NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: GEOTECHNICAL SURVEY TECHNICIAN

LEVEL: NTA 6

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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 6

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGIC SURVEYING AND MAPPING AND INVESTIGATION	**DUTY NO.**	601
TASK TITLE	PLANNING THE ROUTE OF SURVEYING AND MAPPING	**TASK NO.**	6011
PERFORMANCE CRITERIA	The person performing this task must be able to plan the route of surveying and mapping 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. Drawing tools, mapping software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Collect and study existing data; 2. Visit and survey the site; 3. Delineate the scope of engineering geological surveying and mapping and investigation; 4. Select the scale of engineering geological surveying and mapping and investigation; 5. Select the location of the measured geological profile; 6. Arrange measuring points for engineering geological surveying and mapping and investigation; 7. Draw the route map of engineering geological surveying and mapping and investigation.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect and study existing data; 1.2 Visit and survey the site; 1.3 Plan and draw the route map of engineering geological surveying and mapping and investigation. **2.0 Principle** 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. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Methods and requirements for planning the routes for engineering geological surveying and mapping and investigation. **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 Trigonometric operation; 5.2 Plane analytic geometry; 5.3 Solid geometry analysis; 5.4 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The route map for planning engineering geological surveying and mapping and investigation is 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. Knowledge of outdoor production safety; 4. Eco-friendly survey methods.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGIC SURVEYING AND MAPPING AND INVESTIGATION	**DUTY NO.**	601
TASK TITLE	DRAWING A MAP OF SURVEYING AND MAPPING RESULTS	**TASK NO.**	6012
PERFORMANCE CRITERIA	The person performing this task must be able to map the surveying and mapping results 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. Regional geological, structural, remote sensing, meteorological, hydrological, seismic, hydrogeological and engineering geological data; 2. Field sketch; 3. Field record book; 4. Investigation card; 5. Field image data; 6. Computer and office software; 7. Drawing tools, mapping software.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Analyse and collate field sketches and investigation results; 2. Select the scale of the result map; 3. Select the legend and style of the result map; 4. Draw the actual material map; 5. Draw comprehensive engineering geological map.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse and collate field sketches and investigation results; 1.2 Draw the actual material map; 1.3 Draw the comprehensive engineering geological map. **2.0 Principle** 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. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The methods and workflow of drawing surveying

	and mapping results map. **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 Trigonometric operation; 5.2 Plane analytic geometry; 5.3 Solid geometry analysis; 5.4 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The actual material map and comprehensive engineering geological map 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ENGINEERING GEOLOGIC SURVEYING AND MAPPING AND INVESTIGATION	**DUTY NO.**	601
TASK TITLE	PREPARING THE SURVEYING AND MAPPING SUMMARY OR REPORT	**TASK NO.**	6013
PERFORMANCE CRITERIA	The person performing this task must be able to prepare surveying and mapping summaries or reports 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. Regional geological, structural, remote sensing, meteorological, hydrological, seismic, hydrogeological and engineering geological data; 2. Field sketch; 3. Field record book; 4. Investigation card; 5. Field image data; 6. Engineering geological surveying and mapping and investigation results map; 7. Computer and office software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse and collate field sketches; 2. Analyse and collate the field record book; 3. Analyse and collate survey cards and field image data; 4. Analyse and collate engineering geological surveying and mapping and investigation results map; 5. Prepare surveying and mapping summary or report text.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse and collate the data of engineering geological surveying and mapping and investigation achievement data; 1.2 Prepare surveying and mapping summary or report text. **2.0 Principle** 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 Content and format requirements of surveying and mapping summary or report; 3.2 Method and process of preparing surveying and mapping summary or report. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics; 5.2 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The preparation of the surveying and mapping summary or report 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL SURVEY SCHEME DESIGN	**DUTY NO.**	602
TASK TITLE	DESIGN THE SURVEY SCHEME (SURVEY OUTLINE)	**TASK NO.**	6021
PERFORMANCE CRITERIA	The person performing this task must be able to design the survey plan (survey outline) in accordance with the standards and guidelines approved by the competent authorities.		
RANGE STATEMENT	The task can be performed indoors and in geotechnical engineering survey site 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. Existing survey data of the site and nearby areas; 3. General plan of construction project with coordinates and topography; 4. Power of attorney for survey tasks and engineering contracts; 5. Computer and office software.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Study the general plan of the construction project, the power of attorney for survey tasks, the project contract and relevant data; 2. Visit and survey the site; 3. Arrange survey workload; 4. Plan the personnel, equipment and construction period; 5. Prepare the text of the survey and design scheme (survey outline).	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Study the general plan of the construction project, the power of attorney for the survey, the project contract and relevant data; 1.2 Prepare the text of the survey and design scheme (survey outline). **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Methods of geotechnical engineering survey and their applicability; 2.2 Types of foundation and its scheme selection. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The contents of the design of the survey scheme (survey outline); 3.2 Method of preparing the survey and design scheme (survey outline).

