NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

APRIL 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHANICAL EQUIPMENT MAINTENANCE ENGINEER

LEVEL: NTA 7

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ABBREVIATIONS

CBET	Competency Based Education and Training
EA	Economic Analysis
HS	Hydraulic System
MOPP	Maintenance Operation Processes 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 STANDARD FOR MECHANICAL EQUIPMENT MAINTENANCE ENGINEER – NTA 7

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	MAINTENANCE OF HYDRAULIC (PNEUMATIC) SYSTEM	**DUTY NO.**	701
TASK TITLE	DIAGNOSIS AND REPAIRING OF COMMON FAULT HYDRAULIC (PNEUMATIC) SYSTEM	**TASK NO.**	7011
PERFORMANCE CRITERIA	The person performing this task must be able to repair the hydraulic (pneumatic) system normatively according to the technical requirements for hydraulic (pneumatic) system maintenance and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Whole set of toolkit; 2. Hydraulic (pneumatic) flow tester 3. Pressure meter; 4. Differential pressure gauge; 5. High Pressure Gauge; 6. Connector set; 7. Hydraulic oil filtering device; 8. Cleaning tools; 9. Multimeter; 10. Workbench; 11. Labor protection articles; 12. First-aid supplies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the required operation tools and materials; 2. Check whether the hydraulic (pneumatic) valve works sensitively and reliably;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

3. Detect whether the fasteners of the hydraulic (pneumatic) system are complete and firm; 4. Detect whether the connectors, pipes, hydraulic (pneumatic) pumps/motors/valves/cylinder and tank are leaked, deformed or damaged; 5. Replace the parts after overhaul; 6. Install the parts according to standards; 7. Conduct completion inspection according to delivery standards; 8. Check the cleaning tools, residual materials and spare parts, and carefully clean the overhaul site.	1.1 Diagnose the common faults of hydraulic (pneumatic) system; 1.2 Analyze the hydraulic (pneumatic) system diagrams; 1.3 Analyze the hydraulic (pneumatic) system logic; 1.4 Analyze the hydraulic (pneumatic) system fault reversely. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Easy diagnosis principles of equipment; 2.2 Equipment diagram analysis principles; 2.3 Analysis principles of equipment workflow logic diagrams; 2.4 Types and principles of hydraulic (pneumatic) elements in high failure rate. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Hydraulic equipment assembly method; 3.2 Daily maintenance system of hydraulic equipment; 3.3 Types and selection method of hydraulic oil; 3.4 Fitter maintenance technology; 3.5 Electrical and electronic technologies; 3.6 Fault code information processing. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Equipment management competence; 4.3 Engineering logic analysis capability; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The workplace safety is maintained and the common faults of equipment are repaired and diagnosed according to technical specifications and occupational safety and health laws/regulations.

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**	700
DUTY TITLE	MAINTENANCE OF HYDRAULIC (PNEUMATIC) SYSTEM	**DUTY NO.**	701
TASK TITLE	DIAGNOSIS AND REPAIRING OF COMMON FAULT HYDRAULIC (PNEUMATIC) SYSTEM	**TASK NO.**	7012
PERFORMANCE CRITERIA	The person performing this task must be able to repair the hydraulic (pneumatic) system normatively according to the technical requirements for hydraulic (pneumatic) system maintenance and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Whole set of toolkit; 2. Hydraulic (pneumatic) flow tester; 3. Pressure meter; 4. Differential pressure gauge; 5. High Pressure Gauge; 6. Connector set; 7. Hydraulic oil filtering device; 8. Cleaning tools; 9. Multimeter; 10. Workbench; 11. Labor protection articles; 12. First-aid supplies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the required operation tools and materials; 2. Check whether the hydraulic (pneumatic) valve works sensitively and reliably; 3. Detect whether the fasteners of the hydraulic (pneumatic) system are complete and firm; 4. Detect whether the connectors, pipes, hydraulic (pneumatic)	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

pumps/motors/valves/cylinder and tank are leaked, deformed or damaged; 5. Obtain the system parameters with pressure gauge, flowmeter or hydraulic measuring instrument; 6. Determine the cause of fault according to fault phenomenon and system parameters; 7. Conduct major overhaul on hydraulic system after disassembly, such as replace the hydraulic cylinder seal ring, repair the hydraulic cylinder/valve, and purify the hydraulic oil; 8. Install the parts according to standards; 9. Conduct completion inspection according to delivery standards; 10. Check the cleaning tools, residual materials and spare parts, and carefully clean the overhaul site.	1.1 Diagnose the common faults of hydraulic (pneumatic) system; 1.2 Analyze the hydraulic (pneumatic) system diagram. 1.3 Analyze the logic of hydraulic (pneumatic) system; 1.4 Analyze the casual relationship of hydraulic (pneumatic) system. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Fault diagnosis principles of equipment; 2.2 Equipment diagram analysis principles; 2.3 Analysis principles of equipment workflow logic diagrams; 2.4 Types and principles of all hydraulic (pneumatic) elements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic hydrostatics and dynamics; 3.2 Hydraulic equipment assembly method; 3.3 Daily maintenance system of hydraulic equipment; 3.4 Types and selection method of hydraulic oil; 3.5 Fitter maintenance technology; 3.6 Electrical and electronic technologies; 3.7 Fault code information processing. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Equipment management competence; 4.3 Engineering logic analysis capability; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Work order filling skills; 4.7 Computer application skills.

DESCRIPTION OF THE END PRODUCT / SERVICE	The workplace safety is maintained and the common faults of equipment are repaired and diagnosed according to technical specifications and occupational safety and health laws/regulations.
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 method.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE OF HYDRAULIC (PNEUMATIC) SYSTEM	**DUTY NO.**	701
TASK TITLE	MAINTENANCE OF THE HYDRAULIC (PNEUMATIC) SYSTEM	**TASK NO.**	7013
PERFORMANCE CRITERIA	The person performing this task must be able to maintain the hydraulic (pneumatic) system according to technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Whole set of toolkit; 2. Hydraulic (pneumatic) flow tester; 3. Pressure meter; 4. Differential pressure gauge; 5. High Pressure Gauge; 6. Connector set; 7. Hydraulic oil filtering device; 8. Cleaning tools; 9. Multimeter; 10. Workbench; 11. Labor protection articles; 12. First-aid supplies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the required operation tools and materials; 2. Strictly implement the system of periodic fastening, cleaning, filtration and replacement; 3. Keep the oil clean; 4. Control the working temperature of oil; 5. Control the system leakage; 6. Prevent vibration and noise; 7. Conduct completion inspection according to delivery standards; 8. Fill in the equipment management archives;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Maintain the hydraulic (pneumatic) system; 1.2 Check the hydraulic (pneumatic) parts of equipment; 1.3 Maintain the equipment elements. **2.0 Principle** The person performing this task must be able to explain the following principles:

9. Check the cleaning tools, residual materials and spare parts, and carefully clean the overhaul site.	2.1 Equipment maintenance system; 2.2 Equipment maintenance methods; 2.3 Principles of equipment elements; 2.4 Working principles of hydraulic (pneumatic) elements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Hydraulic equipment assembly method; 3.2 Daily maintenance system of hydraulic equipment; 3.3 Types and selection method of hydraulic oil; 3.4 Fitter maintenance technology; 3.5 Electrical and electronic technologies; 3.6 Fault code information processing; 3.7 Types and principles of hydraulic (pneumatic) elements. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Equipment management and maintenance competence; 4.3 Engineering logic analysis capability; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Work order filling skills; 4.7 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The workplace safety is maintained according to technical specification and occupational safety and health regulations, and the hydraulic (pneumatic) equipment is repaired and maintained.

CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating tools; 2. Safety operation of measuring and maintaining instruments; 3. Occupational health and safety; 4. Maintenance operation processes and procedures (MOPP); 5. Waste disposal method.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE OF HYDRAULIC (PNEUMATIC) SYSTEM	**DUTY NO.**	701
TASK TITLE	MAINTENANCE OF HYDRAULIC (PNEUMATIC) SYSTEM	**TASK NO.**	7014
PERFORMANCE CRITERIA	The person performing this task must be able to improve the hydraulic (pneumatic) system safely and normatively according to technical (customer's) requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop or design room under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Whole set of toolkit; 2. Hydraulic pump, valves, pipelines, sensors and electric control elements for hydraulic system transformation; 3. Hydraulic flow tester; 4. Pressure meter; 5. Differential pressure gauge; 6. High Pressure Gauge; 7. Connector set; 8. Hydraulic oil filtering device; 9. Hydraulic (pneumatic) valve cleaning tools; 10. Multimeter; 11. Simulation software; 12. Labor protection articles; 13. First-aid supplies.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Master the working process and principle of mechanical system; 2. Analyze the advantages and disadvantages of existing hydraulic system; 3. Confirm the improved system functions; 4. Improve execution units and place sensors; 5. Confirm the model parameters of power parts, valves and pipelines;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

6. Improve the oil (gas) circuit; 7. Design the control part; 8. Conduct virtual reality of system; 9. Transform and install the improved parts; 10. Test the system operation; 11. Analyze the data flow; 12. Test the control circuit; 13. Test the electronic parts; 14. Conduct simulation operation of hydraulic (pneumatic) equipment.	1.1 Plan the transformation steps of hydraulic (pneumatic) system; 1.2 Draw the hydraulic (pneumatic) system diagram; 1.3 Select hydraulic (pneumatic) components; 1.4 Simulate the operation process of hydraulic (pneumatic) system. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Working principles of hydraulic operation control system; 2.2 Engineering design and calculation theories; 2.3 Logic principles of equipment working process; 2.4 Types and principles of hydraulic (pneumatic) elements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic hydrostatics and dynamics; 3.2 Type selection principles of hydraulic (pneumatic) components; 3.3 Hydraulic equipment installing method; 3.4 Types and selection of hydraulic oil; 3.5 Fitter maintenance technology; 3.6 Electrical and electronic technologies. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Equipment selection competence; 4.3 Engineering logic analysis capability; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Order filling skills; 4.7 Computer application skills.

DESCRIPTION OF THE END PRODUCT / SERVICE	Qualified hydraulic (pneumatic) system transformation products (scheme) are provided according to technical specifications and guidelines of occupational safety and hygiene institutions.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe operation of equipment assembly; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Virtual reality (VR) of the system; 5. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	MAINTENANCE AND REPAIRRING OF THE ELECTRICAL CONTROL SYSTEM	**DUTY NO.**	702
TASK TITLE	MANAGEMENT OF SAFETY UTILIZATION OF ELECTRIC POWER	**TASK NO.**	7021
PERFORMANCE CRITERIA	The person performing this task must be able to implement safe electricity management according to national electric safety technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of electrical engineers. The tools and equipment to be used include: 1. General protective tools and instruments: safety belt, safety helmet, googles, filter type gas mask, climbers, lifting board, speed difference controller and insulating ladder; 2. Basic insulating safety tools and instruments: capacitive electroscope, low voltage tester, insulating rod, phase detector, insulating cover, insulating baffle and personal protective ground wire; 3. Auxiliary insulating safety tools and instruments: insulating gloves, boots and rubber mat; 4. Safety sign boards: safety warning signs and equipment nameplates; 5. Security fences; 6. Measuring tools for electrical detection and maintenance: multimeter, insulation meter, clamp meter, electroprobe, screwdriver, flat nose pliers, needle-nose pliers, wire stripper, crimping pliers and electric soldering iron; 7. Sanitary cleaning suppliers.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the health and safety prevention measures; 2. Choose suitable tools, equipment and safety protection articles; 3. Test electricity; 4. Hang the ground wire; 5. Use and manage safety protection articles; 6. Safely operate temporary electricity;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

7. Check the cables and lines; 8. Check the distribution cabinet; 9. Use the handheld electric tools and mobile equipment safely; 10. Use the electric welding equipment safely; 11. Use the lighting lines safely; 12. Check the grounding, neutralizing and lightning protection; 13. Put out the electrical fire; 14. Implement first aid to electric shock.	1.1 Use electricity safely; 1.2 Check the electrical equipment; 1.3 Choose fire-fighting appliance for electrical fire; 1.4 Implement first aid for electric shock. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Grounding, neutralizing and lighting protection principles; 2.2 Fire-fighting principles for electrical fire; 2.3 Cause of electric shock. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Electric safety methods; 3.2 Safe operation methods of electrical equipment; 3.3 Electrical inspection methods; 3.4 Fire-extinguishing methods for electrical fire. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Safety risk control skills; 4.6 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Electricity safety management for workshop equipment is implemented according to electricity safety management and operation procedures as well as the manufacturer's manual

CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety of handheld electric tools; 2. Working regulation of power safety; 3. Safety signs and guideline for the use; 4. Explosion and fire hazards of electrical installation engineering; 5. Safety code of power supply and consumption for construction site; 6. Grounding for AC electrical installations; 7. Occurrence and prevention of electric shock; 8. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	MAINTENANCE AND REPAIRING OF THE ELECTRICAL CONTROL SYSTEM	**DUTY NO.**	702
TASK TITLE	IDENTIFICATION OF ELECTRIC DRAWING READING AND ELECTRICAL APPLIANCE	**TASK NO.**	7022
PERFORMANCE CRITERIA	The person performing this task must be able to read electric drawings and identify electrical appliances according to the technical requirements for electrical control system maintenance and the manufacturer's manual.		
RANGE STATEMENT	The task may be executed in the studio or equipment workshop under the supervision of an Electrical Engineer. The tools and equipment to be used include: 1. Workshop distribution circuit diagram; 2. Lighting circuit diagram; 3. Electric drive circuit diagram of equipment; 4. Distribution electrical device; 5. Lighting circuit device; 6. Electric drive circuit device; 7. Wire and cable; 8. Measuring tools for electrical installation and detection: multimeter, insulation meter, electroprobe, screwdriver, flat nose pliers, needle-nose pliers, wire stripper and wrench.		

