-startup safety reviews*

- 7.1 There must be a systematic process for pre-startup safety review (PSSR) to ensure a facility and process is in a safe condition to start-up and that personnel are properly prepared before start-up. The PSSR process must be applied for start-up of new or modified facilities and processes, or a change significant enough to require up-dating process safety information, or an extended shutdown.

#### *Operating procedures*

- 8.1. Sites must have current and controlled operating procedures for processes with process safety hazards, according to the risk, that:
- a) outline the steps for each operating phase, including start-up, normal operations, normal shutdown and emergency shutdown;
  - b) clearly define the safe operating envelope (SOE), the steps required to prevent an excursion outside of the SOE, the consequences of excursion and clear instructions on actions to be taken if an excursion occurs; and
  - c) describe safety systems and their functions.

#### *Process safety critical controls*

- 9.1. There must be a process to clearly communicate what are the process safety critical controls throughout all elements of the management system.
- 9.2. Sites must identify all process safety critical controls, as per the Group procedure Process safety hazard identification and risk analysis.

- 9.3. Process safety critical controls must be designed, implemented, verified, operated and maintained, to ensure their effectiveness.
- 9.4. Process safety critical controls must be designed and implemented in consideration of human factors, as defined in the Group procedure Process safety operational control and management.

#### *Process safety asset integrity*

- 10.1. Sites must have a programme to maintain the integrity of process safety assets. The programme must ensure assets are periodically inspected, tested and maintained in accordance with recognized and generally accepted good engineering practice to support continued integrity, fitness for service and to meet relevant government requirements. The programme must include:
  - a) an evaluation of asset criticality from a process safety perspective;
  - b) process safety critical assets must be classified and managed as critical assets in accordance with the Group asset management standard; and
  - c) maintenance tactics for all process safety assets.
- 10.2. A process must be in place to manage deviations from approved inspection and maintenance programmes for process safety assets and must be authorised by specified, competent individuals, at a level commensurate with the risk. For deviation of process safety critical assets, approval to a level authorized by the most senior site leader is required.

#### *Design, installation and fabrication*

- 11.1. There must be a formal inspection and confirmation process to ensure design, fabrication, and installation are in conformance with design specifications and manufacturer's instructions, and suitable for the process application.
- 11.2. Sites must ensure that specifications for materials, spare parts and equipment are relevant for the required application and are in place.
- 11.3. Sites must ensure that process safety assets are designed, fabricated and installed suitable for the process application.

#### *Management of change*

- 12.1. The site's management of change process must be specifically designed to function in a process safety context, considering the following aspects:
  - a) identification / classification of what constitutes a change;
  - b) level of technical and risk evaluation of a change;
  - c) level of authority for approving a change; and
  - d) conducting and/or updating process hazard analysis and process safety information where there is a significant change.
- 12.2. A formal process must be in place to manage risk where a process safety control is compromised, disabled or impaired and must be authorised by specified, competent individuals, at a level commensurate with the risk. For compromise, disablement or impairment of process safety critical controls, approval from the site's most senior leader and an independent competent person is required.

### *Business resilience and recovery*

- 13.1. Response to process safety incident scenarios must be explicitly included in a site's business resilience and recovery planning.
- 13.2. Where there is a potential off-site risk or third-party exposure on-site, a coordinated approach to emergency preparedness and response with relevant external services must be developed and in place.

## **Monitoring**

### *Learning from experience Measuring and monitoring*

- 14.1. Sites must define appropriate lagging and leading performance indicators to measure the integrity and performance of process safety systems and controls and these must be approved by the site's most senior leader.
- 14.2. The site must monitor, evaluate and report against the defined performance indicators.
- 14.3. Reporting must be aligned with the organisational structure and report performance to at least the site's most senior leader.

### *Incident and action management*

- 15.1. Process safety incidents must be classified by actual impact, maximum reasonable consequence and process loss of containment.
- 15.2. All reported process safety incidents must be investigated to a level of detail approved by the site's most senior leader in consultation with the nominated manager responsible for the standard.
- 15.3. Human factors must be identified, analysed and discussed as part of incident and action management as specified in the Group procedure Process safety monitoring and improvement.
- 15.4. The outcome from investigations (including root causes and actions) from process safety incidents with a maximum reasonable consequence of major or catastrophic, must have sign-off from the site's most senior leader and be shared at least at the product group level.
- 15.5. Sites must have a process to identify, evaluate and action learnings from relevant process safety incidents external to the site.

### *Performance assessment and auditing*

- 16.1. Sites must have an internal (first party) assurance process including annual riskbased auditing of compliance to the standard and verifying the effectiveness of process safety management implementation.
- 16.2. The scope, schedule and outcomes from internal assurance must be approved by the site's most senior leader.

## Appendix

This standard applies to the part of an operation or project where the following hazards and thresholds exist:

- a) Chemical and physical explosion:
  - Explosive dust within processing and power facilities.
  - Flammable gas storage and handling greater than 1,000 kg individually or greater than combined total volume of 5,000 kg (excludes cylinders for laboratory use, localised accommodation heating and mobile equipment fuel).
  - Gas fired appliances with volume of combustion chamber greater than 5 m<sup>3</sup>.
  - Carbon monoxide storage and handling is an explosion risk but quantities are determined by toxic hazard (see limits below).
  - Molten material (as triggered by the standard D2 - Molten materials).
  - Pressure equipment exceeding 5,000 MPa.L (operating pressure x volume) (excludes pressurised fire suppression systems and portable gas cylinders).
- b) Fires involving process material (includes only materials used or stored in relation to the process, i.e. excludes electricity generation facilities and bulk fuels for transportation use):
  - Combustible solvents and process material storage and handling greater than 100,000 kg.
  - Flammable solvents and process material storage and handling greater than 10,000 kg.
  - Flammable gas pipelines exceeding 1,000 MPa.mm<sup>2</sup> (pressure x diameter<sup>2</sup>).
- c) Loss of containment of toxic, asphyxiant, corrosive, reactive, hot materials in bulk, (excluding laboratory materials) including:
  - Chlorine, chlorides, fluorine, fluorides, sulphur dioxide and sulphur trioxide storage and handling, greater than 25 kg (excludes cylinders for laboratory use) or more than 25 kg generated in the process in one hour.
  - Carbon monoxide (as a toxic risk), anhydrous ammonia (gaseous ammonia) or concentrated ammonia solution (e.g., aqua ammonia) storage and handling greater than 125 kg (excludes cylinders for laboratory use) or more than 125 kg generated in the process in one hour.
  - Calcium carbide and sodium hydrosulphide storage and handling greater than 1,000 kg (excludes cylinders for laboratory use) or more than 1,000 kg generated in the process in one hour.
  - Moderate acid or base storage and handling greater than 10,000 kg.
  - Arsine generated in the process.
  - Hot materials stored, used or generated in the process greater than 10,000 L and at a temperature greater than 80 degrees Celsius.
  - Nitrogen and argon storage and handling greater than greater than 10,000 kg.
  - Oxygen storage and handling (due to reactive risk) greater than 100 kg individually or greater than combined total volume of 1,000 kg (excludes cylinders for laboratory use).
- d) Engulfment or physical impact from failure of bulk storage of process material and process tankage (includes only materials used or stored in relation to the process, excluding dams):
  - Bulk tank storage greater than 600 m<sup>3</sup> and 5 m high (to the top of the tank above ground level).
- e) Third-party exposure:
  - Third-party hazardous process materials or energy that could have a major or catastrophic HSEC consequence on Rio Tinto managed operations, projects and legacy sites. Where a site has only a third party exposure under this guideline, it only needs to reference the relevant sections of the guideline (Hazard identification and risk management).