NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ARCHITECTURAL ENGINEERING TECHNICIAN

LEVEL: NTA 4

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ABBREVIATIONS

CAD	Computer-Aided Design
CBET	Competency Based Education and Training
HSE	HSE (Health, Safety and Environment) Management System
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
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 circuits, performs troubleshooting in electrical circuits, 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).

Architectural Engineering Technician 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 standard 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. Engineers, supervisory technicians on the job, and experienced Architectural Engineering 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 ARCHITECTURAL ENGINEERING TECHNICIANS

These standards cover a broad range of duties and tasks that can be performed by an Architectural Engineering 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 Architectural Engineering 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 Architectural Engineering Technician shall assist the witness sampling of architectural materials, implement basic surveying and laying out, and execute site work of the project under the supervision of engineers. Architectural Engineering Technician They can also complete the site foundation rod sounding and architectural material witness sampling on the construction site, implement the site leveling measurement and laying out, site 500/1,000 control cable, and carry out the shallow foundation excavation of simple works, template allocation, reinforcement processing and tying, concrete pouring, brick wall masonry, waterproofing paving and so on. Generally, the Architectural Engineering Technician performs the following responsibilities:

a) Site foundation rod sounding

b) Implementation of witness sampling of architectural materials

c) Implementation of the site leveling measurement and laying out

d) Implementation of site 500/1,000 control cable

e) Shallow foundation excavation

f) Formwork configuration

g) Reinforcement processing and tying

h) Concrete preparation and pouring

i) Wall masonry

j) Waterproof membrane paving

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 ARCHITECTURAL ENGINEERING TECHNICIAN - NTA 4

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ASSISTANCE OF WITNESS SAMPLING OF ARCHITECTURAL MATERIALS	**DUTY NO.**	401
TASK TITLE	SITE FOUNDATION ROD SOUNDING	**TASK NO.**	4011
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the site foundation rod sounding in accordance with the requirements of on-site inspection, witness and sampling during the construction and maintenance of the construction project.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Steel chisels; 2. Sledge hammers; 3. Lead wires; 4. Pushcarts; 5. Fixtures; 6. Crowbars; 7. Steel tapes; 8. Medium sand; 9. Stationery.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools; 2. Draw the layout plan of drill points; 3. Place the drill point lines according to the drill sequence; 4. Check the point lines; 5. Drill in place; 6. Record hammering numbers; 7. Pull out the drill rods; 8. Cover holes for protection; 9. Inspect and accept; 10. Fill the sand; 11. Clean the workplace; 12. 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 Use tools such as wear heart hammers and drill rods to drive the steel chisels vertically into the soil layer; 1.2 Drive in the drill rods and record the number of hammering to ensure the depth of rod sounding; 1.3 Tie the drill rods with hemp ropes, leave a loop, insert the crowbars, and use the lever principle to pull out the drill rods; 1.4 Pour sand into the drill holes with accurate inspection records and compact them with reinforcement bars. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of site foundation rod sounding.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Methods of selecting the drill point of site foundation rod sounding; 3.2 Methods of operating site foundation rod sounding; 3.3 Procedures of rod sounding operations. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Teamwork skills; 4.4 Form filling skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The site foundation rod sounding is carried out in accordance with the layout plan of drill points.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Methods of operating tools; 2. Waste disposal methods; 3. Occupational health and safety.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ASSISTANCE OF WITNESS SAMPLING OF ARCHITECTURAL MATERIALS	**DUTY NO.**	401
TASK TITLE	IMPLEMENTATION Of WITNESS SAMPLING OF ARCHITECTURAL MATERIALS	**TASK NO.**	4012
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the witness sampling of architectural materials in accordance with the requirements of on-site inspection, witness and sampling during the construction and maintenance of the construction project.		
RANGE STATEMENT	The task can be performed on the construction sites under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Steel tapes; 2. Sampling tubes; 3. Test block molds; 4. Cutting rings; 5. Platform balances; 6. Stationery; 7. Wallpaper knives; 8. Cutting machines.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools; 2. Notify senior engineers; 3. Determine the sampling location and quantity; 4. Carry out the sampling; 5. Seal the sample; 6. Record the process; 7. Send samples for testing; 8. Clean the workplace; 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 Use the steel tape to measure a certain length of reinforcement raw materials, waterproof membrane materials and other materials; 1.2 Use the cutting machines or wallpaper knives to cut materials; 1.3 Use test block molds to make test blocks such as concrete and mortar; 1.4 Use the platform balance to weigh a certain amount of cement, sand, gravel and other materials; 1.5 Use the cutting ring to take a certain amount of soil samples. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of sample representativeness;

