

THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING



OCCUPATION: SURVEYING AND MAPPING TECHNICIAN

LEVEL: NTA LEVEL 4

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ABBREVIATIONS

CAD	Computer Aided Design
CBET	Competency Based Education and Training
CORS	Continuously Operating Reference Station
DEM	Digital Elevation Model
DLG	Digital Line Graph
DOM	Digital Orthophoto Map
DRG	Digital Raster Graphic
EDM	Electromagnetic Distance Measurement
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ISO	International Organization for Standardization
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
UAV	Unmanned Aerial Vehicle

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: catering service)
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 performance tools of assessment of the prescribed outcomes.
Performance criteria:	Indicate the expected end achievements or outcome in form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skills are conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor activities.
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 analyzing each task to determine the steps, circumstantial knowledge, attitudes, performance criteria, tools and materials needed, and safety concerns required of employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.
UNDERPINNING KNOWLEDGE	The crucial knowledge that an individual must acquire in order to perform a given task.
Verification process:	The process of experts reviewing and confirming the statements of tasks (competency) through occupational analysis. Other questions such as the degree of task learning difficulty are also frequently asked. This process is sometimes referred to as validation.
Occupational competence:	The application of knowledge and skills to perform consistently to the standards required in the working context.

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, with a high level of human development. 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 and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job 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 application across all public and private institutions.

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

For the purpose of TET delivery, Tanzania has 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. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

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.

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 process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026)*. NACTVET 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 team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplace, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATIONAL STANDARDS FOR SURVEYING AND MAPPING TECHNICIANS

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

The Surveying and Mapping Technician works under the supervision of a Surveying and Mapping Engineer to prepare data and instruments and equipment; conduct field surveying and mapping according to field operation process; conduct calculation and mapping with measuring instruments, software and professional measuring software; conduct construction engineering survey and other specialized engineering surveying based on professional knowledge; analyze the surveying data, assess the measurement result and prepare the technical report; and be responsible for periodically checking and maintaining measuring instruments and equipment. Generally, the Surveying and Mapping Technician performs the following duties:

- a) Collect data and conduct field survey;
- b) Prepare relevant data and instruments;
- c) Establish and densify survey control network;
- d) Conduct specialized engineering surveying;
- e) Conduct engineering surveying elements;
- f) Perform and map UAV;

- g) Conduct surveying and section measurement;
- h) Arrange and calculate the engineering surveying data;
- i) Process the observed data;
- j) Conduct Cadastral surveying;
- k) Observe precision and accuracy of data;
- l) Check and maintain the instruments and equipment.

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

4.0. VALIDITY PERIOD

The Occupational Standards will be valid for 3 - 5 years due to the fast-changing nature of technology. The review will proceed in the same manner as the previous one, with new occupational standards being developed based on current labour market information.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR SURVEYING AND MAPPING TECHNICIANS – NTA LEVEL 4

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONTROL MAPPING AND FIELD OBSERVATION	DUTY NO.	401
TASK TITLE	CONDUCT BAR (PRISM) ERECTION FOR MAPPING TRAVERSE SURVEYING	TASK NO.	4011
PERFORMANCE CRITERIA	The person performing this task must be able to perform tripod set and instrument setting for mapping traverse surveying in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Geotechnical/Surveyor.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Tripod; 2. Total Station; 3. Prisms; 4. Notebook; 5. Rubber; 6. Pencils; 7. Control point 8. Steel ruler; 9. Leveling bar; 10. Safety gear. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments, equipment and safety gear; 2. Observe health and safety regulations; 3. Set the tripod; 4. Set the prism; 5. Set the centering rod; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p>		

