Australian Government

Department of Education, Employment and Workplace Relations

MSL973010A Conduct laboratory-based acceptance tests for construction materials

Revision Number: 1

MSL973010A Conduct laboratory-based acceptance tests for construction materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to conduct laboratory tests to confirm the acceptability of raw and/or manufactured construction materials. Personnel will have access to established test methods, enterprise procedures and readily available advice. They are expected to obtain reliable test results safely and efficiently. In general, these personnel do not calibrate equipment and make only limited adjustments to the controls. The unit of competency does not cover interpretation or analysis of results or troubleshooting equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the geotechnical and construction material testing industry sectors who conduct control and compliance tests in consulting laboratories or laboratories at extractive, manufacturing or construction sites using established test methods. These tests could involve aggregates, concrete, soils, road pavement or other specialised construction materials and products. The unit of competency could also be relevant to laboratory technicians working in the water/waste water and trade waste industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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
1. Prepare for laboratory-based acceptance tests	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 enterprise 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
3. Check test equipment before use	3.1. Set up equipment in accordance with test method 3.2. Perform pre-use and safety checks in accordance with enterprise procedures 3.3. Identify faulty or unsafe equipment and report to appropriate personnel 3.4. Check calibration status of instruments and report any out of calibration items to appropriate personnel
4. Perform laboratory tests	4.1. Conduct tests in accordance with test method and enterprise procedures 4.2. Record data and observations in accordance with enterprise procedures 4.3. Recognise obvious errors or atypical data and take appropriate corrective actions 4.4. Perform calculations as set out in test method 4.5. Compare calculated results with expected values and report atypical results promptly to appropriate personnel 4.6. Complete technical/administrative records and test reports in accordance with enterprise procedures 4.7. Seek advice to deal with any situation beyond own technical competence
5. Maintain a safe work	5.1. Use safe work procedures and protective equipment to

ELEMENT	PERFORMANCE CRITERIA
environment	ensure personal safety and that of others 5.2. Minimise generation of wastes and environmental impacts of testing 5.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures 5.4. Care for and store equipment, used test pieces and back-up samples in accordance with enterprise procedures

Required Skills and Knowledge

Required skills include:

- planning work sequences involving multiple/parallel tasks
- applying safety information, such as material safety data sheets (MSDS) and working safely
- applying enterprise procedures and test methods accurately
- checking and using test equipment in accordance with enterprise procedures
- estimating/calculating simple scientific quantities (e.g. density and moisture content)
- recording and presenting results accurately and legibly
- maintaining security, integrity and traceability of all samples and data/results
- cleaning and maintaining equipment
- demonstrating a professional approach and positive company/organisation image

Required knowledge

Required knowledge includes:

- construction materials and test methods routinely used in job role including:
  - purpose and principles of test
  - properties of materials under test
  - key preparation/measurement steps in test method
  - calculation steps to give results in appropriate units and precision
  - expected values for sample type
- pre-use checks and operating procedures for test equipment routinely used in job role
- expected values and sources of uncertainty (and methods for control) in construction materials tests routinely used in job role
- procedures for recording and reporting test results, calculations, test observations and unexpected or atypical results and equipment problems
- procedures for ensuring traceability of samples, test pieces, test data and results
- health, site safety and environmental management requirements relevant to job role
- confidentiality requirements relevant to job role

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.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • plan efficient work sequences • prepare a range of laboratory samples and/or test pieces and conduct associated laboratory-based acceptance tests safely and accurately and within the required timeframe.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with other relevant units of competency such as: • *MSL922001A Record and present data* • *MSL943002A Participate in laboratory/field workplace safety* • *MSL953001A Receive and prepare samples for testing*. Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • 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 laboratory-based acceptance tests reliably, safely and efficiently • questions to assess understanding of enterprise procedures and test methods relevant to their job role. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and

EVIDENCE GUIDE	
	those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing (1)** A technician working at a consulting laboratory receives a job sheet that requires a particle size distribution (PSD) test to be performed on a soil sample. The sample weighs 20kg and is contained in a large bucket. All the required documentation is present and complete. The technician locates the documented method for the PSD test (AS 1289.3.6.1) and assembles the necessary equipment. He/she uses a riffle box to obtain the recommended minimum size of sample and places it in a 50°C oven overnight. He/she performs the sieving process in three stages - coarse (26.5, 19 mm), intermediate (9.5, 4.74, 2.36 mm) and fine (1.18 mm, 600, 300, 150 and 75 micron). The technician uses a stiff brush to carefully clean all the 'fines' off the larger particles and sieves and remembers to continue washing the sample until the wash water is clear. He/she determines the moisture content and mass of the dry fractions according to the test method, taking particular care to check that the sum of the masses on each sieve and in the pan equals the original mass of the sample. The technician then reports the percentage of material retained on each sieve to the nearest 1%. **Construction materials testing (2)** A technician carefully reads through a job sheet for a compactive test on an asphalt core sample. The specified test method is Q306C and the maximum density has already been determined as 2.505. The technician prepares the necessary test equipment and

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	materials and then inspects the core closely. He/she looks for cracks, pits and voids and evidence of over compaction in the form of crushed particles - as these features will affect the reliability of the test result. The technician records the core's general appearance and notes that it meets the test specifications. After checking the accompanying paperwork, he/she logs the job into the laboratory information management system. He/she trims the core sample to obtain a suitable test piece (50-60 mm) and performs the test. The technician makes sure that the test piece is fully encapsulated in wax before weighing the suspended test piece in water. He/she watches for bubbles and any increase in mass that would indicate a leak. After he/she is satisfied that the recorded masses are reliable, the technician calculates the core density as 2.405 indicating a compaction of 96%. After rechecking the data entries and calculations, the technician completes the test report.

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.	
Codes of practice	Where reference is made to industry codes of practice and Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1012 Methods of testing concrete
	  • AS 1141 Methods for sampling and testing aggregates
	  • AS 1289 Methods of testing soils for engineering purposes
	  • AS 2891 Methods of sampling and testing asphalt
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• AustRoads test methods
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• enterprise sampling procedures for specific samples, sites and clients
	• environmental legislation and regulations
	• equipment manuals and warranties, supplier catalogues and handbooks
	• equipment startup, operation and shutdown procedures

RANGE STATEMENT	
	• industry codes of practice • maps, site plans • MSDS • material, production and product specifications • National Association of Testing Authorities (NATA) documents regarding construction materials testing(Field application document) • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • quality manuals • sampling and test procedures, enterprise or standard operating procedures (SOPs) • site safety plans

RANGE STATEMENT	
Hazards may	Hazards may include: • electric shock • light, dust, noise and heat • biohazards, such as microbiological organisms and agents associated with soil • chemicals such as acids, alkalis and hydrocarbons • flammable liquids and gases • burns from hot bitumen, hot plates, hot moulds or ovens • inhalation or burns from sulphur during preparation of concrete samples • fluids under pressure • hand tools • occupational overuse syndrome, slips, trips and falls • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of MSDS • recognising and observing hazard warnings and safety signs/barriers • labelling of samples, reagents and hazardous materials • cleaning and decontaminating equipment and work areas regularly using recommended procedures • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • following established safe handling procedures for tasks involving manual handling • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, coveralls, respirators and safety boots
Laboratory-based acceptance tests	Laboratory-based acceptance tests may include: • testing of concrete:

RANGE STATEMENT	
	• compressive and tensile tests • flexural tests • testing of soils: • laboratory density and moisture content • classification - consistency, particle distribution, dispersion and particle density • unconfined compressive strength • pH and conductivity • colour • testing of asphalt and bitumen seals: • density and compacted density • particle size distribution • stability/flow • stripping (core samples) • testing of aggregates: • particle size distribution and grading • particle shape • particle density, durability and absorption • contamination (silt and organics)

RANGE STATEMENT	
Samples and test pieces	Samples and test pieces may include: • samples of aggregates, soil, rock, concrete and road pavement • beams and cylinders for laboratory testing such as Brazil test • pats for Marshall stability/flow test
Test and sample preparation equipment/materials	Test and sample preparation equipment/materials may include: • crushers, mulchers, grinders, mills, riffles and sieves • moulds, bags and containers • ovens, microwaves and water baths • mass balances • microscopes • dimension apparatus (e.g. calipers and micrometers) • rammers, compression rigs and load cells • chemical reagents and volumetric glassware • temperature measuring devices such as thermometers and thermocouples • pH and conductivity meters • analogue and digital meters, charts/recorders, data loggers and computers
Appropriate corrective actions	Appropriate corrective actions may include: • accuracy check of data entry and transcription • logical check of equipment setup • check of calibration, zero error and drift for basic instruments • careful re-reading of procedures • repeat test measurements • seek advice
Technical/administrative records	Technical/administrative records may include: • test and calibration results • equipment use, maintenance and servicing history • faulty, unsafe or quarantined equipment
Minimising environmental impacts	Minimising environmental impacts may include: • collection of surplus or spent samples and test

RANGE STATEMENT	
	pieces for disposal • correct storage and handling of hazardous chemicals and samples • recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals and glass • appropriate disposal of all waste • compliance with quarantine requirements to prevent transfer of pests (e.g. fire ants and seeds)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		