Australian Government

Department of Education, Employment and Workplace Relations

MSL974002A Conduct geotechnical site investigations

Revision Number: 1

MSL974002A Conduct geotechnical site investigations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare for and conduct and conclude site activities such as excavations, sampling and testing as part of a geotechnical investigation team. Personnel are expected to solve common site problems and seek advice to deal with situations beyond their own technical competence. This competency is typically performed by laboratory technicians working under the guidance of a geotechnical paraprofessional or engineer.

Application of the Unit

Application of the unit	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'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973012A	*Assist with geotechnical site investigations*

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 on-site operations	1.1. Identify the job, location, work instructions, appropriate sampling/test procedures and safety requirements 1.2. Identify site hazards and identify appropriate personal protective equipment and safety procedures that are specified for the job and materials used 1.3. Record description of the job to be undertaken, compare with specification and report any variations 1.4. Arrange for the collection, checking, stowing and transport of all tools, equipment and materials required at the site 1.5. Ensure site access requirements, such as entry permits and safety inductions have been organised
2. Arrange excavation of boreholes, test pits and/or trenches	2.1. Identify the sampling/testing location 2.2. Excavate or oversee 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 and record the reason for termination
3. Conduct site sampling	3.1. Prepare and check sampling equipment and materials 3.2. Take disturbed and undisturbed samples in accordance with enterprise methods/procedures 3.3. Label and record samples in accordance with enterprise methods/procedures 3.4. Recognise and record details of site conditions that may impact on sample integrity or site interpretation
4. Conduct testing	4.1. Prepare and conduct pre-use checks of test equipment 4.2. Perform, or assist with performing, tests in accordance with test methods or enterprise procedures 4.3. Record test data in accordance with test methods or enterprise procedures 4.4. Recognise obvious errors or atypical data and take appropriate corrective actins

ELEMENT	PERFORMANCE CRITERIA
5. Finalise site operations	5.1. Backfill or seal any excavation and ensure that it is left in a safe and uncontaminated condition 5.2. Reinstate surfaces disturbed by sampling or testing 5.3. Clean all equipment (and vehicle, as necessary) avoiding environmental damage, stormwater contamination or spread of pests 5.4. Check all equipment/materials prior to re-stowing them for safe transport 5.5. Handle and transport samples in accordance with established practices 5.6. Notify appropriate site personnel on completion of investigations and prior to leaving site 5.7. On return to base, check serviceability of test equipment before storage
6. Maintain records	6.1. Maintain equipment records in accordance with established practices 6.2. Complete site safety plans, equipment logs and test reports in accordance with enterprise procedures 6.3. Maintain confidentiality of enterprise information
7. Maintain a safe work environment	7.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 7.2. Minimise environmental impacts of testing/sampling and generation of waste 7.3. Collect and/or dispose of all waste in accordance with 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:

- interpreting maps, site plans and drawings
- identifying and locating site services, sampling and testing sites (e.g. global positioning system (GPS))
- setting up, checking, using and cleaning/maintaining tools and equipment
- taking representative samples, handling and transporting samples
- identifying soil, rock and fill materials
- observing, interpreting and reportingsite features and geotechnical conditions
- performing basic in situ tests and site measurements (e.g. location and depth)
- maintaining accurate and complete records
- communicating problems to appropriate personnel
- driving safely on and off-road
- working safely on construction sites aroundheavy equipment and earthmoving plant

Required knowledge

Required knowledge includes:

- 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
- uses of soil and rock materials in engineering and construction
- insitu testing methods
- relevant health, safety and environment requirements

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: • identify and locate site services, sampling and testing sites and recognise site problems • use tools and equipment effectively and efficiently • collect representative samples and handle and transportthem correctly • record sampling and testing information • identify and describe materials accurately • observe, interpret and report geotechnical conditions • communicate problems to appropriate personnel and seek advice • record and communicate work results • work safely.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment 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. This unit of competency may be assessed with: • *MSL952002A Handle and transport samples or equipment* • *MSL954001A Obtain representative samples in accordance with sampling plan* • *MSL973001A Perform basic tests*. Resources may include: • access to sites, tools and equipment • enterprise procedures, sampling plans, test methods and equipment manuals.
Method of assessment	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

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	• 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. 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 study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **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

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	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, safety 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 (CBR) tests. Adjacent to each, he/she performs a dynamic cone penetrometer test to two metres to assess the insitu 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.

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: • industry codes of practice • environmental legislation and regulations • standard operating procedures (SOPs) • equipment manuals • equipment startup, 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	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 and slopes • vehicular and pedestrian traffic
Safety procedures	Safety procedures may include: • location of site services before investigations commence • use of material safety data sheets (MSDS) • use of personal protective equipment, such as hard hats, hearing protection, sunscreen, gloves, masks, goggles, coveralls and safety boots • handling and storage of (hazardous) materials

RANGE STATEMENT	
	and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning of equipment and vehicles • machinery guards • signage, barriers, flashing lights, traffic control
Tools and equipment	Tools and equipment may include: • hand tools, including shovels, crowbars, scoops, spanners, wrenches and tape measures • consumables, including sample bags, labels, sample tubes and wax • documentation, including maps, plans and worksheets • field test equipment, including dynamic cone penetration (DCP) testing, standard penetration testing (SPT), shear vane, pocket penetrometers and water level indicator • safety clothing and equipment, including helmet, boots, gloves, earmuffs and glasses • excavation equipment, including hand and power augers
Common site problems	Common site problems may include: • caving of the excavation • drilling difficulties • not knowing the requirements of the design engineer • not understanding the nature of the item being designed (e.g. retaining wall, piled structure and 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 and construction activities
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise

RANGE STATEMENT	
	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		