<ol style="list-style-type: none"> 6. Measure the height of prism; 7. Set up the leveling rod (prism) 8. Complete the setting up 9. Clean the instruments, equipment and safety gear; 10. Set up the staff rod; 11. Set up the tripod stand; 12. Measure angle and distance; 13. Perform Traverse camps; 14. Perform level camps; 15. Perform adjustment; 16. Store the instruments, equipment and safety gear; 17. Observe health, occupational and environmental safety rules and regulations. 	<ol style="list-style-type: none"> 1.1 Adjust the foot stool and screw to center and level the prism; 1.2 Level the centering rod; 1.3 Measure the height of prism; 1.4 Erect the levelling rod; 1.5 Maintain the instruments and equipment. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Centering and levelling standards; 2.2 Requirements for centering and levelling tolerance. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ol style="list-style-type: none"> 3.1 Relationship between measuring instruments and cooperative targets; 3.2 Effect of bar (prism) plumb bob on observation achievements. <p>4.0 Essential skills</p> <ol style="list-style-type: none"> 4.1 Learning skills; 4.2 Technical skills; 4.3 Communication skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Bar (prism) erection for mapping traverse surveying is performed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONTROL MAPPING AND OBSERVE FIELD	DUTY NO.	401
TASK TITLE	CONDUCT LOW-LEVEL GNSS STATIC OBSERVATION AND RECORDING	TASK NO.	4012
PERFORMANCE CRITERIA	The person performing this task must be able to conduct low-level GNSS static observation and recording in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. GNSS receiver; 2. Base; 3. Rover (Remote Receiver) 4. Notebook; 5. Measuring Tape; 6. Radio Call; 7. Datum Points; 8. Computer; 9. Pencils, pen, logbook 10. Foot stool; 11. Steel ruler; 12. Height finder; 13. Timer; 14. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments and equipment; 2. Observe health and safety regulations; 3. Prepare the GNSS static observation and recording form; 4. Prepare the data of existing control points in survey area; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Judge and use the achievements of existing control points; 1.2 Adjust the foot stool and screw to center and level the GNSS receiver; 1.3 Measure the height of antenna;

<ol style="list-style-type: none"> 5. Set up GNSS receiver; 6. Set the receiver parameters and work mode; 7. Measure the height of GNSS receiver antenna; 8. Observe the working status of receiver; 9. Fill in the record book; 10. Turn off the receiver; 11. Check and summarize the observation data; 12. Clean the instruments, equipment and the workplace; 13. Store instruments, equipment and safety gear. 	<ol style="list-style-type: none"> 1.4 Set the receiver parameters and work mode; 1.5 Judge whether GNSS works normally; 1.6 Check and summarize the observation data; 1.7 Maintain GNSS receiver. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Principles of GNSS positioning; 2.2 Technical requirements for GNSS static measurement; 2.3 Operating procedures of GNSS. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ol style="list-style-type: none"> 3.1 Basic method for GNSS static positioning; 3.2 Technical points for GNSS static measurement. <p>4.0 Essential skills</p> <ol style="list-style-type: none"> 4.1 Learning skills; 4.2 Analysis skills; 4.3 Communication skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Low-level GNSS static observation and recording are completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Confidential knowledge of surveying and mapping achievements; 4. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONTROL MAPPING AND OBSERVE FIELD	DUTY NO.	401
TASK TITLE	OBSERVE AND RECORD TRAVERSE	TASK NO.	4013
PERFORMANCE CRITERIA	The person performing this task must be able to observe and record mapping traverse in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Computer; 2. Printers; 3. Office software; 4. Total station; 5. Tripod, prism, steel ruler, centering rod and support; 6. Recording board; 7. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments, equipment and safety gear; 2. Observe health and safety regulations; 3. Prepare the mapping traverse observation record form; 4. Prepare the data of existing control points in survey area; 5. Set up the total station; 6. Erect the prism; 7. Measure the height of total station and prism; 8. Observe and record the horizontal angle; 9. Observe and record the horizontal distance; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Judge and use the achievements of existing control points; 1.2 Adjust the foot stool and screw to center and level the instruments and equipment; 1.3 Measure the height of instruments; 1.4 Sight to the target; 1.5 Calculate and check the observation achievements of survey station; 1.6 Operate the total station. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p>

