

**NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHANICAL EQUIPMENT MAINTENANCE ENGINEER

LEVEL: NTA 8

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ABBREVIATIONS

CBET	Competency Based Education and Training
EA	Economic Analysis
HS	Hydraulic System
MOPP	Maintenance Operation and Procedures
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PLC	Programmable Logic Controller
PT	Production Technology
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
VR	Virtual Reality

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 Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tool of assessment of the prescribed outcomes.
Performance Criteria:	Indicate the expected end results or outcome in form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	It is a set of statement, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.
Underpinning Knowledge:	This is crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and 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.
Occupational Competence:	The application of knowledge and skills to perform consistently to the standards required in the work context.

1.0. INTRODUCTION

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

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

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

In TET delivery, Tanzania adopted the 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).

The Mechanical Equipment Maintenance Engineer Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM Charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

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

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

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

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Mechanical Equipment Maintenance Engineers were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they 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 MECHANICAL EQUIPMENT MAINTENANCE ENGINEERS

The standards cover a broad range of duties and tasks that can be performed by a Mechanical Equipment Maintenance 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. The Mechanical Equipment Maintenance Engineer may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mechanical Equipment Maintenance Engineer may assist in managing, maintaining and repairing the mechanical equipment; analyze the common problems of equipment, find out the causes, take preventive measures, prepare the mechanical equipment maintenance plan, propose the equipment transformation scheme, formulate the maintenance process and optimize the process. Generally, the Mechanical Equipment Maintenance Engineer performs the following responsibilities:

- a) Improvement of the oil (gas) circuit
- b) Reading of circuit diagrams
- c) Testing of the functions and performance of equipment
- d) Technical transformation or adjustment on the mechanical equipment defects timely
- e) Offering of technical guidance and dispatching on site
- f) Guidance and training of safe operation of equipment
- g) Offering of fault repair, diagnosis and detection technologies
- h) Formulation of mechanical equipment maintenance plan and fault repair
- i) Equipment transformation economic analysis and preparation of the transformation plan
- j) Project planning, repair budgeting and writing of engineering report.

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

4.0. VALIDITY PERIOD

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

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR MECHANICAL EQUIPMENT

MAINTENANCE ENGINEER - NTA 8

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	COMPILATION OF THE MECHANICAL EQUIPMENT MAINTENANCE PLAN	DUTY NO.	801
TASK TITLE	DESIGN OF THE MECHANICAL EQUIPMENT SYSTEM DEBUGGING AND MAINTENANCE PLAN	TASK NO.	8011
PERFORMANCE CRITERIA	The person performing this task must be able to prepare the mechanical equipment system debugging and maintenance plan according to the technical requirements and conditions of mechanical equipment, as well as the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the processing workshop under the supervision of other mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Computer, design software, protractor, compass and straight ruler.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Collect and arrange the paper/electronic data of mechanical equipment; 2. Investigate the technical condition and requirements of mechanical equipment and products; 3. Define the precision and technical indexes of mechanical equipment system debugging and maintenance; 4. Prepare technical documents of system debugging and maintenance, including work contents, special testing equipment and tools list, material list and technical indexes; 5. Prepare debugging and maintenance plan and construction work quota; 6. Prepare equipment delivery form and acceptance transfer form, and formulate equipment acceptance and transfer		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Design mechanical equipment system debugging and maintenance plan; 1.2 Debug and maintain equipment, materials and tools; 1.3 Reach the subsequent technical indexes of mechanical equipment debugging and maintenance. 2.0 Principle The person performing this task must be able to explain the following principles:	

procedures.	2.1 Mechanical equipment maintenance principles; 2.2 Mechanical equipment maintenance principles; 2.3 Mechanical equipment design principles. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Basic theory of electricians; 3.2 Basic theory of machinery; 3.3 Technological requirements for equipment; 3.4 Engineering mechanical structure; 3.5 Engineering mechanical and electrical equipment principles; 3.6 Engineering machinery fault diagnosis and maintenance technology. 4.0 Essential Skills 4.1 Communication skills; 4.2 Management skills; 4.3 Investigation and arrangement skills; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Writing skills. 5.0 Mathematical Skills 5.1 Skills of calculation design and material size estimation
DESCRIPTION OF THE END PRODUCT / SERVICE	The mechanical equipment maintenance design is executed/completed according to the technical requirements and the current laws, regulations and standards for the mechanical equipment field.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation parameters of system equipment; 2. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	800
DUTY TITLE	COMPILATION OF THE MECHANICAL EQUIPMENT MAINTENANCE PLAN	DUTY NO.	801
TASK TITLE	Preparation of the mechanical equipment maintenance project plan	TASK NO.	8012
PERFORMANCE CRITERIA	The person performing this task must be able to prepare the mechanical equipment maintenance project plan according to national technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the processing workshop under the supervision of other mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Computer, design software, protractor, compass and straight ruler.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Choose the maintenance type and ensure the production balance state; 2. Analyze the reliability, maintainability and fault mode of equipment and components, and use different maintenance methods according to different fault modes and effect of different maintenance objects; 3. Prepare the maintenance specification; 4. Prepare the maintenance report.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Formulate the ideas and basis of equipment debugging and maintenance plan; 1.2 Confirm the equipment, materials and tools needed for debugging and maintaining; 1.3 Reach the subsequent technical indexes of mechanical equipment debugging and maintenance. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Reliability centered maintenance; 2.2 Principle of synchronous maintenance; 2.3 Principle of using maintenance window. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Machining process and equipment; 3.2 Basic knowledge of computer application. 4.0 Essential Skills 4.1 Communication skills; 4.2 Management skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer application skills. 5.0 Mathematical Skills 5.1 Numerical computation; 5.2 Material size estimation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The mechanical equipment maintenance project plan conforming to relevant requirements and specifications is prepared.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Operation skills of manufacturing and maintenance bench workers; 2. Computer operation.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	TRAINING AND MANAGEMENT OF MECHANICAL EQUIPMENT MAINTENANCE PERSONNEL	DUTY NO.	802
TASK TITLE	MANAGEMENT OF MECHANICAL EQUIPMENT MAINTENANCE PERSONNEL	TASK NO.	8021
PERFORMANCE CRITERIA	The person performing this task must be able to manage staff according to technical requirements and the company's policies.		
RANGE STATEMENT	The task can be performed in workplace under the supervision of project managers. The equipment and tools to be used include: 1. Office; 2. Tools and equipment; 3. Computers; 4. Production and financial facilities.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Assign duties and liabilities for specific personnel; 4. Organize the activities for achieving goals; 5. Supervise the assigned responsibilities; 6. Evaluate results; 7. Hold the staff meetings; 8. Formulate the training requirements; 9. Carry out staff training; 10. Affect the teamwork; 11. Create a welfare-oriented environment; 12. Motivate the staff.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Manage the mechanical equipment maintenance personnel. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Management principles for mechanical equipment maintenance personnel. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Responsibilities of the manager for mechanical equipment maintenance personnel; 3.2 Working methods of mechanical equipment maintenance personnel. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer application skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The personnel is managed according to approved rules and systems.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Safe operation of operation equipment and tools; 3. Maintenance operation strategies and procedures.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	TRAINING AND MANAGEMENT OF MECHANICAL EQUIPMENT MAINTENANCE PERSONNEL	DUTY NO.	802
TASK TITLE	TRAINING OF MECHANICAL EQUIPMENT MAINTENANCE PERSONNEL	TASK NO.	8022
PERFORMANCE CRITERIA	The person performing this task must be able to carry out training according to the requirements and the company's policies		
RANGE STATEMENT	The task can be performed in the mechanical equipment maintenance workshop or the multimedia classroom under the supervision of project managers. The tools and equipment to be used include: 1. Multimedia teaching equipment; 2. Tools and operation equipment for practical training; 3. Training materials; 4. Computers.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Organize the activities for achieving goals; 4. Supervise the assigned responsibilities and tasks; 5. Evaluate results; 6. Prepare training plan and teaching materials; 7. Train employees with theoretical knowledge; 8. Carry out actual operation of skills.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Train mechanical equipment maintenance personnel. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Management. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Theoretical learning method; 3.2 Operation guidance method. 4.0 Essential Skills 4.1 Plan preparation skills; 4.2 Language expression skills; 4.3 Multimedia application skills; 4.4 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Training is carried out according to the approved training plan.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Overall planning and management of mechanical equipment maintenance; 2. Preparation and implementation of mechanical equipment maintenance plan; 3. Collection, analysis and improvement of main mechanical equipment fault information; 4. Maintenance and servicing of mechanical devices; 5. Technical support and training.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	TRAINING AND MANAGEMENT OF MECHANICAL EQUIPMENT MAINTENANCE PERSONNEL	DUTY NO.	802
TASK TITLE	PROJECT PLANNING, REPAIR BUDGETING AND WRITING OF ENGINEERING REPORT.	TASK NO.	8023
PERFORMANCE CRITERIA	The person performing this task must be able to prepare project planning and maintenance budget and engineering report for mechanical equipment with relevant knowledge, skills and understanding according to the approved responsibilities and tasks.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of senior technicians or mechanical equipment maintenance engineers. The equipment, tools and data to be used include: 1. A manager's office; 2. Workshop facilities; 3. Tools and equipment; 4. Production and financial facilities; 5. Transportation equipment; 6. Computers.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Choose correct tools, equipment and safety protection articles for tasks; 2. Maintain the production quality; 3. Respond to the customer's feedback; 4. Formulate and implement the record; 5. Review the maintenance cost; 6. Control the incomings and outgoings; 7. Prepare the project plan; 8. Prepare the maintenance budget; 9. Prepare the engineering report; 10. Meet the market demand.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Formulate the mechanical equipment maintenance project planning, maintenance budget and engineering report; 1.2 Determine the tools, equipment and data for mechanical equipment maintenance project planning, maintenance budgeting and engineering report; 1.3 Determine the technical indexes required for mechanical equipment maintenance project planning, maintenance budgeting and engineering report.	

	2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Principles of project planning; 2.2 Principles of maintenance budging; 2.3 Principles of engineering report. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Mechanical equipment maintenance project planning, maintenance budging and engineering report; 3.2 Duties and liabilities of mechanical equipment maintenance engineers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer application skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Cost accounting skills; 4.6 Customer service skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	According to the approved responsibilities and tasks, the mechanical equipment maintenance project planning and maintenance budging are conducted and the engineering report is compiled.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of the production equipment; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Maintenance operation strategies and procedures; 5. Waste treatment and storage method.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	800
DUTY TITLE	MANAGEMENT OF THE REPAIR AND MAINTENANCE OF MECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	MANAGEMENT OF THE MAINTENANCE PERSONNEL OF THE CONTROL SYSTEM	TASK NO.	8031
PERFORMANCE CRITERIA	The person performing this task must be able to manage the control system maintenance personnel in the mechanical equipment workshop according to standards, principles and current administrative regulations.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. A mechanical equipment workshop; 2. Mechanical equipment; 3. Detection instruments; 4. Equipment maintenance tools; 5. Projection equipment; 6. Computers.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Prepare work plan and determine activity objectives; 4. Formulate project schedule and assign personnel duties and liabilities; 5. Periodically supervise the execution situation and task promotion; 6. Periodically hold supervision meetings; 7. Provide detailed instructions; 8. Supervise the compliance of safety standard during working; 9. Create a teamwork atmosphere; 10. Formulate incentive policies.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Effectively plan and supervise the staff's work to improve the best performance. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Principles of clear job requirements; 2.2 Principles of power and responsibility integration; 2.3 Principles of fair competition; 2.4 Principles of staffing for strength; 2.5 Principles of systematic management.	

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Management method of the mechanical equipment workshop; 3.2 Supervision mode of the mechanical equipment workshop; 3.3 Leading strategy of the mechanical equipment workshop; 3.4 Team responsibilities of the mechanical equipment workshop. 4.0 Essential Skills 4.1 Leadership skills; 4.2 Interpersonal skills; 4.3 Communication skills; 4.4 Guiding skills; 4.5 Judging skills; 4.6 Technical skills; 4.7 Computer skills; 4.8 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The staff are managed according to standards, principles, rules and systems.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe operation specifications of mechanical equipment; 2. Electrical principles of the mechanical equipment control system; 3. Debugging and maintenance plan of the control system of mechanical equipment; 4. Troubleshooting methods of mechanical equipment control system; 5. Occupational health and safety; 6. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	800
DUTY TITLE	MANAGEMENT OF THE REPAIR AND MAINTENANCE OF MECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	TRAINING OF THE MAINTENANCE PERSONNEL OF THE CONTROL SYSTEM	TASK NO.	8032
PERFORMANCE CRITERIA	The person performing this task must be able to train the control system maintenance personnel with mechanical equipment maintenance knowledge.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. A mechanical equipment workshop; 2. Mechanical equipment (grinding machine, boring machine, gantry milling machine, etc.); 3. Detection instruments; 4. Equipment maintenance tools; 5. Projection equipment; 6. Computers.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Manage safety utilization of electric power; 2. Prepare suitable maintenance plan for mechanical equipment; 3. Choose suitable tools and instruments for mechanical equipment maintenance; 4. Master the mechanical equipment maintenance method; 5. Prepare the training plan for control system maintenance personnel; 6. Prepare the training manual; 7. Fulfill the training tasks.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Maintain and repair mechanical equipment; 1.2 Training the maintenance personnel of the control system. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Working principles of mechanical equipment control system.	

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Working process of mechanical equipment control system; 3.2 Overhaul methods of the control system; 3.3 Using methods of maintenance tools and instruments. 4.0 Essential Skills 4.1 Language expression and communication skills; 4.2 Activity organization skills; 4.3 Office software operation skills; 4.4 Emergency treatment skills for electric shock; 4.5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Personnel participating in the control system maintenance training is capable of maintenance and repairing work.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe operation specifications of mechanical equipment 2. Electrical principles of the mechanical equipment control system; 3. Debugging and maintenance plan of the control system of mechanical equipment 4. Troubleshooting methods of mechanical equipment control system; 5. Preparing of the training plan for control system maintenance personnel; 6. Formulating methods of training courseware and manual.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	OPERATION AND MAINTENANCE OF THE MECHANICAL EQUIPMENT	DUTY NO.	804
TASK TITLE	ORGANIZATION OF TRAINING ON MECHANICAL MAINTENANCE PROCESS	TASK NO.	8041
PERFORMANCE CRITERIA	The person performing this task must be able to organize training on mechanical maintenance according to technical requirements and approved rules/systems.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Workshop facilities; 2. Production and financial facilities; 3. Transportation equipment.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Formulate the training requirements; 4. Carry out professional knowledge training on mechanical equipment maintenance; 5. Carry out training on operation regulations; 6. Carry out training on operation skills; 7. Carry out training on emergency treatment; 8. Manage the tools and equipment; 9. Supervise the storage of tools, materials, equipment and spare parts; 10. Supervise the maintenance of workshop tools and equipment.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Formulate mechanical maintenance process. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Process and principles of mechanical maintenance. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Management of mechanical equipment workshop; 3.2 Duties and liabilities of equipment workshop manager. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Report writing skills; 4.4 Computer application skills; 4.5 Teamwork skills; 4.6 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The training on mechanical maintenance process is organized according to technical requirements and approved rules/systems.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety 4. Maintenance operation processes and procedures (MOPP); 5. Waste disposal methods;

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	800
DUTY TITLE	OPERATION AND MAINTENANCE OF THE MECHANICAL EQUIPMENT	DUTY NO.	804
TASK TITLE	PREPARATION OF EQUIPMENT TRANSFORMATION, INSTALLATION DEBUGGING AND MAINTENANCE PLAN	TASK NO.	8042
PERFORMANCE CRITERIA	The person performing this task must be able to prepare the equipment transformation, installation, debugging and maintenance plan according to technical specifications and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. A manager's office; 2. Workshop facilities; 3. Tools and equipment; 4. Production and financial facilities; 5. Transportation equipment.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Formulate and implement the record; 4. Assign duties and liabilities for specific personnel; 5. Prepare mechanical equipment transformation plan 6. Prepare the installation and debugging plan of mechanical equipment; 7. Prepare the maintenance plan of mechanical equipment; 8. Organize the activities for achieving goals; 9. Formulate the training requirement for plan preparation.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Prepare equipment transformation, installation debugging and maintenance plan 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Preparation principles for the equipment transformation, installation, debugging and maintenance plan. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Management of the mechanical equipment workshop; 3.2 Duties and liabilities of equipment workshop manager. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Report writing skills; 4.4 Computer application skills; 4.5 Teamwork skills; 4.6 Cost accounting skills. 4.7 Management skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment transformation, installation, debugging and maintenance plan is prepared according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Maintenance operation processes and procedures (MOPP); 5. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	OCCUPATION CODE	800
DUTY TITLE	OPERATION AND MAINTENANCE OF THE MECHANICAL EQUIPMENT	DUTY NO.	804
TASK TITLE	ORGANIZATION AND GUIDANCE OF THE MAJOR OVERHAUL OF MECHANICAL EQUIPMENT	TASK NO.	8043
PERFORMANCE CRITERIA	The person performing this task must be able to organize and guide the major overhaul of mechanical equipment according to technical specifications and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. A manager's office; 2. Workshop facilities; 3. Tools and equipment 4. Production and financial facilities; 5. Transportation equipment;		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working 2. Choose correct tools, equipment and safety protection articles for tasks; 3. Prepare the major overhaul plan of mechanical equipment; 4. Manage the tools and equipment; 5. Supervise the maintenance of workshop tools and equipment; 6. Organize the frontline personnel for plan demonstration; 7. Organize materials, technologies and personnel; 8. Formulate the safe delivery conditions and overhaul precautions of overhaul items; 9. Prepare the major overhaul data; 10. Organize the analysis on equipment damage		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Carry out major overhaul of mechanical equipment. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Major overhaul principles for mechanical equipment; 3.0 Theories The person performing this task must be able to explain the following:	

and degradation.	3.1 Management of the mechanical equipment workshop; 3.2 Duties and liabilities of equipment workshop manager. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Report writing skills; 4.4 Computer application skills; 4.5 Teamwork skills; 4.6 Management skills; 4.7 Cost accounting skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The major overhaul of mechanical equipment is organized and guided according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Maintenance operation processes and procedures (MOPP); 5. Waste disposal methods.

TABLE 1: DACUM CHARTS FOR MECHANICAL EQUIPMENT MAINTENANCE ENGINEER - NTA 8

DUTIES	TASKS	ENABLERS
1.0 Compilation of the mechanical equipment maintenance plan	1.1 Design of the mechanical equipment system debugging and maintenance plan.	General skills and knowledge - Cooperating with others using communication skills and reporting to the superiors - Use of the manufacturer's manual - Interpreting of technical data - Preparation of technical scheme Tools and equipment - Production workshop - Testing equipment and maintenance tools Materials - Laptops - Drawings - Technical documents Requirements for employees - Teamwork spirit, integrity, time management and commitment
	1.2 Preparation of the mechanical equipment maintenance project plan.	
2.0 Training and management of mechanical equipment maintenance personnel	2.1 Management of mechanical equipment maintenance personnel.	General skills and knowledge - Communication skills - Computer application skills - Teamwork skills - Report writing skills - Cost accounting skills - Customer service skills - Drawing reading skills - Safe operation specifications of mechanical equipment - Safety operation of measuring instruments - Occupational health and safety - Maintenance operation strategies and procedures
	2.2 Training of the mechanical equipment maintenance personnel.	
	2.3 Project planning, repair budgeting and writing of engineering report.	

DUTIES	TASKS	ENABLERS
		- Waste treatment and storage method Tools and equipment - Workshop facilities - Production and financial facilities - Transportation equipment - Computers Materials - Training manual - Laptops Requirements for employees - Teamwork and cooperation spirit, time management, integrity and commitment
3.0 Management of the repair and maintenance of mechanical equipment	3.1 Management of the control system maintenance personnel.	General skills and knowledge - Cooperating with others using communication skills and reporting to the superiors - Safety, health and environmental knowledge - Management skills - Decision making skills - Interpersonal skills - Conflict solving skills - Time management skills Tools and equipment - A mechanical equipment workshop - Mechanical equipment - Detection instruments - Equipment maintenance tools Materials - Training manual - Laptops
	3.2 Training of the control system maintenance personnel.	

DUTIES	TASKS	ENABLERS
		Requirements for employees Teamwork and cooperation spirit, time management, integrity and commitment
4.0 Operation and maintenance of mechanical equipment	4.1 Organization of training on mechanical maintenance process.	General skills and knowledge - Cooperating with others using communication skills and reporting to the superiors - Use of the manufacturer's manual - Circumstantial knowledge of mechanical equipment elements - Fault diagnosis skills and knowledge - Basic materials, mechanical dynamics, electrical engineering, control engineering, etc. - Interpreting of technical data - Basic management ability - Cost accounting skills Tools and equipment - Workshop facilities - Safety boots, goggles, gloves, hearing protection device, safety helmet, etc. - Whole set of mechanical equipment maintenance tools - Mechanical equipment maintenance protection device - Fabrication tools, measuring tools and auxiliary tools Materials - Laptops - Programming software, etc. Requirements for employees
	4.2 Preparation of equipment transformation, installation debugging and maintenance plan.	
	4.3 Organization and guidance of the major overhaul of mechanical equipment.	

DUTIES	TASKS	ENABLERS
		• Teamwork spirit, integrity, time management and commitment