NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ARCHITECTURAL ENGINEER

LEVEL: NTA 8

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ABBREVIATIONS

BIM	Building Information Modelling
CAD	Computer-Aided Design
CPM	Critical Path Method
CBET	Competency Based Education and Training
ISO 9001	Quality Management System Standard
NACTVET	National Council for Technical and Vocational Education and Training
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 programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training of Tanzania 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 Occupational 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 architectural engineer prepares construction organization designs and verifies construction techniques, 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 Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the Occupational Standards. Occupational Standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant Occupational Standards.

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

Architectural 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 experts 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, supervisors on the job, and experienced architectural engineers were key informants in the survey to discover occupational trends. The 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 also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR ARCHITECTURAL ENGINEERS

These standards cover a broad range of duties and tasks that can be performed by an Architectural Engineer. However, the occupational standards are not meant to replace individual job descriptions.

Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. Architectural Engineers may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Architectural Engineer shall conduct construction organization and planning, construction technology management, construction quality control, construction progress control, construction cost control, safety and environmental management, data information management, and project resource management on the construction site.

Generally, the Architectural Engineer performs the following responsibilities:

a) Analysis of architectural design schemes

b) Assistance in engineering surveying

c) Preparation of construction drawings and construction schemes

d) Supervision of construction quality and schedule on the construction site

e) Coordination of various types of work during the construction process

f) Inspection of the quality and qualification certificates of construction materials

g) Resolution of technical problems and difficulties at the construction site

h) Detection and assessment of safety risks on the construction site

i) Ensuring that the construction site complies with relevant laws, regulations, and safety standards

j) Quality acceptance and rectification on the construction site

k) Assistance in preparing work safety management plans for the construction project

l) Cost control and budget management on the construction site

m) Detection and monitoring of environmental factors on the construction site

n) Coordination of the communication and collaboration with stakeholders such as the owner and the supervisor

o) Participation in technical disclosure and training for the construction project

p) Preparation of completion files and acceptance reports for the construction project

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 7 and 8.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR ARCHITECTURAL ENGINEER - NTA 8

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION ORGANIZATION AND PLANNING	**DUTY NO.**	801
TASK TITLE	PREPARATION OF CONSTRUCTION ORGANIZATION DESIGN	**TASK NO.**	8011
PERFORMANCE CRITERIA	The person performing this task must be able to assist the project manager and technical leader in formulating and adjusting the construction schedule, and prepare operational schedules.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Engineering design documents: architectural structural design drawings, architectural layout drawings, bill of quantities, etc.; 2. Construction equipment and tools: appropriate construction equipment and tools selected according to the requirements of construction organization design, such as lifting machinery, construction machines and tools, and safety equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the construction drawings and technical documents; 2. Determine the construction schemes; 3. Determine the construction schedule; 4. Coordinate resources and manpower; 5. Prepare the construction organization documents.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Study construction drawings, design documents, and technical requirements to understand engineering requirements and constraints; 1.2 Develop a detailed construction scheme in view of engineering requirements and construction drawings, including process arrangements, construction processes, and resource requirements; 1.3 Develop a reasonable construction schedule, arrange the sequence of construction processes and activities, and ensure that the construction is completed on time; 1.4 Coordinate and allocate the resources and manpower required for construction, including materials, equipment, and workers, to ensure the progress of construction; 1.5 Prepare construction organization documents, including construction schemes, schedules, and resource plans, to guide actual construction operations. **2.0 Principles**

	The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Principle of safe and environment-friendly construction. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The principles and methods of engineering construction management; 3.2 Construction process theories; 3.3 Construction processes; 3.4 Construction methods and technologies; 3.5 Principles and specifications for construction organization; 3.6 Resource management for construction. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	A comprehensive construction organization design is completed in accordance with relevant laws and regulations
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety and quality control; 2. Relevant laws and regulations.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION ORGANIZATION AND PLANNING	**DUTY NO.**	801
TASK TITLE	PREPARATION OF DEDICATED CONSTRUCTION SCHEMES	**TASK NO.**	8012
PERFORMANCE CRITERIA	The person performing this task must be able to assist the project manager and technical heads in preparing dedicated construction schemes, and organize and coordinate work on the construction site.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers The tools and equipment to be used include: 1. Construction scheme formwork: the standard formwork for preparing a dedicated construction scheme, including project background, construction objectives, construction steps, and safety measures; 2. Engineering data: relevant design documents, bill of quantities, construction drawings, etc. used as references and basis for preparing a construction scheme; 3. Professional software and computing tools: a dedicated construction scheme shall be formulated and optimized by using computer-aided design (CAD) software, project management software and other tools.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the requirements of engineering projects; 2. Develop the construction scheme; 3. Prepare the construction plan; 4. Determine the construction method; 5. Assign tasks.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carefully study the requirements and objectives of engineering projects, including construction scope, schedule requirements, and resource constraints; 1.2 Develop a detailed construction scheme in accordance with project requirements, including construction processes, process arrangements, and resource allocation; 1.3 Develop a comprehensive construction plan to clarify the schedule and key nodes; 1.4 Select appropriate construction methods and processes in view of the characteristics and requirements of the project to ensure construction efficiency and quality; 1.5 Turn the construction scheme into specific tasks and assign them reasonably to relevant personnel and contractors. **2.0 Principles** The person performing this task must be able to explain the following principles:

	2.1 Principles of compliance with laws and regulations; 2.2 Quality control principles; 2.3 Principles of safety management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Construction project management theories; 3.2 Construction technology theories; 3.3 Resource management theories; 3.4 Risk management theories; 3.5 Construction process theories. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to detail.
DESCRIPTION OF THE END PRODUCT / SERVICE	A comprehensive and detailed construction plan is developed in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Project scheduling; 2. Architectural laws and regulations; 3. Environmental sustainability; 4. Safety management; 5. Cost estimation.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION ORGANIZATION AND PLANNING	**DUTY NO.**	801
TASK TITLE	DEVELOPMENT OF MANAGEMENT SYSTEMS	**TASK NO.**	8013
PERFORMANCE CRITERIA	The person performing this task must be able to participate in the development of practical and feasible management systems.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Management system formwork: the standard formwork for preparing construction organization planning and management systems, including organizational structure, division of duties, workflow, and other content; 2. Project materials: contract documents, design documents, construction drawings, etc. used as the references and basis for formulating management systems; 3. Communication equipment and office tools: mobile phones, walkie talkies, computers, printers, etc. used for communication and document processing with project teams and supervisory personnel		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse demands; 2. Formulate management strategies; 3. Develop management documents; 4. Coordinate the implementation; 5. Carry out regular reviews and improvement.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carefully evaluate the management needs and requirements of the project; 1.2 Create comprehensive management strategies and systems, including workflow, duty allocation, and information management; 1.3 Draft various management documents, such as management manuals, rules and regulations, and work guidelines; 1.4 Collaborate with various departments and stakeholders to ensure the smooth implementation and execution of management systems; 1.5 Regularly review the effectiveness of management systems and make necessary improvement and updates. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Principle of safe and environment-friendly