	2.2 Principles of sampling. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of material sampling and inspection; 3.2 Methods of using tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The witness sampling of architectural materials is carried out in accordance with the plan of witness sampling of construction materials.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational safety and health.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF BASIC SURVEYING AND LAYING OUT	**DUTY NO.**	402
TASK TITLE	IMPLEMENTATION OF THE SITE LEVELING MEASUREMENT AND LAYING OUT	**TASK NO.**	4021
PERFORMANCE CRITERIA	The person performing this task must be able to implement the site leveling measurement in accordance with design drawing requirements and actual site conditions.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Steel tapes; 2. Level gauges; 3. Telemeter rods; 4. Total stations; 5. Stationery; 6. Timber piles; 7. Iron nails; 8. Formation lines; 9. Putty powder.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools for the task; 2. Determine the datum point; 3. Determine the measurement point; 4. Measure the elevation; 5. Calculate the elevation; 6. Collate the data; 7. 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 Determine the leveling range by using the total station; 1.2 Measure the elevation by using the level gauge. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of elevation calculation; 2.2 Principles of measurement point determination. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Usage of measuring instruments. **4.0. Essential Skills** 4.1 Communication skills;

	4.2 Computer skills; 4.3 Teamwork skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The measurement of site leveling is carried out in accordance with design drawing requirements and actual site conditions.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational safety and health.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF BASIC SURVEYING AND LAYING OUT	**DUTY NO.**	402
TASK TITLE	IMPLEMENTATION OF SITE 500/1,000 CONTROL CABLE	**TASK NO.**	4022
PERFORMANCE CRITERIA	The person performing this task must be able to measure and mark the 500/1,000 control cable of the building or other structures on the site in accordance with the requirements of the design drawings.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Steel tapes; 2. Theodolites; 3. Total stations; 4. Stationery; 5. Ink fountains; 6. Formation lines; 7. Putty powder; 8. Cords; 9. Plumbs.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools; 2. Use the theodolite or the method of hanging the plumb with the pull rope to project the axis to the construction face depending on the axis nail or axis control pile on the sight rail; 3. Lay out the lines; 4. Measure with operating tools; 5. Use the ink fountain to snap the lines and mark the control lines; 6. Check the construction; 7. 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 Use the theodolite or the method of hanging the plumb with the pull rope to determine the datum point; 1.2 Use the ink fountain to snap the lines and mark the location. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of datum point determination. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Usage of measuring instruments. **4.0 Essential Skills** 4.1 Communication skills;

