



Australian Government

PMAOPS560 Plan and design tailings management facilities

Release: 1

PMAOPS560 Plan and design tailings management facilities

Modification History

Release 1. Supersedes and is equivalent to PMAOPS560A Plan and design tailings management facilities

Application

This unit of competency covers the skills and knowledge required to plan and design tailings management facilities (TMF). It applies where the activities of a metals, minerals or other processing plant produces waste in the form of tailings (e.g. slag and slurry) or wastewater.

This unit of competency applies to health, safety and environment (HSE) managers/officers, frontline managers, site managers/officers or those in similar roles who are required to develop risk identification and management strategies (business and environmental) and scope and design tailings disposal management systems and facilities.

This unit of competency applies to a person who has the responsibility for the planning and design of a company's tailings waste management system or the planning and design of tailings-specific disposal sites from the early stage metalliferous processes. This would include the planning and design of an environmental management system focused on continual improvement to review, prevent, mitigate or ameliorate adverse environmental impacts and which will provide for the safe storage and disposal of residual wastes and process residues.

This unit of competency applies to early stage metal beneficiation processes, typically associated with aluminium, iron, gold, copper, tin, silver, lead and zinc, and similar processes. 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 this 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 processes.

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

Some jurisdictions may define requirements for tailings storage facility design, construction and ongoing management. Users should check with the relevant authorities and adhere to any such requirements.

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	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
2	Research waste/tailings management requirements	2.1	Research and identify the type and volume of waste generated from process operations
		2.2	Research and identify the type and amount of waste management equipment required
		2.3	Research and identify specific legislation relevant to tailings storage facility design, construction and ongoing management
		2.4	Identify any organisational-specific waste management requirements, practices or processes
		2.5	Search for, and cost out, tailings equipment, resources, development and maintenance requirements
		2.6	Research waste risk management plans and practices
		2.7	Research environmental, WHS and community implications to waste management plan and design
		2.8	Consolidate findings from waste/tailings management requirements, and research and use to inform planning and design considerations
3	Undertake site investigations	3.1	Conduct initial site visit to inform the planning and design of TMF requirements
		3.2	Determine facility needs, including scope for variation (i.e. diurnal and process variations)

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| | | 3.3 | Plan contingencies for developing or future situations which may require action to be pre-planned |
| | | 3.4 | Adjust initial planning and design plans, as appropriate, to incorporate findings of investigations |
| | | 3.5 | Collect samples and information from site visit for further investigation to inform waste management planning and design |
| | | 3.6 | Identify key operating personnel, practices and equipment to be considered in the planning and design phase |
| 4 | Analyse and assess design criteria | 4.1 | Analyse and assess the design criteria requirements for the type and volume of waste generated from process operations |
| | | 4.2 | Analyse and assess the design criteria for the type and amount of waste management equipment required |
| | | 4.3 | Analyse and assess design criteria based on the specific legislation required |
| | | 4.4 | Analyse and assess design criteria in line with organisational-specific waste management requirements, practices or processes |
| | | 4.5 | Analyse and assess tailings equipment, resources, development and maintenance requirements, and cost implications |
| | | 4.6 | Analyse and assess risk management plan design criteria |
| | | 4.7 | Analyse and assess implications to operational personnel, training needs and human resource requirements |
| | | 4.8 | Analyse and assess safety concerns |
| 5 | Assist drafting of TMF construction plan | 5.1 | Plan and review tailings management scope |
| | | 5.2 | Develop timeline, schedule, milestone dates and time management plan |

- 5.3 Develop cost management plan with built-in review and tracking processes
- 5.4 Develop quality management criteria plan with periodic reviews
- 5.5 Develop skill, knowledge, training and human resource requirements with built-in review processes
- 5.6 Develop information generation, distribution and communication plan with structured review of outcomes
- 5.7 Develop risk management plan with risk management strategies, issues registers, opportunities identification and review of outcomes protocols
- 5.8 Develop procurement management plan complete with procurement criteria and requirements, procurement contract management processes and review periods

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
- NSW Dams Safety Act, 1978 and the New South Wales the Dams Safety Committee or similar bodies in other states/territories

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:

- overtopping of dam wall
- breach/collapse of dam wall
- construction hazards
- operational hazards (e.g. drowning)
- eco hazards (e.g. wildlife)
- hazardous products and materials
- 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

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

Design criteria Design criteria include providing sufficient capacity for the adequate

functioning of the TMF and include the following:

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

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
- geological data
- site survey data
- site layout and out of bounds areas
- worksite inspection requirements

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMAOPS560A Plan and design tailings management facilities

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 PMAOPS560 Plan and design 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:

- assess business and environmental risk and incorporate risk management strategies into design
- develop plans for tailings management facility (TMF) that specify technical, budgetary, plant/equipment, human resource, legislative and safety requirements
- determine and plan for conditions which will lead to out-of-specification operations
- plan and develop enterprise procedures for the waste/tailings management plan.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- tailings/waste characteristics and their impact on design of facilities, including:
 - 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 strategies/issues, including:
 - 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)
- principles of operation of waste treatment and management of different tailings and water types, volumes and consistency.

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 is best done from a report and/or folio of evidence drawn from:
 - a single project which provides sufficient evidence of the requirements of all the elements and performance criteria
 - multiple smaller projects which together provide sufficient evidence of the requirements of all the elements and performance criteria.
- A third-party report, or similar, may be needed to testify to the work done by the individual, particularly when the project has been done as part of a project team.
- Assessment should use a real project in an operational workplace. Where this is not possible or practical, assessment must occur using 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.
- Knowledge evidence may be collected concurrently with performance evidence 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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