NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: GEOTECHNICAL SURVEY TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

CBET	Competency Based Education and Training
GNSS	Global Navigation Satellite System
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
RTK	Real-time Kinematic
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation**.**
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to the demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET)

approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Geotechnical Survey Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Geotechnical engineers, technicians, and experienced Geotechnical Survey Technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for

working in the occupation. A total of ... online surveys were completed by experts from the labour market across the country. Apart from the surveys aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR GEOTECHNICAL SURVEY TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Geotechnical Survey Technician However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Geotechnical Survey Technician may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Geotechnical Survey Technicians shall, under the supervision of geotechnical engineers, in laboratories, offices or construction sites, engage in laboratorial geotechnical testing, engineering geological mapping and investigation, engineering geological exploration and evaluation, geotechnical engineering construction and management, geotechnical engineering testing, etc.
Generally, the Geotechnical Survey Technician performs the following responsibilities:

a) Engineering geological surveying and mapping

b) Geotechnical survey scheme design

c) Geotechnical survey points measurement and setting

d) Geological documentation of drill hole

e) Sample collection

f) In-situ test

g) Hydrogeological survey

h) Geotechnical test

i) Water assay

j) Drawing of geotechnical survey maps

k) Geotechnical report compiling

l) Geotechnical engineering construction and management

m) Geotechnical engineering detection

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR GEOTECHNICAL SURVEY TECHNICIAN - NTA 5

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGICAL DATA COLLECTION AND INVESTIGATION	**DUTY NO.**	501
TASK TITLE	COLLECTION OF INFORMATION ON THE INVESTIGATION AREA	**TASK NO.**	5011
PERFORMANCE CRITERIA	The person performing this task must be able to collect information on the investigation area in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT:	The task can be performed outdoors or in the field under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Regional geological, structural, remote sensing, meteorological, hydrological, seismic, hydrogeological and engineering geological data; 2. Topographic base map; 3. Computer and office software; 4. Internet platform.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Confirm the methods to collect data; 2. Collect regional geological information; 3. Collect regional seismic information; 4. Collect regional remote sensing information; 5. Collect hydrological and meteorological information on the investigation area; 6. Collect the hydrogeological conditions of the field area; 7. Collect information on adverse geological phenomena and their effects in the field area; 8. Collect the existing engineering survey information for the field area; 9. Collect information on human engineering activities in the site area; 10. Integrate and filter the information collected.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify topography and landform; 1.2 Delineate the lithology of the strata; 1.3 Identify geological structure; 1.4 Analyse adverse geological phenomena and its effect; 1.5 Integrate and filter the information collected. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Underpinning knowledge of geology; 2.2 Underpinning knowledge related to hydrometeorology.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Sources and methods of collecting information for engineering geological surveying and mapping and investigation; 3.2 Means and approaches of fieldwork for engineering geological surveying and mapping and investigation; 3.3 The content and requirements of engineering geological surveying and mapping and investigation. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Investigation area information is collected in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGICAL DATA COLLECTION AND INVESTIGATION	**DUTY NO.**	501
TASK TITLE	USE OF SIMPLE INSTRUMENTS FOR ENGINEERING GEOLOGICAL SURVEYING AND MAPPING	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to carry out engineering geological surveying and mapping on site in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed outdoors or in the field under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Geological compass; 2. Geological hammer; 3. Magnifier; 4. Steel tapes; 5. Measuring rope; 6. Tape measure; 7. Current meter; 8. Triangular weir; 9. Stopwatch; 10. Straightedge; 11. Communication equipment; 12. Digital camera; 13. GNSS handset.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the tools and equipment required for performing this task; 2. Prepare field safety precautions; 3. Read and understand the basic elements of topographic and geological maps; 4. Locate and identify geological phenomena (topography and landform, stratigraphic lithology, geological structure, hydrogeology, adverse geological phenomena, etc.); 5. Use tools such as geological compasses,	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare field safety precautions; 1.2 Read and write topographical and geological maps; 1.3 Locate and identify geological phenomena; 1.4 Use a simple tool for surveying and mapping on site. **2.0 Principle**

geological hammers, magnifier, measuring ropes and GNSS handhelds for on-site surveying and mapping.	The person performing this task must be able to explain the following principles: 2.1 The concepts and formation mechanisms of strata, geological structure, hydrogeology, topography and landform, adverse geological phenomena, etc.; 2.2 The connotation and characteristics of engineering geological conditions. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical methods for topography and landform surveying and mapping; 3.2 Technical methods for stratum lithology surveying and mapping; 3.3 Technical methods for geologic structure surveying and mapping; 3.4 Technical methods for hydrogeological surveying and mapping; 3.5 Technical methods for the surveying and mapping of adverse geological phenomena. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Solid geometry analysis; 5.3 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The field record books of engineering geological surveying and mapping are completed and hand maps are produced in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGICAL DATA COLLECTION AND INVESTIGATION	**DUTY NO.**	501
TASK TITLE	FILLING IN THE INVESTIGATION CARD	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to carry out investigation for site content and card completion in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT:	The task can be performed on the survey site under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Field record book; 2. Investigation card; 3. Drawing tools.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine the investigation content and format of the engineering geological surveying and mapping to be recorded; 2. Fill in the card for each investigation; 3. Draw geological sketch maps, free hand profiles and other geological sketches.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Fill in the investigation card; 1.2 Draw geological sketch maps, letterboxed profiles and other geological sketches. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The purpose and significance of engineering geological surveying and mapping and investigation; 2.2 The concepts and formation mechanisms of strata, geological structure, hydrogeology, topography and landform, adverse geological phenomena, etc.; 2.3 The connotation and characteristics of engineering geological conditions. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Technical methods and requirements related to engineering geological surveying and mapping and investigation. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Drawing skills; 4.4 Drawing reading skills; 4.5 Learning skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Solid geometry analysis; 5.3 Functional operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The investigation card is completed in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	HYDROGEOLOGICAL SURVEY	**DUTY NO.**	502
TASK TITLE	GEOLOGICAL DOCUMENTATION OF DRILL HOLE (GEOTECHNICAL IDENTIFICATION, STRATIGRAPHIC DIVISION)	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to conduct site surveys in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed on the survey site under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Pen knife, HB pencil, marker pen; 2. Magnifier; 3. Steel tapes; 4. Rock and mineral testing reagents; 5. Drilling record table.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the tools and equipment required for performing this task; 2. Direct the drilling rig in position and record the dimensions of the plan shift; 3. Direct the construction personnel to drill as required; 4. Direct the construction personnel to carry out in-situ test of the hole and collection of specimens as required; 5. Determine the drilling depth, identify the rock core drilled, determine the depth at which the rock core is located and measure its dimensions; 6. Describe the characteristics of each section of the rock core in the record table in separate rounds; 7. Record the data from in-situ tests such as calibration and dynamic probing in a record table in separate rounds; 8. Record the geotechnical sample collection information in a record table in separate	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine the drilling depth; 1.2 Identify geotechnical properties and delineate stratum; 1.3 Conduct in-situ test in the hole; 1.4 Collect specimens; 1.5 Fill in the drilling record table. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Formation mechanism of rock-soil layer; 2.2 Principles of geotechnical classification. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods for geotechnical properties

