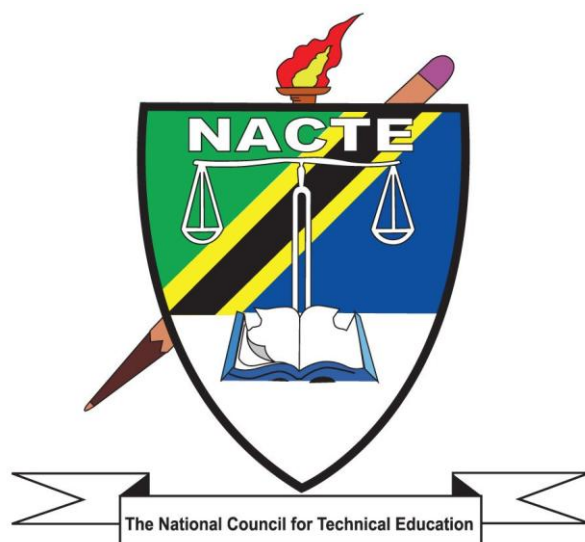


NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: CIVIL ENGINEERING TECHNICIAN

LEVEL: NTA 6

TABLE OF CONTENT

TABLE OF CONTENT	ii
FOREWORD	iii
ACKNOWLEDGEMENT	v
ABBREVIATIONS	ix
GLOSSARY OF TERMS	x
1.0. INTRODUCTION	1
2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS	2
3.0. THE SCOPE AND OVERVIEW OF THE CIVIL ENGINEERING TECHNICIAN OCCUPATION STANDARDS	3
4.0. VALIDITY PERIOD	4
5.0. OCCUPATIONAL STANDARDS	5
5.1. OCCUPATIONAL STANDARDS FOR CIVIL ENGINEERING TECHNICIAN -NTA 6.....	5
TABLE 1: DACUM CHARTS FOR CIVIL ENGINEERING TECHNICIAN NTA 6.....	26

FOREWORD

The National Council for Technical Education (NACTE) is a corporate body established by the National Council for Technical Education Act, Cap.129. The Act provides a legal framework for the Council to coordinate the provision of technical education and training in Tanzania. The mandate of NACTE is three-fold, namely; Regulatory, Quality Assurance and Policy Advisory.

In discharging its mandate, the Council has been charged with the responsibilities, among others, to:

- (a) assist technical institutions in the transmission of knowledge, principles and training in the field of technical education and training for the benefit of the people of Tanzania;
- (b) assist technical institutions in the overall development of the quality of education they provide and to promote and to maintain approved academic standards;
- (c) establish and make awards in technical education which are consistent in standard and comparable to related awards in Tanzania and internationally; and
- (d) ensure that the quality of education required for the awards is met and maintained throughout the duration of the delivery of the course.

In the course of execution of these responsibilities, the Council has been instituting various measures aiming at advancing the quality of training provided in technical institutions in respect of the changing demands of the labour market, both local and international.

To achieve the above obligation, NACTE, under the Ministry of Education, Science and Technology implemented the East Africa Skills for Transformation and Regional Integration Project (EASTRIP), a project aiming at promoting regional integration through supporting the regional corridors and sector markets, developing common standards and qualifications, and promoting mobility of students, faculty, and graduates. The project supports the Government of Tanzania to address shortage of skills in five sectors namely:

- (a) Energy;
- (b) Construction;
- (c) Information and Communication Technology (ICT);
- (d) Transportation; and
- (e) Agrobusiness.

To address the skills, miss-match and shortage in the five (5) sectors in the country, the project funded, among others, a component of Development of Occupational Standards for Technical and Vocational Education and Training (TVET). In this regard, NACTE endeavoured to identify qualified and highly experienced experts in the five sectors from both the industry and training institutions to carry out the development of Occupational Standards. The exercise was carried out at Morogoro Teachers College – Morogoro from 16th July to 10th August, 2021. The output of the exercise is Occupational Standards for 12 occupations. Occupational standards for Civil Engineering Technicians are among the 12 occupational standards which have been developed.

Since Occupational Standards are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills, attitudes and understanding in an occupation, it is the Council's expectations that the developed standards will form a robust base for decision making and provide explicit guidance to policy makers, curriculum developers, educators, employers and other stakeholders in matters related to manpower planning as well as execution of Technical and Vocational Education and Training undertakings.

