



Australian Government

MSL974012 Perform tests to determine the properties of construction materials

Release: 1

MSL974012 Perform tests to determine the properties of construction materials

Modification History

Release 1. Supersedes and is equivalent to MSL974012A Perform tests to determine the properties of construction materials

Application

This unit of competency covers the ability to conduct multi-stage tests to determine the properties of raw and/or manufactured construction materials. These test results are typically used by clients to prove raw material deposits, tender for supply of construction materials, classify soils, determine the suitability of construction materials for specialised uses and to inform the design of civil engineering works. The unit includes data processing and interpretation of results to identify obvious errors or unexpected results and take corrective action. However, personnel are not required to analyse data, optimise test methods or workplace procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

This unit of competency is applicable to laboratory personnel working in the geotechnical and construction material testing industry sectors who conduct tests in consulting laboratories or laboratories at extractive, manufacturing or construction sites using established test methods. These tests (such as load bearing ability, creep, shrinkage, durability, plasticity, permeability, chloride diffusion and reactivity) are used to determine the properties of aggregates, concrete, soils, road pavement or other specialised construction materials and products.

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

MSL973010 Conduct laboratory-based acceptance tests for construction materials

Competency Field

Testing

Unit Sector

Elements and Performance Criteria

Elements describe the Performance criteria describe the performance needed to

essential outcomes.		demonstrate achievement of the element.	
1	Interpret and schedule test requirements	1.1	Access relevant job instructions from laboratory information management system (LIMS)
		1.2	Interpret test request to confirm samples to be tested, the test method and equipment involved
		1.3	Identify hazards and workplace controls associated with the sample, preparation methods, reagents and/or equipment
		1.4	Assemble all required equipment and materials
		1.5	Plan work sequences for optimum efficiency and/or throughput of multiple samples
2	Prepare samples or test pieces	2.1	Retrieve samples and/or test pieces from storage and record their general appearance
		2.2	Check the accuracy and completeness of accompanying labels and documentation to ensure traceability
		2.3	Check that the storage/curing conditions of samples and/or test pieces were appropriate
		2.4	Compare samples and/or test pieces with test specifications, record observations and report discrepancies
		2.5	Prepare samples and/or test pieces in accordance with appropriate test method
		2.6	Conduct preliminary measurements to establish initial dimensions and test conditions as necessary
3	Check test equipment before use	3.1	Set up test equipment/instruments in accordance with test method
		3.2	Perform pre-use and safety checks in accordance with workplace procedures
		3.3	Identify faulty or unsafe equipment/instruments and report to appropriate personnel
		3.4	Check calibration status of instruments and report any

out-of-calibration items to appropriate personnel

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| 4 | Conduct test to determine sample properties | 4.1 | Perform each treatment/measurement stage of the test method precisely and in the correct sequence |
| | | 4.2 | Record all data, observations and any factors that may impact on the quality of results |
| | | 4.3 | Recognise obvious errors or atypical data and take appropriate corrective actions |
| | | 4.4 | Seek advice to deal with any situation beyond own technical competence |
| | | 4.5 | Shut down test equipment/instruments in accordance with workplace procedures |
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| 5 | Process and interpret data | 5.1 | Check data for accuracy and completeness |
| | | 5.2 | Perform required calculations and ensure results are consistent with expected values for the sample type |
| | | 5.3 | Record and report results with the appropriate accuracy, precision and units |
| | | 5.4 | Interpret trends in data and/or results and report out of specification or unexpected results promptly to appropriate personnel |
| | | 5.5 | Determine if obvious procedure or equipment problems have led to unexpected data or results |
| | | | |
| 6 | Maintain laboratory records | 6.1 | Enter approved data and test results into LIMS |
| | | 6.2 | Maintain confidentiality and security of workplace information and test results |
| | | 6.3 | Maintain technical/administrative records and test reports in accordance with workplace procedures |
| | | | |
| 7 | Maintain a safe work | 7.1 | Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of |

environment**others**

- 7.2 Minimise generation of wastes and environmental impacts of testing
- 7.3 Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and workplace procedures
- 7.4 Care for and store equipment, used test pieces and back-up samples 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 management and environmental management
- 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) documents regarding construction materials testing (Field application document)
- 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

Tests

Tests include, but are not limited to, one or more of:

- testing of concrete, such as:
 - drying shrinkage
 - chlorides and sulphates
 - chloride ion penetration
 - stiffness
- testing of cement, such as:
 - air permeability
 - setting times
 - normal consistency
- testing of soils, such as:
 - moisture-density relationships
 - California Bearing Ratio (CBR) (1 point)
 - unconfined compressive strength
 - quick tri-axial stress (total stress parameters)
 - permeability (e.g. drainage material)
 - hydrometer analysis
 - shrink/swell tests (site classification)
- testing of asphalt, such as:
 - Marshall stability/flow
 - skid tests
 - testing of bitumen seals, such as:
 - viscosity
 - penetration
 - softening point
 - flash point
- testing of aggregates, such as:
 - 10% fines, wet-dry strength variation
 - <2 micron test
 - sodium sulphate soundness
 - Los Angeles Abrasion