rounds; 9. Measure groundwater levels in layering and collect groundwater samples; 10. Draw an on-site schematic diagram of the drilling column; 11. Shoot the rock core image; 12. Sort out and submit drilling record tables and rock core images; 13. Clean and sort out operational tools.	identification; 3.2 Methods for stratigraphic division; 3.3 Operating procedures for engineering drilling; 3.4 Operating procedures for in-situ test in holes; 3.5 Requirements for completing the drilling record table. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics; 5.2 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The form of geological documentation of drill hole is completed in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	HYDROGEOLOGICAL SURVEY	**DUTY NO.**	502
TASK TITLE	PUMPING TEST	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to conduct on-site pumping tests in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the field under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Pumping equipment; 2. Tape measure, steel tape, measuring rope; 3. Water meter and triangular weir; 4. Record table; 5. Timer; 6. Pencil and calculator; 7. Squared paper (with 1 cm^2 squares).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the tools and equipment required for performing this task; 2. Assemble equipment; 3. Conduct on-site pumping tests; 4. Record the results of field trials such as water volume and drawdown; 5. Check data and results; 6. Dismantle the equipment, and clean and store the parts; 7. Make drawings for pumping tests.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Assemble equipment; 1.2 Conduct on-site pumping tests; 1.3 Record the test results; 1.4 Make drawings for pumping tests. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Basic principles of hydrogeology; 2.2 Basic principles of groundwater dynamics. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for pumping tests; 3.2 Method for making pumping test drawings.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The field pumping test data is recorded and pumping test drawings are made in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	HYDROGEOLOGICAL SURVEY	**DUTY NO.**	502
TASK TITLE	WATER INJECTION TEST	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to conduct water injection tests in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the field under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Measuring cylinder and measuring cup; 2. Tape measure and steel tape; 3. Timer; 4. Waterstop equipment; 5. Pencil and calculator; 6. Squared paper (with 1 cm^2 squares).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the tools and equipment required for performing this task; 2. Assemble equipment; 3. Conduct on-site water injection tests; 4. Record the results of field trials such as water volume and drawdown; 5. Check data and results; 6. Dismantle the equipment, and clean and store the parts; 7. Make drawings for water injection.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Assemble equipment; 1.2 Conduct on-site water injection tests; 1.3 Record the test results; 1.4 Make drawings for water injection. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Basic principles of hydrogeology; 2.2 Basic principles of groundwater dynamics. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for water injection tests; 3.2 Method for making water injection test drawings.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The data of field water injection test is recorded and water injection test drawings are made in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	HYDROGEOLOGICAL SURVEY	**DUTY NO.**	502
TASK TITLE	WATER PRESSURE TEST	**TASK NO.**	5024
PERFORMANCE CRITERIA	The person performing this task must be able to conduct water pressure tests in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the field under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Water pressure equipment; 2. Waterstop plug; 3. Water meter.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the tools and equipment required for performing this task; 2. Assemble equipment; 3. Conduct on-site water pressure test; 4. Record the field test results; 5. Check data and results; 6. Dismantle the equipment, and clean and store the parts; 7. Make drawings for the water pressure test.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Assemble equipment; 1.2 Conduct on-site water pressure test; 1.3 Record the test results; 1.4 Make drawings for the water pressure test. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Basic principles of hydrogeology; 2.2 Basic principles of groundwater dynamics. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for water pressure tests; 3.2 Method for making water pressure test drawings. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills;

