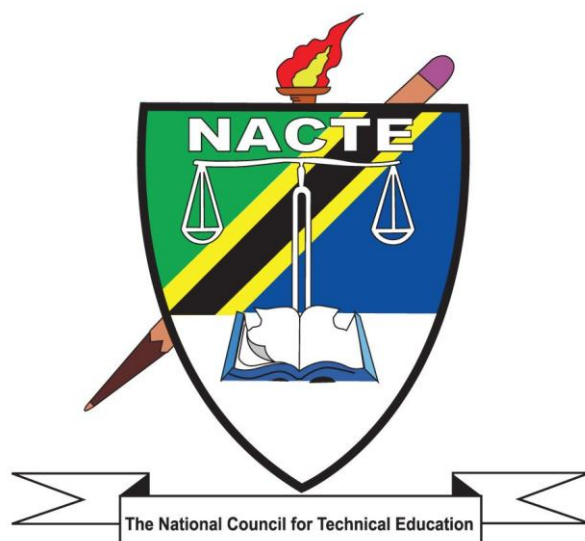


NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR CIVIL ENGINEERS

LEVEL: NTA 8

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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) Agribusiness .

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 Engineers 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 Baregu 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 Tasei	Consulting Engineer	NIMETA Consult (T) Limited
2.	Eng. Josephat Mutembei	Civil Engineer II	Kigamboni Municipal Council
3.	Eng. George M. Chaula	Civil Engineer I	Tanzania Building Agency (TBA)

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. Mwivei Msisili	Principal Civil Engineer	Hinly Company Limited
8.	Dr. Jubily Musagasa	Lecturer	Dar es Salaam Institute of Technology
9.	Eng Cheche Mabiki	Principal Registration Officer	Contractors Registration Board (CRB)
10.	Eng. Fares Washa	Assistant Registrar	Engineers Registration Board (ERB)
11.	Dr. Prosper Mgya	Deputy Rector ARC	National Institute of Transport (NIT)

In addition, NACTVET hopes to further enhance the international level of professional standards and promote the modernization and internationalization of industries, so as to promote Tanzania's integration with the international market and expand its development potential. Therefore, NACTVET invited China-Africa Vocational Education Alliance and China-Africa (Chongqing) Vocational Education Alliance to cooperate with China's vocational colleges to participate in the development, revision and review of vocational standard documents, relying on their rich experience in vocational education, and advanced and complete industrial chain of China and position in the international market, to support vocational education and related industries in Tanzania.

Hereby, I would extend my sincere gratitude to this professional team composed of relevant experts from many Chinese universities and institutions for their hard work and dedication and their intellectual and experienced contributions and efforts to the documents. Thanks for the support of the following experts and organization:

No	Organization	Name	Title/professional field
1	Rizhao Polytechnic	Xu Xiquan	Professor/Civil engineering

2		Xu Chonghua	Associate Professor/Civil engineering
3		Li Chenglong	Associate Professor/Teaching
4		Dong Yanxi	Lecturer/civil engineering
5		Yu Lili	Lecturer/International cooperation and exchange in education
6		Ma Fangxing	Associate Professor/Civil engineering
7		Yang Zhigang	Associate Professor/Civil engineering
8		Xin Chongfei	Professor/Materials science

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 set up of this document for customers' consumption.

Dr. A. B. Rutayuga
Executive Secretary

Dar es Salaam
November 2022

ABBREVIATIONS

CBR	California Bearing Ratio
MOPP	Maintenance Operating Policy and Procedures
NACTE	National Council for Technical Education
NOS	National Occupational Standards
OS	Occupational Standards
PCC	Portland Cement Concrete
PPE	Personal Protective Equipment
PPR	Poly Propylene
PVC	Poly Vinyl Chloride
RC	Reinforced Concrete
RCC	Reinforced Cement Concrete
RPM	Revolutions Per Minute
SPT	Standard Penetration Test
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 Engineer 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 OCCUPATION STANDARDS FOR CIVIL ENGINEERS

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

Civil engineers are in charge of overseeing and managing civil engineering projects. They plan, design, construct, manage, run, and maintain public and private infrastructure projects and systems, such as roads, buildings, airports, maritime ports, trains, pipelines, tunnels, canals, dams, bridges, and water supply and sanitation systems. Their activities require compliance to standards and rules approved by a competent authority.

The Occupational standards developed cover the following main duties of Civil Engineers:

- a) Carryout feasibility study of civil engineering projects;
- b) Design civil engineering infrastructures;
- c) Perform survey for civil engineering infrastructures;
- d) Perform geotechnical investigation;
- e) Provide technical data during the tender document preparation for construction and maintenance of civil works.
- f) Manage civil engineering projects and deliver on time, while observing quality and cost.
- g) Design mixes of materials for building and civil engineering works.

- h) Ensuring compliance to health and safety standards.
- i) Perform structural integrity assessment and demolition of building and civil engineering infrastructures.

The Occupational standards have been clustered into NTA qualification levels i.e. NTA level 7 and 8.