- Washington degradation
- polished aggregate friction value

Samples and test pieces

Samples and test pieces include, but are not limited to, one or more of:

- samples of aggregates, soil, rock, concrete, road pavement and binders
- disturbed and undisturbed samples

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 recommended 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 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:

- 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

Release 1. Supersedes and is equivalent to MSL974012A Perform tests to determine the properties of construction materials

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for MSL974012 Perform tests to determine the properties of construction materials

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Performance Evidence

Evidence of competence in this unit must satisfy all of the requirements of the elements and performance criteria, and include demonstration of:

- safely preparing at least three (3) different laboratory samples or test pieces and conducting multi-stage tests on them to determine their properties
- accurately interpreting client's test requests, test methods, workplace procedures and safety information
- planning efficient work sequences involving multiple/parallel tasks
- checking, operating, cleaning, maintaining and storing test equipment in accordance with workplace procedures
- safely conducting laboratory-based acceptance tests in accordance with workplace procedures and test methods to provide reliable data within the required timeframe
- processing data and recording and reporting results accurately and legibly
- estimating and calculating scientific quantities, such as stress, strain and stiffness
- interpreting gross features of data and graphs (e.g. Mohr circles) and making logical conclusions
- identifying atypical data, errors and unexpected results, tracing any obvious causes and taking corrective action
- maintaining security, integrity and traceability of all samples/test pieces, data/results and technical records
- seeking advice from a supervisor when needed
- communicating with clients or outside service technician in accordance with workplace procedures
- minimising environmental impacts, including safe collection, storage and appropriate disposal of waste.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- relationship between properties and uses of construction materials
- details of construction materials test methods routinely used in job role, including:
 - purpose and principles of test
 - relationship between the properties and uses of construction materials
 - sample preparation procedures

- key treatment/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 the test method, such as:
 - mass, weight, forces, pressure, energy, density, friction and slip resistance
 - elasticity, hardness, strength of materials, plasticity, permeability and dispersion
 - electrical safety concepts, including voltage, current, resistance, conductors/insulators and AC/DC
 - chemical ions, pH and solubility
- principles and concepts related to equipment/instrument operation and testing, including the function of key components and effects on test of modifying variables
- pre-use checks and operating procedures for test equipment/instruments routinely used in job role
- basic equipment/method troubleshooting procedures
- corrective actions, including:
 - checking accuracy of data entry and transcription
 - logical checking of equipment set-up
 - checking calibration, zero error and drift for basic instruments
 - careful re-reading of procedures
 - repeating test measurements
 - seeking advice
- procedures for ensuring traceability of samples, test pieces, test data and results
- procedures for recording and reporting test results, calculations, test observations and unexpected or atypical results and equipment problems
- confidentiality requirements
- hazards associated with construction material testing, relevant work health and safety (WHS) and environmental management requirements.
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Assessment Conditions

- Judgment of competence must be based on holistic assessment of the evidence. Assessment methods must confirm consistency of performance over time, rather than a single assessment event.
- This unit of competency is to be assessed in the workplace or a simulated workplace environment. A simulated workplace environment must reflect realistic operational workplace conditions that cover all aspects of workplace performance, including the environment, task skills, task management skills, contingency management skills and job role environment skills.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.

- 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.
- 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 in each case).
- This unit of competency may be assessed with:
 - MSL924001 Process and interpret data
 - MSL943002 Participate in laboratory or field workplace safety
 - MSL953001 Receive and prepare samples for testing
- Holistic assessment methods include:
 - review of test data, results and records generated by the candidate
 - feedback from supervisors and clients regarding the candidate's ability to conduct a range of multi-stage tests to determine the properties of samples reliably, safely and efficiently
 - questions to assess understanding of workplace procedures and multi-stage test methods relevant to job role.
- Access is required to instruments, equipment, materials, workplace documentation, procedures and specifications associated with this unit, including, but not limited to:
 - sample preparation and test equipment and materials specified in the test method
 - 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 system.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- The assessor must demonstrate both technical competence and currency.
- Technical competence can be demonstrated through:
 - relevant VET or other qualification/Statement of Attainment AND/OR
 - relevant workplace experience.
- Currency can be demonstrated through:
 - performing the competency being assessed as part of current employment OR
 - having consulted with a laboratory about performing the competency being assessed within the last twelve months.

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