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics; 5.2 Plane analytic geometry; 5.3 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The preparation of the survey and design scheme (survey outline) 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	GEOTECHNICAL SURVEY SCHEME DESIGN	**DUTY NO.**	602
TASK TITLE	DRAWING THE LAYOUT PLAN OF THE EXPLORATORY SPOT	**TASK NO.**	6022
PERFORMANCE CRITERIA	The person performing this task must be able to draw the layout of exploratory spots 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. Text of survey plan (survey outline); 2. General plan of construction project with coordinates and topography; 3. Computer and office software; 4. Drawing tools, mapping software.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Determine the scale of the layout plan of exploratory spots; 2. Determine the mappable unit of exploratory spots; 3. Draw the frame and responsibility column; 4. Draw all the elements of the layout of exploratory spots.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Draw the layout of exploratory spots in accordance with the text of survey and design scheme (outline). **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The meaning of each element in the layout of exploratory spots. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods and requirements for drawing the layout of exploratory spots. **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 drawing of the layout of exploratory spots 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL SURVEY SCHEME DESIGN	**DUTY NO.**	602
TASK TITLE	ORGANIZING CONSTRUCTION EQUIPMENT AND PERSONNEL	**TASK NO.**	6023
PERFORMANCE CRITERIA	The person performing this task must be able to organize the construction equipment and personnel in accordance with the survey plan (survey outline) and the actual situation.		
RANGE STATEMENT	The task can be performed indoors under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Text and map of the survey plan (survey outline); 2. Construction equipment and supporting construction personnel.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the text and map of the design scheme (survey outline); 2. Select the construction equipment suitable for the survey technical scheme, including the type, specification, quantity and transportation vehicles of the survey equipment; 3. Organize supporting construction personnel.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Organize construction equipment and supporting construction personnel. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The applicability of engineering survey construction equipment and construction technology. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Requirements of organizing the construction equipment and supporting construction personnel. **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 equipment and construction team that meet the construction requirements and can enter the site on time in accordance with the survey design scheme (survey outline) approved by the survey unit and the actual situation is organized.
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 - NTA 6	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL TEST	**DUTY NO.**	603
TASK TITLE	EXPANSION TEST OF SOIL	**TASK NO.**	6031
PERFORMANCE CRITERIA	The person performing this task must be able to complete the detection of the free expansion rate of soil in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Measuring cylinder (50ml); 2. Soil measuring cup (10ml); 3. Neck-free funnel; 4. Stirrer (composed of straight rod and circular plate with holes, which should be slightly smaller than the diameter of measuring cylinder); 5. Balance (weigh: 200g, minimum division value: 0.01g); 6. Reagents: 5% pure sodium chloride solution; 7. Other equipment: Including dryer, flat knife, support, desiccator, 0.5mm standard sieves, etc.		

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 test samples; 3. Install test devices; 4. Weigh the soil and pour the sample into the measuring cylinder; 5. Estimate the measuring cylinder data to determine the initial and expanded sample height; 6. Calculate the free expansion rate; 7. Determine the expansive potential of expansive soil; 8. Disassemble instruments, clean tools, equipment and workplaces; 9. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare test samples; 1.2 Install test devices; 1.3 Estimate the measuring cylinder data to determine the initial and expanded sample height; 1.4 Calculate the free expansion rate; 1.5 Determine the expansive potential of expansive soil. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Basic concepts and meanings of soil expansion, free expansion rate and expansion potential. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for free expansion rate test.

	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 table of expansion rate test results is filled in accordance with the standards and guidelines approved by the competent authorities and the expansion rate test results.
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	**DUTY NO.**	603
TASK TITLE	SOIL COLLAPSIBILITY TEST	**TASK NO.**	6032
PERFORMANCE CRITERIA	The person performing this task must be able to complete the soil collapsibility detection in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Cutting ring; 2. Consolidometer; 3. Coulter knife and wire saw; 4. Vaseline oil; 5. Glass plate; 6. Filter paper and permeable stone; 7. Scraper; 8. Balance (weigh: 200g, division value: 0.01g).		