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 ENGINEERS - NTA 8

OCCUPATION	CIVIL ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE MAINTENANCE WORKS FOR CIVIL ENGINEERING INFRASTRUCTURE	DUTY NO.	801
TASK TITLE	MANAGE MAINTENANCE WORKS FOR ROADS	TASK NO.	8011
PERFORMANCE CRITERIA	The person performing this task must be able to manage maintenance works for roads as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the field. The following tools and materials will be required in performing the task: computer, stationery, standards and design codes, office furniture, road quality inspection tool.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools, equipment and safety gears for the task; 2. Observe health and safety precautions when performing the task; 3. Conduct conditional survey; 4. Establish scope of maintenance; 5. Decide methodology to be used; 6. Determine resources required for maintenance; 7. Prepare work schedule or program of works; 8. Plan road maintenance works using Road Maintenance Management system (RMMS); 9. Design pavement rehabilitation scheme; 10. Oversee traffic management while conducting maintenance; 11. Oversee maintenance of road drainage; 12. Oversee maintenance of road pavement; 13. Oversee maintenance of road furniture; 14. Oversee maintenance of earth and gravel road; 15. Observe HSE compliance 16. Supervise road maintenance		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Conduct conditional survey; 1.2. Establish scope of maintenance; 1.3. Prepare work methodology; 1.4. Determine resources required for maintenance; 1.5. Prepare work program; 1.6. Design pavement rehabilitation; 1.7. Manage traffic; 1.8. Maintain road drainage; 1.9. Maintain road pavement; 1.10. Maintain road furniture; 1.11. Maintain earth and gravel road; 1.12. Plan for HSE management. 2.0. Principles The person must be able to explain the principles of: 2.1. Undertaking condition survey; 2.2. Traffic management; 2.3. Program of work preparation; 2.4. Resource management; 2.5. Data collection for RMMS; 2.6. Health and safety management. 3.0. Theories The person must be able to explain: 3.1. Types of road defects and repair; 3.2. Procedure for conducting maintenance; 3.3. Road Maintenance Management System	

work 17. Quality acceptance of road maintenance work; 18. Prepare report and update maintenance records; 19. Clean work place, tools and equipment; 20. Store tools and equipment appropriately.	(RMMS); 3.4. Construction management; 3.5. Road drainage maintenance. 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, statistics; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Management of road maintenance 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE MAINTENANCE WORKS FOR CIVIL ENGINEERING INFRASTRUCTURE	DUTY NO.	801
TASK TITLE	MANAGE MAINTENANCE WORKS FOR BUILDINGS	TASK NO.	8012
PERFORMANCE CRITERIA	The person performing this task must be able to manage maintenance works for buildings as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and in the field. The following tools and materials will be required in performing the task: computer, stationery, standards, office furniture, building quality inspection tool.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools, equipment and safety gears for the task; 2. Conduct conditional survey; 3. Establish scope of maintenance; 4. Decide methodology to be used for building maintenance; 5. Determine resources required for maintenance; 6. Prepare program of works; 7. Supervise maintenance work for building; 8. Oversee Foundation maintenance; 9. Oversee Superstructure maintenance; 10. Oversee Maintenance of building finish; 11. Oversee Roof maintenance; 12. Observe HSE compliance; 13. Quality acceptance of building maintenance work; 14. Prepare report and update maintenance records; 15. Clean work place, tools and equipment; 16. Store tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Conduct conditional survey; 1.2. Establish scope of maintenance; 1.3. Prepare methodology to be used for building maintenance; 1.4. Determine resources required for maintenance; 1.5. Prepare program of works; 1.6. Supervise building maintenance work. 2.0. Principles The person must be able to explain the principles of: 2.1. Undertaking conditional survey; 2.2. Designing building structure; 2.3. Observing health and safety; 2.4. Resource management. 3.0. Theories The person must be able to explain: 3.1. Construction management; 3.2. Health and safety management; 3.3. False work; 3.4. Construction and Maintenance techniques; 3.5. Building maintenance materials; 3.6. Superstructure maintenance; 3.7. Maintenance of wall/surface finishing; 3.8. Roof maintenance; 3.9. Foundation maintenance.	

	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	Management of Building works maintenance 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE MAINTENANCE WORKS FOR CIVIL ENGINEERING INFRASTRUCTURE	DUTY NO.	801
TASK TITLE	MANAGE MAINTENANCE WORKS FOR RAILWAYS	TASK NO.	8013
PERFORMANCE CRITERIA	The person performing this task must be able to manage maintenance works for railways as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the field. The following tools and materials will be required in performing the task: computer, stationery, standards and design codes, office furniture, railway quality inspection tool.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools, equipment and safety gears for the task; 2. Observe health and safety precautions when performing the task; 3. Conduct conditional survey; 4. Establish scope of maintenance; 5. Decide methodology to be used; 6. Determine resources required for maintenance; 7. Prepare work schedule or program of works; 8. Plan railway maintenance works; 9. Maintain railway embankment; 10. Oversee Maintenance of ballast; 11. Oversee maintenance of sleepers; 12. Oversee maintenance of rail track; 13. Oversee maintenance of railway drainage; 14. Oversee maintenance of railway furniture; 15. Maintain station and yard; 16. Quality acceptance of railway maintenance work; 17. Prepare report and update maintenance records; 18. Clean work place, tools and		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Conduct conditional survey; 1.2. Establish scope of maintenance; 1.3. prepare work methodology; 1.4. Determine resources required for maintenance; 1.5. Prepare work program; 1.6. Maintain railway embarkment; 1.7. Maintain ballast; 1.8. Maintain sleepers; 1.9. Maintain rail truck; 1.10. Maintain railway drainage; 1.11. Maintain railway furniture; 1.12. Plan for HSE management; 1.13. Maintain station and yard. 2.0. Principles The person must be able to explain the principles of: 2.1. Undertaking condition survey; 2.2. Preparing Program of work; 2.3. Resource management; 2.4. Health and safety management. 3.0. Theories The person must be able to explain: 3.1. Railway design and construction; 3.2. Engineering survey; 3.3. Industry quality standards;	

equipment; 19. Store documents, tools and equipment appropriately.	3.4. Railway maintenance requirement; 3.5. Railway's drainage maintenance; 3.6. Construction management; 3.7. Railway electrification; 3.8. Health and safety management. 4.0. Essential skills 4.1. Team work skills; 4.2. Problem solving; 4.3. Communication skills; 4.4. Computer skills; 4.5. Analytical skills; 4.6. Creativity skills; 4.7. Mathematics skills in algebra, calculus; 4.8. Work ethic; 4.9. Flexibility; 4.10. Time management; 4.11. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Management of Railway maintenance 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE CONSTRUCTION PROJECTS OF CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	802
TASK TITLE	MANAGE CONTRACTS	TASK NO.	8021
PERFORMANCE CRITERIA	The person performing this task must be able to manage construction contracts as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the construction site. The following tools and materials will be required in performing the task: computer, stationery, standards and office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right P.P.E tools and equipment for the task; 2. Interpret contract documents; 3. Prepare program of works; 4. Prepare methodology of works; 5. Perform site inspection; 6. Approve construction activities; 7. Carry out valuation of works; 8. Prepare claims; 9. Evaluate claims; 10. Prepare payment certificate; 11. Certify completed works; 12. Conduct site meetings; 13. Manage disputes; 14. Prepare variation order; 15. Observe compliance to HSE 16. Clean work place, tools and equipment; 17. Store tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Interpret contract documents; 1.2. Prepare program of works; 1.3. Prepare methodology of works; 1.4. Conduct site inspection; 1.5. Carry out valuation of works; 1.6. Prepare claims; 1.7. Evaluate claims; 1.8. Prepare payment certificate; 1.9. Conduct site meeting; 1.10Manage disputes; 1.11. Prepare variation order. 2.0. Principles The person must be able to explain the principles of: 2.1. Disputes management; 2.2. Claims Preparation. 3.0. Theories The person must be able to explain: 3.1. Construction management; 3.2. Professional ethics; 3.3. Construction contract law; 3.4. Health and safety management. 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. Work ethic; 4.7. Adaptability; 4.8. Time management; 4.9. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Management of contracts 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE CONSTRUCTION PROJECTS OF CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	802
TASK TITLE	MANAGE CONSTRUCTION RESOURCES	TASK NO.	8022
PERFORMANCE CRITERIA	The person performing this task must be able to manage construction resources as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the construction site. The following tools and materials will be required in performing the task: computer, stationery, standards and office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools and equipment for the task; 2. Observe compliance to HSE; 3. Establish human resources requirement; 4. Recruit manpower; 5. Assign duties and keep duty roster; 6. Maintain the attendance register; 7. Appraise performance of staff; 8. Identify plants and equipment needed; 9. Allocate plant and equipment to respective duties; 10. Monitor utilization of plant and equipment to meet the goals; 11. Prepare maintenance schedule of plant and equipment; 12. Plan material resource; 13. Estimate material requirement; 14. Prepare material acquisition schedule; 15. Establish inventory of physical resources; 16. Take stock of resources in store and on the site according to the agreed schedule;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Estimate required quantity of materials from working drawings; 1.2. Allocate manpower to respective activities on the bases of work requirements; 1.3. Determine relevant methods of handling construction materials from stock yard to election point; 1.4. Manage equipment break down and discrepancies found during construction work; 1.5. Coordinate between various department for execution of work; 1.6. Prepare cashflow; 1.7. Prepare program of works; 1.8. Prepare material acquisition schedule. 2.0. Principles The person must be able to explain the principles of: 2.1. Program of work preparation; 2.2. Human resource management; 2.3. Financial management; 2.4. Material management; 2.5. Operation and maintenance of equipment; 2.6. Preparation of financial report. 3.0. Theories The person must be able to explain:	

17. Keep records of physical resources; 18. Prepare cashflow; 19. Perform end value assessment; 20. Monitor expenditure; 21. Clean work place, tools and equipment 22. Store documents, tools and equipment appropriately.;	3.1. Construction management; 3.2. Financial management; 3.3. Health and safety management. 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. Work ethic; 4.7. Adaptability; 4.8. Time management; 4.9. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Management of construction resources 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE CONSTRUCTION PROJECTS OF CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	802
TASK TITLE	SUPERVISE EXECUTION OF WORKS	TASK NO.	8023
PERFORMANCE CRITERIA	The person performing this task must be able to supervise execution of works as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed on the construction site. The following tools and materials will be required in performing the task: computer, stationery, standards, survey equipment, batch plant, office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Prepare method statement for execution of works; 2. Comply to HSE; 3. Convey changes to subordinate; 4. Confirm hours worked and work performed; 5. Evaluate performance of manpower; 6. Ensure productivity by checking completed work as per tasks; 7. Prepare progress report; 8. Adjust work in accordance with site condition, manpower and material delivery; 9. Perform quality assurance and control; 10. Conduct technical meetings; 11. Perform measurement of works.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Prepare method statement for execution of works; 1.2. Evaluate performance of man power; 1.3. Determine productivity; 1.4. Prepare progress report; 1.5. Perform quality assurance and control; 1.6. Conduct technical meeting; 1.7. Perform measurement of works; 1.8. Prepare valuation of work. 2.0. Principles The person must be able to explain the principles of: 2.1. Human resource management; 2.2. Financial management; 2.3. Quality control; 2.4. Material management; 2.5. Operation and maintain equipment. 3.0. Theories The person must be able to explain: 3.1. Construction management; 3.2. Financial management; 3.3. Health and safety management; 3.4. Quantity survey; 3.5. Engineering survey; 3.6. Material testing. 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. Work ethic; 4.7. Adaptability; 4.8. Time management; 4.9. Respect; 4.10. Leadership; 4.11. Supervision; 4.12. Management.
DESCRIPTION OF END PRODUCTS/SERVICE	Supervision of execution of work 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE CONSTRUCTION PROJECTS OF CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	802
TASK TITLE	PERFORM PROCUREMENT OF CIVIL ENGINEERING WORKS AND SERVICES	TASK NO.	8024
PERFORMANCE CRITERIA	The person performing this task must be able to participate in procurement process as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the construction site. The following tools and materials will be required in performing the task: computer, stationery, standards and office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Prepare terms of references (TOR); 2. Estimate cost of service; 3. Prepare shortlisting criteria; 4. Participate in preparation of request for proposal; 5. Participate in evaluation process; 6. Prepare list of requirement, specifications and cost of works; 7. Participate in preparation of prequalification document; 8. Participate in preparation of tender document; 9. Participate in evaluation of tender/bid.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Prepare terms of references (TOR); 1.2. Estimate cost of service; 1.3. Prepare shortlisting criteria; 1.4. Prepare request for proposal; 1.5. Evaluate proposal; 1.6. Prepare list of requirements, specifications and cost of works; 1.7. Prepare prequalification document; 1.8. Prepare tender document; 1.9. Evaluate tender/bid. 2.0. Principles The person must be able to explain the principles of: 2.1. Proposal evaluation; 2.2. Tender evaluation; 2.3. Public procurement. 3.0. Theories The person must be able to explain: 3.1. Components of tender document; 3.2. Tendering procedure; 3.3. Professional ethics; 3.4. Construction contract law; 3.5. Computer Aided Design software.	

	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 in algebra, geometry; 4.7. Work ethic; 4.8. Adaptability; 4.9. Time management; 4.10. Respect.
DESCRIPTION OF END PRODUCTS/SERVICE	Procurement process 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	803
TASK TITLE	DESIGN TIMBER STRUCTURES	TASK NO.	8031
PERFORMANCE CRITERIA	The person performing this task must be able to design timber structure as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select right tools and equipment for the task; 2. Determine design load; 3. Analyze timber structures; 4. Design timber floor; 5. Design timber beam; 6. Design timber column; 7. Design timber truss; 8. Design timber connections and joints; 9. Prepare working drawings; 10. Clean work place, tools and equipment; 11. Store drawings, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design load; 1.2. Analyze load for timber structures; 1.3. Carry out structural analysis; 1.4. Design timber floor; 1.5. Design timber beam; 1.6. Design timber column; 1.7. Design timber truss; 1.8. Design timber connections and joints; 1.9. Prepare working drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing timber structures; 2.2. Detailing timber structures. 3.0. Theories The person must be able to explain: 3.1. Structural timber design; 3.2. Structural mechanics; 3.3. Structural analysis; 3.4. Civil engineering materials; 3.5. Strength of materials; 3.6. Engineering drawing; 3.7. Computer Aided Design software. 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	Designing of timber structure 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURES.	DUTY NO.	803
TASK TITLE	DESIGN STEEL STRUCTURES	TASK NO.	8032
PERFORMANCE CRITERIA	The person performing this task must be able to design steel structure as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select right tools and equipment for the task; 2. Determine design load; 3. Analyze loads for steel structure; 4. Carry out structural analysis; 5. Design steel floor; 6. Design steel beams; 7. Design steel columns; 8. Design base plates; 9. Design steel trusses; 10. Design steel frames 11. Design steel connections and joints; 12. Prepare working drawings; 13. Clean work place, tools and equipment; 14. Store drawings, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design load; 1.2. Analyze loads for steel structure; 1.3. Carry out structural analysis; 1.4. Design steel floor; 1.5. Design steel beams; 1.6. Design steel columns; 1.7. Design base plates; 1.8. Design steel trusses; 1.9. Design steel frames 1.10. Design steel connections and joints; 1.11. Prepare working drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing steel structures; 2.2. Detailing steel structures. 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. Strength of materials; 3.5. Engineering drawing; 3.6. Computer Aided Design software. 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	Designing of steel structure 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	803
TASK TITLE	DESIGN STEEL-CONCRETE COMPOSITE STRUCTURES	TASK NO.	8033
PERFORMANCE CRITERIA	The person performing this task must be able to design steel-concrete composite structure as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select right tools and equipment for the task; 2. Determine design load; 3. Analyze loads for composite structure; 4. Carry out structural analysis; 5. Design composite floor; 6. Design composite beams; 7. Design composite columns; 8. Design composite frames; 9. Design composite connections and joints; 10. Prepare working drawings; 11. Clean work place, tools and equipment; 12. Store drawings, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine design load; 1.2. Analyze loads for composite structure; 1.3. Carry out structural analysis; 1.4. Design composite floor; 1.5. Design composite beams; 1.6. Design composite columns; 1.7. Design composite frames; 1.8. Design composite connections and joints; 1.9. Prepare working drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing steel-concrete structures; 2.2. Detailing steel-concrete structures. 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. Concrete technology; 3.5. Strength of materials; 3.6. Engineering drawing; 3.7. Computer Aided Design software. 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	Designing of steel-concrete composite structure 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	803
TASK TITLE	DESIGN OF BRIDGE STRUCTURES	TASK NO.	8034
PERFORMANCE CRITERIA	The person performing this task must be able to design bridge structure as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select right tools, equipment and safety gears for the task; 2. Observe health and safety precautions when performing the task; 3. Determine bridge location; 4. Perform hydrological and hydraulic analysis; 5. Determine bridge opening size; 6. Determine position of support; 7. Check back water effect and scour depth; 8. Perform subsurface exploration; 9. Determine types of foundation; 10. Estimate loading; 11. Analyze loading; 12. Design bridge deck; 13. Design bridge piers and abutments; 14. Design bridge foundation; 15. Evaluate the stability of the bridge; 16. Perform detailing of bridge members; 17. Prepare structural drawings; 18. Clean work place, tools and equipment; 19. Store drawings, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine bridge location; 1.2. Perform hydrological and hydraulic analysis; 1.3. Determine bridge opening size; 1,4. Determine position of supports; 1.5. Check back water effect and scour depth; 1.6. Perform subsurface exploration; 1.7. Perform environmental assessment; 1.8. Determine types of foundation; 1.9. Estimate loading; 1.10. Analyze loading; 1.11. Design bridge deck; 1.12. Design bridge piers and abutments; 1.13. Design bridge foundation; 1.14. Perform detailing of bridge members; 1.15. Prepare structural drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Determining bridge location; 2.2. Engineering hydrology; 2.3. Engineering hydraulics; 2.4. Performing Subsurface exploration; 2.5. Performing environmental impact assessment; 2.6. Designing bridges; 2.7. Designing and detailing timber bridge; 2.8. Designing and detailing concrete bridge; 2.9. Designing and detailing composite bridge; 2.10. Designing and detailing steel bridge;	

	2.11. Designing and detailing different types of bridge foundations; 2.12. Designing prestressed concrete bridge. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Engineering hydrology; 3.3. Engineering hydraulics; 3.4. Reinforced and prestressed concrete; 3.5. Structural timber design; 3.6. Structural steel design; 3.7. Soil mechanics; 3.8. Fluid mechanics; 3.9. Foundation Engineering; 3.10. Composite structure; 3.11. Structural analysis; 3.12. Civil engineering materials; 3.13. Concrete technology; 3.14. Strength of materials; 3.15. Engineering drawing; 3.16. Engineering geology; 3.17. Engineering Survey; 3.18. Environmental Engineering; 3.19. Bridge design software; 3.20. Computer Aided Design software. 4.0. Essential skills 4.1. Team work; 4.2. Communication; 4.3. Computer programming; 4.4. Analytical; 4.5. Creativity; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Designing of bridge structure 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURE	DUTY NO.	803
TASK TITLE	DESIGN AIRPORT	TASK NO.	8035
PERFORMANCE CRITERIA	The person performing this task must be able to design airport as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select appropriate tools and equipment for task; 2. Collect design information and data; 3. Design airport layout; 4. Determine runway orientation; 5. Determine runway length; 6. Design runway geometry; 7. Design runway pavement; 8. Design taxiway and apron geometry; 9. Design taxiway and apron pavement; 10. Design airport water supply and drainage; 11. Design terminal buildings; 12. Design hanger; 13. Design control tower; 14. Design parking; 15. Prepare working drawings; 16. Clean work place, tools and equipment; 17. Store drawings, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Collect design information and data; 1.2. Design airport layout; 1.3. Determine runway orientation; 1.4. Determine runway length; 1.5. Design runway geometry; 1.6. Design runway pavement; 1.7. Design taxiway and apron geometry; 1.8. Design taxiway and apron pavement; 1.9. Design airport water supply and drainage; 1.10. Design terminal buildings; 1.11. Design hanger; 1.12. Design control tower; 1.13. Design parking; 1.14. Prepare working drawings. 2.0. Principles The person must be able to explain the principles of: 2.1. Engineering hydrology; 2.2. Engineering hydraulics; 2.3. Performing Subsurface exploration; 2.4. Runway design; 2.5. Taxiway and Apron design. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Engineering hydrology; 3.3. Engineering hydraulics; 3.4. Reinforced and prestressed concrete; 3.5. Structural timber design;	

	3.6. Structural steel design; 3.7. Soil mechanics; 3.8. Fluid mechanics; 3.9. Foundation Engineering; 3.10. Composite structure; 3.11. Structural analysis; 3.12. Civil engineering materials; 3.13. Concrete technology; 3.14. Strength of materials; 3.15. Engineering drawing; 3.16. Engineering geology; 3.17. Engineering Survey; 3.18. Environmental Engineering; 3.19. Airport planning and design; 3.20. environmental impact assessment; 3.21. Computer Aided Design software. 4.0. Essential skills 4.1. Team work; 4.2. Communication skills; 4.3. Computer programming 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Designing of airport 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	DESIGN CIVIL ENGINEERING INFRASTRUCTURE	DUTY NO.	803
TASK TITLE	DESIGN PORT	TASK NO.	8036
PERFORMANCE CRITERIA	The person performing this task must be able to design port as per standards and guidelines approved by competent authority.		
RANGE STATEMENT	The task will be performed in the office. 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. Select right tools and equipment for the task; 2. Collect design information and data; 3. Determine design loads; 4. Design break water structure; 5. Design fender system (walls and fender); 6. Design jetty; 7. Design wharves/berth; 8. Design container terminal; 9. Design storage facilities (transit sheds, warehouse); 10. Design bollard; 11. Design pierhead; 12. Design mooring facilities; 13. Design wet dock and dry dock; 14. Design navigation facilities; 15. Clean work place, tools and equipment; 16. Store documents, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Collect design information and data; 1.2. Design break water structure; 1.3. Design fender system (walls and fender); 1.4. Design jetty; 1.5. Design wharves/berth; 1.6. Design container terminal; 1.7. Design storage facilities (transit sheds, warehouse); 1.8. Design bollard; 1.9. Design pierhead; 1.10. Design mooring facilities; 1.11. Design wet dock and dry. 2.0. Principles The person must be able to explain the principles of: 2.1. Designing ports components; 2.2. Design Reinforced and prestressed concrete; 2.3. Navigation; 2.4. Determination of design loads; 2.5. Engineering hydrology; 2.6. Engineering hydraulics; 2.7. Performing Subsurface exploration. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Engineering hydrology; 3.3. Engineering hydraulics; 3.4. Reinforced and prestressed concrete; 3.5. Structural timber design; 3.6. Structural steel design;	

	3.7. Soil mechanics; 3.8. Fluid mechanics; 3.9. Foundation Engineering; 3.10. Composite structure; 3.11. Structural analysis; 3.12. Civil engineering materials; 3.13. Concrete technology; 3.14. Strength of materials; 3.15. Engineering drawing; 3.16. Engineering geology; 3.17. Engineering Survey; 3.18. Environmental Engineering; 3.19. Environmental impact assessment; 3.20. Computer Aided Design software; 3.21. Port planning and design. 4.0. Essential skills 4.1. Team work; 4.2. Communication skills; 4.3. Computer programming; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Designing of port 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM STRUCTURAL INTEGRITY ASSESSMENT DEMOLITION OF BUILDING AND CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	804
TASK TITLE	PERFORM STRUCTURAL INTEGRITY ASSESSMENT	TASK NO.	8041
PERFORMANCE CRITERIA	The person performing this task must be able to carry out structural integrity assessment as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the field. The following tools and materials will be required in performing the task: computer, stationery, standards and codes, office furniture, rebound hammer, reinforcement detector and P.P.E.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools, equipment and safety gears for the task; 2. Observe health and safety precautions when performing the task; 3. Conduct visual inspection; 4. Determine static structural system of the structure; 5. Inspect structural system; 6. Determine method of assessment, equipment and tools; 7. Conduct Non-Destructive Tests; 8. Conduct destructive tests; 9. Record results; 10. Analyze results; 11. Prepare structural assessment report; 12. Manage HSE issues required; 13. Clean work place, tools and equipment; 14. Store documents, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Conduct visual inspection; 1.2. Inspect structural system; 1.3. Determine method of assessment, equipment and tools; 1.4. Conduct Non-Destructive Tests; 1.5. Conduct destructive tests; 1.6. Analyze results; 1.7. Prepare structural assessment report. 2.0. Principles The person must be able to explain the principles of: 2.1. Conduct Non-Destructive Tests; 2.2. Conduct destructive tests; 2.3. Perform structural integrity assessment. 3.0. Theories The person must be able to explain: 3.1. Structural mechanics; 3.2. Reinforced and prestressed concrete; 3.3. Structural timber design; 3.4. Structural steel design; 3.5. Soil mechanics; 3.6. Foundation Engineering; 3.7. Composite structure; 3.8. Structural analysis;	

	3.9. Civil engineering materials; 3.10. Concrete technology; 3.11. Strength of materials; 3.12. Engineering drawing; 3.13. Engineering Survey; 3.14. Environmental Engineering; 3.15. Environmental impact assessment; 3.16. Computer Aided Design software; 3.17. Structural analysis software. 4.0. Essential skills 4.1. Team work; 4.2. Communication skills; 4.3. Computer programming; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Structural integrity assessments 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM STRUCTURAL INTEGRITY ASSESSMENT DEMOLITION OF BUILDING AND CIVIL ENGINEERING INFRASTRUCTURES	DUTY NO.	804
TASK TITLE	DEMOLITION OF BUILDING AND CIVIL ENGINEERING INFRASTRUCTURES	TASK NO.	8042
PERFORMANCE CRITERIA	The person performing this task must be able to carry out demolition of building and civil engineering infrastructures as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed on the field. The following tools and materials will be required in performing the task: computer, stationery, standards and codes, office furniture, crane, compressor, excavator, tipper, dumper, wheel loader, spade, hammer, concrete recycle.		
EVIDENCE REQUIREMENTS			
The person performing this task must be able do the following: 1. Select right tools, equipment and safety gears for the task; 2. Observe health and safety precautions when performing the task; 3. Assess the structure to be demolished; 4. Prepare demolition methodology; 5. Identify hazards; 6. Plan for HSE compliance; 7. Secure the work area; 8. Remove hazardous materials; 9. Disconnect all services; 10. Manage HSE; 11. Supervise demolition of building and civil engineering infrastructures; 12. Clean work place, tools and equipment; 13. Store tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Assess the structure of be demolished; 1.2. Prepare demolition methodology; 1.3. Identify hazards; 1.4. Plan for HSE; 1.5. Secure the work area; 1.6. Remove hazardous materials; 1.7. Disconnect all services; 1.8. Manage HSE; 1.9. Supervise demolition of building and civil engineering infrastructures. 2.0. Principles The person must be able to explain the principles of: 2.1. Demolition of structure; 2.2. Assessing the structure to be demolished; 2.3. Structural assessment; 2.4. Material handling and recycling; 2.5. Managing health and safety environment. 3.0. Theories The person must be able to explain: 3.1. Demolition methods; 3.2. Structural mechanics; 3.3. Reinforced and prestressed concrete; 3.4. Structural timber design;	

	3.5. Structural steel design; 3.6. Soil mechanics; 3.7. Foundation Engineering; 3.8. Composite structure; 3.9. Structural analysis; 3.10. Civil engineering materials; 3.11. Concrete technology; 3.12. Strength of materials; 3.13. Engineering drawing; 3.14. Engineering Survey; 3.15. Environmental Engineering; 3.16. Environmental impact assessment. 4.0. Essential skills 4.1. Team work; 4.2. Communication skills; 4.3. Computer programming; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Demolition of buildings and civil engineering structures 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 ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT FEASIBILITY STUDY OF CIVIL ENGINEERING PROJECTS	DUTY NO.	805
TASK TITLE	COLLECT DATA FOR FEASIBILITY STUDY	TASK NO.	8051
PERFORMANCE CRITERIA	The person performing this task must be able to collect data for feasibility study of building and civil engineering infrastructures as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office and on the field. The following tools, equipment and materials will be required in performing the task: computer, stationery, standards and codes, office furniture, survey equipment, ground investigation equipment, laboratory test equipment, traffic weigh bridges, transport and P.P.E.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools and equipment for the task; 2. Review available information; 3. Determine the scope of study; 4. Prepare data collection methodology; 5. Identify resources requirement; 6. Collect relevant data and information from field (e.g. geotechnical data, traffic data, survey data, environmental and social data etc.); 7. Collect data from other sources e.g. economic data; 8. Process information and data from the different data collection tools; 9. Prepare report for data collection; 10. Clean work place, tools and equipment; 11. Store tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine the scope of study; 1.2. Prepare data collection methodology; 1.3. Identify resources requirement; 1.4. Collect data; 1.5. Process collected data; 1.6. Prepare report for data collection. 2.0. Principles The person must be able to explain the principles of: 2.1. Data collection; 2.2. Data processing; 2.3. Material testing. 3.0. Theories The person must be able to explain: 3.1. Soil mechanics; 3.2. Foundation Engineering; 3.3. Civil engineering materials; 3.4. Engineering Survey; 3.5. Environmental and social impact assessment; 3.6. Computer Aided Design software. 4.0. Essential skills 4.1. Team work;	

	4.2. Communication skills; 4.3. Computer programming; 4.4. Analytical skills; 4.5. Creativity skills; 4.6. Mathematics skills calculus, statics, matrixes; 4.7. Work ethic; 4.8. Time management; 4.9. Respect; 4.10. Adaptability.
DESCRIPTION OF END PRODUCTS/SERVICE	Data collection for feasibility study is performed as per standards and guidelines approved by a competent authority, write a feasibility study report.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health.

OCCUPATION	CIVIL ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT FEASIBILITY STUDY OF CIVIL ENGINEERING PROJECTS	DUTY NO.	805
TASK TITLE	CONDUCT PROJECT APPRAISAL	TASK NO.	8052
PERFORMANCE CRITERIA	The person performing this task must be able to carry out project appraisal for building and civil engineering projects as per standards and guidelines approved by a competent authority.		
RANGE STATEMENT	The task will be performed in the office. The following tools and materials will be required in performing the task: computer, stationery, standards and codes, office furniture.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Select right tools and equipment for the task; 2. Collected data; 3. Determine different alternative to meet project objectives; 4. Prepare preliminary design for different alternative; 5. Estimate cost of the project for each alternative; 6. Perform Cost Benefit Analysis for each alternative; 7. Consider Environmental and Social issue; 8. Determine project viability/select most feasible solution; 9. Prepare project appraisal/feasibility study report; 10. Clean work place, tools and equipment; 11. Store drawings, documents, tools and equipment appropriately.		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Determine different alternative to meet project objectives; 1.2. Prepare preliminary design; 1.3. Estimate cost of the project; 1.4. Perform Cost Benefit Analysis; 1.5. Consider Environmental and Social issue; 1.6. Determine project viability; 1.7. Select most feasible solution; 1.8. Prepare project appraisal/feasibility report. 2.0. Principles The person must be able to explain the principles of: 2.1. Estimating cost of project; 2.2. Cost Benefit Analysis; 2.3. Feasibility study. 3.0. Theories The person must be able to explain: 3.1. Engineering economy; 3.2. Engineering drawing; 3.3. Environmental and Social impact assessment. 4.0. Essential skills 4.1. Team work; 4.2. Communication skills; 4.3. Computer programming; 4.4. Computer application; 4.5. Analytical skills;	

	4.6. Creativity skills; 4.7. Mathematics skills calculus, statics, matrixes; 4.8. Work ethic; 4.9. Time management; 4.10. Respect; 4.11. Adaptability; 4.12. Report writing.
DESCRIPTION OF END PRODUCTS/SERVICE	Project appraisal for building and civil engineering projects 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.

TABLE 1: DACUM CHART FOR CIVIL ENGINEERS NTA LEVEL 8

	DUTIES	TASKS	ENABLERS
01	Manage maintenance works for civil engineering infrastructure.	1.1 Manage maintenance works for roads. 1.2 Manage maintenance works for building. 1.3 Manage maintenance works for railways.	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 • 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
02	Manage construction projects of civil engineering infrastructures.	2.1 Manage contracts. 2.2 Manage construction resources. 2.3 Supervise execution of works. 2.4 Perform procurement of civil engineering works and services.	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors, responsible to work • Skills and knowledge on Taking measurements & measuring units. • Leadership skills • Quantity surveying of buildings and civil works • Construction of buildings and civil works • Construction management • Construction Contract Law Tools and Equipment • computer, stationery, standards and office furniture

	DUTIES	TASKS	ENABLERS
			Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect
03	Design civil engineering infrastructures.	3.1 Design timber structures. 3.2 Design steel structures. 3.3 Design steel-concrete composite structures. 3.4 Design of bridge structures. 3.5 Design airport. 3.6 Design port.	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors, responsible to work • Leadership skills self-motivated, strategic thinking and innovates • Skills and knowledge on Taking measurements & measuring units. • Interpretation of architectural drawing • Civil Engineering Material • Reinforced concrete design Tools and Equipment • computer, stationery, standards and design codes, office furniture Materials Concrete, steel, timber, etc. Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect
04	Perform structural integrity assessment demolition of building and civil engineering infrastructures.	4.1 Perform structural integrity assessment of building and civil engineering infrastructures. 4.2 Demolition of building and civil engineering	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors, responsible to work • Leadership skills self-motivated, strategic thinking and innovates • Skills and knowledge on Taking measurements &

	DUTIES	TASKS	ENABLERS
		infrastructures.	measuring units. • Interpretation of architectural drawing • Civil Engineering Material • Reinforced concrete design • Engineering drawing • Engineering Survey • Environmental Engineering • Environmental impact assessment Tools and Equipment • PPE such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats. • computer, stationery, standards and design codes, office furniture, rebound hammer, reinforcement detector. Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect.
05	Carry out feasibility study of civil engineering projects.	5.1 Collect data for feasibility study. 5.2 Conduct project appraisal.	Generic skills and knowledge • Using communication skills to work with others, reporting to superiors, responsible to work • Leadership skills self-motivated, strategic thinking and innovates • Skills and knowledge on Taking measurements & measuring units. • Interpretation of architectural drawing • Civil Engineering Material • Reinforced concrete design Tools and Equipment • PPE such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats.

	DUTIES	TASKS	ENABLERS
			• computer, stationery, standards and design codes, office furniture, rebound hammer, reinforcement detector Worker behaviours Team spirit, trustworthy, time management, commitment, Work ethic, Adaptability and Respect