	4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The data of field water pressure test is recorded and water pressure test drawings are made in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL TEST DATA PROCESSING AND DRAWINGS MAKING	**DUTY NO.**	503
TASK TITLE	PARTICLE-SIZE ANALYSIS TEST DATA PROCESSING AND DRAWINGS MAKING	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to conduct the data processing and draw grading curves in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the laboratory and indoors under the supervision of the geotechnical engineers. The tools and equipment to be used include: 1. Semilogarithmic paper; 2. Drawing tool; 3. Calculator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Calculate the percentage content of each grain group and cumulative percentage content; 2. Draw particle grading curves; 3. Determine the name of the soil sample based on the percentage content of each grain group; 4. Calculate the nonuniform coefficient; 5. Determine the degree of uniformity and continuity of the grain size of sandy soils.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Calculate the percentage content of each grain group and cumulative percentage content; 1.2 Draw particle grading curves; 1.3 Determine the name of the soil sample; 1.4 Calculate the nonuniform coefficient. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of particle grading. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Method for naming coarse-grained soils. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The result table of coarse-grained soil particle analysis is prepared and grading curves are drawn in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Safety knowledge of laboratory; 4. Disposal methods for laboratory waste.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL TEST DATA PROCESSING AND DRAWINGS MAKING	**DUTY NO.**	503
TASK TITLE	DATA PROCESSING AND DRAWINGS MAKING OF CONVENTIONAL TEST OF SOILS	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to carry out data processing of conventional test of soil and produce relevant drawings in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the laboratory and indoors under the supervision of the geotechnical engineers. The tools and equipment to be used include: 1. Measured data of geotechnical test; 2. Computer and office software; 3. Drawing tools, calculators; 4. Test data analysis software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare suitable tools and materials; 2. Calculate indicators of moisture content, density and specific gravity of soil particles; 3. Deal with the moisture content test data, draw the boundary moisture content test drawing and determine the boundary moisture content; 4. Process consolidation test data, produce compressibility test drawings and determine compressibility indicators; 5. Process shearing test data, draw shearing test drawings and determine shearing strength indicatorS; 6. Determine the name of the soil sample.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Deal with the data of conventional test of soils; 1.2 Prepare geotechnical test drawings; 1.3 Determine parameters and indicators such as water content, density, specific gravity, boundary moisture content, compression coefficient, compression modulus, cohesion and angle of internal friction of the soil; 1.4 Name the soil sample. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Underpinning knowledge of specific gravity of soil particle, density, moisture content, boundary moisture content, compression coefficient, compression modulus, cohesion and angle of internal friction of soil particles;

	2.2 The correlation between geotechnical parameters. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Geotechnical test data processing methods; 3.2 Methods for making geotechnical test result drawings; 3.3 Method for naming soil samples. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Drawing skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Summary tables of geotechnical test data achievements are formulated and relevant drawings are made in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL TEST DATA PROCESSING AND DRAWINGS MAKING	**DUTY NO.**	503
TASK TITLE	TRIAXIAL COMPRESSION TESTING OF SOILS, DATA PROCESSING AND DRAWINGS MAKING	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to perform triaxial compression test operations on soils, data processing and drawings making in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed in the laboratory and indoors under the supervision of the geotechnical engineers. The tools and equipment to be used include: 1. Triaxial apparatus and ancillary equipment; 2. Computer and office software; 3. Drawing tools, calculators.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare suitable tools, equipment and materials; 2. Choose a test method based on engineering practice; 3. Prepare 3 to 4 specimens from the same stratum; 4. Mount specimen samples and select a suitable confining pressure sample by sample for triaxial compression test; 5. Record test data; 6. Prepare drawings to determine the shearing strength indicator; 7. Disassemble and clean the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose a test method based on engineering practice; 1.2 Prepare the samples; 1.3 Conduct triaxial compression test; 1.4 Record test data; 1.5 Prepare drawings to determine the shearing strength indicator. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Basic principles of pore water pressure and shearing strength of soils; 2.2 Possible problems, reasons and solutions during the test. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 Operating procedures for triaxial compression testing of soils. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Drawing skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Summary tables of triaxial compression test data achievements for soils are formulated and relevant drawings are made in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Safety knowledge of laboratory; 4. Disposal methods for laboratory waste.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DRAWING OF GEOTECHNICAL SURVEY MAPS	**DUTY NO.**	504
TASK TITLE	DRAWING OF ENGINEERING GEOLOGICAL PLANS	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to draw the engineering geological plan in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Computer and office software; 2. Drawing tools, mapping software; 3. Geological information for drilling hole.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Summarize information on exploratory spot hole number, type, coordinates, elevation, water level, hole depth, etc.; 2. Select the appropriate paper and proportional scale, draw the frame, figure name, legend, scale, responsibility column and determine the coordinate system; 3. Draw exploratory spots, proposed building contours, field environment, coordinates and elevation pilot testing points in accordance with coordinates; 4. Draw profile lines; 5. Complete drawings.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose the appropriate paper and proportional scale; 1.2 Select the legend; 1.3 Draw the elements of an engineering geological plan; 1.4 Complete drawings. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The implication of the elements of an engineering geological plan. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Requirements and methods for drawing engineering geological plans. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The engineering geological plans are prepared in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DRAWING OF GEOTECHNICAL SURVEY MAPS	**DUTY NO.**	504
TASK TITLE	DRAWING OF ENGINEERING GEOLOGICAL HISTOGRAM	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to draw the engineering geological histogram in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Computer and office software; 2. Drawing tools, mapping software; 3. Geological information for drilling hole.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**PRACTICAL PERFORMANCE**
The person performing this task must be able to do the following: 1. Check the field compilation sheet to summarise information on exploratory spot hole number, type, coordinates, elevation, water level, hole depth, stratigraphic division, in-situ test and specimen collection; 2. Choose the appropriate paper and proportional scale and draw the frame; 3. Draw header information for the histogram, including project name, borehole number, borehole coordinates, water level, borehole depth, etc.; 4. Draw information on the depth and thickness of soil layers and describe their properties; 5. Draw the codes of soil age, genesis; 6. Draw sampling and in-situ test information; 7. Draw the responsibility column; 8. Complete drawings.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose the appropriate paper and proportional scale and draw the frame; 1.2 Draw the elements of a profile; 1.3 Complete drawings. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The implication of the elements in an engineering geological histogram; 2.2 Principles of geotechnical layer classification. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods for drawing engineering geological histogram. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The engineering geological histograms are prepared in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DRAWING OF GEOTECHNICAL SURVEY MAPS	**DUTY NO.**	504
TASK TITLE	DRAWING OF ENGINEERING GEOLOGICAL PROFILE	**TASK NO.**	5043
PERFORMANCE CRITERIA	The person performing this task must be able to draw the engineering geological profile in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Computer and office software; 2. Drawing tools, mapping software; 3. Geological information for drilling hole.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**PRACTICAL PERFORMANCE**
The person performing this task must be able to do the following: 1. Check field documentation sheets and borehole histograms; 2. Choose the appropriate paper and proportional scale; 3. Draw the frame and elevation proportional scales; 4. Draw frame information of the exploratory spot dissected by the hatching line; 5. Draw information on sampling, in-situ test, water levels, etc. at exploratory spot; 6. Draw stratum stratification lines with information such as depth of stratification and elevation; 7. Draw the responsibility column; 8. Complete drawings.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose the appropriate paper and proportional scale; 1.2 Draw frames and borehole grillages; 1.3 Draw the elements of an engineering geological profile; 1.4 Complete drawings. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The implication of the elements in an engineering geological profile; 2.2 Principle of comprehensive classification of geotechnical layer. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods for drawing engineering geological profiles.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills of understanding and making drawings; 4.4 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics; 5.2 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The engineering geological profiles are prepared in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING CONSTRUCTION	**DUTY NO.**	505
TASK TITLE	CONSTRUCTION OF SHALLOW FOUNDATIONS ON NATURAL GROUND	**TASK NO.**	5051
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the construction of shallow foundations on natural ground in accordance with technical requirements and project technical documentation		
RANGE STATEMENT	The task can be performed on construction site or indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Technical requirements, geotechnical engineering investigation reports, shallow foundation construction drawings, construction organisation designs; 2. Engineering measuring instrument, such as level gauge, total stations, GNSS-RTK equipment; 3. Computer and office software; 4. Communication tools; 5. Personal protective equipment, such as safety shoes, safety helmets, work clothes.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Read technical documents such as shallow foundation construction drawings and construction organisation designs; 2. Organise construction work teams for technical communication; 3. Organize the surveying and setting out and checking of building line; 4. Control the quality of the whole process of shallow foundation construction; 5. Control the safety of shallow foundations throughout the construction process; 6. Write and submit construction records and other relevant construction information.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read technical documentation for pile foundation construction projects; 1.2 Organise construction work teams for technical communication; 1.3 Organize the surveying and setting out and checking of building line; 1.4 Control quality and safety during construction; 1.5 Write and submit construction records. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for the selection and layout of

	foundations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Construction techniques and quality control standards for shallow foundations; 3.2 Methods for identifying safety risk sources in shallow foundation construction. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Skills of understanding and making drawings; 4.5 Learning skills. **5.0 Math Skills** 5.1 Trigonometric operation; 5.2 Plane analytic geometry; 5.3 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The quality of the construction of shallow foundations is controlled and construction records are prepared and submitted in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of work safety in architectural engineering.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING CONSTRUCTION	**DUTY NO.**	505
TASK TITLE	CONSTRUCTION OF FOUNDATION TREATMENT	**TASK NO.**	5052
PERFORMANCE CRITERIA	The person performing this task must be able to carry out foundation treatment works in accordance with technical requirements and project technical documentation		
RANGE STATEMENT	The task can be performed at the construction site or indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Technical requirements, foundation treatment construction drawings, construction organisation design; 2. Engineering measuring instrument, such as level gauge, total stations, GNSS-RTK equipment; 3. Personal protective equipment, such as safety shoes, safety helmets, work clothes; 4. Communication tools; 5. Computer and office software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Read technical documents such as foundation treatment construction drawings and construction organisation designs; 2. Organise construction work teams for technical communication; 3. Organise the surveying and setting out and checking of building line; 4. Control the quality of the whole process of foundation treatment construction; 5. Control the safety throughout the construction of foundation treatment; 6. Write and submit construction records and other relevant construction information.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read technical documentation for foundation treatment construction projects; 1.2 Organise construction work teams for technical communication; 1.3 Organise the surveying and setting out and checking of building line; 1.4 Control the quality and safety of the construction process; 1.5 Write and submit construction records. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The applicable scope of the various foundation treatment methods; 2.2 Mechanisms of reinforcement for various

	types of foundation treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Construction techniques and quality control standards for foundation treatment; 3.2 Methods for identifying safety risk sources in foundation treatment construction. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Skills of understanding and making drawings; 4.5 Learning skills. **5.0 Math Skills** 5.1 Trigonometric operation; 5.2 Plane analytic geometry; 5.3 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The quality of the foundation treatment construction is controlled and construction records are prepared and submitted in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of work safety in architectural engineering.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING DETECTION	**DUTY NO.**	506
TASK TITLE	FIELD TEST FOR COMPOSITE FOUNDATION LOAD TEST	**TASK NO.**	5061
PERFORMANCE CRITERIA	The person performing this task must be able to carry out field test of composite foundation loads in accordance with the standards and guidelines approved by the competent authorities		
RANGE STATEMENT	The task can be performed on the survey site under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Test equipment (bearing plates, jacks, counterweights, load sensors, displacement sensors, etc.); 2. Shovels, hoes, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select the appropriate tools, equipment and safety devices; 2. Dig the test pits; 3. Install the test equipment; 4. Load and record the test data; 5. Determine the criteria for termination of the test; 6. Unload and record test data; 7. Dismantle equipment; 8. Clean and store the equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Dig the test pits; 1.2 Install the test equipment; 1.3 Load and record the test data; 1.4 Determine the criteria for termination of the test; 1.5 Unload and record test data; 1.6 Clean and store the equipment after dismantling it. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Mechanisms for strengthening composite foundations; 2.2 Knowledge of the bearing capacity (strength) and settlement deformation of composite foundations. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 Operating procedures for composite foundation load tests. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Composite foundation load tests are conducted and test data is recorded in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of work safety in architectural engineering.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING DETECTION	**DUTY NO.**	506
TASK TITLE	FIELD TESTING OF FOUNDATION PILE LOAD TESTS	**TASK NO.**	5062
PERFORMANCE CRITERIA	The person performing this task must be able to carry out field testing of foundation pile loads in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed at the construction site under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Test equipment (loading counterforce device, loading and control system, measuring system, jacks, load sensors and displacement sensors); 2. Shovels, hoes, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select the appropriate tools, equipment and safety devices; 2. Deal with the pile heads; 3. Install the test equipment; 4. Load and record the test data; 5. Determine the criteria for termination of the test; 6. Unload and record test data; 7. Dismantle equipment; 8. Clean and store the equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Deal with the pile heads; 1.2 Install the test equipment; 1.3 Load and record the test data; 1.4 Determine the criteria for termination of the test; 1.5 Unload and record test data; 1.6 Clean and store the equipment after dismantling it. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Sources of pile bearing capacity; 2.2 Knowledge of pile bearing capacity (strength) and settlement deformation. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Operating procedures for foundation pile load tests. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The test record data is filled out in accordance with the standards and guidelines approved by the competent authorities.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics; 3. Knowledge of work safety in architectural engineering.

TABLE 1: DACUM CHARTS FOR GEOTECHNICAL SURVEY TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Engineering geological data collection and investigation	1.1 Collection of information on the investigation area. 1.2 Use of simple instruments for engineering geological surveying and mapping. 1.3 Fill in the investigation card.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of the underpinning knowledge of geology · A good knowledge of the underpinning knowledge of hydrometeorology · A good knowledge of the sources and methods for collecting information for engineering geological surveying and mapping and investigation · A good knowledge of the tools and methods for engineering geological surveying and mapping and fieldwork Investigation · A good knowledge of the content and requirements of engineering geological surveying and mapping and investigation · Ability to divide strata lithologies · Ability to identify geological structure · Ability to analyse adverse geological effects · Ability to integrate and filter the information collected · A good knowledge of the concepts and formation mechanisms of strata, geological structure, hydrogeology, topography and landform and adverse geological phenomena as well as the meaning and characteristics of engineering geological conditions · A good knowledge of the technical methods for topography and landform surveying and mapping, stratum lithology surveying and mapping, geological structure surveying and mapping, hydrogeology surveying and mapping and adverse geological

DUTIES	TASKS	ENABLERS
		phenomena surveying and mapping · Ability to prepare field safety precautions · Ability to read and write topographical and geological maps · Ability to locate and identify geological phenomena · Ability to use a simple tool for surveying and mapping on site · A good knowledge of the purpose and significance of engineering geological surveying and mapping and investigation · A good knowledge of technical methods and requirements related to engineering geological surveying and mapping and investigation · Ability to fill in Investigation cards · Ability to draw geological sketch maps, free hand profiles and other geological sketches · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Geological compass · Geological hammer · Magnifier · Steel tape · Tape measure · Steel ruler · Current meter · Triangular weir · Computer and communication equipment (including stopwatch) · GNSS handset · Electronic water level gauge

DUTIES	TASKS	ENABLERS
		Materials · Field record book, pencils, sample packs, Investigation cards **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
2.0 Hydrogeology survey	2.1 Geological documentation of drill hole (geotechnical identification, stratigraphic division). 2.2 Pumping test. 2.3 Water injection test. 2.4 Water pressure test.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of geotechnical identification methods · A good knowledge of stratigraphic divisions · A good knowledge of the operating procedures for engineering drilling · A good knowledge of the requirements for completing the drill record table · A good knowledge of the mechanism of formation of geotechnical layer · A good knowledge of the principles of rock-soil classification · Ability to conduct a geological documentation of drill hole according to the requirements · A good knowledge of the basic principles of hydrogeology · A good knowledge of basic groundwater dynamics · A good knowledge of operating procedures for pumping tests, water injection tests and water pressure tests · A good knowledge of methods for producing the drawing of pumping test, water injection test and water pressure test · Ability to conduct pumping tests, water injection tests, water pressure tests, and record test results and make test

DUTIES	TASKS	ENABLERS
		drawings · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Knife · HB pencil · Marker pen · Magnifier · Steel tape · Straightedge · Pumping equipment · Water supply equipment · Water pressure equipment · Water measurement tool · Timer · Measurement equipment · Waterstop equipment **Materials** · Rock and mineral testing reagents · Record tables **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
3.0 Geotechnical test data processing and drawings making	3.1 Particle-size analysis test data processing and drawing. 3.2 Data processing and drawings making of conventional test of soils. 3.3 Triaxial tests on cohesive soils and data processing and drawing.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of the principles of particle grading · A good knowledge of coarse-grained soil nomenclature · Ability to calculate the percentage content of each grain group and