	4.2 Computer skills; 4.3 Teamwork skills. **5.0 Math Skills** 5.1 Plane analytic geometry; 5.2 Mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The site 500/1,000 control cable are implemented in accordance with design drawing requirements and actual site conditions.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational safety and health.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	SHALLOW FOUNDATION EXCAVATION	**TASK NO.**	4031
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the foundation excavation of buildings.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of technicians. The tools and equipment to be used include: 1. Excavators, shovels, hoes, pushcarts, dampers, construction squares, nails, timbers, manila ropes, measuring tapes, plummets, sledge hammers, pry hammers, dumb levels, level gauges, white chalk, transparent tubes, horizontal pipes and personal protective equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Comprehend construction drawings; 2. Select excavation equipment, tools, materials and safety protection equipment reasonably; 3. Prepare excavation tools and materials; 4. Determine the excavation edges; 5. Lay out the lines; 6. Excavate to the designed elevation; 7. Provide support work when the soil is soft or during deep excavation; 8. Excavate in a flat way; 9. Remove materials from the excavation work area; 10. Clean the tools and equipment; 11. Organise and pack equipment and tools; 12. Store tools, equipment and safety protection equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out shallow foundation excavation according to construction drawings; 1.2 Use reasonable equipment and tools to determine the excavation edges; 1.3 Use reasonable equipment and tools to lay out the lines; 1.4 Provide support work for loose soil; 1.5 Use the dumb level. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Operating specifications for leveling; 2.2 Planking principles; 2.3 Best practice principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The type, selection, and operation methods of excavation equipment; 3.2 Relevant knowledge of side slopes; 3.3 Calculation methods of earth quantity; 3.4 Looseness of the soil;

	3.5 Methods of measuring and leveling. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Organisation and coordination skills; 4.3 Basic architectural and engineering drawings interpreting skills; 4.4 Professional ethics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The shallow foundation excavation is carried out in accordance with engineering drawings and the general design description.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational health and safety; 4. Waste disposal.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	FORMWORK CONFIGURATION	**TASK NO.**	4032
PERFORMANCE CRITERIA	The person performing this task must be able to carry out formwork configuration in accordance with approved drawings.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Claw hammers, nails, screwdrivers, measuring tapes, level gauges, chisels, iron crowbars, hygrometers, utility knives, miter gauges, hand planes, hand saws, electric drills, circular saws, wire saws, construction squares, nail guns, straightedges, table saws, grinders, wood lathes, band saws, drill presses, miter gauges, surface planers and personal protective equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Comprehend drawings and develop template allocation plans; 2. Select equipment, tools, materials and safety protection equipment; 3. Select supplies; 4. Use manual or electric cutting tools to shape the wood according to the established plan; 5. Select shaped wood for different structural components; 6. Install wood templates; 7. Connect or fix wood with nails, dowels, screws, or adhesives; 8. Check accuracy by using rulers, level gauges and plumbs; 9. Clean the equipment, tools and workplaces; 10. Organise and pack equipment and tools; 11. Store tools, equipment and safety protection articles.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Write and develop template allocation plans; 1.2 Operate wood cutting tools; 1.3 Perform all carpentry operations; 1.4 Cut, shape, and connect wood; 1.5 Prepare various wooden templates for different structural components. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 HSE; 2.2 Operating specifications for carpentry; 2.3 Operating specifications for joinery; 2.4 Operating specifications for various carpentry tools and equipment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Classification of basic architectural materials; 3.2 Theories of carpentry and joinery; 3.3 The process of drawing architectural and engineering drawings;

	3.4 Math skills in the field of geometry; 3.5 Classification and differentiation methods of basic civil engineering materials; 3.6 Twmplate installation methods and requirements; 3.7 Design requirements for composite templates. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Communication skills; 4.3 Computing skills; 4.4 Professional ethics; 4.5 Adaptability; 4.6 Plan writing skills; 4.7 Time management skills. **5.0 Math Skills** 5.1 Mathematical skills in the field of geometry.
DESCRIPTION OF THE END PRODUCT / SERVICE	The allocated templates are submitted in accordance with engineers' drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Maintenance of manual and electric tools; 3. Scope of duties; 4. Occupational safety and health; 5. Waste disposal.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	REINFORCEMENT PROCESSING AND TYING	**TASK NO.**	4033
PERFORMANCE CRITERIA	The person performing this task must be able to carry out steel structure fixing according to approved drawings.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians. The equipment, tools and materials to be used include: 1. Anglebenders, pliers, fastening wires, reinforcement bars, hacksaw blades and frames, manila ropes, measuring tapes, plummets, level gauges, crowbars, blowers, brushes, and personal protective equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Comprehend structural working drawings; 2. Select equipment, tools, materials and safety protection equipment for the task reasonably; 3. Prepare batching list of reinforcement bars; 4. Cut and bend the steel bar by hand and electric tools; 5. Mark the position line of the main bar on the template; 6. Fix reinforcement bars in the preparation area; 7. Fix the separators and backing plates (brackets); 8. Clean the inside of the template and the work area in preparation for the concrete entry; 9. Clean the equipment, tools and workplaces; 10. Organise and pack equipment and tools; 11. Store tools, equipment and safety protection articles.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Comprehend the construction drawings of architectural structures and strictly follow the drawings for construction; 1.2 Carry out the operations of cutting, bending, straightening and binding of reinforcement bars; 1.3 Operate manual and electric tools. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Health, safety and environmental protection; 2.2 Principles of reinforcement bar replacement; 2.3 Specification requirements for reinforcement bar lapping. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Architectural structures; 3.2 Architectural engineering technology and engineering drawings; 3.3 Reinforcement bar processing. **4.0 Essential Skills** 4.1 Teamwork skills;