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. Test the density of soil samples; 3. Prepare soil samples; 4. Install soil samples; 5. Determine and apply pressure at all levels; 6. Evaluate and read the dial indicator and measure the deformation at all levels; 7. Calculate collapsibility coefficient and self-weight collapsibility coefficient; 8. Disassemble instruments, clean tools, equipment and workplaces; 9. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Test the density of soil samples; 1.2 Prepare soil samples; 1.3 Determine and apply pressure at all levels; 1.4 Evaluate and read the dial indicator and measure the deformation at all levels; 1.5 Calculate collapsibility coefficient and self-weight collapsibility coefficient. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The basic concepts and meanings of collapsible soil, collapsibility coefficient and self-weight collapsibility coefficient; 2.2 Influence of collapsible soil on engineering. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Operating procedures for soil collapsibility test. **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 table of soil collapsibility test results is filled in accordance with the standards and guidelines approved by the competent authorities and soil collapsibility test results.
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	**DUTY NO.**	603
TASK TITLE	ROCK COMPRESSIVE STRENGTH TEST	**TASK NO.**	6033
PERFORMANCE CRITERIA	The person performing this task must be able to complete the rock compressive strength test in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Pressure testing machine or universal testing machine; 2. Equipment for processing and preparing rock samples: Including stone cutter, stone grinder and pool; 3. Dryer, desiccator; 4. Vernier caliper, universal angle ruler.		

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. Preparing the rock sample; 3. Describe the sample; 4. Place the samples; 5. Operate the press machine to press the sample until it is damaged; 6. Record the test process and describe the failure mode of the sample; 7. Calculate the compressive strength of the sample; 8. Clean the tools, equipment and workplaces; 9. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Preparing the rock sample; 1.2 Place the sample; 1.3 Apply pressure; 1.4 Describe the failure mode of the samples; 1.5 Calculate the compressive strength of the sample. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Sources and influencing factors of rock compressive strength. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for rock compressive strength test. **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 table of the rock compressive strength test results is filled in accordance with the standards and guidelines approved by the competent authorities and the rock compressive strength test results.
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	**DUTY NO.**	603
TASK TITLE	PREPARING GEOTECHNICAL TEST REPORT	**TASK NO.**	6034
PERFORMANCE CRITERIA	The person performing this task must be able to prepare geotechnical test reports in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of 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. Obtain the tools and equipment required for performing this task; 2. Check and gather test parameters and maps; 3. Prepare geotechnical test reports.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check and gather test parameters and maps; 1.2 Prepare geotechnical test reports. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Correlation and rationality of soil sample parameters. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of checking and gathering test parameters and maps; 3.2 Method and process of preparing geotechnical test reports. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills;

	4.5 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The geotechnical test report is prepared in accordance with the standards and guidelines approved by the competent authorities and geotechnical test results.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Laws and regulations of construction projects; 2. Occupational ethics.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	WATER ASSAY	**DUTY NO.**	604
TASK TITLE	BRIEF ANALYSIS OF WATER QUALITY AND PREPARATION OF REPORT	**TASK NO.**	6041
PERFORMANCE CRITERIA	The person performing this task must be able to complete the brief analysis test of water quality and prepare the water quality analysis report in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Filtration equipment: Including vacuum pump, flat-bottomed magnetic funnel and suction filter bottle; 2. Centrifuge; 3. Electric furnace, dryer, evaporating dish; 4. Titration table, burette, pipette, conical flask, triangular flask, beaker, thermometer, glass electrode; 5 Precision PH meter; 6. Balance (weigh: 200g, division value: 0.01g); 7. Reagents: Including methyl orange solution, hydrochloric acid standard solution, silver nitrate standard solution, potassium chromate solution, sodium hydroxide solution, acid chrome blue K naphthol green B indicator, disodium diethylamine tetraacetate solution, ammonia buffer solution, Congo red test paper, barium magnesium mixed solution and other solutions/reagents; 8. Computer and office software.		

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. Collect groundwater samples; 3. Preserve water samples; 4. Assemble instruments; 5. Prepare reagents; 6. Titrate the total hardness, total alkalinity, pH value, dissolved total solids, free carbon dioxide, carbonate ions, bicarbonate ions, chloride ions, sulfate ions, calcium ions, magnesium ions, potassium and sodium ions of water samples;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect and preserve groundwater samples; 1.2 Prepare reagents; 1.3 Titrate relevant indicators; 1.4 Analyse the test results; 1.5 Fill in the record table of brief analysis of water quality; 1.6 Prepare the brief analysis report of water quality. **2.0 Principle** The person performing this task must be able to explain the following principles:

7. Analyse the test results; 8. Prepare the brief analysis report of water quality; 9. Disassemble instruments, clean tools, equipment and workplaces; 10. Arrange and store the tools and equipment.	2.1 Basic concepts and principles of hydrogeochemistry; 2.2 Corrosive categories and hazards of groundwater to building materials. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures for brief analysis test of water quality; 3.2 Method of preparing brief analysis report of water quality. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Learning skills. **5.0 Math Skills** 5.1 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The brief analysis test of water quality is prepared in accordance with the standards and guidelines approved by the competent authorities and water quality analysis test parameters.
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 REPORT COMPILING	**DUTY NO.**	605
TASK TITLE	ANALYSIS AND STATISTICS OF SURVEY DATA	**TASK NO.**	6051
PERFORMANCE CRITERIA	The person performing this task must be able to analyse and count survey data 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. Drilling (exploration well) catalog table; 2. Rock core photos; 3. Geotechnical test report; 4. Brief analysis report of water quality; 5. In-situ test results table; 6. Scientific calculator or data analysis software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check and collate the survey results data; 2. Divide engineering geological units and rock and soil layers; 3. Conduct layered statistics on geotechnical parameters, including sample number, maximum value, minimum value, average value, standard deviation, coefficient of variation and standard value; 4. Analyse the rationality of stratigraphic division with statistical results, and identify and exclude distorted data; 5. Compile the statistical table of geotechnical parameters and indicators.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check and collate the survey results data and analyse the authenticity of the data; 1.2 Divide engineering geological units and rock and soil layers; 1.3 Conduct layered statistics of geotechnical parameters; 1.4 Compile the statistical table of geotechnical parameters and indicators. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Engineering implication of related geotechnical parameters and indicators; 2.2 Correlation of physical and mechanical performance parameters and indicators of rock and soil. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 Methods and processes of survey data analysis and statistics. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Solid geometry analysis; 5.3 Mathematical statistics; 5.4 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The compilation of the statistical table of geotechnical parameters and indicators 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL REPORT COMPILING	**DUTY NO.**	605
TASK TITLE	APPLICATION OF SURVEY DATA RESULTS	**TASK NO.**	6052
PERFORMANCE CRITERIA	The person performing this task must be able to apply the survey data achievement 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. Drilling (exploration well) catalog table; 2. Geotechnical test report; 3. Brief analysis report of water quality; 4. In-situ test results table; 5. Statistical table of geotechnical parameters and indicators; 6. Specifications for geotechnical engineering survey.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse and evaluate the geotechnical properties of the site and the uniformity of the geotechnical layer; 2. Analyse the results of exploration sampling, in-situ test and laboratory test; 3. Determine the design parameters such as foundation bearing capacity, compression modulus, pile side friction and pile end resistance.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Evaluate the geotechnical properties of the site and the uniformity of the geotechnical layer; 1.2 Analyse the survey and test results, and provide geotechnical parameters needed for architectural design. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Sources and influencing factors of bearing capacity of geotechnical layer foundation; 2.2 Sources and influencing factors of pile foundation bearing capacity. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of determining the design parameters such as foundation bearing capacity, compression modulus, pile side friction and pile end resistance.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills. **5.0 Math Skills** 5.1 Mathematical statistics; 5.2 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The design parameter table of foundation bearing capacity, compression modulus, pile side friction and pile end resistance, etc. 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL REPORT COMPILING	**DUTY NO.**	605
TASK TITLE	PREPARATION OF SURVEY SUMMARY OR REPORT	**TASK NO.**	6053
PERFORMANCE CRITERIA	The person performing this task must be able to complete the survey summary or report preparation 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. Drilling (exploration well) catalog table; 2. Rock core photos; 3. Geotechnical test report; 4. Brief analysis report of water quality; 5. In-situ test results table; 6. Statistical table of geotechnical parameters and indicators; 7. Existing survey data of the site and nearby areas; 8. Planning plan and field construction plan; 9. Computer and office software; 10. Drawing tools, mapping software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Revise the layout charts of exploratory spots; 2. Revise the engineering geological profile; 3. Revise the engineering geological histogram; 4. Evaluate site stability, stratum uniformity and seismic effect; 5. Determine the type of the foundation; 6. Prepare survey summary or report text.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Revise the survey result map; 1.2 Evaluate site stability, stratum uniformity and seismic effect; 1.3 Determine the type of the foundation; 1.4 Prepare survey summary or report text. **2.0 Principle** 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 Types of foundation and its scheme selection. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Contents and format requirements of survey summary or report; 3.2 Method and process of preparing survey summary or report. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Skills of understanding and making drawings; 4.6 Learning skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Solid geometry analysis; 5.3 Mathematical statistics; 5.4 Functional operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The preparation of the survey summary or report 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING CONSTRUCTION AND MANAGEMENT	**DUTY NO.**	606
TASK TITLE	CONSTRUCTION AND MANAGEMENT OF PILE FOUNDATION	**TASK NO.**	6061
PERFORMANCE CRITERIA	The person performing this task must be able to carry out pile foundation construction and management in accordance with technical requirements and technical documents of the project.		
RANGE STATEMENT	The task can be performed at construction sites under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Computer and office software; 2. Engineering measuring instruments, such as level gauge, total station or GNSS-RTK equipment; 3. Mud performance testing instruments, such as funnel viscometer, specific gravity scale, etc.; 4. Hole-forming quality testing instruments and tools, such as hole-forming and grooving quality inspection instrument, ultrasonic testing instrument, umbrella aperture meter, special inclinometer, sediment tester, steel ruler; 5. Personal protective equipment, such as safety shoes, safety helmets, work clothes; 6. Sampling tools for engineering materials, such as concrete test mold and electronic scale; 7. Technical requirements, geotechnical engineering survey report, pile foundation construction drawing and construction organization design.		

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. Read technical documents such as pile foundation construction drawings and construction organization design; 3. Organize construction work teams for technical communication; 4. Organize the surveying and setting out and checking of building line; 5. Control the quality of the whole process of precast pile construction; 6. Control the quality of the whole construction process of cast-in-place piles with mud wall protection; 7. Control the quality of the whole	**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 Select the appropriate pile type and pile-forming process; 1.3 Implement the technical requirements of pile foundation construction, organize pile foundation construction and control the construction quality of various types of pile foundations; 1.4 Write and submit construction records. **2.0 Principle** The person performing this task must be able to

construction process of long spiral bored pressure grouting pile; 8. Control the quality of the whole construction process immersed pipe cast-in-place piles; 9. Control the quality of the whole construction process of cast-in-place piles of dry operation; 10. Control the quality of post-grouting construction of cast-in-place pile; 11. Organize pile position deviation, pile body quality and bearing capacity inspections; 12. Write and submit construction records and other relevant construction information.	explain the following principles: 2.1 Sources and influencing factors of bearing capacity of pile foundation; 2.2 Principles for the selection and layout of piles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical requirements for foundation pile and pile cap structure; 3.2 Technical requirements for foundation construction; 3.3 Quality inspection standard for pile foundation construction. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Skills of understanding and making drawings; 4.6 Learning skills. **5.0 Math Skills** 5.1 Functional operation; 5.2 Trigonometric operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The construction quality of all kinds of pile foundations is controlled, and construction records and materials 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 AND MANAGEMENT	**DUTY NO.**	606
TASK TITLE	EXCAVATION ENGINEERING CONSTRUCTION AND MANAGEMENT	**TASK NO.**	6062
PERFORMANCE CRITERIA	The person performing this task must be able to carry out excavation engineering construction and management in accordance with technical requirements and technical documents of the project.		
RANGE STATEMENT	The task can be performed at construction sites under the supervision of geotechnical engineers. The tools and equipment to be used include: 1. Computer and office software; 2. Engineering measuring instruments, such as level gauge, total station or GNSS-RTK equipment; 3. Mud performance testing instruments, such as funnel viscometer, specific gravity scale, etc.; 4. Hole-forming quality testing instruments and tools, such as hole-forming and grooving quality inspection instrument, ultrasonic testing instrument, special inclinometer, sediment tester, steel ruler; 5. Personal protective equipment, such as safety shoes, safety helmets, work clothes; 6. Sampling tools for engineering materials, such as concrete test mold and electronic scale; 7. Technical requirements, geotechnical engineering survey report, excavation construction drawings, construction organization design.		

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. Read technical documents such as excavation construction drawings and construction organization design; 3. Conduct technical communication to the construction operation team; 4. Organize the surveying and setting out and checking of building line; 5. Control the construction quality of slope excavation; 6. Control the quality of the whole process of row pile construction;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read the design documents of excavation support ; 1.2 Implement the technical requirements of supporting structure construction, organize the engineering construction of excavation project and control the construction quality of supporting structure; 1.3 Control the quality of excavation dewatering and drainage construction; 1.4 Write and submit construction records.

7. Control the quality of the whole process of underground diaphragm wall construction; 8. Control the quality of the whole process of bolt construction; 9. Control the quality of the whole process of inner support construction; 10. Control the quality of the whole process of soil nailing wall construction; 11. Control the quality of the whole process of gravity cement-soil wall construction; 12. Control the quality of the whole process of excavation dewatering and drainage construction; 13. Write construction records and other relevant construction information.	**2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Models and mechanical principles related to excavation support; 2.2 Types and influencing factors of excavation damage. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Method of selecting supporting structure; 3.2 Technical requirements for the construction of excavation supports; 3.3 Construction quality inspection standard of excavation supports; 3.4 Groundwater control methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Skills of understanding and making drawings; 4.6 Learning skills. **5.0 Math Skills** 5.1 Functional operation; 5.2 Trigonometric operation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The engineering construction quality inspection of the excavation is completed, and the construction records are filled, in accordance with the standards and guidelines approved by the competent authorities and the technical documents of the project.
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 DATA ANALYSIS AND REPORT PREPARATION	**DUTY NO.**	607
TASK TITLE	LOAD TEST DATA ANALYSIS AND REPORT COMPILATION OF COMPOSITE FOUNDATION	**TASK NO.**	6071
PERFORMANCE CRITERIA	The person performing this task must be able to analyse the field test data and prepare the static load test report of composite foundation in accordance with technical requirements.		
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, calculators; 3. Test data analysis software; 4. Technical requirements; 5. Test data.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Draw vertical load-settlement (Q-s) curve and settlement-time logarithm (s-lgt) curve; 2. Analyse curves and test data to determine the bearing capacity of single piles and composite foundations; 3. Compile the static load test report of composite foundation in accordance with the technical requirements.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Draw static load test curves; 1.2 Analyse and determine the bearing capacity of composite foundations; 1.3 Compile the static load test reports composite foundations. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Mechanisms for strengthening various types of composite foundations; 2.2 Sources and composition of the bearing capacity of various types of composite foundations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Data analysis and processing method of load test of composite foundation; 3.2 Analysis and determination methods of bearing

	capacity of single pile and composite foundation; 3.3 Format content and compilation requirements of static load test report of composite foundation. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Skills of understanding and making drawings; 4.6 Learning skills. **5.0 Math Skills** 5.1 Functional operation; 5.2 Mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The static load test report of composite foundation 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.

OCCUPATION	GEOTECHNICAL SURVEY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GEOTECHNICAL ENGINEERING DATA ANALYSIS AND REPORT PREPARATION	**DUTY NO.**	607
TASK TITLE	LOAD TEST DATA ANALYSIS AND REPORT COMPILATION OF FOUNDATION PILE	**TASK NO.**	6072
PERFORMANCE CRITERIA	The person performing this task must be able to analyse the field test data and prepare the static load test report of foundation pile in accordance with technical requirements.		
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, calculators or test data analysis software; 3. Technical requirements; 4. Test data.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Draw vertical load-settlement (Q-s) curve and settlement-time logarithm (s-lgt) curve for the pile foundation; 2. Analyse the test data and curves to determine the vertical compressive bearing capacity of single pile; 3. Compile the static load test report of foundation pile.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Draw static load test curves of foundation piles; 1.2 Analyse and determine the vertical compressive bearing capacity of single pile; 1.3 Compile the static load test report of foundation pile. **2.0 Principle** The person performing this task must be able to explain the following principles; 2.1 Sources and influencing factors of bearing capacity of foundation pile. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Data processing methods of foundation pile load test; 3.2 Analysis and determination method of vertical compressive bearing capacity of single pile; 3.3 Format content and compilation requirements of static load test report of foundation pile.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Office software operation skills; 4.4 Practical writing skills; 4.5 Skills of understanding and making drawings; 4.6 Learning skills. **5.0 Math Skills** 5.1 Functional operation; 5.2 Mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The static load test report of foundation pile 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.

TABLE 1: DACUM CHARTS FOR GEOTECHNICAL SURVEY TECHNICIAN - NTA 6

DUTIES	TASKS	ENABLERS
1.0 Engineering geologic surveying and mapping and investigation	1.1 Planning the route of surveying and mapping. 1.2 Drawing a map of surveying and mapping results. 1.3 Preparing the surveying and mapping summary or report.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the concepts and formation mechanisms of strata, geological structure, hydrogeology, topography and landform, adverse geological phenomena, etc. · Mastering the connotation and characteristics of engineering geological conditions · Mastering the methods and requirements of planning surveying and mapping routes · Being able to collect and study existing data · Being able to visit and survey the site with reference to topographic map · Being able to draw and complete the observation roadmap in accordance with technical requirements · Mastering the methods and workflow of drawing surveying and mapping results map. · Being able to analyse and collate field sketches and investigation results · Being able to use drawing tools to draw actual material maps and comprehensive engineering geological maps · Being able to collate and analyse the data of engineering geological surveying and mapping and investigation results · Mastering the content and format requirements of surveying and mapping summary or report · Mastering the process of preparing surveying and mapping summary or report. · Being able to prepare surveying and mapping summary or report text. · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment**