<p>10. Check and summarize the observation data;</p> <p>11. Clean instruments, equipment and the workplace</p> <p>12. Store instruments, equipment and safety gear.</p>	<p>2.1 Principles of angle measurement;</p> <p>2.2 Principles of electromagnetic distance measurement;</p> <p>2.3 Technical requirements for mapping traverse surveying;</p> <p>2.4 Operation instructions of total station.</p>
<p>3.0 Theories</p>	<p>The person performing this task must be able to explain:</p>
<p>3.1 Knowledge of mapping traverse surveying;</p> <p>3.2 Structure and basic operation process of total station;</p> <p>3.3 Underpinning knowledge on angle and distance measurement of total station.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>	<p>Observation and recording for mapping traverses are completed in accordance with the surveying and mapping standards and specifications approved by the competent authority</p> <p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONTROL MAPPING AND OBSERVE FIELD	DUTY NO.	401
TASK TITLE	OBSERVE AND RECORD LEVELS	TASK NO.	4014
PERFORMANCE CRITERIA	The person performing this task must be able to observe and record mapping level in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Computer; 2. Printer; 3. Office software; 4. Leveling Machines; 5. Tripod, leveling rod and staff plate; 6. Recording board; 7. Safety box. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments, equipment and safety gear 2. Observe the health and safety regulations; 3. Prepare the mapping level observation record form; 4. Prepare the data of existing control points in survey area; 5. Set the level instrument; 6. Set the leveling rod; 7. Observe field items; 8. Record the field observation achievements; 9. Check and summarize the observation data; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Judge and use the achievements of existing control points; 1.2 Set stations according to actual terrain and tolerance requirement; 1.3 Level the sight line of level bubble and plumb bob of levelling rod; 1.4 Calculate and check the observation achievements of survey station; 1.5 Maintain the level gauge; 1.6 Perform levels. <p>2.0 Principle</p> <p>The person performing this task must be able to</p>

<p>10. Clean instruments equipment and the workplace</p> <p>11. Store instruments, equipment and safety box.</p>	<p>explain the following principles:</p> <p>2.1 Principle of levelling survey;</p> <p>2.2 Technical requirements for mapping levelling survey;</p> <p>2.3 Operation instructions of levels.</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <p>3.1 Underpinning knowledge on mapping levelling survey;</p> <p>3.2 Structure and basic operation of level gauge.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Technical skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Mapping level is observed and recorded in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Confidential knowledge of surveying and mapping achievements; 4. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONTROL MAPPING AND OBSERVE FIELD	DUTY NO.	401
TASK TITLE	MEASURE GNSS RTK MAPPING POINTS	TASK NO.	4015
PERFORMANCE CRITERIA	The person performing this task must be able to measure GNSS RTK mapping points in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Computer; 2. Printers; 3. Office software; 4. GNSS receiver; 5. Centering rod and support (tripod and base); 6. Data recorder; 7. Measuring tape; 8. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments, equipment and safety gear; 2. Observe the health and safety regulations; 3. Prepare the data of existing control points in survey area; 4. Erect and power on the instruments and equipment; 5. Measure the height of GNSS receiver antenna; 6. Collect the data of mapping control points; 7. Fill in the observation record form; 8. Clean instruments, equipment and the 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Judge and use the achievements of existing control points; 1.2 Adjust the foot stool and screw to center and level the GNSS receiver; 1.3 Measure the height of antenna; 1.4 Control the data recorder to collect the coordinate and elevation of mapping points; 1.5 Fill in the record form normatively; 1.6 Maintain GNSS receiver. <p>2.0 Principle</p> <p>The person performing this task must be able to</p>

<p>workplace</p> <p>9. Store instruments, equipment and safety gear.</p>	<p>explain the following principles:</p> <p>2.1 Principles of GNSS positioning;</p> <p>2.2 Operating procedures of GNSS;</p> <p>2.3 Technical requirements for GNSS mapping points measurement.</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <p>3.1 Underpinning knowledge of GNSS positioning;</p> <p>3.2 Underpinning knowledge of GNSS mapping control surveying.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>GNSS RTK mapping points are measured in accordance with the surveying and mapping standards and specifications approved by the competent authority</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <p>1. Environmental management knowledge;</p> <p>2. Occupational health and safety protection;</p> <p>3. Safety operation of measuring instruments and equipment.</p>

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ESTABLISH ENGINEERING SURVEYING ELEMENTS	DUTY NO.	402
TASK TITLE	MEASURE ANGLE, DISTANCE AND HEIGHT DIFFERENCE	TASK NO.	4021
PERFORMANCE CRITERIA	The person performing this task must be able to survey the angle, distance and height difference in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Level gauge, leveling rod, staff plate and tripod; 2. Theodolite, leveling rod and tripod; 3. Total station, prism, sighting board, support, centering rod and tripod; 4. Measuring tape, marking pin and plumb bob; 5. Scientific calculators; 6. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate instruments and equipment; 2. Observe the health and safety regulations; 3. Set instruments; 4. Complete orientation by backsight; 5. Calculate the direction value of surveying and mapping targets; 6. Adjust the angle value; 7. Complete line orientation; 8. Read the steel ruler; 9. Read the level gauge; 10. Calculate the front reading of leveling rod; 11. Clean instruments, equipment and the workplace; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Adjust the foot stool and screw to center and level the instruments and equipment; 1.2 Aim the backsight point and reset; 1.3 Estimate the target direction value; 1.4 Adjust the angle; 1.5 Conduct line orientation; 1.6 Obtain the known height difference and sight height and calculate the front reading;

<p>12. Store instruments, equipment and safety gear.</p>	<p>1.7 Maintain the instruments and equipment.</p> <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ul style="list-style-type: none"> 2.1 Principle of angle measurement; 2.2 Principles of electromagnetic distance measurement; 2.3 Operation instructions of total station, theodolite and level gauge. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ul style="list-style-type: none"> 3.1 Knowledge of angle measurement; 3.2 Knowledge of horizontal and diagonal distance measurement; 3.3 Knowledge of elevation surveying; 3.4 Underpinning knowledge of surveying. <p>4.0 Essential skills</p> <ul style="list-style-type: none"> 4.1 Learning skills; 4.2 Adjustment skills; 4.3 Computing skills; 4.4 Communication skills; 4.5 Teamwork skills.
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Angle, distance and height difference are surveyed in accordance with the surveying and mapping standards and specifications approved by the competent authority</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ul style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Use of scientific calculator; 4. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ESTABLISH ENGINEERING SURVEYING ELEMENTS	DUTY NO.	402
TASK TITLE	CONDUCT FORESIGHT FIXING FOR ENGINEERING SURVEY AND ALIGNMENT	TASK NO.	4022
PERFORMANCE CRITERIA	The person performing this task must be able to fix foresight points for engineering survey and alignment in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Level gauge, leveling rod, staff plate and tripod; 2. Theodolite, leveling rod and tripod; 3. Total station, prism, sighting board, support, centering rod and tripod; 4. Steel ruler, marking pin and plumb bob; 5. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select instruments, equipment and safety gear; 2. Observe the health and safety regulations; 3. Find the foresight points; 4. Check the foresight points; 5. Clean instruments equipment and the workplace 6. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Adjust the foot stool and screw to center and level the instruments and equipment; 1.2 Approach to the foresight points; 1.3 Calibrate the surveying points; 1.4 Maintain the instruments and equipment. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Centering and levelling principles; 2.2 Principles of angle measurement; 2.3 Principles of electromagnetic distance measurement; 2.4 Principles of levelling survey.

	<p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ul style="list-style-type: none"> 3.1 Underpinning knowledge for planar point surveying; 3.2 Underpinning knowledge for elevation surveying; 3.3 Underpinning knowledge for distance surveying. <p>4.0 Essential skills</p> <ul style="list-style-type: none"> 4.1 Learning skills; 4.2 Computational skills; 4.3 Communication skills; 4.4 Adjustment skills 4.5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Foresight fixing for engineering survey and alignment is completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ul style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ESTABLISH ENGINEERING SURVEYING ELEMENTS	DUTY NO.	402
TASK TITLE	CONDUCT BAR (PRISM) ERECTION FOR VERTICAL/CROSS SECTION VIEW SURVEY	TASK NO.	4023
PERFORMANCE CRITERIA	The person performing this task must be able to conduct bar (prism) erection for vertical/cross section view survey in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Theodolite, sighting rod and tripod; 2. Total station, centering rod and prism; 3. Level gauge, leveling rod and tripod 4. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select instruments, equipment and safety gear; 2. Observe the health and safety regulations; 3. Determine the direction of vertical/cross section view; 4. Determine the position of feature points in vertical section and erect the bar (prism); 5. Determine the position of feature points in cross section and erect the bar (prism); 6. Clean instruments, equipment and the workplace 7. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Identify the vertical/cross section; 1.2 Determine the erection position of bar (prism); 1.3 Erect straightedge (prism); 1.4 Maintain the instruments and equipment. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Principles of electromagnetic distance measurement; 2.2 Principles of leveling survey; 2.3 Centering and leveling principles.

	<p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ul style="list-style-type: none"> 3.1 Concept of vertical/cross section; 3.2 Purpose of vertical/cross section view; 3.3 Underpinning knowledge of bar (prism) erection; 3.4 Selection standards for section feature points. <p>4.0 Essential skills</p> <ul style="list-style-type: none"> 4.1 Learning skills; 4.2 Analysis skills; 4.3 Communication skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Bar (prism) erection for vertical/cross section view surveying is completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ul style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ESTABLISH ENGINEERING SURVEYING ELEMENTS	DUTY NO.	402
TASK TITLE	MARK POSITION OF SURVEYING ELEMENTS	TASK NO.	4024
PERFORMANCE CRITERIA	The person performing this task must be able to mark the position of surveying elements in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Hammer 2. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select tools, equipment and safety gear; 2. Observe the health and safety regulations; 3. Choose the marking mode; 4. Mark the surveying points. 5. Store tools, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods The person performing this task must be able to explain how to: <ol style="list-style-type: none"> 1.1 Choose the marking mode; 1.2 Mark the surveying points. </p> <p>2.0 Principle The person performing this task must be able to explain the following principles: <ol style="list-style-type: none"> 2.1 Point marking rules </p> <p>3.0 Theories The person performing this task must be able to explain: <ol style="list-style-type: none"> 3.1 Surveying point marking mode; 3.2 Surveying point marking rules. </p> <p>4.0 Essential skills <ol style="list-style-type: none"> 4.1 Learning skills; 4.2 Analysis skills; </p>

	<p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Positions of surveying elements are marked in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Operation instructions for field safety.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	OBSERVE TERRAIN FEATURE POINTS	DUTY NO.	403
TASK TITLE	DRAW TOPOGRAPHIC SKETCHES	TASK NO.	4031
PERFORMANCE CRITERIA	The person performing this task must be able to draw the topographic sketch in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Drawing board; 2. Straightedge; 3. Compass. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select appropriate tools and equipment; 2. Observe health and safety regulations; 3. Prepare the sketch paper; 4. Determine the approximate scale; 5. Draw the contour points of surface and landform; 6. Draw the diagrammatical symbol; 7. Determine the direction of compass; 8. Arrange the feature point number; 9. Check and summarize the sketches; 10. Clean tools, equipment and the workplace; 11. Store tools, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Determine the north direction with compass; 1.2 Determine the approximate scale; 1.3 Express the surface and landform information; 1.4 Choose the contour and feature points. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Technical requirements for sketching; 2.2 Map projection requirements. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ol style="list-style-type: none"> 3.1 Concept of sketches; 3.2 Sketching process and requirement;

	<p>3.3 Selection requirement of feature points;</p> <p>3.4 Classification and expression standards of commonly used diagrammatical symbols;</p> <p>3.5 Basic knowledge of topographic map surveying and mapping.</p> <p>4.0 Essential skills</p> <p>4.1 Drawing skills;</p> <p>4.2 Learning skills;</p> <p>4.3 Analysis skills;</p> <p>4.4 Communication skills;</p> <p>4.5 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Topographic sketches are drawn in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Measured data storage.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	OBSERVE TERRAIN FEATURE POINTS	DUTY NO.	403
TASK TITLE	SET UP BAR (PRISM) ERECTION OF FEATURE POINTS	TASK NO.	4032
PERFORMANCE CRITERIA	The person performing this task must be able to conduct bar (prism) erection of feature points in accordance with the surveying and mapping standards and specifications approved by the competent authority.		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Centering rod; 2. Prisms; 3. Leveling rod; 4. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select instruments, equipment and safety gear; 2. Observe the health and safety regulations; 3. Set the height of prism bar; 4. Set the prism; 5. Erect the bar (prism); 6. Clean instruments, equipment and the workplace; 7. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Adjust the foot stool and screw to center and level the bar (prism); 1.2 Adjust the height of centering rod; 1.3 Determine the terrain feature points and erect the bar (prism); 1.4 Maintain the instruments and equipment. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Centering and levelling principles; 2.2 Technical requirements for topographic surveying. <p>3.0 Theories</p>