	4.2 Organisation and coordination skills; 4.3 Computing skills; 4.4 Professional ethics; 4.5 Time management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Reinforcement bars are manufactured in accordance with the engineer's drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational safety and health; 4. Waste disposal.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	CONCRETE PREPARATION AND POURING	**TASK NO.**	4034
PERFORMANCE CRITERIA	The person performing this task must be able to prepare and pour concrete in accordance with construction specifications for concrete structure projects and concrete quality inspection and acceptance specifications, builders' specifications and other technical requirements.		
RANGE STATEMENT	The task can be performed at the concrete mixing plant and construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Mixing stations; 2. Concrete mixers (forced type, self-falling type); 3. Weighing scales; 4. Concrete mixer trucks; 5. Pushcarts; 6. Dumper trucks; 7. Concrete pump trucks or delivery pumps; 8. Concrete internal vibrators (surface vibrators).		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select equipment, tools, materials and safety protection equipment; 2. Remove sundries in the template; 3. Convert concrete construction mix proportion; 4. Select the casting sequence and mix the concrete; 5. Determine the setting of construction joints and pour the concrete; 6. Transport the concrete; 7. Vibrate the concrete; 8. Maintain the concrete; 9. Carry out the management of construction specifications and safety on site; 10. Protect the templates, reinforcement bars and equipment installation; 11. Clean the equipment and workplaces;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Calculate concrete allocation; 1.2 Use concrete mixing, transport and vibrating equipment; 1.3 Maintain the concrete. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of converting concrete construction mix proportion; 2.2 Principles of layered concrete pouring; 2.3 Peinciples of setting concrete construction joints; 2.4 Principles of concrete vibration; 2.5 Principles of concrete maintenance. **3.0 Theories** The person performing this task must be able to explain the following:

12. Store tools, equipment and safety protection articles.	3.1 Concrete casting sequence; 3.2 Concrete mixing methods; 3.3 General regulations for pouring concrete construction joints; 3.4 Concrete vibrating requirements. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills. **5.0 Math Skills** 5.1 Numerical computation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Concrete batching, mixing, transport, pouring, maintenance and quality inspection are carried out in accordance with the construction specifications for concrete structure projects.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of working equipment and tools; 2. Safety operation of concrete construction equipment; 3. Occupational health and safety; 4. Concrete construction operation strategies and procedures.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	WALL MASONRY	**TASK NO.**	4035
PERFORMANCE CRITERIA	The person performing this task must be able to carry out wall masonry in accordance with approved drawings, masonry construction specifications, quality inspection and acceptance standards and other technical requirements.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Large spades, line hammers, guiding rules, level rulers, measuring tapes, feeler gauges, ash bins, height poles, ink buckets (ropes), red and blue pencils, leveling instruments, planers, mortar mixers, pushcarts, scaffoldings, bricks or blocks, sand, cement, and personal protective equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the drawings to clarify the task content; 2. Select equipment, tools, materials and safety protection equipment reasonably; 3. Calculate material consumption for material preparation; 4. Mix mortar and make mortar test blocks; 5. Carry out basic treatment, leveling and laying out; 6. Select the masonry method and brick samples; 7. Hang the line at the corner of the plates and erect the height pole; 8. Use appropriate masonry methods to build walls; 9. Erect scaffoldings; 10. Clear the waterwall pointing; 11. Inspect masonry quality; 12 Deal with quality defects; 13. Manage construction quality and safety on site; 14. Clean the equipment, tools and workplaces;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select equipment, tools and materials; 1.2 Calculate the material consumption, prepare the materials, mix the mortar, and make test blocks; 1.3 Carry out basic treatment, leveling and laying out; 1.4 Select the masonry method and brick samples, hang the line at the corners, erect height poles, carry out wall masonry and wall pointing, and erect scaffoldings; 1.5 Inspect masonry quality and deal with masonry defects; 1.6 Control on-site construction quality and safety. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Standards for inspection and acceptance of approaching raw materials; 2.2 Standard requirements of mixing mortar and making motar test blocks; 2.3 Specifications of hanging the line at the corner of the plates and erecting the height pole;