	construction. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The principles and methods of engineering construction management; 3.2 Organizational behaviours; 3.3 Quality control; 3.4 Transformation management; **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to details; 4.6 Leadership skills; 4.7 Decision-making skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Comprehensive and effective management systems and strategies are developed in accordance with relevant laws and regulations to ensure the smooth operation and success of the construction project.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Project management; 2. Architectural technologies; 3. Architectural regulations and rules; 4. Environmental sustainability; 5. Contract management.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGEMENT OF CONSTRUCTION TECHNOLOGY	**DUTY NO.**	802
TASK TITLE	VERIFICATION OF CONSTRUCTION TECHNOLOGY	**TASK NO.**	8021
PERFORMANCE CRITERIA	The person performing this task must be able to develop a reasonable construction technology scheme in view of the actual situation of the project to ensure technical safety and quality during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Construction drawings: building structure drawings, electrical layout drawings, etc. used as the basis and references for the verification of construction technologies; 2. Measuring tools: measuring instruments, level gauges, distance measuring tools, etc. used to detect and verify the accuracy of construction technologies; 3. Technical documents and materials: design documents, construction plans, bill of quantities, etc. used as the references for verifying construction technologies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Review construction plans and specifications to ensure technical accuracy and compliance; 2. Carry out on-site inspections to evaluate construction progress and quality; 3. Collaborate with engineers and architects to solve technical problems and provide technical guidance; 4. Evaluate construction methods and propose improvement or alternative solutions to improve efficiency and quality; 5. Record and communicate approved construction technologies to relevant stakeholders.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Ensure technical accuracy and compliance; 1.2 Evaluate construction progress and quality; 1.3 Solve technical problems and provide technical guidance; 1.4 Put forward improvement or alternative solutions to improve efficiency and quality; 1.5 Determine the details of the approved construction technologies. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Principle of safe and environment-friendly construction. 2.3 Building quality standards. **3.0 Theories** The person performing this task must be able to explain

	the following: 3.1 Theories of structural engineering and building materials; 3.2 Knowledge about construction project management principles and technologies; 3.3 Sustainability and environmental factors; 3.4 Construction process theories. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	A verified construction technology scheme is developed in accordance with relevant laws and regulations to ensure compliance, safety, and quality.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Construction cost estimation and budget preparation; 2. Construction equipment and machinery; 3. Construction contract management; 4. Construction risk assessment and management; 5. Legal and contractual obligations related to construction.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGEMENT OF CONSTRUCTION TECHNOLOGY	**DUTY NO.**	802
TASK TITLE	SUPERVISION AND IMPLEMENTATION OF TECHNICAL DISCLOSURE	**TASK NO.**	8022
PERFORMANCE CRITERIA	The person performing this task must be able to Prepare technical disclosure documents and implement technical disclosure.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Construction specifications and operation manuals: relevant specifications and manuals used to reference and guide construction personnel in technical disclosure; 2. Demonstration patterns and samples: they serve as references and demonstrations for technical disclosure to demonstrate correct construction methods and technical requirements; 3. Videos and photographic equipment: they are used to record the process and results of technical disclosure for subsequent supervision and evaluation; 4. Communication tools and conference equipment: interpretation boards, projectors, audio equipment, etc. used for technical disclosures and discussions.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Organize technical disclosure meetings; 2. Supervise the construction personnel in technical disclosure; 3. Provide technical guidance and answer questions from the construction personnel; 4. Inspect the construction site; 5. Collaborate with designers and engineers.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Clarify the technical requirements and operating methods during the construction process; 1.2 Ensure that every construction personnel understand and comply with technical requirements; 1.3 Ensure that they carry out construction tasks in the correct manner; 1.4 Verify the implementation of technical requirements and record relevant issues and improvement measures; 1.5 Solve technical issues and doubts that arise during the construction. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations;

	2.2 Basic principles for quality control of construction; 2.3 Construction quality acceptance standards. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic principles and process of construction; 3.2 Performance and application of building materials; 3.3 Quality control methods and standards in construction; 3.4 Measurement and detection techniques in construction engineering. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Technical disclosure is supervised and implemented according to relevant laws and regulations to ensure that the construction personnel understand and comply with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety management and environmental protection requirements for construction; 2. Safety protection and emergency rescue measures on the construction site; 3. Knowledge about relevant quality management systems, such as ISO 9001; 4. Construction project management and schedule control; 5. Application of relevant building equipment and technologies.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGEMENT OF CONSTRUCTION TECHNOLOGY	**DUTY NO.**	802
TASK TITLE	ORGANIZATION OF TECHNICAL REVIEW	**TASK NO.**	8023
PERFORMANCE CRITERIA	The person performing this task must be able to carry out comprehensive technical reviews and re-examinations of construction organization techniques during the engineering construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Technical documents and drawings: relevant design documents, construction drawings, etc. used for technical review; 2. Measuring tools: measuring instruments, testing equipment, etc. used for accurate measurement and evaluation of construction results; 3. Computer software and tools: computer-aided design (CAD) software, construction management software and other tools used for digital review and analysis of technology; 4. Inspection and recording equipment: inspection forms, checklists, cameras, etc. used to record the process and results of technical review.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Conduct technical reviews; 2. Review construction drawings, specifications, and technical documents; 3. Record discrepancies, errors, or conflicts; 4. Put forward appropriate solutions; 5. Provide feedback and suggestions.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Coordinate and arrange with relevant stakeholders and conduct technical reviews; 1.2 Ensure accuracy and compliance with the project requirements; 1.3 Identify and record items in technical documents; 1.4 Collaborate with design and engineering teams to solve technical problems; 1.5 Provide feedback and suggestions on the technical aspects of the construction project. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles for building safety management; 2.3 Principles and practices for quality control of construction projects. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Principles, techniques, and methodology of construction; 3.2 Properties, applications, and related knowledge about building materials; 3.3 Methods and standards for building construction quality control; 3.4 Measurement and testing techniques in construction. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Technical reviews are organized and conducted in accordance with relevant laws and regulations to ensure compliance with the project requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Principles and practice of construction project management; 2. Health and safety regulations and practices in construction; 3. Relevant quality management systems, such as ISO 9001; 4. Construction equipment and technologies; 5. Environmental sustainability practices in construction.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION QUALITY CONTROL	**DUTY NO.**	803
TASK TITLE	PREPARATION OF CONSTRUCTION PROJECT QUALITY PLAN AND MANAGEMENT SYSTEM	**TASK NO.**	8031
PERFORMANCE CRITERIA	The person performing this task must be able to carry out comprehensive technical reviews and re-examinations of construction organization techniques during the engineering construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Quality control software and tools: quality control system software and quality management manuals for standardized construction quality management; 2. Inspection and test equipment: testing instruments and test equipment used for inspecting and testing construction materials and components; 3. Quality documents and recording equipment: quality record forms, cameras, etc. used to record quality inspection results and issues during the construction process.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse project requirements and relevant standards; 2. Determine measures and methods for quality control; 3. Develop quality control systems; 4. Supervise quality control activities during the construction process; 5. Collect and analyse quality data.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Develop applicable construction project quality plans; 1.2 Detect, test, and evaluate; 1.3 Clarify the process and responsibilities for quality control; 1.4 Ensure the compliance with plans and standards; 1.5 Prepare reports and propose improvement measures. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles for building safety management; 2.3 Basic principles for quality control in construction projects. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Theoretical models and methods of building quality management; 3.2 Quality requirements for building materials, processes, and construction processes; 3.3 Quality control techniques and tools in construction; 3.4 Theoretical knowledge about quality inspection and evaluation. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Systems that comply with the construction project quality plan and management are developed according to relevant laws and regulations to ensure that quality control meets relevant requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge about engineering design principles and architectural structure; 2. Knowledge about engineering surveying and mapping for construction projects; 3. Engineering materials and testing methods; 4. Environmental protection and sustainability practices in construction; 5. Quality management systems and certification standards.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION QUALITY CONTROL	**DUTY NO.**	803
TASK TITLE	ENGINEERING QUALITY ACCEPTANCE	**TASK NO.**	8032
PERFORMANCE CRITERIA	The person performing this task must be able to carry out acceptance in accordance with standards and specifications, rectify defective projects, and timely record the acceptance process and results.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Measurement and test equipment: measuring instruments, testing instruments, etc. used for actual measurement and inspection of construction quality; 2. Quality acceptance record forms: quality acceptance records, inspection forms, etc. used to record the process and results of engineering quality acceptance; 3. Reference samples and specimens: samples and specimens of qualified engineering quality displayed for comparison and reference and used for acceptance judgment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Review the specifications and requirements of the project; 2. Inspection and testing 3. Find out deviations during the inspection; 4. Solve quality-related issues; 5. Prepare quality acceptance reports and documents.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Understand the scope of quality acceptance work; 1.2 Verify the compliance with quality standards and regulatory requirements; 1.3 Keep records; 1.4 Collaborate with the project stakeholders and ensure corrective measures are taken; 1.5 Conduct final reviews and approval. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles for quality control in construction projects. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Quality control methods and techniques for

