



Australian Government

PMAOPS460 Monitor and operate tailings management facilities

Release: 1

PMAOPS460 Monitor and operate tailings management facilities

Modification History

Release 1. Supersedes and is equivalent to PMAOPS460A Monitor and operate tailings management facilities

Application

This unit of competency covers the skills and knowledge required to monitor and operate a tailings disposal site.

This unit of competency applies to environmental officers, operators or those in similar roles who are required to apply in-depth knowledge to identify risks (business and environmental), operate equipment to deposit tailings in the tailings management facility (TMF), take measurements and make observations on the integrity of the facility, and take actions to prevent or ameliorate adverse environmental outcomes from the tailings management facility.

This unit of competency applies to early stage metal beneficiation processes, typically associated with aluminium, iron, gold, copper, tin, silver, lead and zinc. The TMF will 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; the focus being sub-aerial deposition (not subaqueous or sea deposition).

However, with appropriate contextualisation the unit of competency may be applied to other types of waste deposited in a TMF, including overburden, slag or other solid waste products from later metalliferous or other processes.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Operations

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- | | | | |
|---|-------------------------|-----|---------------------------------|
| 1 | Prepare for work | 1.1 | Receive and give shift handover |
|---|-------------------------|-----|---------------------------------|

- 1.2 Identify work requirements.
 - 1.3 Identify and control work health and safety (WHS) hazards and identify risks to the environment
 - 1.4 Coordinate with appropriate personnel
 - 1.5 Check for recent work undertaken on TMF
 - 1.6 Note any outstanding/incomplete work
 - 1.7 Check operational status of TMF and ancillary equipment
 - 1.8 Coordinate with appropriate personnel, including facility managers and team members
- 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 Measure and report on rate of flow, tailings characteristics and deposition outcomes, as required
 - 2.4 Set plant to deliver tailings to appropriate location of discharge point according to tailings management plan
 - 2.5 Complete routine checks, logs and paperwork, taking action on unexpected readings and trends
 - 2.6 Discharge tailings, as appropriate, based on set rotation sequence for discharges ('paddocks') and duration of deposition
- 3 **Monitor and control TMF in accordance with procedures**
 - 3.1 Carry out routine plant and facility inspections
 - 3.2 Check flora and fauna near TMF
 - 3.3 Check for indications of problems with TMF containment/wall
 - 3.4 Monitor indicators of location of phreatic zone

- 3.5 Check beaching and decant water draw off locations
 - 3.6 Collect samples and conduct and analyse tests
 - 3.7 Record observations
 - 3.8 Compare operational performance against standards established in the tailings management plan
 - 3.9 Adjust spigots (feed) and decant location (withdrawal) to optimise operation of TMF
 - 3.10 Report operational condition of the tailings management facility
- 4 **Recognise problems and take action in accordance with procedures**
 - 4.1 Recognise developing situations which may require action
 - 4.2 Use water balance principles to determine adequacy of TFM capacity
 - 4.3 Adjust inflows and outflows (e.g. decant rate and tailings inflow) to respond to potential water imbalance especially overflows
 - 4.4 Identify and respond to problems arising from dust generated in TMF
 - 4.5 Report any issues identified with the integrity of the equipment delivering tailings to the TMF
 - 4.6 Apply the requirements of the emergency management plan in case of significant breaches of TMF integrity (for instance a breach of dam wall).
- 5 **Isolate and de-isolate facility**
 - 5.1 Complete any required pre-start checks
 - 5.2 Start up/shut down TMF plant and equipment according to their type and duty in liaison with other personnel
 - 5.3 Start up/shut down/changeover component plant items which are part of the TMF according to their type and duty in liaison with other personnel
 - 5.4 Isolate entire TMF and/or any component plant item

- 5.5 Make safe for required work
- 5.6 Check TMF/plant item is ready to be returned to service
- 5.7 De-isolate and prepare TMF plant unit/plant item for return to service

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (HSE) requirements, which may be imposed through state/territory 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.

Hazards

Hazards include one or more of the following:

- drowning
- breach of TMF containment
- structural collapse

- equipment failures
- industrial (machinery, equipment and product)
- hazardous products and materials
- unauthorised personnel
- slippery surfaces, spills or leaks
- extreme weather
- other hazards that might arise

Procedures All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, include one or more of the following:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Routine problems

Routine problems are predictable problems with known solutions and include one or more of the following:

- 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 or storm event
- seepage of hazardous materials through the dam wall or through the foundation into the groundwater
- migration of the phreatic zone so as to emerge from the face of the dam wall
- dust emissions especially of toxic materials
- uncontained floodwater in high rainfall areas

Non-routine problems

Non-routine problems are unexpected problems, or variations of previous problems and must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person

Operational knowledge includes one or more of the following:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people

Logs and reports Logs and reports include one or more of the following:

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

Action

Action in accordance with procedures includes one or more of the following:

- 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), and 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

Tailings/waste characteristics

Tailings/waste characteristics include the following:

- 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 includes one or more of the following:

- 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)

Work requirements

Work requirements will be identified from one or more of the following:

- briefings
- handovers
- orders
- compliance documentation
- product specifications
- nature and scope of tasks
- achievement targets
- operational conditions

- lighting conditions
- plant or equipment defects
- hazards and potential hazards
- coordination requirements or issues

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

Assessment Requirements for PMAOPS460 Monitor and operate tailings management facilities

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria, and include the ability to:

- conduct checks/tests to measure tailings management facility (TMF) performance, including water quality, dam wall movement, water pressure and water flow
- interpret outcome measures from tests performed
- identify early warning signs of equipment/processes needing attention or with potential problems
- implement emergency management plan
- identify environmental risks and take appropriate action
- operate and monitor deposition and decant equipment.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- types and characteristics of site-specific tailings
- design of tailings management facilities and impact on environmental risk
- methods of tailings disposal and deposition and associated equipment
- environmental risk and environmental management
- water balance and related issues
- 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)
- typical issues causing problems (plant/equipment, process, environmental) and the resolution of those problems
- relevant environmental and heritage requirements
- hierarchy of control
- hazards that may arise in the job/work environment, and:
 - their possible causes
 - potential consequences
 - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
 - should occur over a range of situations which include typical disruptions to normal, smooth operations
 - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
 - must include the use of industrial type TMF allowing operation and checking
 - may use industry-based simulation for part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible, or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment reflecting realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
 - walk-throughs
 - pilot plant operation
 - demonstration of skills
 - industry-based case studies/scenarios
 - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.

- In addition, the assessor or anyone acting in subject matter expert role in assessment must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
 - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
 - conducting on-the-job training/assessments of the type of work being assessed
 - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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