15. Organise and pack equipment and tools; 16. Store tools, equipment and safety protection articles.	2.4 Specifications of wall masonry and wall pointing, scaffoldings erecting; 2.5 Specifications of masonry quality inspection. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Selection of material mix proportion for mixing mortar; 3.2 Rules for selecting masonry modes and placing brick samples; 3.3 Safe erection of scaffoldings; 3.4 Principles of clearing the waterwall pointing. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Computing skills; 4.4 Professional ethics; 4.5 Time management skills. **5.0 Math Skills** 5.1 Numerical computation; 5.2 Geometry.
DESCRIPTION OF THE END PRODUCT / SERVICE	Lines are hung at the corner of the plates, height poles are erected and wall masonry is carried out in accordance with engineering drawings, quality standards and specification requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational safety and health; 4. Waste disposal.

OCCUPATION	ARCHITECTURAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF THE SITE WORK FOR THE PROJECT	**DUTY NO.**	403
TASK TITLE	WATERPROOF MEMBRANE PAVING	**TASK NO.**	4036
PERFORMANCE CRITERIA	The person performing this task must be able to pave the waterproof membrane in accordance with approved drawings, roof construction specifications, roof quality inspection and acceptance specifications, and other technical requirements.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of senior technicians or architectural engineers. The tools and equipment to be used include: 1. Coiled materials (asphalt glass cloth felt, asphalt glass fiber base felt, aluminum foil faced felt, etc.), asphalt mastic, cold primer oil, brooms, putty knives, putty knives, wire brushes, hammers, scissors, steel tapes, long-handle brushes, scrapers, electric stirrers, nail guns, percussion drills, air compressors, spray guns, hot air welders and press rollers.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Check whether the base quality meets the standard requirements; 2. Use wire brushes and brooms to clean the base; 3. Calculate the consumption of waterproof materials based on the construction area; 4. Select corresponding measuring instruments, mixing tools and transportation facilities according to the variety of waterproof materials; 5. Brush the base primer on the leveling layer with the long-handled brush and other tools; 6. Use the spray gun and other tools to pave the waterproof membrane according to the paving direction of the membrane; 7. Use pressure rollers and scrapers to exhaust the air under the coiled materials; 8. Use tools such as spray guns and scrapers to treat the overlap joints; 9. Clean up the stacked items on the completed waterproof layer;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Calculate the material consumption; 1.2 Select equipment and tools; 1.3 Pave coiled materials; 1.4 Deal with overlap joints; 1.5 Protect finished products. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Waterproof technology; 2.2 Zero elongation rupture. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Grade classification of waterproof layers; 3.2 Requirements for roof waterproofing layers; 3.3 Types of the waterproof membrane; 3.4 Waterproof membrane paving operation strategies and procedures. **4.0 Essential Skills**

10. Ensure smooth air flow during the construction of the waterproof membrane; 11. Clean the equipment, tools and workplaces.	4.1 Teamwork skills; 4.2 Organisation and coordination skills; 4.3 Drawing interpretation skills. **5.0 Math Skills** 5.1 Slope calculation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The waterproof membrane paving is carried out in accordance with engineering drawings and design descriptions.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of equipment and tools; 2. Scope of duties; 3. Occupational health and safety.