	construction projects; 3.2 Statistical quality control principles and their application in engineering projects; 3.3 Quality management systems and their implementation; 3.4 Quality assurance and quality control processes; 3.5 Building materials and their properties; 3.6 Building technologies and construction processes; 3.7 Quality control procedures in related fields such as civil engineering or architecture. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Engineering quality acceptance is implemented according to relevant laws and regulations to ensure the compliance with relevant specifications and standards.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Environmental regulations and practices; 2. Health and safety regulations for construction projects.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION QUALITY CONTROL	**DUTY NO.**	803
TASK TITLE	INVESTIGATION, ANALYSIS, AND HANDLING OF QUALITY INCIDENTS	**TASK NO.**	8033
PERFORMANCE CRITERIA	The person performing this task must be able to investigate, analyse, and handle quality incidents.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Quality accident investigation record forms: they are used to record the detailed information of quality incidents, including time, location, accident description, and other information; 2. Quality accident analysis tools: fishbone diagram (causal analysis diagram), fault tree analysis, etc. used to analyse the causes and effects of incidents; 3. On-site investigation tools: measuring instruments, cameras, etc. used for on-site investigation and collection of relevant evidence; 4. Fault handling guidelines and manuals: they provide methods and steps for handling different types of quality incidents for reference and operation by the quality control personnel.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Investigate and collect information on incidents; 2. Analyse the root cause of the accident; 3. Evaluate the accident; 4. Develop appropriate preventive measures; 5. Implement necessary measures.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct comprehensive investigations and collect the information about quality incidents; 1.2 Analyse the root cause and influencing factors of the accident; 1.3 Assess the impact and severity of the accident on the project; 1.4 Develop appropriate corrective and preventive measures to handle the accident; 1.5 Implement necessary measures to resolve the accident and prevent its recurrence. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles for quality control in construction projects.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Methods and techniques for accident investigation; 3.2 Quality management systems and their application in accident handling; 3.3 Risk assessment and management principles; 3.4 Laws and regulations related to accident handling. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	An effective report is prepared for investigating, analysing, and resolving the quality accident in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Understanding of building materials and their characteristics; 2. Construction process and technology; 3. Relevant laws and regulations in the construction industry; 4. Knowledge related to quality control, such as civil engineering or architecture; 5. Health and safety regulations for construction projects.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION SCHEDULE CONTROL	**DUTY NO.**	804
TASK TITLE	PREPARATION OF CONSTRUCTION SCHEDULE	**TASK NO.**	8041
PERFORMANCE CRITERIA	The person performing this task must be able to control the construction schedule, arrange reasonable construction sequence and human resources, and ensure the construction quality in the construction period.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Plan preparation software: professional project management software used to prepare and manage the construction schedule, such as Microsoft Project; 2. Project schedule table: project schedules tables created and maintained to record key nodes, workload, and time requirements for progress tracking and adjustment; 3. Communication devices: mobile phones, walkie talkies, computers, etc. used for timely communication and coordination with project teams, supervisors, and stakeholders; 4. Construction site observation tools: cameras, measuring instruments, etc. used to record actual construction schedule and compare and analyse it with the plan.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Look into project specifications, drawings, and related documents; 2. Determine the sequence and duration of activities; 3. Develop detailed construction schedules; 4. Coordinate with the project stakeholders; 5. Regularly monitor and update the schedule.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Confirm the scope of work and project requirements; 1.2 Determine the sequence and duration of activities in view of construction methods and resource availability; 1.3 Develop detailed construction schedules, including task dependency relationship, milestone and critical path method analysis; 1.4 Collect opinions and incorporate them into the schedule; 1.5 Regularly monitor and update the schedule to reflect actual progress and make necessary adjustments. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations;

	2.2 Project management principle; 2.3 Principles for quality management of engineering construction project; 2.4 Principles of safety management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods and techniques for accident investigation; 3.2 Quality management systems and their application in accident handling; 3.3 Risk assessment and management principles; 3.4 Laws and regulations related to accident handling. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	An effective report is prepared for investigating, analysing, and resolving the quality accident in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Understanding of building materials and their characteristics; 2. Construction process and technologies; 3. Relevant laws and regulations in the construction industry; 4. Knowledge related to quality control, such as civil engineering or architecture; 5. Health and safety regulations for construction projects.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION SCHEDULE CONTROL	**DUTY NO.**	804
TASK TITLE	PREPARATION OF CONSTRUCTION SCHEDULE	**TASK NO.**	8041
PERFORMANCE CRITERIA	The person performing this task must be able to control the construction schedule, arrange reasonable construction sequence and human resources, and ensure the construction quality in the construction period.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Plan preparation software: professional project management software used to prepare and manage the construction schedule, such as Microsoft Project,; 2. Project schedule table: project schedules tables created and maintained to record key nodes, workload, and time requirements for progress tracking and adjustment; 3. Communication devices: mobile phones, walkie talkies, computers, etc. used for timely communication and coordination with project teams, supervisors, and stakeholders; 4. Construction site observation tools: cameras, measuring instruments, etc. used to record actual construction schedule and compare and analyse it with the plan.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Investigate and collect information on incidents; 2. Analyse the root cause of the accident; 3. Evaluate the accident; 4. Develop appropriate preventive measures; 5. Implement necessary measures.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct comprehensive investigations and collect the information about quality incidents; 1.2 Analyse the root cause and influencing factors of the accident; 1.3 Assess the impact and severity of the accident on the project; 1.4 Develop appropriate corrective and preventive measures to handle the accident; 1.5 Implement necessary measures to resolve the accident and prevent its recurrence. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles for quality control in construction

	projects. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Key Path Method (CPM) and project evaluation; 3.2 Principle of resource allocation and balance; 3.3 Risk management principles and their application in project schedule planning; 3.4 Use of schedule software and computer-aided design (CAD) tools. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details; 4.6 Predictive skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	A comprehensive construction schedule that meets project objectives and requirements is developed in accordance with relevant laws and regulations
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Construction methods and technologies; 2. Construction industries and their interdependence; 3. Relevant regulations and standards on construction project management; 4. Cost estimation and budgeting principles in project scheduling; 5. Health and safety regulations for construction projects.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION SCHEDULE CONTROL	**DUTY NO.**	804
TASK TITLE	SUPERVISION OF CONSTRUCTION SITE ORGANIZATION AND COORDINATION	**TASK NO.**	8042
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the organization and coordination of the construction site in view of the specific project characteristics and field conditions.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Project schedule table: it is used to track and record construction progress, ensuring that construction is carried out according to plan; 2. Communication tools: mobile phones, walkie talkies, computers, etc. used for communication and coordination with project teams, contractors, and stakeholders 3. Construction site observation tools: cameras, measuring instruments, etc. used to monitor and record the actual situation of the construction site; 4. Construction documents and recording equipment: construction record sheets, meeting minutes, etc. used to record construction progress, issues, and decisions.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Monitor the progress of construction activities; 2. Coordinate and ensure smooth workflow and timely completion of tasks; 3. Solve problems during the construction process; 4. Ensure the compliance with safety regulations and quality standards; 5. Record deviations or delays.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Monitor the progress of construction activities and ensure that they are carried out as planned; 1.2 Coordinate with different teams and subcontractors to ensure smooth workflow and timely completion of tasks; 1.3 Address conflicts or issues that arise during the construction process; 1.4 Conduct regular inspections to ensure compliance with safety regulations and quality standards; 1.5 Record and report deviations or delays in the construction progress. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations;

	2.2 Basic principles for building safety management; 2.3 Basic principles for quality control in construction projects. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Techniques and methods for controlling construction schedule; 3.2 Critical path method (CPM) and other scheduling tools; 3.3 Resource allocation and optimization principles; 3.4 Risk management principles and their application in construction schedule control. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	The work on the construction site is effectively supervised and coordinated according to relevant laws and regulations to ensure that it is carried out according to the schedule and project requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Construction methods, technologies, and materials; 2. Health and safety regulations on the construction site; 3. Environmental considerations in construction projects; 4. Construction cost estimation and budgeting principles; 5. Quality control processes and standards in construction.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION SCHEDULE CONTROL	**DUTY NO.**	804
TASK TITLE	SUPERVISION OF DYNAMIC MANAGEMENT OF CONSTRUCTION PLANE LAYOUT	**TASK NO.**	8043
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the plane layout on the construction site and dynamically manage it in view of factors such as construction schedule, process requirements, and safety requirements.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Plane layout drawings: they are used to understand the construction layout and the location of each construction area; 2. Construction schedule table: it is used to record construction tasks and time requirements for dynamic management and adjustment; 3. On-site signs and symbols: construction area signs and symbols used to guide workers and visitors to understand the requirements and arrangements for construction plane layout; 4. Real time monitoring equipment: cameras, monitoring instruments, etc. used to monitor the actual situation of the construction site and compare and adjust them with the plan.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse and evaluate the needs and requirements; 2. Develop plans; 3. Supervise the plane layout work on the construction site; 4. Coordinate the work among different types of work and subcontractors; 5. Address construction issues and conflicts.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse and evaluate the needs and requirements for construction plane layout; 1.2 Develop dynamic management plans for construction plane layout; 1.3 Supervise the plane layout work on the construction site to ensure that it is carried out according to the plan; 1.4 Coordinate the work among different types of work and subcontractors to ensure the coordination and smooth progress of the plane layout; 1.5 Address issues and conflicts in construction plane layout. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic principles of construction plane layout;

	2.2 Basic principles for building safety management; 2.3 Principles of environmental protection; 2.4 Basic principles of engineering project management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Design principles and methods of construction plane layout; 3.2 Software tools and technologies for construction plane layout; 3.3 The correlations and impacts between construction plane layout and other construction processes; 3.4 Optimization principles and methods for construction plane layout. **4.0 Essential Skills** 4.1 Ability to analyse and interpret drawings; 4.2 Planning and organizational skills; 4.3 Cooperation competence; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	The construction plane layout is effectively supervised and managed according to relevant laws and regulations to ensure the compliance with relevant requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Principles of architectural design and characteristics of building materials; 2. Construction process and construction technologies; 3. Correlation between construction plane layout and construction safety management; 4. Regulations and specifications on construction.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION COST CONTROL	**DUTY NO.**	805
TASK TITLE	PREPARATION OF CONSTRUCTION COST PLAN	**TASK NO.**	8051
PERFORMANCE CRITERIA	The person performing this task must be able to assist in preparing construction cost plans.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Cost management software: professional cost management software used for preparing and managing construction cost plans, such as Microsoft Excel; 2. Bill of quantities; bills of quantities for production and maintenance provides a detailed list of materials, labour, and equipment required for construction, in order to facilitate cost control and estimation; 3. Procurement and contract documents: supplier quotations, procurement contracts, etc. used to record and manage the procurement costs of materials and equipment; 4. Real-time cost tracking tools: cost tracking tables, reports, etc. used to record the differences between actual costs and budgeted costs and conduct cost analysis and adjustments.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the needs and requirements of construction projects; 2. Collect and organize data related to construction costs; 3. Develop construction cost plans; 4. Monitor and control costs during the construction process; 5. Analyse cost deviations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse the needs and requirements of construction projects, including design documents, and technical requirements; 1.2 Collect and organize data related to construction costs, such as material prices, labour costs, and equipment leasing; 1.3 Develop construction cost plans, and determine cost targets and budgets for each stage of the project; 1.4 Monitor and control the costs during the construction process to ensure they are within the budget range; 1.5 Analyse cost deviations and put forward improvement measures for cost control. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Basic principles of cost control.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Theoretical knowledge about cost estimation and budgeting; 3.2 Software tools and technologies for cost management; 3.3 Key elements of cost structure and cost control in construction projects; 3.4 Cost control techniques and strategies. **4.0 Essential Skills** 4.1 Data analysis and processing; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	An effective construction cost plan is developed according to relevant laws and regulations to ensure that the project is carried out within the cost budget.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Price and market changes of building materials and equipment; 2. Construction technology and process; 3. Financial management and accounting knowledge to support cost accounting and control; 4. Basic principles of construction project management; 5. Basic concepts of architectural economics and investment evaluation.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION COST CONTROL	**DUTY NO.**	805
TASK TITLE	ACCOUNTING OF ENGINEERING QUANTITY AND CONSTRUCTION COST	**TASK NO.**	8052
PERFORMANCE CRITERIA	The person performing this task must be able to develop bills of quantities, list all materials, equipment, and labour required, and estimate the required quantities.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Measuring tools: measuring instruments, measuring tapes, etc. used for measuring engineering quantities and dimensions; 2. Cost accounting software: professional cost accounting software used for calculating and accounting construction quantities and costs, such as Microsoft Excel, and professional accounting software; 3. Bill of quantities: it is used for cost accounting and budget control, as well as recording the quantities and unit prices of each construction project; 4. Project management software: software used to track and manage construction progress and cost, as well as accounting and analysis of quantities and costs, such as Microsoft Project.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Calculate the engineering quantities; 2. Query and collect price information related to construction; 3. Calculate the estimated cost of the construction project; 4. Monitor the actual engineering quantities and costs during the construction process; 5. Analyse the deviations between engineering quantities and costs.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Calculate various engineering quantities, including materials, labour, and equipment, in view of the design drawings and bills of quantities; 1.2 Query and collect price information related to construction, such as material prices, salary standards, and equipment rental fees; 1.3 Calculate the estimated cost of the construction project in view of the quantity and price information; 1.4 Monitor the actual engineering quantities and costs during the construction process, and conduct accounting and comparison; 1.5 Analyse deviations between quantities and costs and put forward improvement measures for cost control. **2.0 Principles** The person performing this task must be able to explain the following principles:

	2.1 Principles of compliance with laws and regulations; 2.2 Financial management principles; 2.3 Cost accounting management principles; 2.4 Basic principles of construction project management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Theoretical knowledge about engineering quantities measuring and accounting; 3.2 Relevant theories of cost calculation and cost control; 3.3 Cost accounting techniques and strategies. **4.0 Essential Skills** 4.1 Data analysis and comparison; 4.2 Planning and organizational skills; 4.3 Query and analysis of cost figures; 4.4 Computing skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Accurate engineering quantities and construction costs are calculated in accordance with relevant laws and regulations to provide a basis for project decision-making and cost control.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Characteristics and purposes of materials and equipment; 2. Construction technology and process; 3. Financial management and accounting knowledge to support cost accounting and control; 4. Basic concepts of architectural economics and investment evaluation.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONSTRUCTION COST CONTROL	**DUTY NO.**	805
TASK TITLE	ANALYSIS AND CORRECTION OF COST DEVIATION	**TASK NO.**	8053
PERFORMANCE CRITERIA	The person performing this task must be able to analyse cost deviations and takes corrective measures to control costs.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Cost analysis tools: professional cost analysis tools used to analyse construction cost deviations and determine the reasons, such as cost control software, and financial analysis tools; 2. Real-time data collection equipment: sensors, data recorders, etc. used to collect actual construction cost and progress data for comparison and analysis; 3. Financial statements and records: cost statements, accounting records, etc. used to record and track deviations in construction costs; 4. Communication and coordination equipment: computers, mobile phones, conference equipment, etc. used for communication and coordination with project teams, financial personnel, and relevant parties to correct cost deviations.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Collect and organize cost data during the construction process; 2. Compare actual costs with budgeted costs; 3. Track and monitor the development trend of cost deviations; 4. Identify key factors and risk points; 5. Put forward corrective measures and suggestions for improvement.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect and organize cost data during the construction process, including actual expenses and budgeted costs; 1.2 Compare actual costs with budgeted costs, and analyse the causes for and extent of cost deviations; 1.3 Track and monitor the development trend of cost deviations, and promptly identify problems; 1.4 Identify key factors and risk points that lead to cost deviations; 1.5 Put forward cost corrective measures and suggestions for improvement to control and reduce cost deviations. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Financial management principles;

	2.3 Cost accounting management principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Theoretical knowledge about cost analysis and cost control; 3.2 Budget preparation and cost accounting methods and techniques; 3.3 Principles and strategies for cost deviation analysis and correction; 3.4 Use of cost management software and tools. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Accurate cost analysis reports and corrective suggestions are provided in accordance with relevant laws and regulations to support project decision-making and cost control.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The correlations between construction project management and project progress; 2. Price and market changes of building materials and equipment; 3. Construction technology and process; 4. Financial management and accounting knowledge to support cost accounting and control; 5. Basic concepts of risk management and quality control.

<table>
<tr><td>OCCUPATION</td><td>ARCHITECTURAL ENGINEER</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>SAFETY AND ENVIRONMENT MANAGEMENT</td><td>DUTY NO.</td><td>806</td></tr>
<tr><td>TASK TITLE</td><td>PREPARATION OF SAFETY PRODUCTION MANAGEMENT PLANS AND MANAGEMENT SYSTEMS FOR CONSTRUCTION PROJECTS</td><td>TASK NO.</td><td>8061</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to prepare safety production management plans and management systems for construction projects</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed on the construction site under the supervision of chief architectural engineers.
The tools and equipment to be used include:
1. Safety management software: professional safety management software used to prepare and manage safety management plans and systems of construction projects, such as safety management system software, and document management software;
2. Safety signs and warning equipment: safety signs, protective railings, emergency parking equipment, etc. used to identify and remind you of safety requirements and hazardous areas on the construction site;
3. Safety detection instruments: smoke alarms, gas detectors, measuring instruments, etc. used to monitor the safety environment and potential risks on the construction site;
4. Safety training materials and equipment: safety education videos, training documents, training equipment, etc. used for safety training and promotion to enhance workers' safety consciousness and knowledge.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Analyse the safety risks and hidden dangers of construction projects;
2. Develop work safety management plans and management systems for construction projects;
3. Organize safety training and educational activities;
4. Supervise the safety status of the construction site;
5. Inspection and evaluation.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Develop corresponding safety measures;
1.2 Develop a safety production management plan and management system for construction projects, and ensure the improvement and implementation of safety rules and regulations and systems;
1.3 Improve employees' safety consciousness and skills;
1.4 Timely identify and handle safety issues;
1.5 Regularly conduct safety inspections and evaluations to ensure that construction projects comply with safety standards and regulatory requirements.

2.0 Principles
The person performing this task must be able to explain</td></tr>
</table>

	the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Quality control principles; 2.3 Principles of safety management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Theoretical knowledge about work safety management, including methods for safety evaluation and risk control; 3.2 The correlations between construction technology and on-site safety management; 3.3 Principles and strategies for accident prevention and emergency management; 3.4 Safety management tools and techniques, such as safety inspections, and accident investigations. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to detail
DESCRIPTION OF THE END PRODUCT / SERVICE	Comprehensive work safety management plans and systems are provided in accordance with relevant laws and regulations to ensure that the construction safety comply with standard requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Construction technology and process; 2. Use of safety equipment and protective measures; 3. Basic concepts of environmental protection and occupational hygiene; 4. Laws, regulations, and standards, such as construction safety management standards; 5. Knowledge about emergency management and hazardous chemical safety.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SAFETY AND ENVIRONMENT MANAGEMENT	**DUTY NO.**	806
TASK TITLE	DEVELOPMENT OF EMERGENCY RESCUE PLANS FOR ON-SITE SAFETY INCIDENTS	**TASK NO.**	8062
PERFORMANCE CRITERIA	The person performing this task must be able to develop emergency rescue plans for on-site safety incidents.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Emergency communication equipment: walkie talkies, mobile phones, emergency broadcasting equipment, etc. used for real-time communication and coordination of emergency rescue work; 2. First aid equipment and drugs: first aid kits, equipment, commonly used drugs, etc. used for on-site first aid and injury treatment; 3. Safe escape equipment: fire extinguishers, safety ropes, safety oxygen respirators, etc. used for emergency escape and firefighting; 4. Emergency lighting equipment: emergency lights, headlights, etc. used to ensure lighting needs during emergencies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse potential safety risks on the construction site; 2. Develop detailed emergency rescue plans for safety incidents; 3. Configure emergency rescue equipment and resources; 4. Organize safety drills and training; 5. Launch emergency rescue plans and organize effective emergency response.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse the potential safety risks and potential incidents on the construction site; 1.2 Develop detailed emergency rescue plans for safety accidents, including incident classification, emergency measures, and rescue procedures; 1.3 Configure and maintain necessary emergency rescue equipment and resources; 1.4 Organize safety drills and training to ensure that the personnel are familiar with emergency rescue plans and possess corresponding emergency skills; 1.5 Quickly activate emergency rescue plans and organize effective emergency responses in the event of safety incidents. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Quality control principles;

	2.3 Principles for the evolution process and emergency decision-making of safety incidents. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic theories and methods of emergency rescue for safety incidents, including emergency response, rescue measures, and accident investigation; 3.2 Principles for the evolution process and emergency decision-making of safety incidents; 3.3 Legal liability and compensation mechanisms related to safety incidents on the construction sites; 3.4 Operation mechanisms of emergency rescue organizations and command systems. **4.0 Essential Skills** 4.1 Emergency response and organizational coordination skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 On-site rescue and first aid skills for safety incidents; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Comprehensive emergency rescue plans are provided for the on-site safety incidents in accordance with relevant laws and regulations to ensure prompt and effective handling and rescue in the event of any safety incident
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Processes and characteristics of construction engineering; 2. Knowledge about the characteristics and hazard assessment of building materials; 3. First aid knowledge.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SAFETY AND ENVIRONMENT MANAGEMENT	**DUTY NO.**	806
TASK TITLE	SUPERVISION AND MANAGEMENT OF ON-SITE ENVIRONMENT	**TASK NO.**	8063
PERFORMANCE CRITERIA	The person performing this task must be able to supervise and manage the on-site environment.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Environmental monitoring equipment: air quality monitors, noise detectors, vibration monitors, etc. used to monitor environmental parameters at construction sites and ensure compliance with relevant standards and regulatory requirements; 2. Safety inspection tools: safety facilities and personal protective equipment used to inspect and ensure the safety of the construction site, such as safety helmets, safety shoes, and safety ropes; 3. Environmental protection equipment: oil-water separators, dust screens, environmental barriers, etc. used to protect the environment around the construction site from pollution and damage.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Supervise the implementation of environmental safety measures on the construction site; 2. Check the environmental hygiene of the construction site, detect and monitor the environmental factors on the construction site; 3. Carry out coordination and communication; 4. Train and guide the construction personnel.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Supervise the implementation of environmental safety measures on the construction site to ensure compliance with relevant laws, regulations, and safety standards; 1.2 Check the environmental hygiene of the construction site, including noise, dust, and waste, and put forward improvement suggestions; 1.3 Detect and monitor environmental factors on the construction site, such as air quality and water quality, to ensure the compliance with relevant requirements; 1.4 Coordinate and communicate with relevant departments and contractors to solve problems and difficulties in environmental management on the construction site; 1.5 Train and guide the construction personnel to enhance their awareness and competence in environmental management. **2.0 Principles**

	The person performing this task must be able to explain the following principles: 2.1 Principles of compliance with laws and regulations; 2.2 Quality control principles; 2.3 Environmental management principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic concepts and principles of environmental management, including environmental impact assessment, and environmental monitoring; 3.2 Methods and technologies for environmental monitoring and detection, including sampling and analysis; 3.3 Impacts of environmental factors on construction processes and personal health on the construction site. **4.0 Essential Skills** 4.1 Environmental monitoring and detection skills; 4.2 Planning and organizational skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Attention to details.
DESCRIPTION OF THE END PRODUCT / SERVICE	On-site environmental management that meets laws and regulations is provided to ensure environmental safety and hygiene during the construction process.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Basic knowledge in the field of environmental protection and hygiene, such as noise control, dust control, and waste disposal; 2. Cross-disciplinary knowledge related to environmental management, such as environmental impact assessment, and environmental management systems; 3. Knowledge about building materials.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SAFETY AND ENVIRONMENT MANAGEMENT	**DUTY NO.**	806
TASK TITLE	INVESTIGATION, ANALYSIS, AND HANDLING OF SAFETY AND ENVIRONMENTAL ISSUES	**TASK NO.**	8064
PERFORMANCE CRITERIA	The person performing this task must be able to investigate, analyse, and handle safety and environmental issues.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Building specifications: relevant specifications and manuals used to refer to and guide the construction personnel to conduct technical disclosure; 2. Safety inspection tools: safety facilities and personal protective equipment used to inspect and ensure the safety of the construction site, such as safety helmets, safety shoes, and safety ropes; 3. Videos and photographic equipment: they are used to record the process and results of technical disclosure for subsequent supervision and evaluation; 4. Communication tools and conference equipment: interpretation boards, projectors, audio equipment, etc. used for technical disclosures and discussions.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check civilized construction measures against safe, civilized, and standardized construction schemes; 2. Check and accept civilized construction measures in accordance with safe, civilized, and standardized construction schemes; 3. Check the environmental protection measures on the construction site against safe, civilized, and standardized construction schemes; 4. Check and accept environmental protection measures on the construction site in accordance with safe, civilized, and standardized construction	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct on-site investigations on the hazards, safety hazards, and illegal operations that exist during the construction process in view of the key points of civilized construction 1.2 Conduct on-site acceptance of the implementation of civilized construction measures in accordance with relevant national laws and regulations on engineering construction; 1.3 Analyse and handle hazards, safety hazards, and illegal operations based on on-site investigations and national laws and regulations on engineering construction. **2.0 Principles** The person performing this task must be able to explain the following principles:

schemes; 5. Analyse and handle hazards, safety hazards, and illegal operations that arise during the construction; 6. Optimize civilized construction schemes.	2.1 Safe, civilized, and standardized construction schemes; 2.2 Requirements for safe, civilized, and standardized construction. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Key points of civilized construction of the project; 3.2 Key points of green construction of the project; 3.3 Key points of safety technical disclosure of the project. **4.0 Essential Skills** 4.1 Competence to analyse safety and environmental issues; 4.2 Ability to investigate safety and environmental issues; 4.3 Ability to organize safety and environmental issues; 4.4 Communication with construction personnel; 4.5 Sharp insight into details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Civilized construction schemes are implemented in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Key points of safety inspection; 2. Management of civilized construction sites and green construction; 3. Emergent handling of safety incidents.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	807
TASK TITLE	DEVELOPMENT OF CONSTRUCTION DATA MANAGEMENT PLAN AND MANAGEMENT SYSTEM	**TASK NO.**	8071
PERFORMANCE CRITERIA	The person performing this task must be able to develop construction data management plans and management systems during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Data management software: professional data management software used for preparing construction data plans and management systems; 2. Construction schedule: it is used to prepare a construction data schedule; 3. Building specifications: they are used for reference and guidance of documenters in data management; 4. Office supplies: computers, printers, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the management duties on engineering data and draw relationship diagrams of various organs; 2. Analyse the position of data collector and clarify their job duties and responsibilities; 3. Develop construction data management systems; 4. Study the construction schedule and prepare construction data management plans.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse the duties of each organ in engineering data management in accordance with current national quality management laws and regulations, and develop construction data management systems; 1.2 Develop construction data management plans in view of the construction schedule and the requirements for construction data management at each stage. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic knowledge about secretarial and official document writing; 2.2 National laws and regulations on engineering construction. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Requirements for construction project data

	management; 3.2 Responsibilities of construction project data management; 3.3 Duties of the documenter; 3.4 Construction schedule. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Writing skills; 4.3 Organizing competence; 4.4 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Construction data management plans and management systems are developed in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	807
TASK TITLE	SUPERVISION OF THE COLLECTION, ORGANIZATION, USE, STORAGE, ARCHIVING AND HANDOVER OF CONSTRUCTION DATA	**TASK NO.**	8072
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the collection, organization, use, storage, archiving and handover of construction data during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Data management software: professional data management software used for preparing construction data plans and management systems; 2. Construction schedule: it is used to prepare a construction data schedule; 3. Building specifications: they are used for reference and guidance of documenters in data management; 4. Office supplies: computers, printers, file boxes, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Number the construction project data; 2. Organize and compile a directory of construction project data, and verify and bind them into volumes; 3. Compile the page numbers of documents in the construction project data volumes; 4. Participate in the acceptance of construction project files; 5. Participate in the handover of compliant engineering files to the archive centre.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Organize and inspect construction project data according to the *Code for Construction Project Document Filing and Arrangement*; 1.2 Organize the project data into volumes according to the *Code for Construction Project Document Filing and Arrangement*; 1.3 Hand over files according to the acceptance requirements of urban construction archive centre within the specified time. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 *Code for Construction Project Document Filing and Arrangement*; 2.2 Regulations on the acceptance content and handover of urban construction archive centre. **3.0 Theories** The person performing this task must be able to explain

	the following: 3.1 National laws and regulations on engineering construction; 3.2 Basic knowledge about engineering materials; 3.3 Engineering construction processes and methods; 3.4 Basic knowledge about engineering project management. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Writing skills; 4.3 Organizing competence; 4.4 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The collection, organization, use, storage, archiving and handover of construction data are completed in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Standards and management regulations related to the position; 2. Management knowledge about project completion acceptance filing; 3. Basic knowledge about urban construction archive management, construction data management, and construction industry statistics; 4. Basic knowledge about secretarial and official document writing;

OCCUPATION	ARCHITECTURAL ENGINEER	OCCUPATION CODE	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	DUTY NO.	807
TASK TITLE	PARTICIPATION IN ESTABLISHING A COMPUTER-AIDED MANAGEMENT PLATFORM FOR CONSTRUCTION DATA AND SUPERVISION OF ITS OPERATION	TASK NO.	8073
PERFORMANCE CRITERIA	The person performing this task must be able to participate in establishing a computer-aided management platform for construction data during the construction process and supervise its operation.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Data management software: professional data management software used for preparing construction data plans and management systems; 2. Construction schedule: it is used to prepare a construction data schedule; 3. Building specifications: they are used for reference and guidance of documenters in data management; 4. Office supplies: computers, printers, file boxes, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Participate in establishing a computer-aided management platform for construction data; 2. Be proficient in operating construction data management software; 3. Use construction data management software to process construction data.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use construction management software to understand the key points of construction data writing and acceptance; 1.2 Use construction data management software to manage and hand over construction data; **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 *Code for Construction Project Document Filing and Arrangement*; 2.2 Regulations on the acceptance content and handover of urban construction archive centre; 2.3 Operating construction data management software. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 National laws and regulations on engineering construction;

	3.2 Knowledge about using computers and related data management software. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Computer application skills; 4.3 Communication skills; 4.4 Sharp insight into details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Information-based management is conducted for the construction data in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Standards and management regulations related to the position; 2. Management knowledge about project completion acceptance filing; 3. Basic knowledge about urban construction archive management, construction data management, and construction industry statistics; 4. Operating the computer-aided management platform for construction data.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	808
TASK TITLE	PREPARATION OF CONSTRUCTION RESOURCE DEMAND PLAN AND MANAGEMENT SYSTEM	**TASK NO.**	8081
PERFORMANCE CRITERIA	The person performing this task must be able to develop construction resource demand plans and management systems during the construction process.		
RANGE STATEMENT	The task can be performed in the office area on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Project construction drawings: they are used for construction resource demand plans and management systems; 2. Construction schedule: it is used to prepare a resource demand plan; 3. Building specifications: they are used as references and to guide the construction workers to prepare and manage the data requirements; 4. Office supplies: computers, printers, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Understand and manage the material information, material classification, material suppliers, material planning, material procurement and supply, material site, material cost, etc. of the project; 2. Understand the content and duties of mechanical equipment management, as well as the methods and systems of mechanical equipment management; 3. Be familiar with the role and management of labour quota management, as well as the economic contracting responsibility system and incentive mechanism on the construction site; 4. Predict and compare construction project funds; 5. Develop construction resource demand plans and management systems;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Clarify the key management points of the project's material information, material classification, material suppliers, material planning, material procurement and supply, material site, material cost, etc. according to the construction scheme; 1.2 Clarify the content and duties of mechanical equipment management according to the construction scheme; 1.3 Predict and compare the construction project funds in view of the quota specifications; 1.4 Clarify the economic contracting responsibility system for the construction site and develop incentives in accordance with national laws and regulations. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Concept of project resource management; 2.2 Concept of project material management. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Content and duties of mechanical equipment management; 3.2 Methods of labour management; 3.3 Content of project funding principles. **4.0 Essential Skills** 4.1 Analytical skills; 4.2 Ability to predict and compare funds; 4.3 Project coordination competence; 4.4 Organizing competence; 4.5 Communication skills; 4.6 Sharp insight into details.
DESCRIPTION OF THE END PRODUCT / SERVICE	Construction resource demand plans and management systems are developed in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Basic content, main content, principles, and resource management plan of project resource management; 2. Clarify the key management points of the project's material information, material classification, material suppliers, material planning, material procurement and supply, material site, material cost, etc. according to the construction scheme; 3. Significance and characteristics of mechanical equipment management, content and duties of mechanical equipment management, and methods and systems of mechanical equipment management; 4. Methods of labour management, role and management of labour quota management, grouped labour management, labour economic contracting responsibility system, and incentive mechanism; 5. Prediction and comparison of project funds management, and key points of construction project funds management.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	808
TASK TITLE	SUPERVISION OF PROCUREMENT, ACCEPTANCE, USE, AND STORAGE OF CONSTRUCTION MATERIALS	**TASK NO.**	8082
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the procurement, acceptance, use, and storage of construction materials during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Construction scheme: it is used to prepare material procurement plans; 2. Building specifications: they are used as references and to guide the purchase, acceptance, use and storage of construction materials; 3. Office supplies: computers, printers, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Develop material procurement plans; 2. Evaluate the qualifications of material suppliers; 3. Accept and sample the incoming materials and equipment; 4. Supervise and inspect the reasonable use of materials; 5. Check and count the materials; 6. Calculate the cost of materials; 7. Sample and test engineering materials.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Develop a material procurement plan based on the construction resource demand plan; 1.2 Evaluate the qualifications of material suppliers in accordance with current national quality management laws and regulations; 1.3 Accept and sample incoming materials and equipment in accordance with current national quality management laws and regulations; 1.4 Supervise and inspect the reasonable use of materials according to the construction resource demand plan; 1.5 Check and count the materials according to the construction resource demand plan; 1.6 Calculate the cost of materials according to the quota specifications; 1.7 Sample and test engineering materials in accordance with current national quality management laws and regulations. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 *Unified Standard for Constructional Quality Acceptance of Building Engineering*; 2.2 Construction scheme;

	2.3 Classification and characteristics of building materials; 2.4 Principles of material sampling. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Key points of material procurement; 3.2 Key points of material acceptance; 3.3 Key points of material storage; **4.0 Essential Skills** 4.1 Ability to develop various plans; 4.2 Evaluation ability; 4.3 Report writing skills; 4.4 Communication skills; 4.5 Ability to analyse test results; 4.6 Cost accounting skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The procurement, acceptance, use, and storage of construction materials are supervised in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Classification, characteristics, and technical requirements of various building materials; 2. Material sampling; 3. Material management; 4. Sampling and testing.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	808
TASK TITLE	SUPERVISION OF THE PROCUREMENT, LEASING AND SAFETY USE OF CONSTRUCTION EQUIPMENT	**TASK NO.**	8083
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the procurement, leasing and safety use of construction equipment during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Construction scheme: it is used to prepare procurement and leasing plans for construction equipment; 2. Building specifications: they are used to develop procurement or leasing plans for construction equipment, inspect the education, training, and qualification certificates of mechanical equipment operators, etc.; 3. Office supplies: computers, printers, stationery, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Develop equipment usage plans and maintenance plans; 2. Participate in the overall construction floor plan, procurement or leasing of mechanical equipment; 3. Manage and supervise the safety of the installation and disassembly of special equipment; 4. Conduct inspection and acceptance of mechanical equipment, and disclose safety technologies; 5. Check the education, training, and qualification certificates of mechanical equipment operators; 6. Establish files for special mechanical operators; 7. Supervise and inspect the use and maintenance of mechanical equipment, and inspect the safe	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Develop procurement or leasing plans for construction equipment, and manage and supervise the safety of the installation and dismantling of special equipment according to the *Technical Specification for Safety Operation of Construction Machinery*; Supervise and inspect the use and maintenance of mechanical equipment, and inspect the safe use of special equipment; Identify, investigate, analyse, and handle mechanical equipment accidents. 1.2 Check the education, training, and qualification certificates of mechanical equipment operators according to the *Regulations on the Work Safety Management of Construction Engineering*; Establish files for special mechanical operators. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic principles of applied mechanics;

use of special equipment; 8. Identify, investigate, analyse, and handle mechanical equipment accidents.	2.2 Basic principles of budgeting; 2.3 Working principles, types, structures, and technical performance of mechanical equipment; 2.4 *Technical Specification for Safety Operation of Construction Machinery;* 2.5 *Regulations on the Work Safety Management of Construction Engineering*; **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Pre-management methods for mechanical equipment; 3.2 Management methods for the safe use of mechanical equipment; 3.3 Correct methods for the use of construction machinery; 3.4 Mobilization system of mechanical equipment; 3.5 Supervision and inspections system for construction machinery. **4.0 Essential Skills** 4.1 Ability to develop various plans; 4.2 Evaluation ability; 4.3 Report writing skills; 4.4 Communication skills; 4.5 Ability to analyse test results; 4.6 Cost accounting skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The procurement, leasing, and safety use of construction equipment are supervised in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance and repair of equipment; 2. Prevention and handling of mechanical accidents; 3. Asset management of construction machinery.

OCCUPATION	ARCHITECTURAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PROJECT RESOURCE MANAGEMENT	**DUTY NO.**	808
TASK TITLE	SUPERVISION OF THE REVIEW, TRAINING, AND CONTRACT MANAGEMENT OF CONSTRUCTION PERSONNEL	**TASK NO.**	8084
PERFORMANCE CRITERIA	The person performing this task must be able to supervise the review, training, and contract management of construction personnel during the construction process.		
RANGE STATEMENT	The task can be performed on the construction site under the supervision of chief architectural engineers. The tools and equipment to be used include: 1. Labour contracts: they are used to verify the identity and professional qualifications of labour personnel; 2. Labour laws: they are used to review the standardization of labour contracts, evaluate labour subcontracting contracts, and comprehensively evaluate the labour force; 3. Various training plans: they are used to develop training programs for construction personnel; 4. Office supplies: computers, printers, stationery, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Participate in the preparation of labour demand and training programs; 2. Verify the identity and professional qualifications of labour personnel; 3. Review labour subcontracting contracts and comprehensively evaluate the workers; 4. Conduct normative review of labour contracts; 5. Verify labour subcontracting payments and salaries of the workers; 6. Establish personal salary ledger for the workers.	**CIRCUMSTANTIAL KNOWLEDGE** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Manage labour contracts, verify labour-related matters, and maintain records according to the *Labour Law*; 1.2 Review qualification training in accordance with relevant regulations on qualification management of construction enterprises. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 *Labour Law*; 2.2 Regulations on qualification management of construction enterprises **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Qualification review training; 3.2 Labour contract management.

	4.0 Essential Skills 4.1 Ability to develop training programs; 4.2 Communication skills; 4.3 Archive management skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The review, training, and contract management of construction personnel are supervised in accordance with relevant laws and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Skills in labour management in the construction industry; 2. Labour contract management; 3. Labour subcontracts.

TABLE 1: DACUM CHARTS FOR ARCHITECTURAL ENGINEER - NTA 8

DUTIES	TASKS	ENABLERS
1.0 Construction organization and planning	1.1 Preparation of construction organization design. 1.2 Preparation of dedicated construction schemes. 1.3 Development of management systems.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods · Basic knowledge about mechanics · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Entrepreneurial skills **Tools and equipment** · Drawings · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity
2.0 Management of construction	2.1 Verification of construction technology. 2.2 Supervision and	**General skills and knowledge** · Ability to identify and produce engineering drawings

DUTIES	TASKS	ENABLERS
technology	implementation of technical disclosure. 2.3 Organization of technical review.	· Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods · Basic knowledge about mechanics · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Entrepreneurial skills **Tools and equipment** · Specifications · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Keeping promises · Pursuit of excellence · Solidarity and cooperation · Career identity
3.0 Construction quality control	3.1 Preparation of construction project quality plan and management system. 3.2 Engineering quality acceptance. 3.3 Investigation, analysis, and handling of quality incidents.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering

DUTIES	TASKS	ENABLERS
		construction processes and methods · Basic knowledge about mechanics · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Paper · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity
4.0 Construction schedule control.	4.1 Preparation of construction schedule. 4.2 Supervision of construction site organization and coordination. 4.3 Supervision of dynamic management of construction plane layout.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods · Basic knowledge about mechanics · Ability to develop construction organization designs and dedicated

DUTIES	TASKS	ENABLERS
		construction schemes · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Drawings · Construction schemes · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Keeping promises, · Pursuit of excellence, · Solidarity and cooperation · Career identity
5.0 Construction cost control.	5.1 Preparation of construction cost plan. 5.2 Accounting of engineering quantity and construction cost. 5.3 Analysis and correction of cost deviation.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Cost budgeting and accounting skills · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods · Basic knowledge about mechanics · Ability to develop construction

DUTIES	TASKS	ENABLERS
		organization designs and dedicated construction schemes · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Drawings · Construction schemes · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity
6.0 Safety and environment management	6.1 Preparation of safety production management plans and management systems for construction projects. 6.2 Develop emergency rescue plans for safety incidents at the construction site. 6.3 Supervision and management of on-site environment. 6.4 Investigation, analysis, and handling of safety and environmental issues.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Cost budgeting and accounting skills · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods · Basic knowledge about mechanics

DUTIES	TASKS	ENABLERS
		· Ability to develop construction organization designs and dedicated construction schemes · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Drawings · Construction schemes · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity
7.0 Data information management	7.1 Development of construction data management plan and management system.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Cost budgeting and accounting skills · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and methods
	7.2 Supervision of the collection, organization, use, storage, archiving and handover of construction data.	
	7.3 Participation in establishing a computer-aided management platform for construction data and supervision of its operation.	

DUTIES	TASKS	ENABLERS
		· Basic knowledge about mechanics · Ability to develop construction organization designs and dedicated construction schemes · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Drawings · Construction schemes · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity
8.0 Project resource management	8.1 Preparation of construction resource demand plan and management system.	**General skills and knowledge** · Ability to identify and produce engineering drawings · Cost budgeting and accounting skills · Engineering surveying skills · Be familiar with national laws and regulations on engineering construction · Be familiar with engineering construction processes and

DUTIES	TASKS	ENABLERS
		methods · Basic knowledge about mechanics · Ability to develop construction organization designs and dedicated construction schemes · Building software application skills · Experience in the construction industry · Logical thinking · Project organization · Communication skills · Writing skills · Analytical skills · Innovation skills **Tools and equipment** · Drawings · Construction schemes · Pens and drawing tools · Computers · Measuring tools · Construction safety supplies · Other auxiliary tools and equipment **Materials** · Stationeries **Requirements for employees** · Business proficiency · Emphasis on commitment · Pursuit of excellence · Solidarity and cooperation · Career identity