Prof. J. W. Kondoro
Chairman

Dar es Salaam
NOVEMBER 2022

ACKNOWLEDGEMENT

The National Council for Technical Education (NACTE) is charged with the mandate to be the Quality Assurance organ of the Government in matters related to Technical and Vocational Education and Training (TVET) and production of qualified manpower for both local and international labour markets. In order to realize this obligation, NACTE endeavours to institute policies, guidelines and standards and to set the quality benchmarks for training institutions.

However, this is only possible if there is a strong base, linking the training institutions on one hand and the demands of the industry/labour market for relevant manpower on the other hand. Therefore, the Council undertook a step to develop Occupational Standards in sectors considered to be the engine to steer the country's desire to achieve an industrial economy. This exercise would not be a success without the input and support from our stakeholders. I am indebted to acknowledge some of them here.

I wish to acknowledge and appreciate the support from the Ministry of Education, Science and Technology through the East Africa Skills for Transformation and Regional Integration Project (EASTRIP) for the financial support which facilitated the preparation of this document. I wish also to appreciate Mrs Leah Lukindo and Eng. Dr. Simon Bareguand for the tireless efforts and commitment in facilitating and guiding the standards development process, Ms. Eileen Tzamburakis and Ms. Chausiku Yakweli Ibrahim for compiling and type setting the final document; and the NACTE Secretariat for coordinating the whole activity.

In a very special way I wish further to extend my sincere gratitude to this team of wonderful experts who tirelessly dedicated their time and availed their invaluable intellect in the preparation of this document. I would like to recognise the colossal inputs of the following experts:

S/N	Name	Designation	Organization
1	Eng. Emmanuel Taseni	Consulting Engineer	NIMETA Consult (T) Limited
2	Eng. Josephat Mutembei	Civil Engineer II	Kigamboni Municipal Council

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4	Eng. Franco Faustine	Civil Engineer I	Tanzania Building Agency (TBA)
5	Eng. Godfrey Komba	Civil Engineer	The National Council for Technical Education (NACTE)
6	Eng. Milton J. Nyerere	Managing Director	Aquifer Construction Limited
7	Eng. MwiveiMsisili	Principal Civil Engineer	Hinly Company Limited
8	Dr. JubilyMusagasa	Lecturer	Dar es Salaam Institute of Technology
9	Cheche Mabiki	Principal Registration Officer	Contractors Registration Board (CRB)
10	Eng. Fares Washa	Assistant Registrar	Engineers Registration Board (ERB)
11	Dr. Prosper Mgaya	Deputy Rector ARC	National Institute of Transport (NIT)

In addition, the Council hopes to further improve the international level of occupational standards, and promote the modernization and internationalization of industrial industries, so as to make Tanzania's occupational standards more in line with the international ones and expand its development potential. Therefore, the Council has invited China & Africa Technical and Vocational Education Cooperation Alliance and China & Africa (Chongqing) Technical and Vocational Education Cooperation Alliance to develop, revise and review vocational standards together with vocational colleges in China. Based on their rich experience in vocational education, as well as China's advanced and complete industrial chain and its position in the international market, they will help Tanzania develop its vocational education and related industries.

Therefore, I would like to express my heartfelt thanks to the team composed of many Chinese colleges and relevant experts, for their hard work and dedication, and for their wisdom and experience in preparing this document. They are listed below:

S/N	Organization	Name	Title/Field of Expertise
1	Guangdong Construction Polytechnic	Li Yufu	Senior Engineer/Civil Engineering
2		Zhang Wenxin	Assistant/Structural Engineering
3		Guan Tianding	Associate Professor/Civil Engineering
4		Liu Huaiwei	Senior Engineer/Civil Engineering
5		Li Shang	Assistant/Geotechnical Engineering
6		Tan Zhijun	Associate Professor/Civil Engineering
7		Zhou Guangyong	Lecturer/Engineering Survey
8	Guangdong Engineering Polytechnic College	Xu Lifeng	Associate Professor/Municipal Public Engineering
9	Guangzhou Municipal Construction Group Co., Ltd.	Zhang Guangzhi	Deputy Chief Engineer/Electrical & Mechanical Engineering

Last, but not least, I would like to acknowledge the enormous inputs from all stakeholders who were consulted during the validation process to provide their expert views and opinions on the validity of the contents and preparation of this document for customers' consumption.

