



Australian Government

Department of Education, Employment and Workplace Relations

MSL973009A Conduct field-based acceptance tests for construction materials

Revision Number: 1

MSL973009A Conduct field-based acceptance tests for construction materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to conduct in situ tests to confirm the acceptability of raw or manufactured, construction materials prior to or after their use. Personnel are expected to be able to work independently and liaise with site personnel to ensure that testing is conducted safely and efficiently. They may transport samples and/or equipment to and from the site as necessary and prepare test pieces on-site for later laboratory testing.
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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 relatively quick and straightforward control and compliance tests at extractive, manufacturing or construction sites using established test methods. These tests could involve aggregates, concrete, soils, road pavement or other specialised construction materials. The unit 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'.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.
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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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for field-based acceptance tests	1.1. Review job request to identify the test method and equipment involved, samples to be collected and/or test pieces to be prepared 1.2. Identify hazards and enterprise safe work procedures associated with the site, samples, test methods and equipment used 1.3. Confirm site location, access, timing and any special test requirements 1.4. Assemble all required equipment/materials and check that they are fit for purpose 1.5. Stow equipment/materials to ensure their safe transport, as necessary 1.6. Arrange transport to site, as necessary 1.7. Liaise with appropriate personnel on arrival at site to ensure safety and minimise disruption to other workers during testing/sampling
2. Perform field tests	2.1. Identify locations for in situ tests in accordance with test method or client instructions 2.2. Set up, check and operate test equipment safely and in accordance with enterprise procedures and test method 2.3. Perform tests as specified in test method or enterprise procedures 2.4. Take sufficient test measurements to ensure reliable data 2.5. Recognise obvious errors or atypical data and take appropriate corrective actions 2.6. Recognise and record details of site conditions that may impact on data quality 2.7. Seek advice to deal with any situation beyond own technical competence
3. Collect site samples and prepare test pieces	3.1. Identify locations for sample collection in accordance with test method or client instructions 3.2. Seek advice if samples cannot be collected or if sampling procedures require modification 3.3. Obtain required samples and maintain their integrity in accordance with sampling procedures or test method 3.4. Label all samples to ensure their traceability 3.5. Recognise and record any information about the sample appearance or site conditions that may impact on sample integrity 3.6. Prepare required test pieces and organise their safe curing, storage and/or transport in accordance with test method
4. Finalise field testing	4.1. Re-instate all disturbed surfaces in accordance with enterprise procedures

ELEMENT	PERFORMANCE CRITERIA
	4.2. Clean all equipment (and vehicle as necessary) to avoid environmental damage including stormwater run-off and/or transfer of pests 4.3. Check that all equipment/materials are present and undamaged prior to re-stowing them for safe transport, as necessary 4.4. Notify appropriate site personnel on completion of tests and prior to leaving site 4.5. On return to base, check serviceability of test equipment before storage 4.6. Complete site safety plans, equipment logs and test reports in accordance with enterprise procedures
5. Maintain a safe work environment	5.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 5.2. Minimise environmental impacts of testing/sampling and generation of waste 5.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

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

Required knowledge

Required knowledge includes:

- construction materials 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, site 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:

- liaise effectively with site personnel to arrange for testing to be performed safely and efficiently
- conduct field-based acceptance tests and collect/prepare associated field samples or test pieces 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*
- *MSL943001A Work safely with instruments that emit ionising radiation*
- *MSL943002A Participate in laboratory/field workplace safety.*

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 work independently and conduct a range of field-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

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	by questions to assess underpinning knowledge and 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 A technician working for a consulting laboratory receives a telephone request from a client to conduct some concrete tests at their site at 10 am. They require a slump test and the preparation of three test cylinders and two flexural beam test pieces for later testing. The technician arrives at the site early and checks with the foreman about where the concrete truck will come in and positions his/her vehicle in a shady spot close by where the samples can cure without being disturbed. He/she prepares the slump plate, shovel, scoops, slump rod, cylinder moulds, bucket, steel ruler, spirit level, thermometer, brushes and worksheets. He/she checks the slump plate for level and damps down the moulds when the truck arrives. After waiting for the recommended volume of concrete to be discharged, he/she collects a sample and conducts the slump test. He/she pays particular attention to how each layer is added to the cone and 'rodded' and then carefully lifts off the cone in one easy motion. Using the slump rod on top of the cone as a benchmark, he/she measures the slump as 80+/-5 mm. This result is consistent with the results obtained from several repeat tests. He/she returns the slump material to the kibble and collects five buckets of concrete to make the cylinders and beams. The technician places a maximum/minimum thermometer alongside the prepared samples to monitor the curing process and the covers them with

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insulating material. He/she carefully cleans all the test equipment while the concrete is still wet and re-stows it in the vehicle. On returning to the laboratory, he/she ensures that all results and records are completed according to standard procedures.