TABLE 1: DACUM CHARTS FOR ARCHITECTURAL ENGINEERING TECHNICIAN - NTA 4

DUTIES	TASKS	ENABLERS
1.0 Assistance of witness sampling of architectural materials	1.1 Site foundation rod sounding. 1.2 Implementation of witness sampling of architectural materials.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Skills and knowledge of foundation rod sounding · Architectural engineering materials · Skills and knowledge of architectural material sampling **Tools and equipment** · Steel chisel · Sledge hammer · Lead wire · Pushcart · Fixture · Crowbar · Steel tape · Medium sand · Sampling tube · Test block mold · Cutting ring · Platform balance · Stationery and computor · Standards and design regulations · Office furniture **Materials** · Soil sample · Concrete · Reinforcement bar · Cement · Gravel · Sand · Brick **Requirements for employees** · Teamwork spirit · Integrity · Time management · Emphasis on commitment

DUTIES	TASKS	ENABLERS
		· Professional ethics · Adaptability · Respect
2.0 Implementation of basic surveying and laying out	2.1 Implementation of the site leveling measurement and laying out. 2.2 Implementation of site 500/1,000 control cable.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of various measuring instruments · Determination of the leveling range by using the total station · Measurement of the elevation by using the level gauge · Use of the theodolite or the method of hanging the plumb with the pull rope to determine the datum point · Use of the ink fountain to snap the lines and mark the location · Implementation steps of elevation measurement · Implementation steps of axes measurement · Processing methods of angle, elevation and length measurement data · Construction drawing interpretation **Tools and equipment** · Steel tape · Level gauge · Telemeter rod · Total station · Stationery · Wood pile · Iron nail · Formation line · Plumb · Putty powder · Theodolite · Ink fountain · Stationery · Standards and design regulation · Office furniture

DUTIES	TASKS	ENABLERS
		Materials · Wood · Concrete **Requirements for employees** · Teamwork spirit · Integrity · Time management · Emphasis on commitment · Professional ethics · Adaptability · Respect
3.0 Implementation of the site work for the project	3.1 Shallow foundation excavation. 3.2 Formwork configuration. 3.3 Reinforcement processing and tying. 3.4 Concrete preparation and pouring. 3.5 Wall masonry. 3.6 Waterproofing membrane laying.	**General skills and knowledge** · Determination of the excavation edges · Support work for soft soil · Methods of measuring and leveling · Calculation of earth quantity · The cutting, shaping, and connection of wood · Different wood models made for different structural members · Shearing, bending, straightening and binding of reinforcement bars · Specification requirements for reinforcement bar construction · Mixing, transport and vibration of concrete · Teamwork skills · Organisation and coordination skills · Engineering drawings interpreting skills · Form filling skills · Quality control skills · Customer service skills · Professional ethics **Tools and equipment** · Safety helmet, goggles, gloves and labour protection equipment · Mixing plant, concrete mixer (forced type, self-falling type), weighing scale, concrete mixer truck, pushcart, dumper truck,

DUTIES	TASKS	ENABLERS
		concrete pump truck or transfer pump, concrete internal vibrator (surface vibrator), etc. · Large shovel, line hammer, guiding rule, level ruler, steel tape, ash bin, height pole, leveling instrument, adze, mortar mixer, pushcart, scaffolding, · electric stirrer, nail gun, percussion drill, · air compressor, blowtorch, flame gun, and hot air welder **Materials** · Concrete · Brick · Block · Stone · Coiled material **Requirements for employees** · Teamwork spirit · Integrity · Time management · Emphasis on commitment · Professional ethics · Adaptability · Respect