Dr. A. B. Rutayuga
Executive Secretary

Dar es Salaam
NOVEMBER 2022

ABBREVIATIONS

NACTE	National Council of Technical Education
NOS	National Occupational Standards
OS	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 program 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 Analysis:	A process used to identify the tasks that are important to employees in any given occupation
Occupational Area:	This is a broad grouping of related jobs. Example: food service
Occupational Competence:	The application of knowledge and skills to perform consistently to the standards required in 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 performance tool of assessment of the pre – scribed outcomes.

Performance Criteria:	Indicate the expected end results or outcome in 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:	It is a set of statement, 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, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.
Tasks:	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:	This is 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 conform the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

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

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

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

In TET delivery, Tanzania adopted the Competency-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 Education and Training (CBET) programs. TET institutions will be required to benchmark their curricula with relevant occupational standards.

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

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

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

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

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

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

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the occupational standards. Engineers, supervisory technicians on the job, and experienced Civil 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 survey aiding in defining the scope for the occupational analysis, they served to engage a wide cross-section of experts in the occupation. The stakeholders' forum was attended by 100 participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE CIVIL ENGINEERING TECHNICIAN OCCUPATION STANDARDS

These standards cover a broad range of duties and tasks that can be performed by a Civil Engineering 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 Civil 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.

In most cases, civil engineering technicians work under the supervision of licensed civil engineers. They can assist in the design of simple civil engineering infrastructures and provide inputs in the preparation of tender documents. The infrastructure may include buildings, bridges, highways, railways, marine ports, airports, canals, dams, water and wastewater systems, pipelines, processing and re cycling of waste. These technicians also play important roles in the construction industry, from site evaluation to quality control and problem solving during the construction phase. They also perform field and laboratory tests. The standard has covered the following main duties of a Civil Engineering Technician:

1. Performing basic field and laboratory test for civil engineering materials.
2. Executing site works for construction and maintenance of buildings, roads, ports, airports and railways projects.
3. Performing construction and maintenance of water supply and sanitation works.
4. Performing survey for civil engineering infrastructures.
5. Supervising civil engineering construction projects.
6. Providing inputs in preparation of tender document for construction and maintenance of building and civil works.
7. Designing simple civil engineering infrastructures.

The Occupational standards have been clustered into NTA qualification levels i.e. NTA level 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 CIVIL ENGINEERING TECHNICIAN - NTA 6

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN OF SIMPLE CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	601
TASK TITLE	PERFORM DESIGN OF REINFORCED CONCRETE STURACTURAL MEMBERS	TASK NO.	6011
PERFORMANCE CRITERIA	The person performing this task must be able to design simple reinforced concrete members as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationery, standards and design codes, office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine design load; 2. Design Reinforcement Concrete (RC) slab; 3. Design RC beam; 4. Design RC column; 5. Design RC foundation; 6. Design drainage structures; 7. Plot structural drawings; 8. Prepare bar processing scheme.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design loads; 1.2. Design RC slab; 1.3. Design RC beam; 1.4. Design RC column; 1.5. Design RC foundation; 1.6. Design drainage structures; 1.7. Plot structural drawings; 1.8. Prepare bar bending schedule. 2.0. Principles The person must be able to explain the principles of: 2.1. Design RC structures; 2.2. Design RC structure details; 2.3. Foundation engineering. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Structural analysis; 3.3. Reinforcement Concrete Design; 3.4. Foundation engineering; 3.5. Soil mechanics; 3.6. Concrete technology; 3.7. Civil engineering materials; 3.8. Mechanics of materials; 3.9. Engineering drawing. 4.0. Essential skills 4.1. Team work skills;	