DUTIES	TASKS	ENABLERS
		· Computer and office software · Topographic base map · Field record book · Investigation card · Drawing tools, mapping software · Regional geological, structural, remote sensing, meteorological, hydrological, seismic, hydrogeological and engineering geological data; **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
2.0 Geotechnical survey scheme design	2.1 Design the survey scheme (survey outline). 2.2 Drawing the layout plan of exploratory spots. 2.3 Organization of construction equipment and personnel.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the methods of geotechnical engineering survey and their applicability · Mastering types of foundation and its scheme selection · Mastering the contents of the design of the survey scheme (survey outline) · Mastering the methods of designing compiling survey scheme (survey outline) · Being able to study the general plan of the construction project, the power of attorney for the survey, the project contract and relevant data · Being able to compile the text of survey plan (survey outline) · Mastering the meaning of each element in the layout of exploratory spots. · Mastering the methods and requirements for drawing the layout of exploratory spots. · Being able to draw the layout of exploratory spots with reference to the survey plan (outline) · Mastering the applicability of engineering

DUTIES	TASKS	ENABLERS
		survey construction equipment and construction technology · Mastering the requirements of organizing construction equipment and personnel · Being able to organize and arrange construction equipment and supporting construction personnel reasonably according to the survey technical scheme · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Computer and office software · Drawing tools, mapping software · Regional geology, tectonics, remote sensing, meteorology, hydrology, seismology, hydrogeology, engineering geology, topographic base maps, existing survey data of the site and nearby areas, general plan of the construction project with coordinates and topography, power of attorney for survey tasks and engineering contracts, etc. **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
3.0 Geotechnical test	3.1 Expansion test of soil. 3.2 Soil collapsibility test. 3.3 Rock compressive strength test. 3.4 Preparing geotechnical test report.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the operating procedures of free expansion rate test, soil collapsibility test and rock uniaxial compressive strength test · Being able to conduct soil expansion tests · Being able to conduct soil collapsibility tests · Being able to conduct rock compressive strength tests · Mastering the basic concepts and meanings of

DUTIES	TASKS	ENABLERS
		soil expansion, free expansion rate and expansion potential. · Mastering the basic concepts and meanings of collapsible soil, collapsibility coefficient and self-weight collapsibility coefficient; · Mastering the influence of collapsible soil on engineering · Understanding the sources and influencing factors of rock compressive strength. · Understanding the correlation and rationality of soil sample parameters. · Mastering the methods of checking and summarizing test parameters and drawings · Mastering the method and process of preparing geotechnical test reports. · Being able to prepare geotechnical test reports. · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Computer and office software · Drawing tools, mapping software · Cutting ring, consolidation instrument, coulter knife, dial indicator, glass plate, filter paper and permeable stone, soil scraper, balance, measuring cylinder, soil measuring cup, dryer, neckless funnel, pressure testing machine or universal testing machine, vernier caliper, universal angle ruler, rock sample processing equipment: including stone cutting machine and stone grinding machine. · Geotechnical test record table, geotechnical test result summary table, specimen **Materials** · 5% pure sodium chloride solution **Requirements for employees** · Hard-working spirit, teamwork spirit, honesty

DUTIES	TASKS	ENABLERS
		and trustworthiness, safety awareness and environmental protection awareness
4.0 Water assay	4.1 Brief analysis of water quality and preparation of report.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the basic concepts and principles of hydrogeochemistry · Understanding the corrosive categories and hazards of groundwater to building materials. · Mastering the operating procedures for brief analysis test of water quality · Mastering the compilation method of the brief analysis report of water quality. · Being able to conduct brief analysis test of water quality · Being able to prepare the brief analysis report of water quality · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Computer and office software · Electric furnace, titration table, burette, pipette, conical flask, triangular flask, centrifuge, glass electrode, thermometer, beaker, precision PH meter, dryer, balance, evaporating dish **Materials** · Methyl orange solution, hydrochloric acid standard solution, silver nitrate standard solution, potassium chromate solution, sodium hydroxide solution, acid chrome blue K naphthol green B indicator, disodium diethylamine tetraacetate solution, ammonia buffer solution, Congo red test paper, barium magnesium mixed solution and other reagents