DUTIES	TASKS	ENABLERS
		cumulative percentage content · Ability to draw particle grading curves · Ability to the name of the soil sample · Ability to calculate the nonuniform coefficient · A good knowledge of underpinning knowledge of specific gravity of soil particle, density, moisture content, boundary moisture content, compression coefficient, compression modulus, cohesion and angle of internal friction of soil particles · Understanding of the related knowledge between geotechnical parameters · A good knowledge of the handling of overproof in parallel measurements · A good knowledge of the handling of overproof in boundary moisture content result · A good knowledge of rapid consolidation test data processing and results drawing methods · A good knowledge of direct shear test data processing and results drawing methods · Ability to identify the name of a soil and describe its characteristics · Ability to measure basic parameters such as specific gravity, water content, density, boundary moisture content and shearing strength h of soils · A good knowledge of underpinning knowledge of pore water pressure and shearing strength of soils · A good knowledge of the operating procedures for triaxial tests on cohesive soils · Ability to perform triaxial tests on cohesive soils and data processing and drawing · Office software operation skills

DUTIES	TASKS	ENABLERS
		· Application writing skills · Graph reading and drawing skills **Tools and equipment** · Table of Geotechnical Test Results · Software related to drawing coordinates · Tri-axis compressor and ancillary equipment **Materials** · Basic drawing stationery and coordinate paper **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
4.0 Drawing of geotechnical survey maps	4.1 Drawing of engineering geological plans. 4.2 Drawing of engineering geological bar charts. 4.3 Drawing of engineering geological profile.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of the comprehensive principles for rock-soil layer classification · A good knowledge of the implication of the elements in engineering geological plans, histograms and profiles · A good knowledge of the requirements and methods for drawing engineering geological plans, histograms and profiles · Ability to draw engineering geological plans, histograms and profiles · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Mapping software.

DUTIES	TASKS	ENABLERS
		· Engineering geological survey site information **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
5.0 Geotechnical engineering construction	5.1 Construction of shallow foundations on natural ground. 5.2 Construction of foundation treatment.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of the principles of foundation selection and layout · A good knowledge of the applicable scope of the various foundation treatment methods · A good knowledge of mechanisms of reinforcement for various types of foundation treatment. · A good knowledge of construction techniques and quality control standards for shallow foundations and foundation treatment construction process · A good knowledge of identification methods for shallow foundations and foundation treatment construction safety risk source · Ability to read technical documentation for construction projects · Ability to organise construction work teams for technical communication · Ability to organise the surveying and setting out and checking of building line · Ability to carry out quality and safety control of the construction process · Ability to prepare and submit construction records · Office software operation skills · Application writing skills · Graph reading and drawing skills

DUTIES	TASKS	ENABLERS
		Tools and equipment · Personal protective equipment such as safety shoes, goggles, gloves and safety helmets · Communication devices, computers and other office equipment · Measuring tapes, theodolites, measuring bars, level gauges, total stations, GNSS-RTK equipment, prism targets, etc. · Construction organization design schemes · Construction management platforms **Materials** · Sand, gravel, crushed stone, cement, reinforcement, formwork · Precast pile **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
6.0 Geotechnical engineering detection	6.1 Field test for composite foundation load test. 6.2 Field testing of foundation pile load tests.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · A good knowledge of the sources of pile load bearing capacity · Understanding of pile bearing capacity (strength) and settlement deformation. · A good knowledge of the mechanism of composite foundation strengthening · Understanding of the bearing capacity (strength) and settlement deformation of composite foundations · A good knowledge of operating procedures for foundation piles and composite load tests

DUTIES	TASKS	ENABLERS
		· Ability to carry out field testing of foundation piles and composite foundation load tests and record data · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Bearing plate · Load benches and counterweights · Jack · Load sensor · Displacement sensor · Settlement observation equipment · Shovels and hoes · Counterweights, ground anchors, steel plates **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness