



Australian Government

MSL975044 Perform complex tests to measure engineering properties of materials

Release: 1

MSL975044 Perform complex tests to measure engineering properties of materials

Modification History

Release	Comments
Release 1	This version was released in <i>MSL Laboratory Operations Training Package Release 2.0</i>. Supersedes and equivalent to MSL975016 Perform complex tests to measure engineering properties of materials. Changes to elements and performance criteria. Foundation skills information added. Range of conditions removed. Assessment requirements amended.

Application

This unit of competency describes the skills and knowledge to prepare test specimens and perform multi-stage mechanical tests on them. The unit requires personnel to create test conditions that suit the materials intended use, optimise measurement procedures and recognise critical measurement points during the tests. The unit also covers data analysis and troubleshooting procedures/equipment that have led to atypical data or results.

This unit applies to laboratory personnel in the construction materials, mining and manufacturing industry sectors.

No licensing or certification requirements exist at the time of publication. However, regulations and/or external accreditation requirements for laboratory operations exist, so local requirements should be checked. Relevant legislation, industry standards and codes of practice within Australia must also be applied.

Pre-requisite Unit

MSL974026 Perform tests to determine the properties of construction materials

MSL973022 Conduct laboratory-based acceptance tests for construction materials

Competency Field

Testing

Elements and Performance Criteria

Elements describe the essential outcomes.

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

- | | | | |
|---|---|-----|---|
| 1 | Interpret and schedule test requirements | 1.1 | Review test request and sample documentation to identify required test parameters and intended use of bulk material |
| | | 1.2 | Identify hazards and workplace control measures associated with the sample, preparation/testing methods and equipment |
| | | 1.3 | Inspect samples, compare with specifications, record and report discrepancies |
| | | 1.4 | Liaise with client when samples and/or request forms do not comply with workplace procedures |
| | | 1.5 | Match required parameters with suitable test methods, available equipment and instrument specifications |
| | | 1.6 | Plan parallel work sequences to optimise throughput of multiple sets of samples |
| | | | |
| 2 | Prepare and measure test specimens | 2.1 | Prepare test specimens in accordance with test method |
| | | 2.2 | Conduct preliminary measurements to establish initial dimensions and conditions |
| | | 2.3 | Store test specimens and residual sample materials to maintain their integrity |
| | | | |
| 3 | Check equipment before use | 3.1 | Set up equipment/instruments in accordance with test method |
| | | 3.2 | Perform pre-use and safety checks in accordance with workplace procedures and manufacturer specifications |
| | | 3.3 | Identify faulty or unsafe components and equipment and report to appropriate personnel |
| | | 3.4 | Check calibration status of equipment and quarantine out-of-calibration or faulty items |
| | | 3.5 | Clean, care for and store equipment and consumables in |

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element. accordance with workplace procedures	
4	Test samples	4.1	Position and secure test specimen in test equipment/instrument
		4.2	Conduct preliminary measurements to determine optimum test conditions and instrument settings
		4.3	Perform each measurement stage in sequence, terminating each stage at the appropriate end point
		4.4	Record all test measurements, observations and factors that may impact on quality of results
		4.5	Remove test piece and conduct post-test measurements
		4.6	Shut down equipment and store used test pieces in accordance with workplace procedures
5	Process and analyse data	5.1	Confirm data is the result of valid measurements
		5.2	Perform required calculations and ensure results are consistent with estimations and expectations
		5.3	Record results with the appropriate accuracy, precision and units
		5.4	Estimate and document uncertainty of measurement in accordance with workplace procedures, if required
		5.5	Analyse trends in data and/or results and report out-of-specification or atypical results promptly to appropriate personnel
		5.6	Troubleshoot procedure or equipment problems which have led to atypical data or results
6	Maintain laboratory records	6.1	Make entries on report forms or into a laboratory information management system accurately calculating, recording or transcribing data as required

Elements describe the essential outcomes.

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

6.2 Ensure traceability of sample from receipt to reporting of results

Foundation Skills

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

- Numeracy skills to:
 - calculate and determine required engineering properties with appropriate accuracy, precision and units (such as total and effective stress, strain and pressure)
 - use calibration charts.

Other foundation skills essential to performance are explicit in the performance criteria of this unit.

Unit Mapping Information

Equivalent to MSL975016 Perform complex tests to measure engineering properties of materials, Release 1.

Links

Training Package Companion Volumes -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5c63a03b-4a6b-4ae5-9560-1e3c5f462baa>

Assessment Requirements for MSL975044 Perform complex tests to measure engineering properties of materials

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Performance Evidence

There must be evidence the candidate has completed the tasks outlined in the elements and performance criteria of this unit, and:

- safely prepared at least 3 different test specimens and performing complex, multi-stage mechanical tests on each.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- details of complex, multi-stage mechanical test methods routinely used in job role, including:
 - purpose and principles of test
 - relationship between the engineering properties and uses of construction materials
 - key sample preparation stages
 - key treatment and measurement stages
 - calculation steps to give results in appropriate units and precision
 - expected values for sample type
 - sources of uncertainty and methods for their control
- principles and concepts underpinning test methods, such as:
 - stress, strain, pressure, total and effective stress, fatigue, creep, failure modes of materials, strength/consolidation of materials and permeability
 - electrical safety concepts, including voltage, current, resistance, conductors/insulators and AC/DC
- principles and concepts related to equipment/instrument operation and testing, including the function of key components and effects on test of modifying variables

- methods used to prepare samples:
 - moisture conditioning and compaction of soil
 - trimming to required size and shape
 - orientation of test pieces
 - polishing
 - curing concrete test pieces
- typical test methods and procedures:
 - consolidation of soil (e.g. one-dimensional and triaxial)
 - shear testing of soil and rock (e.g. total stress, effective stress, direct stress and triaxial stress)
 - permeability of soil, rock and concrete (e.g. falling head and constant head)
 - California Bearing Ratio (CBR) (4 point)
 - fatigue and creep of metals, polymers and concrete
 - wheel tracking in asphalt
 - stiffness and creep of asphalt
- National Association of Testing Authorities (NATA) supplementary requirements for the relevant field of testing
- workplace and/or legal traceability requirements
- awareness of environmental sustainability issues as they relate to the work task
- legal, ethical and work health and safety (WHS) requirements specific to the work task including traceability, confidentiality and security requirements of all client information, and laboratory data and records.

Assessment Conditions

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions and contingencies. The following conditions must be met for this unit:

- use of suitable facilities, equipment and resources, including:
 - an engineering materials testing laboratory with appropriate test equipment, instruments and samples as specified in the test methods
 - test methods and description of test set-up, data sets and technical/administrative records, and workplace procedures
 - calculator and/or computer and relevant software or laboratory information management system (LIMS).

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

Links

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