



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **NWP327A Inspect and report on concrete dam safety**

**Revision Number: 1**

## **NWP327A Inspect and report on concrete dam safety**

### **Modification History**

Not applicable.

### **Unit Descriptor**

**Unit descriptor** This unit of competency describes the outcomes required to plan, implement and report on concrete and masonry dam safety inspection. This requires the operator to conduct routine visual inspection, capture and report dam condition and faults in dams. Dam safety operators should be aware of the damage potential of the dam and be able to recognise and report deficiencies, or adverse trends that could lead to failure.

### **Application of the Unit**

**Application of the unit** This unit is required by operators with responsibility for the inspection of concrete dams and reporting of faults or trends.

This unit forms part of the skills set for:

Monitor and inspect concrete dams

### **Licensing/Regulatory Information**

Not applicable.

### **Pre-Requisites**

Not applicable.

## Employability Skills Information

**Employability skills** 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

| ELEMENT  | PERFORMANCE CRITERIA  |
|--|---|
| <b>1 Plan and prepare concrete dam inspection</b>                        | 1.1 Identify and apply the relevant <i>organisational procedures and proformas</i> relating to concrete dam safety inspection.<br>1.2 Identify features of concrete dam types and their applications relevant to the dams to be inspected.<br>1.3 Identify concrete <i>dam behaviour</i> under a range of <i>conditions</i> .<br>1.4 <i>Assess</i> information from checklists and previous inspection reports.<br>1.5 Schedule activities and equipment for concrete dam inspection according to workplace requirements. |
| <b>2 Inspect and assess the condition of components of concrete dams</b> | 2.1 Implement concrete dam inspection procedures and practices including for <i>unusual events</i> according to <i>organisation and regulatory information</i> .<br>2.2 Inspect and assess the condition and performance of identified areas and features of the concrete dam.<br>2.3 Recognise, record and assess any faults and changes in the condition of the concrete dam and its appurtenant structures.  |
| <b>3 Report the condition of the components of the concrete dams</b>     | 3.1 Compare observations with previous inspection reports.<br>3.2 Collect and record <i>evidence</i> to establish the extent of changes in conditions.<br>3.3 Prepare and submit inspection reports to meet organisational requirements.<br>3.4 Report significant changes and deviations with recommendations for follow up action.  |

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

#### Required skills:

- follow instructions, standard operating procedures, policies and standards for concrete dam safety
- plan and organise work schedules and responses to contingencies
- communicate with engineering professionals, team members and the public on concrete dam safety using clear and direct communication and identifying and confirming monitoring requirements
- record and report information and interpret a range of workplace documents
- make mathematical calculations to collect and process data from dam inspections
- identify concrete dam faults and failure indicators
- assess the importance and urgency of deficiencies
- collect and process concrete dam observation information
- read and interpret plans, drawings and charts
- produce inspection reports
- identify safety hazards and implement safety protocols
- use digital photography and equipment for determining location.

#### Required knowledge:

- concrete dam types, elements, and failure modes
- historic information and lessons from previous concrete dam incidents
- properties of stored water
- concrete dam design and construction principles, including basic:
  - materials science
  - hydraulics
  - aging of concrete
  - concrete technology
  - treatment of foundations, grouting and drainage systems
  - post tensioning principles
  - principles of gravity action
  - principles of arch action
  - principles of buttress action
  - principles of roller compacted concrete
  - uplift pressures and drainage systems
  - concrete dam faults and change indicators
  - dam performance history
  - principles of concrete dam inspection
- occupational health and safety and personal work site safety in procedures and worksite specific requirements

## **REQUIRED SKILLS AND KNOWLEDGE**

- organisational policies, procedures, guidelines and requirements relevant to the work site and dam safety monitoring.

# Evidence Guide

## 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**

The candidate should demonstrate the ability to conduct and report on concrete dam safety inspection including:

- interpreting and applying relevant organisational and regulatory information and requirements to the planning of safety monitoring activities
- identifying inspection features and scheduling activities according to the required frequency
- conducting concrete dam inspection activities
- gathering and recording data
- identifying faults, changes and failure indicators
- reporting on inspection and monitoring outcomes, with recommendations for action.

### **Context of and specific resources for assessment**

Access to the workplace and resources including:

- documents that should normally be available in dam workplaces
- codes, standards, and government regulations applying to dam monitoring.

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and/or assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be

## EVIDENCE GUIDE

authenticated and show that it represents competency demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit.

In all cases where practical assessment is used it will be combined with targeted questioning and or examination to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.



## Range Statement

### 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.

***Organisational procedures and proformas*** will include:

- Australian National Committee on Large Dams (ANCOLD) guidelines
- dam monitoring templates and proformas
- relevant regulator's technical bulletins
- occupational health and safety information
- operation and maintenance information and manuals
- instrumentation records, plans and manuals
- dam safety performance indicators
- roles, responsibilities and delegations for instrumentation monitoring and action
- security and storage of data
- dam safety inspection manuals
- past inspection reports design and construction reports, surveillance reports and risk assessments
- prescribed surveillance schedules
- incident management plans
- data storage and security
- state and local government requirements
- Standard Operating Procedures
- asset management plan.

***Dam behaviour*** will include:

- horizontal and vertical movement of concrete dams
- leakage and seepage through drainage systems under a range of weather and storage content situations
- structural movements expected during and post earthquakes
- and may include:
- vibration and water flow patterns.

***Conditions*** may include:

- climatic
- geological
- location
- dimensions
- catchment.

***Assess*** will include:

- analyse observations

## RANGE STATEMENT

- Unusual events* will include:
- make judgements of urgency and seriousness of problem
  - priorities for action.
  - seismic events
  - floods
  - extreme inflows
  - rapid draw down
  - landslides and slips
  - dam incidents
  - sabotage/terrorist attack
  - fires
  - long term low storage levels.
- Organisational and regulatory information* will include:
- Australian National Committee on Large Dams (ANCOLD) guidelines
  - past inspection reports, surveillance reports and risk assessments
  - survey information
  - relevant regulator's technical bulletins
  - occupational health and safety information
  - operation and maintenance manuals
  - dam performance history
  - dam safety performance indicators
  - dam safety inspection manuals
  - and may include:
  - design and modification plans and reports
  - construction records and reports.
- Identified areas and features* will include:
- dam structure
  - concrete walls and structures
  - hydraulic structures
  - spillways/diversions systems
  - outlet works / intake structures
  - pipes/conduits
  - abutments and foundations
  - access to areas
  - reservoir perimeter and downstream areas
  - weirs and monitoring installations
  - tunnels, galleries and drainage systems.
  - and may include:
  - mechanical and electrical components including valves, winches, hydraulic and electrical systems
  - civil infrastructure including ladders, pipe work, and

## RANGE STATEMENT

- Inspection techniques and details* will include:
- security
  - post tensioning anchors.
  - visual observation and note taking
  - use of manual, electronic and/or computer equipment and digital camera
  - dam condition assessments
  - site security
  - site access
  - concrete dam safety emergency indicator reporting
  - landslides and environmental conditions
  - details of concrete dam sites to be inspected.
- Faults and changes* will include:
- cracks (existing and new)
  - drain blockage
  - seepage/leakage
  - cavitation
  - foundation piping
  - misalignment/movement/instability
  - settlement
  - concrete deterioration
  - alkali aggregate reaction
  - concrete defects:
    - efflorescence
    - honeycombing
    - segregation
    - erosion
    - chemical attack
  - joint damage/deterioration
  - maintenance concerns including:
    - vegetation in joints or cracks
    - missing or damaged sealants and water bars
    - leaking or inoperative valves and gates
    - damaged monitoring instrumentation.
- Evidence* may include:
- flood, rainfall and relevant weather information
  - incident details including seismic
  - inspection findings
  - location and extent of faults and changes
  - photographs
  - monitoring data.

## **Unit Sector(s)**

Not applicable.

## **Competency field**

**Competency field**      Dam safety