	<p>The person performing this task must be able to explain:</p> <p>3.1 Relationship between measuring instruments and cooperative targets;</p> <p>3.2 Effect of bar (prism) plumb bob on observation achievements.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Bar (prism) erection of feature points is completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	OBSERVE TERRAIN FEATURE POINTS	DUTY NO.	403
TASK TITLE	OBSERVE FEATURE POINTS	TASK NO.	4033
PERFORMANCE CRITERIA	The person performing this task must be able to observe the feature points in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Surveying and Mapping Engineer.</p> <p>The instruments and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Theodolite, leveling rod and tripod; 2. Total station, prism, sighting board, support, centering rod and tripod; 3. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select instruments, equipment and safety gear; 2. Observe the health and safety regulations; 3. Set up the theodolite/total station; 4. Operate the theodolite to observe targets; 5. Operate the total station to observe targets; 6. Clean the instruments, equipment and the workplace; 7. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Choose the type of instruments and supporting equipment; 1.2 Adjust the foot stool and screw to center and level the instruments and equipment; 1.3 Aim at and observe the targets; 1.4 Maintain the instruments and equipment. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Technical requirements for topographic surveying; 2.2 Principles of angle measurement; 2.3 Principles of electromagnetic distance measurement; 2.4 Operation instructions of total station and theodolite.

	<p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ol style="list-style-type: none"> 3.1 Underpinning knowledge of surface and landform; 3.2 Concept of feature points; 3.3 Structure and underpinning knowledge of total station and theodolite. <p>4.0 Essential skills</p> <ol style="list-style-type: none"> 4.1 Learning skills; 4.2 Analysis skills; 4.3 Communication skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Observation of feature points is completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Safety operation of measuring instruments and equipment.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SURVEY CADASTRAL PARCELS AND FARMS	DUTY NO.	404
TASK TITLE	CONDUCT AUXILIARY SURVEY ON CADASTRAL PARCEL OWNERSHIP	TASK NO.	4041
PERFORMANCE CRITERIA	The person performing this task must be able to conduct auxiliary survey on cadastral parcel ownership in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Digital camera 2. Safety gear 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select tools, equipment and safety gear; 2. Observe the health and safety regulations; 3. Divide neighborhood distribution map; 4. Choose the survey base map; 5. Distribute the boundary notice; 6. Collect ownership information; 7. Measure the distance; 8. Fill in the cadastral survey questionnaire; 9. Record the survey data; 10. Clean instruments, equipment and the workplace; 11. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Divide the neighborhood distribution map; 1.2 Choose the survey base map; 1.3 Distribute the boundary notice; 1.4 Measure the distance with steel ruler, measuring tape or electronic distance measuring instrument; 1.5 Collect the ownership information; 1.6 Fill in the cadastral survey questionnaire. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Technical requirements for cadastral parcel survey <p>3.0 Theories</p> <p>The person performing this task must be able to</p>

	<p>explain:</p> <p>3.1 Underpinning knowledge of cadastral survey</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Auxiliary survey on cadastral parcel ownership is completed in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Measured data storage.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SURVEY CADASTRAL PARCELS AND FARMS	DUTY NO.	404
TASK TITLE	FIX POSITIONS OF BOUNDARY POINTS	TASK NO.	4042
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate positions of boundary points in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Steel nails; 2. Spraying template; 3. Hammer; 4. Measuring tape or steel ruler; 5. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select tools, equipment and safety gear; 2. Observe the health and safety regulations; 3. Determine the position of boundary points; 4. Spray the boundary points; 5. Mark the boundary point number 6. Record the survey data; 7. Clean instruments, equipment and the workplace; 8. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Determine the boundary points; 1.2 Mark the boundary points; 1.3 Mark the boundary point number. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Technical requirements for cadastral parcel survey; 2.2 Point marking rules. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p>

	<p>3.1 Concept and category of boundary points;</p> <p>3.2 Concept of cadastral parcels;</p> <p>3.3 Underpinning knowledge of cadastral survey.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Positions of boundary points are calibrated in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SURVEY CADASTRAL PARCELS AND FARMS	DUTY NO.	404
TASK TITLE	DETERMINE CADASTRAL PARCEL UTILIZATION CATEGORY	TASK NO.	4043
PERFORMANCE CRITERIA	The person performing this task must be able to determine cadastral parcel utilization categories in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Computer; 2. Mapping software; 3. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select tools, equipment and safety gear; 2. Observe health and safety regulations; 3. Determine the location of cadastral parcel; 4. Determine the cadastral parcel utilization category; 5. Mark the land utilization category number 6. Record the survey data; 7. Clean instruments, equipment and the workplace; 8. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Determine the location of cadastral parcel; 1.2 Judge the cadastral parcel utilization category; 1.3 Inquire the cadastral parcel utilization category number. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Classification of the land utilization status; 2.2 Technical requirements for cadastral parcel survey. <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <ol style="list-style-type: none"> 3.1 Circumstantial knowledge of cadastral parcel;

	<p>3.2 Underpinning knowledge of land utilization category.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills;</p> <p>4.5 Computer application skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Cadastral parcel utilization categories are determined in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection.

OCCUPATION	SURVEYING AND MAPPING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SURVEY CADASTRAL PARCELS AND FARMS	DUTY NO.	404
TASK TITLE	DRAW CADASTRAL PARCEL SKETCHES	TASK NO.	4044
PERFORMANCE CRITERIA	The person performing this task must be able to draw cadastral parcel sketches in accordance with the surveying and mapping standards and specifications approved by the competent authority		
RANGE STATEMENT	<p>The task may be executed in the survey/mapping site under the supervision of a Senior Surveying and Mapping Technician or Senior Surveying and Mapping Surveyor/Geomatician.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Drawing board; 2. Straightedge or set square; 3. Compass 4. Safety gear. 		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Select tools, equipment and safety gear; 2. Observe health and safety regulations; 3. Prepare the sketch paper; 4. Determine the direction of the compass; 5. Determine the approximate scale; 6. Draw the cadastral parcel sketches; 7. Check and summarize the sketches 8. Record the survey data; 9. Clean instruments, equipment and the workplace; 10. Store instruments, equipment and safety gear. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Determine the north direction with compass; 1.2 Determine the approximate scale; 1.3 Express the ownership information and geographical location of cadastral parcels; 1.4 Express the boundary information and four boundaries of cadastral parcels; 1.5 Determine the positions of required buildings and structures on boundary point map and in boundary address. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Map projection;

	<p>2.2 Technical requirements for cadastral parcel sketching.</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain:</p> <p>3.1 Concept of cadastral parcels;</p> <p>3.2 The four boundaries of a piece of land.</p> <p>4.0 Essential skills</p> <p>4.1 Learning skills;</p> <p>4.2 Analysis skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Teamwork skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Cadastral parcel sketches are drawn in accordance with the surveying and mapping standards and specifications approved by the competent authority
CIRCUMSTANTIAL KNOWLEDGE:	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Environmental management knowledge; 2. Occupational health and safety protection; 3. Measured data storage.

APPENDIX: DACUM CHARTS FOR SURVEYING AND MAPPING TECHNICIAN – NTA

4

DUTIES	TASKS	ENABLERS
1.0 Control mapping and observe field	<p>1.1 Conduct bar (prism) erection for mapping traverse surveying.</p> <p>1.2 Conduct low-level GNSS static observation and recording.</p> <p>1.3 Observe and record mapping traverse.</p> <p>1.4 Observe and record mapping level.</p> <p>1.5 Measure GNSS RTK mapping points.</p>	<p>Generic skills and knowledge</p> <ul style="list-style-type: none"> Cooperating with others using communication skills and reporting to the superiors Application skills of mathematics and computer Application of operation instructions of instruments Application of industrial standards and technical requirements Skills and knowledge of measuring instrument Basic skills and knowledge of GNSS positioning surveying Reading of topographic map Fundamentals of surveying <p>Tools and equipment</p> <ul style="list-style-type: none"> Personal protective equipment such as safety helmet and reflective vest Computer and printer Total station, theodolite, level gauge and GNSS receiver Foot stool, prism, sighting board, marking pin, ruler, steel tape, leveling rod, staff plate, centering rod for GNSS receiver, storage battery, radio, recorder, antenna, etc. Circlip pliers, inner hexagon wrench, flat nose screwdriver, cross screwdriver and calibration needle Soft brush, hair dryer, towel, ear syringe, etc. Recording board, hammer, marking pen, brush, pencil, pen, etc. <p>Materials</p> <ul style="list-style-type: none"> Paint, survey nail, etc. Lubricant, drying agent, alcohol, cotton ball, etc.

DUTIES	TASKS	ENABLERS
		<p>Worker behaviors</p> <ul style="list-style-type: none"> • Hardworking, teamwork, precision, seriousness, time management, honesty and trustworthiness, adaptability and respect
2.0 Establish engineering surveying elements	2.1 Establish angle, distance and height difference. 2.2 Conduct foresight fixing for engineering survey and alignment. 2.3 Conduct bar (prism) erection of vertical/cross section view survey. 2.4 Mark position of surveying elements.	<p>Generic skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and reporting to the superiors • Application skills of mathematics and computer • Application of operation instructions of instruments • Application of industrial standards and technical requirements • Skills and knowledge of measuring instrument • Skills and knowledge of engineering drawing reading • Reading of topographic map • Fundamentals of surveying <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as safety helmet and reflective vest • Total station, theodolite, GNSS receiver and level gauge • Foot stool, prism, sighting board, steel ruler, marking pin, centering rod for GNSS receiver, recorder, leveling rod, staff plate, etc. • Circlip pliers, inner hexagon wrench, flat nose screwdriver, cross screwdriver and calibration needle • Soft brush, hair dryer, towel, ear syringe, etc. • Recording board, pencil, marking pen, hammer, brush, etc. <p>Materials</p>

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> Survey nail, paint, wood pile, etc. Lubricant, drying agent, alcohol, cotton ball, etc. <p>Worker behaviors</p> <ul style="list-style-type: none"> Hardworking, teamwork, precision, seriousness, time management, honesty and trustworthiness, adaptability and respect
3.0 Observe terrain feature points	3.1 Draw topographic sketches. 3.2 Conduct bar (prism) erection of feature points. 3.3 Observe feature points.	<p>Generic skills and knowledge</p> <ul style="list-style-type: none"> Cooperating with others using communication skills and reporting to the superiors Application skills of mathematics and computer Application of operation instructions of instruments Application of industrial standards and technical requirements Skills and knowledge of measuring instrument Basic skills and knowledge of cartography Reading of topographic map Fundamentals of surveying <p>Tools and equipment</p> <ul style="list-style-type: none"> Personal protective equipment such as safety helmet and reflective vest Total station, theodolite, and GNSS receiver Foot stool, prism, sighting board, marking pin, leveling rod, centering rod for GNSS receiver, recorder, steel tape, etc. Circlip pliers, inner hexagon wrench, flat nose screwdriver, cross screwdriver and calibration needle Soft brush, hair dryer, towel, ear syringe, etc. Recording board, pencil, scribbling pad, etc.

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> • Lubricant, drying agent, alcohol, cotton ball, etc. <p>Worker behaviors</p> <ul style="list-style-type: none"> • Hardworking, teamwork, preciseness, seriousness, time management, honesty and trustworthiness, adaptability and respect
4.0 Survey cadastral parcels	4.1 Conduct auxiliary survey of the cadastral parcel ownership. 4.2 Calibrate the position of boundary points. 4.3 Determine the cadastral parcel utilization category. 4.4 Draw cadastral parcel sketches.	<p>Generic skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and reporting to the superiors • Application skills of mathematics and computer • Application of operation instructions of instruments • Application of industrial standards and technical requirements • Skills and knowledge of measuring instrument • Skills and knowledge of cadastral survey • Reading of topographic map • Fundamentals of surveying <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as safety helmet and reflective vest • Computer and printer • Handheld distance measuring instrument, steel ruler, etc. • Electric drill, recording board, marking pen, pencil, brush, scribbling pad, etc. <p>Materials</p> <ul style="list-style-type: none"> • Paint, survey nail, cement, sand, aggregates, etc. <p>Worker behaviors</p>

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> • Hardworking, teamwork, precision, seriousness, time management, honesty and trustworthiness, adaptability and respect