Construction materials testing

A laboratory technician has been tasked with conducting a series of field density measurements using a nuclear gauge at a road construction site. Prior to leaving for the site, he/she locates the test method (AS 1289.5.8.1) and assembles all the materials and equipment needed for the job. The technician reviews the company's safe working rules for using the gauge, conducts the specified pre-use checks of the equipment, does a 'standard count' and enters all the required information in the relevant technical and administrative records. After safely stowing the equipment, he/she drives to the site. On arrival, the technician checks with the foreman about the size of the lot, test locations and datum point and the details about the other work currently going on at the site. The technician sets up the specified safety barriers and signs, ensures that the gauge is operating correctly and checks the radiation levels around the instrument. He/she drills the first of the ten required holes, carefully ensuring that it is the correct depth and is vertical, clear of obstructions and large enough to enable the gauge to be raised and lowered without jamming. He/she spreads sand near the hole to ensure that the instrument is flush with the ground and there is no air gap. With the source in position, he/she performs two measurements (@ 0° and 90°) to minimise the effect of any rocks or voids that may be close to the surface. He/she notes that the two results agree to within the accepted tolerance of 75kg/m³. The technician then carefully retracts the rod and locks the source in its shielded position before moving the instrument to the next location. After successfully completing all the required measurements, the technician carefully cleans, checks and re-stows the equipment, fills in the holes, removes the barriers/signs and advises the foreman that he/she has finished the testing. On returning to base, he/she finalises the job in accordance with enterprise procedures.

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/or 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 warranty, supplier catalogues and handbooks
- equipment startup, operation and shutdown procedures
- industry codes of practice

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- maps, site plans
- material safety data sheets (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
- State/Territory Road Authority test methods

RANGE STATEMENT	
Hazards	Hazards may include: • sunlight, dust and noise and heat • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery • vehicular traffic on roads and sites • injuries caused by falling objects and working conditions such as uneven surfaces, heights, slopes, wet surfaces, trenches and confined spaces • biohazards, such as microbiological organisms in soils • nuclear density/moisture gauges and industrial X-ray equipment
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of site safety plans and MSDS • use personal protective equipment, such as hard hats, sunscreen lotion, hearing protection, gloves, goggles, coveralls, respirators and safety boots • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment • signage, barriers, traffic control and flashing lights
Field-based acceptance tests	Field-based acceptance tests may include: • testing of concrete: • consistency (e.g. slump) • making and curing of concrete cylinders • air content • Schmidt hammer • testing of soils: • field density (e.g. compaction control) • coarse particle distribution (e.g. rock protection layers and embankments) • dynamic cone penetration (DCP) • infiltration • Clegg hammer • sample cores from stabilised pavements

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	• testing of asphalt and bitumen seals: • temperature of freshly laid asphalt • field density • texture depth • permeability • aggregate spread rate and binder spray rate

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Site samples and test pieces	Site samples and test pieces may include: • site samples of aggregates, soil, concrete and road pavement • beams and cylinders for subsequent laboratory testing such as Brazil test and Marshall stability/flow test • asphalt cores and slabs for testing wheel tracking and fatigue
Test/sampling equipment and materials	Test/sampling equipment and materials may include: • survey equipment, steel ruler/tape and spirit level • shovel, scoops, plates, rods, cylinder and beam moulds • buckets, bags and sample containers • coring equipment • excavation equipment • slump cones, density cones and density sand • thermometer • air content meter • brushes • nuclear density/moisture gauge • worksheets, test methods • portable computers and personal digital assistants (PDAs)
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 measuring instrument • careful re-reading of procedures and checklists • repeat test measurements • seek advice
Minimising environmental impacts	Minimising environmental impacts may include: • disposal of surplus or spent or materials • containing run-off of water • recycling of wastes • compliance with quarantine requirements, including cleaning of vehicles to prevent transfer of pests (e.g. fire ants and seeds) and contaminants • compliance with environmental, cultural and

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	heritage protection requirements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise occupational health safety 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
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		