



Australian Government

MSL975016 Perform complex tests to measure engineering properties of materials

Release: 1

MSL975016 Perform complex tests to measure engineering properties of materials

Modification History

Release 1. Supersedes and is equivalent to MSL975016A Perform complex tests to measure engineering properties of materials

Application

This unit of competency covers the ability 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 of competency is applicable to laboratory personnel in the construction materials, mining and manufacturing industry sectors.

While no specific licensing or certification requirements apply to this unit at the time of publication, laboratory operations are governed by relevant legislation, regulations and/or external accreditation requirements. Local requirements should be checked.

Pre-requisite Unit

MSL974012 Perform tests to determine the properties of construction materials

MSL973010 Conduct laboratory-based acceptance tests for construction materials

Competency Field

Testing

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

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

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| 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, as required |
| 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

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| 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 |
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| 6 | Maintain a safe work environment | 6.1 | Use established safe work practices to ensure personal safety and that of other laboratory personnel |
| | | 6.2 | Minimise the generation of wastes and environmental impact |
| | | 6.3 | Ensure the safe disposal of laboratory wastes |

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| | 6.4 | Clean, care for and store equipment and consumables in accordance with workplace procedures |
| 7 | Maintain laboratory records | |
| | 7.1 | Enter approved data and results into laboratory information management system (LIMS) |
| | 7.2 | Maintain security and confidentiality of workplace information and laboratory data |
| | 7.3 | Maintain equipment and calibration logs in accordance with workplace procedures |

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.

Standards, codes, procedures and/or workplace requirements

Standards, codes, procedures and/or workplace requirements include the latest version of one or more of:

- Australian and international standards covering the requirements for the competence of testing and calibration laboratories, laboratory safety, quality and environmental management, and uncertainty of measurement
- national work health and safety (WHS) standards and codes of practice, national measurement regulations and guidelines, and environmental legislation and regulations
- standard methods for sampling and testing construction materials, such as soils, aggregates, concrete and asphalt
- specific codes, guidelines, procedures and methods, such as:
 - AustRoads test methods, and State/Territory Road Authority test methods
 - National Association of Testing Authorities (NATA) supplementary requirements for the relevant field of testing, and NATA technical notes and guides
- workplace documents, such as standard operating procedures (SOPs); quality and equipment manuals; calibration and maintenance schedules; material safety data sheets (MSDS) and safety procedures; material, production and product specifications; production and laboratory schedules; workplace recording and reporting procedures; waste minimisation and safe disposal procedures; maps and site plans
- sampling and testing procedures for specific sites, clients and samples

Preparation of samples

Preparation of samples includes, but is not limited to, one or more of:

- moisture conditioning and compaction of soil
- trimming to required size and shape
- orientation of test pieces
- polishing
- curing concrete test pieces

Test methods and procedures

Test methods and procedures include, but are not limited to, one or more of:

- 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

Safe work procedures Safe work procedures include, but are not limited to, one or more of:

- ensuring access to service shut-off points
- recognising and observing hazard warnings and safety signs/barriers
- using machinery guards
- labelling of samples, reagents and hazardous materials
- cleaning equipment and work areas regularly using workplace procedures
- handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer instructions, and workplace procedures and regulations
- following established manual handling procedures for tasks involving manual handling
- use of personal protective equipment (PPE), such as hard hats, hearing protection, gloves, goggles, safety glasses, coveralls, respirators and safety boots
- reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/wastewater, gases, smoke, vapour, fumes, odour and particulates, to appropriate personnel

WHS and environmental management requirements

WHS and environmental management requirements include:

- complying with WHS and environmental management requirements at all times, which may be imposed through state/territory or federal legislation. These requirements must not be compromised at any time
- applying standard precautions relating to the potentially hazardous nature of samples

Unit Mapping Information

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Links

MSA Training Package Implementation Guides - <http://mskills.org.au/training-packages/info/>