	4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Design of simple reinforced concrete member is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN OF SIMPLE CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	601
TASK TITLE	PERFORM DESIGN OF SIMPLE TIMBER STURACTURAL MEMBERS	TASK NO.	6012
PERFORMANCE CRITERIA	The person performing this task must be able to design simple timber members as per standards and guidelines approved by competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationary, standards and design codes, office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine design load; 2. Design timber slab; 3. Design timber beam; 4. Design timber column; 5. Design timber truss members; 6. Design timber connections and joints; 7. Plot construction drawings.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design loads; 1.2. Design timber slab; 1.3. Design timber beam; 1.4. Design timber column; 1,5, Design timber truss members; 1.6. Design timber connections and joints; 1.7. Plot construction drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing timber structures; 2.2. Designing timber structure details. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Structural analysis; 3.3. Civil engineering materials; 3.4. Mechanics of materials; 3.5. Engineering drawing. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills;	

	4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
Description of the end products or service:	Design of simple timber structural member is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN OF SIMPLE CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	601
TASK TITLE	PERFORM DESIGN OF SIMPLE STEEL STURACTURAL MEMBERS	TASK NO.	6013
PERFORMANCE CRITERIA	The person performing this task must be able to design simple steel members as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationery, standards and design codes, office furniture		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine design load; 2. Design steel slab; 3. Design steel beam; 4. Design steel column; 5. Design base plate; 6. Design steel truss members; 7. Design steel connections and joints; 8. Prepare construction drawings.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design loads; 1.2. Design steel slab; 1.3. Design steel beam; 1.4. Design steel column; 1.5. Design base plate; 1.6. Design steel truss members; 1.7. Design steel connections and joints; 1.8. Plot construction drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing steel structures; 2.2. Detailing steel structure details. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Structural analysis; 3.3. Civil engineering materials; 3.4. Mechanics of materials; 3.5. Engineering drawing. 4.0. Essential skills 4.1. Team work skills;	

	4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Design of simple steel structural member is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN OF SIMPLE CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	601
TASK TITLE	PERFORM SIMPLE GEOMETRY DESIGN FOR ROAD AND RAILWAYS	TASK NO.	6014
PERFORMANCE CRITERIA	The person performing this task must be able to design simple geometry for road and railways as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationery, standards, design codes and manuals.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Perform traffic studies for roads; 2. Determine design parameter for road and railway alignment; 3. Design of simple horizontal alignment for road and railways; 4. Design of simple vertical alignment for road and railways; 5. Design traffic control devices.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Interpret survey map/plan/profile/cross section; 1.2. determine design parameter; 1.3. design horizontal curve; 1.4. design vertical curve; 1.5. Plot construction drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Survey; 2.2. Route location; 2.3. Railways and road design; 2.4. Traffic engineering analysis; 2.5. Geometry design. 3.0. Theories The person must be able to explain: 3.1. Road design and construction; 3.2. Railway design and construction; 3.3. Engineering drawing; 3.4. Traffic engineering. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills;	

	4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Simple geometrical design for road and railways is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN OF SIMPLE CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	601
TASK TITLE	PERFORM SIMPLE PAVEMENT DESIGN FOR ROADS	TASK NO.	6015
PERFORMANCE CRITERIA	The person performing this task must be able to design simple pavement for roads as per standards and guidelines approved by competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationary, standards, design codes and manuals.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Estimate traffic loading; 2. Evaluate subgrade characteristics; 3. Determine cross section; 4. Design pavement layers; 5. Plot construction drawings.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Estimate traffic loading; 1.2. Evaluate subgrade characteristics; 1.3. Demarcate cross section; 1.4. Design pavement; 1.5. Plot construction drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Pavement design; 2.2. Estimating traffic loading; 2.3. Conducting soil tests; 2.4. Sample preparation; 2.5. Data processing. 3.0. Theories The person must be able to explain: 3.1. Traffic engineering; 3.2. Road construction; 3.3. Soil mechanics; 3.4. Civil engineering materials; 3.5. Engineering drawing. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills; 4.5. Creativity skills;	

	4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Simple pavement is designed for road and railways as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PROVIDE INPUTS IN PREPARATION OF TENDER DOCUMENT FOR CONSTRUCTION AND MAINTENANCE OF BUILDINGS AND CIVIL WORKS	DUTY NO.	602
TASK TITLE	ESTIMATE QUANTITIES FOR BUILDINGS AND CIVIL ENGINEERINGWORKS	TASK NO.	6021
PERFORMANCE CRITERIA	The person performing this task must be able to estimate quantities for buildings and civil engineering works as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationery, standards and manuals, office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine full project scope; 2. Review construction drawings; 3. Calculate quantities as per the drawings; 4. List types and quantities of materials determined; 5. Identity percentage for waste.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Read construction drawings; 1.2. Calculate quantities of building and civil works; 1.3. Record quantities and units of measurement; 1.4. Identity percentage for waste. 2.0. Principles The person must be able to explain the principles of: 2.1. Quantity surveying; 2.2. Taking-off; 2.3. Estimating quantities; 2.4. Building and civil works measurement. 3.0. Theories The person must be able to explain: 3.1. Contents on the drawings; 3.2. Quantity surveying of building and civil works; 3.3. Construction of buildings and civil works. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills;	

	4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Estimation of quantities for buildings and civil engineering works is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PROVIDE INPUTS IN PREPARATION OF TENDER DOCUMENT FOR CONSTRUCTION AND MAINTENANCE OF BUILDING AND CIVIL WORKS	DUTY NO.	602
TASK TITLE	PREPARE BILLS OF QUANTITIES	TASK NO.	6022
PERFORMANCE CRITERIA	The person performing this task must be able to prepare bills of quantities for buildings and civil works as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following tools and materials will be required in performing the task: computer, stationery, standards, and manuals.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Prepare work description; 2. Establish/ obtain costing rates; 3. Identify units of items; 4. Calculate total cost.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Prepare work description; 1.2. Establish/ obtain costing rates; 1.3. Identify units of items; 1.4. Calculate total cost. 2.0. Principles The person must be able to explain the principles of: 2.1. Quantity surveying; 2.2. Estimating quantities; 2.3. Building and civil works measurement. 3.0. Theories The person must be able to explain: 3.1. Quantity surveying of building and civil works; 3.2. Cost calculation of works; 3.3. Construction of building and civil works. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability;	

	4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Bill of quantities for buildings and civil works is performed as per standards and guidelines approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SUPERVISE CIVIL ENGINEERING CONSTRUCTION PROJECTS	DUTY NO.	603
TASK TITLE	PLAN FOR CONSTRUCTION ACTIVITIES OF BUILDING AND CIVIL WORKS	TASK NO.	6031
PERFORMANCE CRITERIA	The person performing this task must be able to plan for construction activities of buildings and civil works as per project documents.		
RANGE STATEMENT	The task will be performed in the office under the supervision of an Engineer. The following equipment, tools and materials will be required in performing the task: computer, stationery, office furniture's, project's documents.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine human resources requirement; 2. Determine equipment requirement; 3. Determine materials requirement; 4. Prepare construction plan; 5. Prepare resources acquisition schedule; 6. Prepare site layout plan.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine human resources requirement; 1.2. Determine equipment requirement; 1.3. Determine materials requirement; 1.4. Prepare construction plan; 1.5. Prepare resources acquisition schedule; 1.6. Prepare site layout plan. 2.0. Principles The person must be able to explain the principles of: 2.1. Construction of buildings and civil works; 2.2. Construction management; 2.3. Operating and utilization of construction equipment Construction of buildings and civil works. 3.0. Theories The person must be able to explain: 3.1. Construction management; 3.2. Construction technology; 3.3. Civil engineering material; 3.4. Read drawings. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills;	

	4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Planning for construction activities of buildings and civil works is performed as per project contracts.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Operating and utilization of construction equipment; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SUPERVISE CIVIL ENGINEERING CONSTRUCTION PROJECTS	DUTY NO.	603
TASK TITLE	MONITOR WORKS PROGRESS AND REPORT TO SUPERVISOR	TASK NO.	6032
PERFORMANCE CRITERIA	The person performing this task must be able to monitor works progress for construction activities of buildings and civil works as per specifications and methodology approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on construction site under the supervision of an Engineer. The following equipment, tools and materials will be required in performing the task: computer, stationery, office furniture’s, project’s documents.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Adhere to standards and specifications; 2. Implement program of works; 3. Report breakdown of plant and equipment; 4. Locate manpower to respective activities basing on working requirement; 5. Perform site inspections; 6. Monitor quality of works 7. Monitor performance of subordinates; 8. Prepare daily report.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Locate manpower; 1.2. Perform site inspections; 1.3. Monitor quality of works; 1.4. Monitor performance of subordinates; 1.5. Prepare daily report. 2.0. Principles The person must be able to explain the principles of: 2.1. Construction management; 2.2. Report writing; 2.3. Site organization management; 2.4. Quality control. 3.0. Theories The person must be able to explain: 3.1. Construction management; 3.2. Construction technology; 3.3. Civil engineering materials; 3.4. Read engineering drawings. 4.0. Essential skills 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills;	

	4.5. Creativity skills; 4.6. Listening skills; 4.7. Leadership skills; 4.8. Motivation skills; 4.9. Mathematics skills in algebra; 4.10. Numeracy; 4.11. Work ethic; 4.12. Adaptability; 4.13. Time management; 4.14. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Monitoring of works progress for construction activities of buildings and civil works is performed as per specifications and methodology approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Operating and utilization of construction equipment; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SUPERVISE CIVIL ENGINEERING CONSTRUCTION PROJECTS	DUTY NO.	603
TASK TITLE	MONITOR HEALTH, SAFETY AND ENVIRONMENTS IN CONSTRUCTION SITE	TASK NO.	6033
PERFORMANCE CRITERIA	The person performing this task must be able to monitor health, safety and environment in construction activities of buildings and civil works as per specifications and methodology approved by competent authority.		
RANGE STATEMENT	The task will be performed in the office and on construction sites under the supervision of an Engineer. The following equipment, tools and materials will be required in performing the task: computer, stationary, office furniture's, project's documents and PPEs.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Determine health and safety requirements at the work place; 2. Identify PPEs requirement at the work place; 3. Monitor safety and health at the work place; 4. Provide appropriate PPEs for the employees at the work place; 5. Adhere to health and safe regulations at the work place; 6. Report accidents and health hazards to superiors; 7. Conduct awareness seminars regarding health and safe regulations at the work place.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Establish health and safety requirements at the work place; 1.2. Secure health, safety and welfare of employees on the construction site; 1.3. Protect public from health and safety risks of construction activity; 1.4. Eliminate potential safety risks at construction site; 1.5. Conduct toolbox meeting; 1.6. Monitor safety and health on the construction site; 1.7. Write HSE report; 1.8. Use PPEs. 2.0. Principles The person must be able to explain the principles of: 2.1. Occupational health and safety; 2.2. Handling hazardous material; 2.3. First aids. 3.0. Theories The person must be able to explain: 3.1. Occupational health and safety; 3.2. Hazardous materials; 3.3. Hazard source; 3.4. First aids.	

	4.0. Essential skills: 4.1. Team work skills; 4.2. Communication skills; 4.3. Computer skills; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills in algebra, calculus; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Monitoring of health, safety and environment in construction activities of buildings and civil works is performed as per specifications and methodology approved by a competent authority.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

TABLE 1: DACUM CHARTS FOR CIVIL ENGINEERING TECHNICIAN NTA 6

S/No	DUTIES	TASKS	ENABLERS
01	Design of simple civil engineering infrastructures.	1.1. Perform design of reinforced concrete structural members. 1.2. Perform design of simple timber structural members. 1.3. Perform design of simple steel structural members. 1.4. Perform simple geometry design for road and railways. 1.5. Perform simple pavement design for roads.	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors • Skills and knowledge on Taking measurements & measuring units. • Interpretation of architectural drawing • Civil Engineering Material • Reinforced concrete design • Steel design • Timber design Tools and Equipment • computer, stationery, standards and design codes, office furniture Materials Concrete, steel bar, timber etc. Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect
02	Provide inputs in prepare of tender document for construction and maintenance of building and civil works.	2.1 Estimate quantity for buildings and civil engineering works. 2.2 Prepare bills of quantity.	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors • Skills and knowledge on Taking measurements & measuring units. • Quantity surveying of buildings and civil works
03	Supervise civil engineering construction projects.	3.1 Plan for construction activities of	

S/No	DUTIES	TASKS	ENABLERS
		building and civil works. 3.2 monitor works progress and report to supervisor. 3.3 monitor health, safety and environments in construction site.	- Construction of buildings and civil works Tools and Equipment - computer, stationery, standards and office furniture Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect