



Australian Government

PMAOPS460A Monitor and operate tailings management facilities

Release 1

PMAOPS460A Monitor and operate tailings management facilities

Modification History

Release 1 – New unit

Unit Descriptor

This unit of competency covers the skills and knowledge needed to monitor tailings disposal sites, identify and manage risks (business and environmental), and respond to threats to tailings site integrity.

Application of the Unit

This unit applies to a person who has the responsibility for deposition of tailings from early stage metalliferous beneficiation processes and monitoring and operating tailings management facilities for the duration of a facility's life. The work may involve assessing risks associated with a tailings management facility, operating equipment to deposit tailings in the tailings management facility, taking measurements and making observations on the integrity of the facility, and taking actions to prevent or ameliorate adverse environmental outcomes from the tailings management facility. The type of people to whom this unit may apply include (but are not limited to):

- environmental officer
- process worker
- operator
- inspection and monitoring officer.

This unit applies to an individual working alone or as part of a team or group and working in liaison with other shift team members and the control room operator, as appropriate.

Where sampling and testing is part of this job, *MSAPMSUP292A Sample and test materials and product* may also be relevant.

Where operating a vehicle is part of the job, *PMASUP236B Operate vehicles in the field* may also be relevant

This unit requires a detailed knowledge about the characteristics of the tailings (particularly as they occur in regard to the facility being managed), the design of the tailings management facility, methods of tailings disposal and deposition and associated equipment, water balance issues and environmental risks. Understanding of related processes and plant that produces tailings would be beneficial.

This unit has been written with a focus on early stage metal beneficiation processes in mind, particularly in regard to processes associated with aluminium, iron, gold, copper, tin, silver, lead and zinc. Tailings management facilities may have deposited material suspended in varying levels of water ranging from slurry (e.g. 'red mud'), through high slump pastes (e.g. filter cake) to low slump pastes, but the focus has been on sub-aerial deposition (not subaqueous or sea deposition). While not specifically considered, the unit should also be applicable to other types of waste that might be deposited in a tailings management facility, including overburden and possibly slag or other solid waste products from later metalliferous processes with appropriate contextualisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

- | | | | |
|---|------------------|-----|---|
| 1 | Prepare for work | 1.1 | Identify work requirements |
| | | 1.2 | Identify and control work health and safety (WHS) hazards and identify risks to the environment |
| | | 1.3 | Coordinate with appropriate personnel, including facility managers and team members |
| | | 1.4 | Check for recent work undertaken on facility |
| | | 1.5 | Note any outstanding/incomplete work |
| | | 1.6 | Check operational status of ancillary/feed equipment |
| | | 1.7 | Complete any required pre-start checks, including an assessment of process production levels, and therefore likely tailings production levels |

- | | | | |
|---|--|-----|---|
| 2 | Operate equipment for tailings deposition | 2.1 | Access and interpret process waste/tailings management plan and comply with documented processes |
| | | 2.2 | Identify the type of facility equipment and assess the appropriateness of the equipment given the tailings physical characteristics |
| | | 2.3 | Start up and shut down deposition equipment according to the tailings management plan and equipment type and duty |
| | | 2.4 | Measure and report on rate of flow, tailings characteristics and deposition outcomes, as required |
| | | 2.5 | Set plant to deliver tailings to appropriate location of discharge point according to tailings management plan |
| | | 2.6 | Complete routine checks, logs and paperwork, taking appropriate action on unexpected readings and trends |
| | | 2.7 | Discharge tailings, as appropriate, based on set rotation sequence for discharges ('paddocks') and duration of deposition |
| 3 | Monitor and control tailings management facility | 3.1 | Carry out routine plant and facility inspections |
| | | 3.2 | Record observations |
| | | 3.3 | Collect samples and conduct and analyse tests, as required |
| | | 3.4 | Calculate operational performance against standards established in the tailings management plan |
| | | 3.5 | Report operational condition of the tailings management facility |
| 4 | Recognise problems and take appropriate action | 4.1 | Recognise developing situations which may require action |
| | | 4.2 | Calculate water balance, as required |
| | | 4.3 | Adjust inflows and outflows (e.g. decant rate and tailings inflow) appropriately to respond to potential water imbalance especially overflows |

- 4.4 Identify problems arising from dust generated in tailings management facilities
 - 4.5 Respond to dust problems, as appropriate
 - 4.6 Apply 'mud farming' where dusting (for instance in arid, low rainfall regions) is prevalent to keep the surface moist
 - 4.7 Report any issues identified with the integrity of the equipment delivering tailings to the management facility
 - 4.8 Apply the requirements of the Emergency Management Plan in case of significant breaches of tailings management facility integrity (for instance a breach of dam wall)
- 5 Isolate and de-isolate facility
 - 5.1 Isolate equipment
 - 5.2 Make safe for required work
 - 5.3 Check is ready to be returned to service
 - 5.4 Prepare for return to service

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- conducting a range of tests to measure tailings management facility performance, including for water quality, dam wall movement, water pressure and water flow
- interpreting outcome measures from tests performed
- recognising conditions which will lead to out of specification operation
- implementing enterprise procedures against the waste/tailings management plan within time constraints and in a manner relevant to the correct use of the equipment
- conveying information relevant to the operation clearly and effectively
- using communication technology
- driving vehicles in remote settings with limited support, as required
- maintaining appropriate levels of quality assurance
- reading and numeracy to interpret workplace documents, calculate various indices and interpret technical information
- applying mathematics to the level of year 10

Required knowledge

Required knowledge, to the breadth and depth required for the operation of the tailings management facility, includes:

- principles of operation of pumps under conditions of different tailings consistency and water percentage
- principles of operation of conveyor belts under conditions of different tailings consistency and water percentage
- process parameters and limits of tailings disposal plant (e.g. pressure, flow and pH)
- duty of care obligations
- hierarchy of control
- communication protocols (e.g. radio, phone, computer, paper and permissions/authorities)
- typical issues causing problems (plant/equipment, process, environmental) and the resolution of those problems
- relevant alarms and actions
- physics and chemistry relevant to the tailings being managed and their chemical, physical, handling and placement characteristics

- relevant environmental and heritage requirements
- mathematical formulae and their application to waste management calculations, as needed

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria required skills and knowledge range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Critical aspects for assessment and evidence are:

- work requirements are identified
- appropriate routine checks, logs and paperwork are completed and appropriate action planned, as required
- routine plant and facility inspections are properly carried out
- problems are identified and responses planned
- work environment and equipment are made safe for use.

Context of and specific resources for assessment

Assessment of this competency will occur over a range of situations which will include typical disruptions to normal, smooth operation. This will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability. Where safety, lack of opportunity or significant cost is an issue an industry-based simulation may be employed to assist the process.

Guidance information for assessment

Assessment processes and techniques must be appropriate to the language, competency and safety requirements of the site and consistent with workplace systems or procedures.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Procedures

Procedures may be written, verbal, computer-based or in some other form. They may include, but are not

limited to:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant
- good operating practice as may be defined by industry codes of practice

Procedures would be expected to comply with any relevant government regulations.

Logs and reports

Logs and reports may include:

- paper or electronic-based logs and reports
- verbal/radio reports
- reporting items found which require action

Appropriate action

Appropriate action includes, but is not limited to:

- positioning of the decant pond, damp or seepage at the dam wall, status of leak detection systems, any unusual vegetation or wildlife occurrences, tailings surface status, and integrity of the dam wall
- recording piezometer readings on water pressure, groundwater quality, seepage and leakage rates through notch weirs, settlement and displacement survey measurements of dam walls
- calculating water balance based on measures of inflow (with tailings, rainfall, catchment run-off, and so on), storage and outflow (seepage, water reclaim, evaporation, and so on)
- responding to dust issues by spraying with chemical dust suppressants, covering the tailings with gravel, setting up silt trap fences or changing the tailings water ratio to maximise the wetted surface
- determining problems needing action
- accessing and applying relevant technical and plant data
- applying appropriate problem solving techniques to determine possible fault causes
- rectifying problem using appropriate solution within area of responsibility
- following through items initiated until final resolution has occurred

- reporting problems outside area of responsibility/ability to designated person

Typical problems

Typical problems may include, but are not limited to:

- rupture of the tailings slurry delivery pipeline or decant water return pipeline
- rainfall induced erosion of the tailings facility containment wall or water imbalance
- geotechnical failure/excessive deformation of containment wall
- overfilling with tailings beyond management facility capacity, especially the result of unpredicted tailings production
- seepage of hazardous materials through the dam wall or through the foundation into the groundwater
- dust emissions especially of toxic materials
- uncontained floodwater in high rainfall areas

Tailings/waste characteristics

Tailings/waste characteristics include:

- mineralogy: residual resource potential, and plant nutrients
- chemical reactivity: toxicity, leachate potential, acid producing potential, spontaneous combustion, cementation/hydration and weathering
- physical characteristics: particle size distribution, particle density compressibility, shear strength, liquefaction potential, erodibility and dusting potential
- placement characteristics: placed dry density, particle sorting, permeability, bearing capacity and initial placement density
- handling characteristics: solids content of slurries, trafficability during placement, flocculation/settling time and abrasiveness

Tailings disposal strategy

Tailings disposal strategy can include:

- use/operating of equipment, such as pipes, pumps, conveyor belts, pipeline delivering tailings to management facility (leaks, blockages) and associated equipment (for instance centrifugal or positive displacement pumps)
- the location of discharge points
- the rotation sequence for discharges
- the duration of deposition in an area
- the location of settling ponds and decant facilities

- the location and timing of intermediate paddock bunding
- the likely landform created by the deposition processes at stages throughout operations up to and including final landform
- flowable volumes and potential flow paths
- operational maintenance requirements (e.g. dust suppression, fauna exclusion and drainage)

Health, safety and environment (HSE)

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence.

Work requirements

Work requirements may come from briefings, handovers and work orders and may include:

- compliance documentation
- product specifications
- nature and scope of tasks
- achievement targets
- operational conditions
- geological data
- site survey data
- site layout and out of bounds areas
- worksite inspection requirements
- lighting conditions
- plant or equipment defects
- hazards and potential hazards
- coordination requirements or issues

Unit Sector(s)

Competency field Operational/technical

Unit sector

Custom Content Section

Not applicable.