



Australian Government

Department of Education, Employment and Workplace Relations

PMLTEST403B Assist with geotechnical site investigations

Release: 1

PMLTEST403B Assist with geotechnical site investigations

Modification History

Unit Descriptor

This unit of competence covers the ability to assist with geotechnical site investigations. This competency is typically performed by laboratory technicians working under the guidance of a geotechnical (para)-professional or engineer.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory technicians working in the construction, mining and drilling 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 are found at the end of this unit of competency under the section This competency in practice.

Application of the Unit

Licensing/Regulatory Information

Pre-Requisites

Employability Skills Information

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance Criteria describe the level of performance required to demonstrate achievement of the element.

Elements and Performance Criteria

Elements and Performance Criteria

Element	Performance Criteria				
1 Prepare for on-site operations	<table><tr><td>1.1</td><td>Identify the job, location, appropriate procedures and safety requirements</td></tr><tr><td>1.2</td><td>Identify site hazards and use appropriate personal protective equipment and safety procedures as specified for job and materials to be used</td></tr></table>	1.1	Identify the job, location, appropriate procedures and safety requirements	1.2	Identify site hazards and use appropriate personal protective equipment and safety procedures as specified for job and materials to be used
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1.2	Identify site hazards and use appropriate personal protective equipment and safety procedures as specified for job and materials to be used				

- 1.3 Record description of the job to be undertaken, compare with specification and report any variations
 - 1.4 Select and prepare tools, equipment and materials in accordance with job requirements
 - 1.5 Select suitable transport for site access
 - 1.6 Ensure site access requirements, such as entry permits and safety inductions have been organised
- 2 Assist with excavation of boreholes, test pits and/or trenches
 - 2.1 Identify the sampling/testing location
 - 2.2 Excavate or supervise excavation to the sampling/testing depth, minimising disturbance and potential contamination of the site
 - 2.3 Identify materials and record changes of strata, test results, and other relevant information
 - 2.4 Ensure materials from different strata are kept separate
 - 2.5 Terminate the excavation at the appropriate depth, recording the reason for termination
 - 2.6 Clean up on completion, backfilling or sealing the excavation or ensuring that it is left in a safe and uncontaminated condition
- 3 Assist with sampling
 - 3.1 Prepare sampling equipment and materials
 - 3.2 Take disturbed and undisturbed samples in accordance with established practices
 - 3.3 Label samples and record details in accordance with established practices
 - 3.4 Handle and transport samples in accordance with established practices
 - 3.5 Clean and maintain sampling equipment, avoiding environmental damage, including stormwater contamination
- 4 Assist with testing
 - 4.1 Prepare test equipment and materials
 - 4.2 Perform or assist in performing tests in accordance

with established practices

4.3 Record test data in accordance with established practices

4.4 Clean and maintain testing equipment, avoiding environmental damage, including stormwater contamination

5 Maintain records

5.1 Record data in accordance with established practices

5.2 Maintain equipment records in accordance with established practices

5.3 Maintain confidentiality of enterprise information.

Required Skills and Knowledge

Evidence Guide

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- identifies and locates site services, sampling and testing sites
- identifies problems in siting (for example, services) immediately
- takes representative samples
- identifies and describes materials accurately
- handles and transports samples correctly
- records sampling and testing information
- uses tools and equipment effectively and efficiently
- observes, interprets and reports on the geotechnical conditions
- communicates problems to appropriate personnel
- records and communicates work results
- works safely.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the basic concepts, purposes and principles of geotechnical site investigation
- identification and classification of materials
- engineering properties of soil and rock materials
- representative sampling and testing
- map and drawing interpretation
- uses of soil and rock materials in engineering and construction
- in-situ testing methods
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical, additional assessment techniques must be used.

The following assessment methods are suggested:

- review of work outputs over a period of time to ensure accurate and consistent work is obtained within required timelines
- examples of completed workplace documentation
- feedback from peers and supervisors
- oral or written questioning.

In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

PMLSAMP302A Handle and transport samples or equipment**PMLSAMP400B Obtain representative samples in accordance with a sampling plan****PMLTEST300B Perform basic tests.****Resource implications**

Resources may include:

access to sites, tools, equipment

enterprise procedures, sampling plans, test methods and equipment manuals.

This competency in practice**Construction materials**

A geotechnical consultancy company is carrying out the investigation for the construction of an industrial complex involving building pads and roadways. A contract drilling company has been hired to carry out auger drilling for the building pad foundations. The drill rig will be used to perform standard penetration tests in some boreholes to determine bearing capacities. Undisturbed sample tubes will be pushed to obtain samples for consolidation testing in the laboratory.

A senior technician is in charge of site activities, and arranges for a drill rig. She/he plans a program of drilling, sampling and testing. A laboratory assistant is allocated to carry out the majority of site activities. These include overseeing drilling, testing and sampling operations. He/she is provided with a marked-up plan of the site showing borehole locations so that he/she can direct where to drill. The senior technician makes site visits every second day to oversee the work.

The drilling contractor operates the drill rig, takes tube samples, performs the standard penetration tests and cases the hole if required, as directed by the senior technician. The assistant records and samples the soil profile, seals the sample tubes with wax and labels them. He/she also records the SPT readings and bags and labels the material from the split-spoon sampler. Each borehole is capped to prevent access by unauthorised persons so that the assistant can record standing water level 24 hours after the hole has been drilled. He/she wears a helmet, work boots and earmuffs while working near the rig. He/she covers up and wears sunscreen while working in the sun and drinks large quantities of water.

The assistant also excavates hand auger holes to a depth of one metre at regular intervals in the proposed roadways to obtain samples for California Bearing Ratio tests. Adjacent to each, he/she performs a dynamic cone penetrometer test to two metres to assess the in-situ material. He/she records the logs of the auger holes and the test results on the company's standard data sheets and backfills each auger hole immediately after sampling.

He/she reports each day's activities to the senior technician using the company's standard summary form. He/she is confident to identify soil types thus minimising the need for laboratory testing of the samples taken. Based on the field logs, cross-sections of the site can be drawn so that the designer can assess its geotechnical characteristics and determine the extent of any further investigations.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, Communic Planning Working Using Solving Using

analysing and organising information	ating ideas and information	and organising activities	with others and in teams	mathematic al ideas and techniques	problems	technology
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Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2
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Range Statement

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

This unit of competence describes the work conducted by laboratory operators or technicians conducting sampling and testing at construction, mining or drilling sites.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements may include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Site hazards may include:

- solar radiation, dust and noise
- manual handling of heavy materials and equipment
- working in/on trenches, confined spaces, wet and uneven surfaces, heights, slopes
- vehicular and pedestrian traffic.

Safety procedures may include:

- location of site services before investigations commence
- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as hard hat, hearing protection, sunscreen, gloves, masks, goggles, coveralls, safety boots
- handling, and storage of (hazardous) materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning of equipment and vehicles
- machinery guards
- signage, barriers, flashing lights, traffic control.

Tools and equipment may include:

- hand tools, including shovels, crowbars, scoops, spanners, wrenches, tape measure
- consumables, including sample bags, labels, sample tubes, wax
- documentation, including maps, plans, worksheets
- field test equipment, including DCP, SPT, shear vane, pocket penetrometer, water level indicator
- safety clothing and equipment, including helmet, boots, gloves, earmuffs, glasses
- excavation equipment, including hand and power augers.

Typical skills may include:

- working safely with equipment and around earthmoving plant
- driving safely on- and off-road
- working safely in field conditions

setting up and maintaining tools and equipment
using tools and equipment to perform basic sampling techniques
using tools and equipment to perform basic in-situ testing techniques
cleaning equipment before leaving site in compliance with environmental authority requirements
reading site plans and operating GPS equipment to locate sampling positions
identification of soil, rock and fill materials
observing and recording information on testing and sampling
making basic measurements of plan location and depth
handling and storing samples appropriately.
Typical problems include:
caving of the excavation
drilling difficulties
not knowing the requirements of the design engineer
not understanding the nature of the item being designed (for example, retaining wall, piled structure, earthworks)
sample loss during retrieval
knowing when to stop a hole, or what and when to test and sample
misidentification of samples and sampling locations
equipment breakdown and breakage
environmental problems and issues, including site access, inclement weather, traffic, wildlife, vegetation, construction activities.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

Unit Sector(s)