DUTIES	TASKS	ENABLERS
		Requirements for employees Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
5.0 Geotechnical report compiling	5.1 Analysis and statistics of survey data. 5.2 Application of survey data results. 5.3 Preparation of survey summary or report.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the engineering implication of related geotechnical parameters and indicators · Understanding the correlation of physical and mechanical properties of geotechnical parameters and indicators · Mastering the methods and processes of survey data analysis and statistics · Being able to check and collate the survey results data and analyse the authenticity of the data · Being able to divide engineering geological units and rock and soil layers · Being able to conduct layered statistics of geotechnical parameters · Being able to compile the statistical table of geotechnical parameters and indicators · Understanding the sources and influencing factors of bearing capacity of geotechnical layer foundation · Understanding the sources and influencing factors of pile foundation bearing capacity · Mastering the methods of determining the design parameters such as foundation bearing capacity, compression modulus, pile side friction and pile end resistance · Being able to evaluate the geotechnical properties of the site and the uniformity of the geotechnical layer · Being able to analyse test parameters and provide geotechnical parameters required by architectural design · Mastering the types of foundation and scheme selection

DUTIES	TASKS	ENABLERS
		· Being able to revise the survey result map · Being able to evaluate site stability, stratum uniformity and seismic effect; · Being able to determine the type of foundation · Mastering the content and format requirements of survey summary or report · Mastering the methods and process of compiling survey summary or report · Being able to compile survey summary or report text · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Computer and office software · Drawing tools, mapping software · Drilling (exploration well) cataloging table, core photos, rock and geotechnical test results summary table, water quality analysis results table, in-situ test results table, existing survey data of site and nearby areas **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
6.0 Geotechnical engineering construction and management	6.1 Construction and management of pile foundation. 6.2 Engineering construction and management of excavation project.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the principles of pile selection and layout · Mastering technical requirements for foundation pile and pile cap structure · Mastering the sources and influencing factors of bearing capacity of pile foundation · Mastering the relevant models and mechanical principles of excavation support · Mastering the types and influencing factors of

DUTIES	TASKS	ENABLERS
		excavation damage · Mastering the selection method of supporting structure · Being able to read technical documents of pile foundation construction project and excavation support design documents · Being able to select the appropriate pile type and pile-forming process · Mastering the technical requirements of pile foundation and excavation support construction · Mastering the quality inspection standard of pile foundation and excavation support construction · Being able to implement the technical requirements of pile foundation construction and control the construction quality of various pile foundations · Being able to control the construction quality of excavation drainage and supporting structure according to the technical requirements of supporting structure construction · Being able to prepare and submit construction records as required · Mastering the methods of groundwater control · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Personal protective equipment such as safety shoes, safety helmets and work clothes · Communication and computer equipment · Measuring tapes, theodolites, measuring bars, level gauges, total stations, GNSS-RTK equipment, prism targets, etc. · Quality testing instruments and tools such as hole-forming and grooving quality inspection instrument, ultrasonic testing instrument, umbrella aperture meter, special inclinometer,

DUTIES	TASKS	ENABLERS
		sediment measuring instrument, steel ruler, etc. · Sampling tools for engineering materials such as concrete test mold and electronic scale · Funnel viscometer, specific gravity scale and other mud performance testing instruments · Construction record table **Materials** · Reinforcement cage, concrete, mud **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness
7.0 Geotechnical engineering detection	7.1 Load test data analysis and report compilation of composite foundation. 7.2 Data analysis and report preparation of foundation pile load test.	**General skills and knowledge** · Certain communication skills to cooperate and communicate with related parties and report to superiors · Mastering the reinforcement mechanism of various composite foundations · Mastering the sources and composition of the bearing capacity of various types of composite foundations. · Mastering the sources and influencing factors of bearing capacity of foundation pile. · Mastering the data analysis and processing methods of load test of composite foundation and single pile · Being able to draw static load test curves of composite foundation and single pile · Mastering the analysis and determination methods of bearing capacity of single pile and composite foundation. · Being able to analyse and determine the bearing capacity of single pile and composite foundation · Mastering the format, content and compilation requirements of static load test report of single pile and composite foundation

DUTIES	TASKS	ENABLERS
		· Being able to compile static load test report of single pile and composite foundation · Office software operation skills · Application writing skills · Graph reading and drawing skills **Tools and equipment** · Computer and office software · Drawing tools, calculators or test data analysis software · Static load test data **Requirements for employees** · Teamwork awareness, honesty and trustworthiness, safety awareness and environmental protection awareness