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. Refer to the technical manual of equipment; 3. Choose correct drawings, measuring tools, equipment and electric device for tasks; 4. Read the symbols of electric components; 5. Read the electric component diagrams; 6. Disassemble and measure the electric components; 7. Read the workshop distribution circuit	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Disassemble and assemble the electric components; 1.2 Measure the electric components; 1.3 Read the symbols of electric components; 1.4 Read circuit diagrams. **2.0 Principle** The person performing this task must be able to explain the following principles:

diagrams; 8. Read the workshop and equipment lighting circuit diagrams; 9. Read the electric drive circuit diagrams; 10. Read the specification and model of wires and cables.	2.1 Working principles of electric components; 2.2 Working principles of the multimeter. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 International standard knowledge of electric symbols; 3.2 Electric drawing standard and method; 3.3 Structure of electric components and its dismounting and using method. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Safety risk control skills; 4.6 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Electrical drawing recognition, electrical component disassembly and measurement, and wire and cable specification and model recognition for workshop lighting circuits, equipment distribution circuits, equipment control circuits, and wires and cables are conducted according to technical standards and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe use of electrical tools; 2. Standard dismounting of electrical appliance; 3. Safe operation of electrical measuring instruments; 4. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	MAINTENANCE AND REPAIRING OF THE ELECTRICAL CONTROL SYSTEM	**DUTY NO.**	702
TASK TITLE	MAINTENANCE OF MACHINE TOOL LIGHTING, ELECTRIC DRIVE CIRCUIT AND THREE-PHASE ASYNCHRONOUS MOTOR	**TASK NO.**	7023
PERFORMANCE CRITERIA	The person performing this task must be able to maintain and repair the machine tool light, electric drive circuit and three-phase asynchronous motor according to technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of electrical engineers. The equipment and tools to be used include: 1. Machine tool lighting circuit; 2. Electric control cabinet of mechanical equipment; 3. Three-phase asynchronous motor; 4. Measuring tools for electrical installation and detection: multimeter, insulation meter, clamp meter, infrared thermometer, electroprobe, screwdriver, flat-nose pliers, needle-nose pliers, wire stripper, wrench, copper rod and bearing puller; 5. Cleaning products: hair brush and towel; 6. Lubricating oil.		

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. Refer to the technical manual of equipment; 3. Choose correct drawings, measuring tools, equipment and electric device for tasks; 4. Clean the lighting circuit, electric drive circuit and three-phase asynchronous motor of mechanical equipment; 5. Detect the lighting circuit, electric drive circuit and three-phase	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain the following: 1.1 Maintenance of circuit and electric components; 1.2 Maintenance of three-phase asynchronous motor. **2.0 Principle** The person performing this task must be able to explain the following principles:

asynchronous motor of mechanical equipment; 6. Disassemble and assemble the lighting circuit, electric drive circuit and three-phase asynchronous motor of mechanical equipment; 7. Repair the lighting circuit, electric drive circuit and three-phase asynchronous motor of mechanical equipment; 8. Lubricate the three-phase asynchronous motor.	2.1 Electrical maintenance principles of mechanical equipment; 2.2 Functions of lubrication. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Spot check of electrical equipment; 3.2 Installation of electrical equipment; 3.3 Principles and application of electrical instruments; 3.4 Working principles of three-phase asynchronous motor; 3.5 Measurement and dismounting of three-phase asynchronous motor; 3.6 Lubrication of equipment. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Safety risk control skills; 4.6 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The lighting circuit, electric drive circuit and three-phase asynchronous motor of mechanical equipment are maintained according to technical standard and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe use of electrical tools; 2. Standard dismounting of electrical appliance; 3. Safe operation of electrical measuring instruments; 4. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	REPAIR AND OVERHAUL EQUIPMENT	**DUTY NO.**	703
TASK TITLE	REPAIR COMPLICATED AND PRECISION EQUIPMENT	**TASK NO.**	7031
PERFORMANCE CRITERIA	The person performing this task must be able to repair complicated/precision equipment according to technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment maintenance workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Whole set of universal mechanical maintenance tools, such as sleeve, inner hexagon wrench, box-end wrench, file and screwdriver; 2. Whole set of universal electrical maintenance tools, such as multimeter, wire stripper, crimping pliers and electric welding iron; 3. Special equipment maintenance tools; 4. Equipment detection instruments, such as level gauge, dial gauge, leveling ruler and square ruler; 5. PPE, such as safety boots, googles and gloves; 6. Sanitary cleaning suppliers. 7. Testing power supply.		

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. Refer to the technical manual of equipment; 3. Diagnosis equipment fault; 4. Formulate maintenance plan; 5. Choose suitable tools, equipment and safety protection articles; 6. Repair electrical fault of equipment; 7. Repair mechanical fault of equipment; 8. Repair pneumatic/hydraulic fault of equipment; 9. Test equipment operation; 10. Clean the tools, equipment and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Repair the equipment fault; 1.2 Detect the mechanical functions of equipment; 1.3 Diagnose the functional fault of equipment. **2.0 Principle** The person performing this task must be able to explain the following principles:

workplace; 11. Arrange and store the tools and equipment.	2.1 Equipment fault diagnosis principles; 2.2 Equipment fault repair principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Mechanical structure composition of equipment; 3.2 Electric control theory of equipment; 3.3 Functional operation of equipment. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Management skills; 4.6 Safety risk control skills; 4.7 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment is repaired according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Functional debugging knowledge of equipment; 2. Maintenance specification; 3. Maintenance knowledge; 4. Occupational health and safety; 5. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	REPAIRING AND OVERHAUL OF EQUIPMENT	**DUTY NO.**	703
TASK TITLE	MAJOR OVERHAUL OF UNIVERSAL EQUIPMENT	**TASK NO.**	7032
PERFORMANCE CRITERIA	The person performing this task must able to maintain the workplace safety according to technical requirements and the occupational quality and safety specification.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Whole set of universal mechanical maintenance tools (monkey wrench, dull-head wrench, sleeve and file; 2. Electrical maintenance tools (multimeter, screwdriver, wire stripper and crimping pliers); 3. Dial gauge, square ruler, leveling ruler, level gauge, magnetic meter base and testing rod; 4. Laser interferometer, double ball bar, vibration meter and noise decibel meter; 5. Oilstone, red lead powder, scraper, angle grinder, electric hand drill, twist drill and grinding disc; 6. Sanitary cleaning suppliers; 7. PPE, such as safety boots, googles, safety helmet and protective gloves; 8. Workbench.		

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. Refer to the technical manual of equipment; 3. Diagnosis equipment fault; 4. Formulate the equipment overhaul plan; 5. Choose suitable tools, equipment and safety protection articles; 6. Perform major overhaul task;	**Detailed knowledge about:** 1.0 Methods The person performing this task must be able to explain how to: 1.1 Repair the functional parts of mechanical equipment; 1.2 Conduct fault diagnosis and analysis on the mechanical equipment; 1.3 Replace the parts of mechanical equipment.

7. Perform equipment function/performance test; 8. Clean the tools, equipment and workplace; 9. Arrange and store the tools and equipment.	2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Working principles of mechanical equipment; 2.2 Mechanical equipment diagram analysis principles; 2.3 System control principles of mechanical equipment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 System components of mechanical equipment and its functional principles; 3.2 Functional repair and debugging principles of mechanical equipment; 3.3 Operation status principles of mechanical equipment. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Management skills; 4.6 Safety risk control skills; 4.7 Maintenance plan formulation skills; 4.8 Data collection skills; 4.9 Innovation ability.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment is repaired according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Maintenance operation specifications; 2. Maintenance knowledge; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION AND DESIGN OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	704
TASK TITLE	PREPARATION OF MECHANICAL EQUIPMENT TRANSFORMATION PLAN	**Task No.**	7041
PERFORMANCE CRITERIA	The person performing this task must be able to prepare the mechanical equipment transformation plan according to the technical requirements.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of senior technicians or mechanical equipment maintenance engineers. The data and equipment to be used include: 1. Computers; 2. Operation instruction of mechanical equipment; 3. Schematic diagram of mechanical equipment; 4. Electric diagram of mechanical equipment; 5. Electric diagram of mechanical equipment; 6. Maintenance record of mechanical equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose correct tools and equipment for tasks; 2. Test the electrical functions of mechanical equipment; 3. Test the structure functions of mechanical equipment; 4. Test the electric operation performance of mechanical equipment; 5. Test the structure operation performance of mechanical equipment; 6. Analyze the technical feasibility of mechanical equipment transformation; 7. Analyze the transformation economy of mechanical equipment; 8. Prepare mechanical equipment transformation plan.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Transform the equipment functions; 1.2 Transform the equipment functions; 1.3 Analyze the transformation economy of mechanical equipment. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Functions of mechanical equipment; 2.2 Performance parameters of mechanical equipment; 2.3 Economic analysis principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Production technology (PT) transformation theories; 3.2 Transformation theory of mechanical equipment; **4.0 Essential Skills** 4.1 Communication skills; 4.2 Economic analysis skills; 4.3 Cooperation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The comprehensive efficiency of equipment is improved and the mean time between failures is reduced through the mechanical equipment transformation plan.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance record of mechanical equipment; 2. Questionnaire on using demand of mechanical equipment; 3. Operation instruction of mechanical equipment; 4. Schematic diagram of mechanical equipment; 5. Economic analysis (EA) on mechanical equipment transformation; 6. Occupational health and safety; 7. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION AND DESIGN OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	704
TASK TITLE	PREPARATION OF TECHNICAL DOCUMENT OF THE MECHANICAL EQUIPMENT TRANSFORMATION	**TASK NO.**	7042
PERFORMANCE CRITERIA	The person performing this task must be able to prepare the mechanical equipment transformation plan according to the technical requirements.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of senior technicians or mechanical equipment maintenance engineers. The data and equipment to be used include: 1. Computers; 2. Printers; 3. Operation instruction of mechanical equipment; 4. Schematic diagram of mechanical equipment; 5. Electric diagram of mechanical equipment; 6. Electric diagram of mechanical equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the work flow chart of mechanical equipment transformation; 2. Prepare the operation instruction of mechanical equipment transformation; 3. Prepare the electrical instruction of mechanical equipment transformation; 4. Prepare the mechanical instruction of mechanical equipment transformation; 5. Prepare the maintenance instruction of mechanical equipment; 6. Draw the schematic diagram of mechanical equipment transformation with computer-aided drawing software; 7. Draw the component diagram of mechanical equipment transformation with computer-aided drawing software; 8. Draw the assembly diagram of mechanical equipment transformation	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 TRANSFORMATION OF THE MECHANICAL EQUIPMENT; 1.2 Draw the technical drawings; 1.3 Use the computer-aided drawing software. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Structure transformation principles; 2.2 Mechanical power transformation principles; 2.3 Computer-aided drawing steps. **3.0 Theories** The person performing this task must be able to

with computer-aided drawing software; 9. Draw the electrical diagram of mechanical equipment transformation with computer-aided drawing software; 10. Formulate the mechanical equipment transformation application form with computer-aided drawing software.	explain the following: 3.1 Mechanical design theory; 3.2 Interchangeability design theory; 3.3 Measuring technology theory of mechanical equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer operation skills; 4.3 Problem-solving ability.
DESCRIPTION OF THE END PRODUCT / SERVICE	A complete technical documents of mechanical equipment transformation is prepared according to technical requirements
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Use of computer-aided drawing software; 2. Mechanical equipment transformation process; 3. Drawing specifications for part drawings; 4. Drawing specifications for assembly drawings; 5. Drawing specifications for electrical drawings.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORM AND SELECT THE MECHANICAL EQUIPMENT	**DUTY NO.**	705
TASK TITLE	SELECT TYPE OF MECHANICAL EQUIPMENT TRANSFORMATION DEVICES	**TASK NO.**	7051
PERFORMANCE CRITERIA	The person performing this task must be able to select mechanical equipment transformation devices according to the technical standard for type section, and determine the equipment/devices to be transformed.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of senior technicians or mechanical equipment maintenance engineers. The tools and data to be used include: 1. Schematic diagram of mechanical equipment; 2. Electric diagram of mechanical equipment; 3. Installation drawings of mechanical equipment; 4. Testing report of mechanical equipment; 5. Detection tools of mechanical equipment/devices; 6. Drawings of mechanical equipment transformation devices 7. Manual of mechanical equipment transformation devices		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, equipment and safety protection articles; 2. Select the transforming components according to technical document of mechanical equipment transformation; 3. Check whether there are hazards affecting the personnel and equipment safety; 4. Check whether the working environment and conditions should be improved; 5. Checking whether it complies with the requirements of environmental protection; 6. Check whether to meet the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the precision of mechanical equipment; 1.2 Judge the reliability and defects of equipment. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Transformation standard of mechanical equipment. **3.0 Theories** The person performing this task must be able to explain the following:

requirements of energy conservation, consumption reduction and efficiency improvement; 7. Clean the tools, equipment and workplace; 8. Store the tools;	3.1 Processing theories of mechanical equipment; 3.2 Processing precision degradation principles of mechanical equipment; 3.3 Demand principles for mechanical equipment transformation. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Team management skills; 4.4 Data collection skills; 4.5 Report writing skills; 4.6 Computer application skills; 4.7 Equipment maintenance skills; 4.8 Customer service skills; 4.9 Management skills; 4.10 Entrepreneurship capability. 4.11 Plan formulation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The transformation devices of mechanical equipment are selected according to precision detection result and mechanical equipment transformation standard, and the devices are obtained through purchasing or processing.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Preventive measures for mechanical equipment defects.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION AND SELECTION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	705
TASK TITLE	ACCEPTANCE OF MECHANICAL EQUIPMENT TRANSFORMATION DEVICES	**TASK NO.**	7052
PERFORMANCE CRITERIA	The person performing this task must be able to accept mechanical equipment transformation devices according to the technical standard for acceptance, and determine whether the equipment/devices transformed conform to the requirements.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of senior technicians or mechanical equipment maintenance engineers. The tools and data to be used include: 1. Schematic diagram of mechanical equipment; 2. Electric diagram of mechanical equipment; 3. Schematic diagram of mechanical equipment; 4. Testing report of mechanical equipment; 5. Micrometer; 6. Depth meter; 7. Magnetic gauge stand; 8. Torque wrench; 9. Caliper.		

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. Accept the purchased/processed mechanical equipment transforming devices and judge whether they meet the transformation requirements; 3. Check whether there are hazards affecting the personnel and equipment safety; 4. Check whether to improve the working environment and conditions; 5. Check whether it complies with the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the shape, appearance, size and functions of mechanical equipment transforming devices; 1.2 Accept the accessories for mechanical equipment transformation. **2.0 Principle** The person performing this task must be able to explain the following principles:

requirements of environmental protection; 6. Check whether to meet the requirements of energy conservation, consumption reduction and efficiency improvement; 7. Clean the tools, equipment and workplace; 8. Store the tools;.	2.1 Acceptance standards for mechanical equipment transformation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Processing theories of mechanical equipment; 3.2 Processing precision degradation theories of mechanical equipment; 3.3 Purpose theory of mechanical equipment transforming devices. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Team management skills; 4.4 Data collection skills; 4.5 Report writing skills; 4.6 Computer application skills; 4.7 Customer service skills; 4.8 Management skills; 4.9 Plan formulation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The purchased/processed mechanical equipment transforming devices are detected and accepted to determine whether the mechanical equipment transformation requirements are met.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of the production equipment; 2. Safety operation of measuring instruments; 3. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	706
TASK TITLE	DECOMPOSITION OF THE MECHANICAL EQUIPMENT TRANSFORMATION INTO MODULES	**TASK NO.**	7061
PERFORMANCE CRITERIA	The person performing this task must be able to complete modular decomposition of the mechanical equipment transformation according to technical requirements, the manufacturer's manual and safety regulations.		
RANGE STATEMENT	The modular decomposition of mechanical equipment transformation may be completed under the review of mechanical engineers. The tools and equipment to be used include: 1. Mechanical equipment transformation plan; 2. Technical document of the mechanical equipment transformation; 3. Design drawing of mechanical equipment transformation; 4. Computer and office printing equipment; 5. PPE: safety boots, goggles and gloves; 6. Sanitary cleaning supplies.		

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. Refer to the technical manual of equipment; 3. Study the mechanical equipment transformation plan; 4. Study the technical documents of mechanical equipment transformation; 5. Analyze the design drawing of equipment transformation; 6. Choose correct tools, equipment and safety protection articles for tasks; 7. Determine the transformation content; 8. Complete modular decomposition of transformation and form written technical data;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse the technical field of transformation; 1.2 Complete technical classification of transformation. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Working principles of equipment; 2.2 Equipment transformation content and technical field. **3.0 Theories** The person performing this task must be able to

9. Clean the tools, equipment and workplace; 10. Arrange and store the tools and equipment.	explain the following: 3.1 System components of the equipment and its functions; 3.2 Technical indexes of equipment transformation modules. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Management skills; 4.6 Safety risk control skills; 4.7 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Modular decomposition of mechanical equipment transformation is completed according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Office software application; 2. Project management process and system; 3. Workload estimation of mechanical equipment transformation project; 4. Occupational health and safety; 5. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	706
TASK TITLE	DECOMPOSITION OF THE MECHANICAL EQUIPMENT TRANSFORMATION INTO MODULES	**TASK NO.**	7061
PERFORMANCE CRITERIA	The person performing this task must be able to complete modular decomposition of the mechanical equipment transformation according to technical requirements, the manufacturer's manual and safety regulations.		
RANGE STATEMENT	The modular decomposition of mechanical equipment transformation may be completed under the review of mechanical engineers. The tools and equipment to be used include: 1. Mechanical equipment transformation plan; 2. Technical document of the mechanical equipment transformation; 3. Design drawing of mechanical equipment transformation; 4. Computer and office printing equipment; 5. PPE: safety boots, goggles and gloves; 6. Sanitary cleaning supplies.		

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. Refer to the technical manual of equipment; 3. Study the mechanical equipment transformation plan; 4. Study the technical documents of mechanical equipment transformation; 5. Analyze the design drawing of equipment transformation; 6. Choose correct tools, equipment and safety protection articles for tasks; 7. Determine the transformation content;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyze the technical field of transformation; 1.2 Complete technical classification of transformation. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Working principles of equipment; 2.2 Equipment transformation content and technical field. **3.0 Theories** The person performing this task must be able to explain

8. Complete modular decomposition of transformation and form written technical data; 9. Clean the tools, equipment and workplace; 10. Arrange and store the tools and equipment.	the following: 3.1 System components of the equipment and its functions; 3.2 Technical indexes of equipment transformation modules. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Management skills; 4.6 Safety risk control skills; 4.7 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Modular decomposition of mechanical equipment transformation is completed according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Office software application; 2. Project management process and system; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	706
TASK TITLE	PREPARATION OF THE IMPLEMENTATION AND PROMOTION PLAN OF MECHANICAL EQUIPMENT TRANSFORMATION	**TASK NO.**	7062
PERFORMANCE CRITERIA	The person performing this task must be able to compile the implementation and promotion plan for the mechanical equipment transformation according to technical requirements, the manufacturer's manual and safety regulations.		
RANGE STATEMENT	The task can be performed in the seminar room under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Equipment technical data; 2. Mechanical equipment transformation plan; 3. Technical document of the mechanical equipment transformation; 4. Design drawing of mechanical equipment transformation; 5. Computer and office printing equipment; 6. PPE: safety boots, goggles and gloves; 7. Sanitary cleaning supplies.		

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. Study the mechanical equipment transformation plan; 3. Study the technical documents of mechanical equipment transformation; 4. Formulate the equipment transformation schedule; 5. Choose correct tools, equipment and safety protection articles for tasks; 6. Prepare the implementation and promotion plan of mechanical equipment transformation; 7. Clean the tools, equipment and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare the implementation plan of mechanical equipment transformation; 1.2 Formulate the promotion plan of mechanical equipment transformation. **2.0 Principle** The person performing this task must be able to explain the following principles:

workplace; 8. Arrange and store the tools and equipment.	2.1 Working principles of the equipment; 2.2 Technical specifications for mechanical equipment transformation; 2.3 Management process of enterprise mechanical equipment transformation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 System components of the equipment and its functions; 3.2 Functional indexes of equipment transformation; 3.3 Management process of enterprise mechanical equipment transformation. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Teamwork skills; 4.3 Customer service skills; 4.4 Communication skills; 4.5 Management skills; 4.6 Safety risk control skills; 4.7 Plan formulation skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The implementation and promotion plan of mechanical equipment transformation is prepared according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Office software application; 2. Project management process and system; 3. Workload estimation of mechanical equipment transformation project; 4. Tools and methods of project quality control; 5. Project safety management; 6. Occupational health and safety;

	7. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	706
TASK TITLE	IMPLEMENTATION OF THE TRANSFORMATION PROJECT	**TASK NO.**	7063
PERFORMANCE CRITERIA	The person performing this task must be able to complete the mechanical equipment transformation according to technical requirements, the manufacturer's manual and safety regulations.		
RANGE STATEMENT	The task can be performed in the equipment maintenance workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Whole set of universal mechanical installation tools: sleeve, inner hexagon wrench, box-end wrench, file and screwdriver; 2. Whole set of universal electrical installation tools: multimeter, wire stripper, crimping pliers and electric welding iron; 3. Special equipment installation tools; 4. Equipment detection instruments: leveling gauge, dial gauge, leveling ruler and square ruler; 5. PPE: safety boots, goggles and gloves; 6. Sanitary cleaning supplies. 7. Testing power supply.		

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. Read the implementation and promotion plan of mechanical equipment transformation; 3. Read the technical drawings and documents of mechanical equipment transformation project; 4. Formulate the work plan of mechanical equipment transformation project; 5. Choose correct tools, equipment and safety protection articles for tasks; 6. Transform the mechanical part of equipment according to technology and plan requirements; 7. Transform the electrical part of equipment	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read the technical drawings and documents of mechanical equipment transformation project; 1.2 Formulate implementation and promotion plan of mechanical equipment transformation; 1.3 IMPLEMENTATION OF THE TRANSFORMATION PROJECT. **2.0 Principle** The person performing this task must be able

according to technology and plan requirements; 8. Transform the hydraulic/pneumatic part of equipment according to technology and plan requirements; 9. Clean the tools, equipment and workplace; 10. Arrange and store the tools and equipment.	to explain the following principles: 2.1 Working principles of equipment; 2.2 Principles for mechanical equipment transformation project. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Modular structure and functions of transformation project; 3.2 Modular installation technology and process of transformation project; 3.3 Technical requirements and detection method of transformation project. **4.0 Essential Skills** 4.1 Basic operation skills of equipment; 4.2 Report writing skills; 4.3 Teamwork skills; 4.4 Customer service skills; 4.5 Communication skills; 4.6 Management skills; 4.7 Safety risk control skills; 4.8 Data collection skills; 4.9 Learning skills; 4.10 Creation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The transformation project is implemented according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Reading of mechanical assembly drawing; 2. Reading of electrical installation drawing; 3. Reading of technical drawing and documents of transformation project; 4. Reading of the implementation and promotion plan of mechanical equipment transformation; 5. Formulation of the work plan of

	transformation project; 6. Lifting operation safety; 7. Mechanical assembly process; 8. Electrical installation process; 9. Correct selection of mechanical installation tools; 10. Correct selection of electrical installation tools; 11. Correct selection of special equipment installation tools; 12. Occupational health and safety; 13. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	700
DUTY TITLE	TRANSFORMATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	706
TASK TITLE	DEBUGGING OF AFTER MECHANICAL EQUIPMENT TRANSFORMATION	**TASK NO.**	7064
PERFORMANCE CRITERIA	The person performing this task must be able to debug after mechanical equipment transformation according to technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the equipment maintenance workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Whole set of universal mechanical installation tools: sleeve, inner hexagon wrench, box-end wrench, file and screwdriver; 2. Whole set of universal electrical installation tools: multimeter, wire stripper, crimping pliers and electric welding iron; 3. Equipment detection instruments: leveling gauge, dial gauge, leveling ruler and square ruler; 4. PPE: safety boots, goggles and gloves; 5. Sanitary cleaning supplies. 6. Testing power supply.		

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. Refer to the technical manual of equipment; 3. Look up the technical drawings and documents of mechanical equipment transformation project; 4. Choose correct tools, equipment and safety protection articles for tasks; 5. Detect the equipment functions; 6. Determine whether the equipment is normal or not; 7. Adjust and remove the abnormality of equipment; 8. Perform equipment operation test and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the equipment functions; 1.2 Adjust and remove the abnormality of equipment; 1.3 Perform the equipment operation test. **2.0 Principle** The person performing this task must be able to explain the following principles:

debugging; 9. Prepare the equipment debugging report; 10. Clean the tools, equipment and workplace; 11. Arrange and store the tools and equipment; 12. Conduct functional debugging of mechanical structure; 13. Conduct functional debugging of electrical system; 14. Conduct functional debugging of hydraulic/pneumatic system; 15. Conduct joint debugging of electromechanical functions.	2.1 Working principles of equipment; 2.2 Principles for the equipment transformation project; 2.3 Performance indexes after equipment transformation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 System components of the equipment and its functions; 3.2 Technical requirements and detection method of transformation project; 3.3 Functional debugging method of equipment. **4.0 Essential Skills** 4.1 Basic operation skills of equipment; 4.2 Report writing skills; 4.3 Teamwork skills; 4.4 Customer service skills; 4.5 Communication skills; 4.6 Management skills; 4.7 Safety risk control skills; 4.8 Plan formulation skills; 4.9 Data collection skills; 4.10 Learning skills; 4.11 Innovation ability.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment is commissioned after transformation according to technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Correct selection of detection/measuring tools; 2. Reading and analysis of measured data; 3. Equipment debugging report; 4. Occupational health and safety; 5. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	STANDARD OPERATION AND MAINTENANCE OF MECHANICAL EQUIPMENT	**DUTY NO.**	707
TASK TITLE	COMPLIANCE WITH SAFE OPERATION SPECIFICATIONS OF MECHANICAL EQUIPMENT	**TASK NO.**	7071
PERFORMANCE CRITERIA	The person performing this task must guarantee the safety of working environment and operation according to the operation specifications of the mechanical equipment.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Storage place of tools and waste materials; 2. Dressing room; 3. Cleaning room; 4. Location of power source; 5. Fire-fighting facilities and fire alarm; 6. PPE, such as safety helmet, boots, googles and gloves; 7. Protection articles for mechanical equipment; 8. Sanitary cleaning supplies; 9. Safety monitoring camera; 10. First-aid medical box; 11. Remarkable warning signs; 12. Operations specifications of mechanical equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Establish the occupational safety hazard ledger; 2. Formulate the process for handling hazardous substances and events; 3. Carry out emergency and fire drills; 4. Show the staff how to use PPE,; 5. Monitor the safety operation of	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

positions; 6. Observe the preventive measures for health and safety during working; 7. Choose suitable tools, equipment and safety protection articles; 8. Strictly abide by the safety operation specification and correctly use the mechanical equipment; 9. Judge the operation safety hazards of mechanical equipment; 10. Have the independent ability in fault analysis, handling and recovery of mechanical equipment; 11. Test the working conditions of mechanical equipment; 12. Collect the materials and tools; 13. Clean the tools, equipment and workplace.	1.1 Establish the occupational safety hazard ledger; 1.2 Formulate the process for handling hazardous substances and events; 1.3 Carry out emergency and fire drills; 1.4 Supervise the implementation of occupational health and safety laws and regulations; 1.5 Use PPE; 1.6 Operate the mechanical equipment safely and normatively; 1.7 Perform workshop 7S management (arrange and rectify the quality of cleaning, safety and saving); 1.8 Analyze and handle the faults of mechanical equipment. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Fire extinguishing; 2.2 Safety operation system of machinery and equipment; 2.3 Emergency disposal. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Safety hazard type and cause of workplace; 3.2 Handling measures for different hazards; 3.3 Safety awareness for establishing workplace; 3.4 Safety symbols and signs; 3.5 Different waste and pollutants and treatment measures; 3.6 Standard safety operation steps; 3.7 Standard wearing during working; 3.8 Preparation for good working environment.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Management skills; 4.3 Equipment operation skills; 4.4 Equipment fault removal skills; 4.5 Safety hazard removal skills; 4.6 Teamwork skills; 4.7 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The workplace safety is maintained according to technical specifications for mechanical equipment operation and occupational safety regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of the production equipment; 2. Safety operation of measuring instruments; 3. Correct application of protective articles; 4. Occupational health and safety 5. Removal of mechanical equipment faults; 6. Waste material disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	STANDARD OPERATION AND MAINTENANCE OF MECHANICAL EQUIPMENT	**DUTY NO.**	707
TASK TITLE	DEBUGGING AND MAINTENANCE OF THE CONTROL SYSTEM OF MECHANICAL EQUIPMENT	**TASK NO.**	7072
PERFORMANCE CRITERIA	The person performing this task must able to debug and maintain the control system according to technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the mechanical equipment workshop under the supervision of mechanical engineers. The tools and equipment to be used include: 1. Digital multimeter; 2. PLC programmer; 3. Common fitter's tools; 4. Oscilloscope; 5. Logic testing pen; 6. Pulse signal pen; 7. Integrated circuit tester; 8. Short-circuit tracker of cleaning machine; 9. Logical analyzer; 10. Power source; 11. PPE, such as safety boots, googles and gloves; 12. Air compressor; 13. Oil/coolant collection unit; 14. Protection articles for mechanical equipment; 15. Sanitary cleaning suppliers.		

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 suitable tools, equipment and safety protection articles;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

3. Conduct internal/external data backup of numerical control system; 4. Set numerical control system parameters, and handle alarm, fault analysis, treatment and recovery; 5. Conduct parameter configuration of numerical control system driver; 6. Conduct PLC program debugging of numerical control system; 7. Set the electronic gear ratio and axle speed parameters of the numerical control system; 8. Conduct reference point setting and precision error compensation of NC machine tool; 9. Test the working conditions of mechanical equipment; 10. Arrange and store the tools and equipment; 11. Clean the tools, equipment and workplace.	1.1 Identify different components of numerical control system; 1.2 Interpret the codes. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Operating principles of slack action control. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Control system components of mechanical equipment and its functional principles; 3.2 Fault analysis of control system; 3.3 PLC application program; 3.4 Parameter setting of numerical control system; 3.5 Removal of control system. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Entrepreneurial skills; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Report writing skills; 4.7 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The maintenance plan for mechanical equipment control system is formulated 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**	
DUTY TITLE	PREPARATION OF THE MECHANICAL EQUIPMENT MAINTENANCE PLAN	**DUTY NO.**	707
TASK TITLE	PREPARATION OF THE MAINTENANCE PLAN FOR EXECUTION UNIT OF MECHANICAL EQUIPMENT	**TASK NO.**	7073
PERFORMANCE CRITERIA	The person performing this task must be able to diagnose, repair and maintain the engineering machinery host, general assembly and major components/accessories with detection instruments, overhaul tools and diagnosis equipment.		
RANGE STATEMENT	The task can be performed in the mechanical equipment maintenance workshop under the supervision of mechanical equipment maintenance engineers. The tools and equipment to be used include: 1. Whole set of mechanical maintenance tools; 2. Lifter; 3. Fault diagnosis testers; 4. Power source; 5. Fuel injection pump testers; 6. Cleaning machines; 7. PPE, such as safety boots, googles, safety helmet, protective gloves and insulating gloves; 8. Tester of gasoline/diesel engine nozzle; 9. General tools: monkey wrench, dull-head wrench, box-end wrench, socket wrench, pliers and screwdriver; 10. Bench-work tools: platform, bench clamp, saw, file, drill and grinder; 11. Professional tools: air compressor, electric welding machine, gas cutting/welding machine, etc. 12. Measuring tools: caliper, micrometer, dial gauge, height/depth gauge, angle ruler, speedometer, thermometer and pressure gauge.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Establish the mechanical equipment maintenance ledger;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

2. Formulate and implement the periodic maintenance and repair plan for mechanical equipment; 3. Report the effect and equipment status timely on the implemented maintenance content; 4. Show the staff how to use PPE,; 5. Prepare a unsafe incident list every day; 6. Evaluate the mechanical maintenance, formulate the maintenance plan and establish the emergency repair system; 7. Identify the pollutants in workplace; 8. Provide technical support for the repair, maintenance and fault diagnosis of mechanical equipment during production; 9. Collect and analyze the fault information of major process equipment and implement special improvement; 10. Guide the mechanical equipment operators for correct maintenance; 11. Provide technical training and support for all mechanical maintenance technicians; 12. Timely summarize the spare parts information of mechanical maintenance activity for relevant personnel, so as to adjust and control the using conditions of spare parts timely.	1.1 Implement mechanical diagnosis; 1.2 Conduct emergency drills; 1.3 Perform workshop 7S management (arrange and rectify the quality of cleaning, safety and saving). **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Mechanical diagnosis; 2.2 Repairing of the mechanical execution parts. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Mechanical fault diagnosis; 3.2 Classification of mechanical faults; 3.3 Safety symbols and signs; 3.4 Preparation for good working environment. **4.0 Essential Skills** 4. 1 Communication skills; 4. 2 Management skills; 4. 3 Engineering mathematics skills; 4. 4 Customer service skills; 4. 5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The workplace safety is maintained according to technical specifications and occupational safety and health regulations.
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 7

DUTIES	TASKS	ENABLERS
1.0 Maintenance of the hydraulic/pneumatic system	1.1 Diagnosis and repairing of common fault hydraulic (pneumatic) system. 1.2 Diagnosis and repairing of difficult fault hydraulic (pneumatic) system. 1.3 Maintenance of the hydraulic (pneumatic) system. 1.4 Transformation of the hydraulic (pneumatic) system.	**General skills and knowledge** · Cooperating with others through communication skills, reporting to the superior leaders and linking with the upstream manufacturers · Use of the mechanical equipment safety manual · Workshop safety regulations and mechanical equipment safety operation knowledge · Correct application of protective articles · Understanding of technical drawings · Occupational health and safety · Drawing compilation · Data sorting **Tools and equipment** · PPE, such as safety boots, googles and gloves · Fire safety equipment · Fire alarm · Supporting tools of toolkit · Protection/mechanical/fire-fighting/sanitation tools **Materials** · Cleaning supplies · Lubricating oil **Requirements for employees** · Teamwork spirit · Safety · Integrity · Time management and commitment
2.0 Maintenance and repairing of the	2.1 Management of electricity safety.	**General skills and knowledge**

electrical control system	2.2 Identificaiton of electric drawing reading and electrical appliance. 2.3 Maintenance of machine tool lighting, electric drive circuit and three-phase asynchronous motor	· Cooperating with others using communication skills and reporting to the superiors · Use of the manufacturer's technical manual · Circuit diagram reading · Identification, dismounting and measurement of electrical components · Electrical safety · Electrical equipment maintenance · Lubrication of electrical equipment mechanism and three-phase asynchronous motor **Tools and equipment** · Multimeter, insulation meter, clamp meter, infrared thermometer, electroprobe, screwdriver, flat-nose pliers, needle-nose pliers, wire stripper, and wrench; · Distribution/lighting/power drive circuit diagram and electrical system · Three-phase asynchronous motor · Labor protection articles **Materials** · Cleaning supplies · Lubricating oil · Wires and cables **Requirements for employees** · Teamwork spirit · Integrity · Dedication · Profession · Time management and commitment

3.0 Repairing and maintenance of equipment	3.1 Repairing of complicated/precision equipment.	**General skills and knowledge** · Learning skills · Teamwork skills · Management skills · Communication skills · Customer service skills · Data collection skills · Entrepreneurial skills · Computer operation skills · Report writing skills · Plan formulation skills **Tools and equipment** · Determining tools and equipment according to the actual situation of maintenance equipment **Materials** · Determining materials according to the actual situation of maintenance equipment **Requirements for employees** · Teamwork spirit · Striving for excellence · Professional ethics. · Studying assiduously · Whole heartedness
	3.2 Overhaul of universal equipment.	
4.0 Design of the mechanical equipment transformation	4.1 Preparation of the mechanical equipment transformation plan.	**General skills and knowledge**

	4.2 Preparation of technical document of the mechanical equipment transformation.	· Cooperating with others using communication skills and reporting to the superiors · Use of the manufacturer's manual · Skills and knowledge related to workshop safety rules · Machine elements · Understanding of technical drawings · Occupational health and safety **Tools and equipment** · PPE, such as safety boots, googles and gloves · Fire safety equipment · Fire alarm · Supporting tools of toolkit **Materials** · Drinking water · Gaging mandrel · Printing paper **Requirements for employees** · Teamwork spirit · Integrity · Time management and commitment
5.0 Selection of type for mechanical equipment transformation	5.1 Selection of type for components of mechanical equipment transformation.	**General skills and knowledge** · Cooperating with others using communication skills and reporting to the superiors

	5.2 Acceptance of mechanical equipment transforming components.	· Use of the equipment instruction · Reading of the equipment structural diagram · Use of the equipment acceptance standard · Equipment maintenance knowledge · Writing of the equipment transformation plan · Explaining of the type selection and acceptance basis of mechanical equipment transforming devices · Checking of the appearance and size of mechanical equipment/devices · Testing of the performance of mechanical equipment/devices **Tools and equipment** · Special detection tools of mechanical equipment · Bearing thermometer · Vibroscope · Mechanical equipment installation tools · Multimeter · Caliper **Materials** · Copper sheet · Marking pen · Workpiece cleaner · Clean rag **Requirements for employees** · Honesty and integrity · Teamwork spirit · Time management · Compliance with regulations

6.0 Implementation of mechanical equipment transformation	6.1 Decomposition of the mechanical equipment transformation into modules.	**General skills and knowledge** · Cooperating with others using communication skills and reporting to the superiors · Use of the mechanical equipment safety manual · Workshop safety regulations and mechanical equipment safety operation knowledge · Use of the manufacturer's technical manual · Correct application of protective
	6.2 Preparation of the implementation and promotion plan of mechanical equipment transformation.	
	6.3 Implementation of the transformation project.	

	6.4 Debugging after mechanical equipment transformation.	articles · Understanding of technical drawings · Selection of standard parts · Selection of electrical elements · Occupational health and safety **Tools and equipment** · PPE, such as safety boots, googles and gloves · Fire safety equipment · Computer and office printing equipment · Whole set of universal mechanical installation tools · Whole set of universal eletrical installation tools · Equipment detection/measuring tools such as level gauge, dial gauge, flat ruler and square ruler **Materials** · Lubrication materials such as lubricating oil and grease · Cleaning materials such as kerosene and diesel oil · Cleaning articles such as rag, towel and mop · Office supplies such as printing paper, folder and bookbinding machine **Requirements for employees** · Teamwork spirit · Integrity · Dedication · Time management and commitment

7.0 Standard operation and maintenance of mechanical equipment	7.1 Compliance with safe operation specifications of mechanical equipment.	**General skills and knowledge** · Cooperating with others using communication skills and reporting to the superiors · Use of the manufacturer's manual · Mechanical diagnosis skills and knowledge · Machine elements · Understanding of technical drawings · Basic electricity **Tools and equipment** · PPE, (such as safety boots, googles, gloves, hearing protection device and safety helmet) · Whole set of auto toolkit · Special measuring tools **Materials** · Electronic control devices · Sensors and actuators **Requirements for employees** · Teamwork spirit · Integrity and time management
	7.2 Debugging and maintenance of the control system of mechanical equipment.	
	7.3 Preparation of the maintenance plan for execution unit of mechanical equipment.	