NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

APRIL 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN

LEVEL: NTA 4

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ABBREVIATIONS

CAD	Computer-aided Design
CBET	Competency Based Education and Training
MOPP	Maintenance Operational Procedures
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PLC	Programmable Logic Controller
PPT	PowerPoint
QC	Quality Control
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

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

1.0. INTRODUCTION

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

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

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational Standards are defined in terms of activities performed by a person in a selected occupation (e.g., an 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 Installation Technician Occupation has its own set of occupational standards. The document explains how the Occupational Standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

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

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

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

The Occupational Standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, Supervisory Technicians on the job, and experienced Mechanical Equipment Installation Technicians were key informants in the survey to discover occupational trends. The information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. At least 3 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 28 participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MECHANICAL EQUIPMENT INSTALLATION TECHNICIANS

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

The Mechanical Equipment Installation Technician shall complete on-site installation and debugging of mechanical equipment, and be responsible for routine maintenance, emergency equipment maintenance and preventive maintenance for normal use of mechanical equipments under the supervision of engineers. Generally, the Mechanical Equipment Installation Technician performs the following responsibilities:

a) Preparations before operation

b) Assembly of typical components

c) Production and installation of typical mechanical components

d) Installation of auxiliary pipeline

e) General equipment installation

f) Special equipment installation

g) General equipment debugging

h) Special equipment debugging

i) Assembly and debugging of typical equipment

j) Maintenance and upkeep of general equipment

k) Maintenance and upkeep of special equipment

l) Maintenance and upkeep of typical equipment

m) Organization and management of mechanical equipment installation

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 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 INSTALLATION TECHNICIAN -- NTA 4

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATIONS BEFORE OPERATION	**DUTY NO.**	401
TASK TITLE	MACHINE (MACHINERY) BODY INSPECTION	**TASK NO.**	4011
PERFORMANCE CRITERIA	The person performing this task must be able to accept the machine (machinery) body according to the machine (machinery) body acceptance checklist and quality requirements, including but not limited to quantity counting, dimensional measurement, quality inspection, etc., and issue an acceptance instruction to ensure the smooth progress of subsequent installation and debugging.		
RANGE STATEMENT	The task can be performed under the supervision of a Senior Technician or a Mechanical Engineer to inspect and accept the machine (machinery) body. The tools and equipment to be used include: 1. Machine (machinery) body to be installed; 2. Vernier caliper, micrometer, measuring tape; 3. Angle ruler, level gauge; 4. Flashlight, pencil, notebook, inspection instruction; 5. White gloves and relevant tools for unpacking.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Inspect the machine (machinery) body; 2. Identify the part drawing; 3. Prepare relevant tools according to inspection requirements; 4. Inspect the key dimensions of the whole and parts of the machinery according to the technical requirements of the drawings; 5. Check the number of machine parts according to the details of the general assembly drawing; 6. Check whether the dimensions of key parts meet the requirements; 7. Check whether there are cracks and dents on the surface of the parts.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Explain the structural composition and main function of the machine (machinery) body; 1.2 Check the delivery list and acceptance list; 1.3 Check the technical specification requirements; 1.4 Check the main parts and important dimensions; 1.5 Check the surface of the parts for defects and cracks; 1.6 Check the parts in combination with the technical drawings. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Parts list for acceptance and technical drawings; 2.2 Accurate inspection of the machine body; 2.3 Quantity and quality checking of the parts.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Description of the structure and function of the machine (machinery) body; 3.2 Technical requirements of the assembly drawings; 3.3 Accurate identification of technical drawings and proficiency in the use of measuring tools for the measurement of critical dimensions; 3.4 Use of tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.6 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Acceptance and inspection are completed according to the machine (machinery) body handover list, and an acceptance report is issued.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Report writing.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATIONS BEFORE OPERATION	**DUTY NO.**	401
TASK TITLE	MECHANICAL SYSTEM INSPECTION OF PERIPHERAL EQUIPMENT	**TASK NO.**	4012
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and evaluate the surrounding environment in accordance with the environmental, site, and auxiliary facility specifications required for the mechanical equipment installation process.		
RANGE STATEMENT	The task can be performed with the cooperation of a Senior Technician or a Mechanical Engineer to inspect the surrounding mechanical systems. The tools and equipment to be used include: 1. Measuring tape, temperature and humidity indicator; 2. Voltmeter, ammeter; 3. Hardness tester, vibration sensor; 4. Level gauge, jackhammer electric drill and other related tools.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Familiarize with the working environment of the machine (machinery) body and the requirements of peripheral equipment; 2. Evaluate the technology of peripheral equipment; 3. Evaluate the surrounding environment as a whole; 4. Check and evaluate the installation site; 5. Check and evaluate the installation conditions; 6. Systematically check and evaluate the peripheral equipment and facilities; 7. Propose solutions and write inspection reports for the peripheral equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Meet the requirements of the machine (machinery) body to be installed for the surrounding auxiliary facilities; 1.2 Evaluate the mechanical technology of the surrounding auxiliary facilities; 1.3 Evaluate the impact of the surrounding non-auxiliary facilities on the machine body; 1.4 Evaluate the technical requirements of the machine (machinery) body to be installed for current, voltage, installation ground and environment, etc.; 1.5 Evaluate the technical requirements and standards for the mechanical system inspection of peripheral equipment; 1.6 Propose assessment reports and solutions in combination with local electricity and other conditions. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Technical requirements of the machine body to be installed (assembled); 2.2 Technical evaluation of the mechanical system;

	2.3 Evaluation of the installation site, installation environment and other conditions; 2.4 Evaluation of the mechanical system compatibility of peripheral equipment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical description of the structure and function of the machine (machinery) body; 3.2 Technical requirements of the installation of the machine (machinery) body to be assembled for the surrounding facilities, and inspection of the technical state of the surrounding associated mechanical equipment; 3.3 Technical requirements for the installation environment and installation conditions of the equipment; 3.4 Comprehensive evaluation standards for the installation site and environment. **4.0 Essential Skills** 4.1 Technical drawing interpretation skills; 4.2 Judgment skills; 4.3 Analysis skills; 4.4 Necessary communication skills; 4.5 Customer service skills; 4.6 Teamwork spirit; 4.7 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Acceptance and inspection are completed according to the machine (machinery) body handover list, and an acceptance report is issued.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Report writing.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATIONS BEFORE OPERATION	**DUTY NO.**	401
TASK TITLE	HAZARD IDENTIFICATION AND RISK ASSESSMENT	**TASK NO.**	4013
PERFORMANCE CRITERIA	The person performing this task must be able to identify and evaluate the risks involved during installation and subsequent use in accordance with the machine (machinery) body to be installed.		
RANGE STATEMENT	The task can be performed on installation site under the supervision of a Senior Technician or a Fire-protection Engineer. The tools and equipment to be used include: 1. Measuring tape; 2. Angle ruler, level gauge; 3. Various wrenches; 4. Smoke generator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Design the installation process of the machine (machinery) to be installed; 2. Design the installation process of the surrounding mechanical equipment; 3. Prepare the related tools; 4. Identify potential risks and mark them; 5. Measure the configuration parameters of the fire exit and fire-fighting facilities; 6. Check the water, electricity, access, firefighting and rescue elements of the site; 7. Propose solutions according to the inspection.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify potential risks in the machine (machinery) body installation; 1.2 Identify potential risks of the fire-fighting facilities; 1.3 Deploy and place safety warning signs; 1.4 Identify potential risks regarding water, electricity, communications, rescue roads, etc. involved in the installation process; 1.5 Propose solutions and explain them. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Characteristics and installation process of the machine (machinery) body; 2.2 Potential risks of the surrounding environment and equipment; 2.3 Risk warning signs. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Hazardous nature of the product to be installed (flammable and explosive and special work operations, etc.);

	3.2 Hazard Identification and Risk Assessment during Production; 3.3 Basic knowledge of fire rescue and fire-fighting facilities setup. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Information searching and learning skills; 4.3 Communication and cooperation skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Acceptance and inspection are completed according to the machine (machinery) body handover list, and an acceptance report is issued.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Report writing.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATIONS BEFORE OPERATION	**DUTY NO.**	401
TASK TITLE	SAFETY REQUIREMENTS AND PROTECTIVE MEASURES	**TASK NO.**	4014
PERFORMANCE CRITERIA	The person performing this task must be able to develop site safety management requirements in combination with work site requirements and propose solutions to provide safety for subsequent installation.		
RANGE STATEMENT	The task can be performed on installation site under the supervision of a Senior Technician or a Mechanical Engineer. The tools and equipment to be used include: 1. Portable fire extinguisher; 2. Gas mask and facilities related to fire evacuation; 3. Safety helmet, safety belt and other basic configurations; 4. Eye and face protection cover shield, etc.; 5. Machine protection-related facilities.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Develop safety production rules; 2. Handle production accidents and make emergency rescues; 3. Identify safety hazards and propose solutions; 4. Develop safety production rescue process; 5. Purchase products related to labor protection; 6. Develop operating instruction of labor insurance supplies; 7. Post safety warning signs.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Comply with safety production regulations; 1.2 Identify the safety production hazards involved in the basic process of installing the machine (machinery) body; 1.3 Identify safety hazards on site; 1.4 Post safety signs and warning signs and explain their significance; 1.5 Deploy labor protection products and supervise their standard use in safe production; 1.6 Develop safety management procedures corresponding to the process flow; 1.7 Develop first aid procedures for production accidents. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Safety production laws and regulations; 2.2 Guidelines for identifying and eliminating safety hazards; 2.3 Standards for posting safety warning signs; 2.4 Labor protection laws and regulations.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Principles for the development of production safety management rules and regulations; 3.2 Principles and reasons for the configuration of labor protection supplies; 3.3 Accidental first aid process and methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Accidental first aid skills; 4.3 Customer service skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Acceptance and inspection are completed according to the machine (machinery) body handover list, and an acceptance report is issued.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION OF TYPICAL COMPONENTS	**DUTY NO.**	402
TASK TITLE	PREPARATION FOR THE ASSEMBLY	**TASK NO.**	4021
PERFORMANCE CRITERIA	The person performing this task must be able to install the auxiliary equipment and tools and prepare for the installation in accordance with the installation procedures for the machine (machinery) body to be assembled.		
RANGE STATEMENT	The task can be performed on installation site under the supervision of a Senior Technician or a Mechanical Engineer. The tools and equipment to be used include: 1. Lubricating oil and lubricating grease; 2. Various types of wrenches, screwdrivers, files, scrapers, etc.; 3. Small drilling machine, small electric welding machine, grinding machine, grinding wheel bed, electric hand drill, polishing wheel and other mechanical equipments; 4. Cotton yarn and organic cleaning agents and other related consumables products; 5. Various types of engine oil, hydraulic oil, fuel, etc.; 6. Forklift, crane, auxiliary handling machine hand and other tools; 7. Straight rule, screw tap and threading die and other related tools.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify the overall and partial installation types according to the installation drawings; 2. Prepare lubricating oil (grease) and other related auxiliary materials according to the drawing requirements; 3. Prepare relevant tools according to the overall and typical component installation characteristics; 4. Prepare standard parts (screws, nuts, washers, sealing rings, etc.) according to the assembly drawing; 5. Operate the electric hand drill; 6. Operate the small drilling machine; 7. Operate the surface grinder; 8. Operate the grinding machine; 9. Verify the conditions of forklift, crane, water and electrical	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select the type of electric hand drill and supporting tools; 1.2 Select the type of small drilling machine and supporting tools; 1.3 Select the type of surface grinder; 1.4 Select the type of grinding machine and the condition of the grinding wheel piece; 1.5 Inspect installation auxiliary facilities such as forklifts and cranes. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Technical drawing interpretation principles; 2.2 Matching principles of the lubricating oil and grease; 2.3 Principles of use of installation tools and electro-mechanical equipment; 2.4 Code of conduct for equipment inspection.

facilities.	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 Construction and assembly characteristics of the machine (machinery) body; 3.2 Installation characteristics of typical parts; 3.3 Function of lubricating oil (grease) and other adjuvant materials in the installation; 3.4 Functions and selection principles of various installation tools. **4.0 Essential Skills** 4.1 Skills to read engineering technical drawings; 4.2 Safety consciousness; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Preparation work before assembly is completed and the corresponding tools are equipped for subsequent assembly in accordance with the machine (machinery) body.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION OF TYPICAL COMPONENTS	**DUTY NO.**	402
TASK TITLE	SIMPLE COMPONENT ASSEMBLY	**TASK NO.**	4022
PERFORMANCE CRITERIA	The person performing this task must be able to assemble the simple parts and inspect them according to the condition of the parts of the machine (machinery) body to be installed, in combination with the general assembly and part assembly drawings.		
RANGE STATEMENT	The task can be performed on assembling site under the supervision of a Senior Technician or a Mechanical Engineer. The tools and equipment to be used include: 1. The machine (machinery) body and parts to be installed; 2. Vernier caliper, micrometer, measuring tape; 3. Straight rule, angle ruler, level gauge; 4. Commonly-used tools such as electric hand drill, screw tap, threading die, file, wrench, oilstone, scraper, copper rod, hammer, and rubber hammer; 5. Small drilling machine, small grinding machine, small lathe, arc welding machine and other tools; 6. Auxiliary tools such as vices, detergent, gauze, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify the parts installation information based on the technical drawing of the machine (machinery) to be installed; 2. Sort out the parts to be assembled; 3. Clean and lubricate the parts to be assembled; 4. Polish the burrs of the parts; 5. Install screws and other fasteners; 6. Assemble locating pins, locating holes, and polish mating surfaces; 7. Drill, tap, polish and lubricate; 8. Install seals, threaded parts, hole and shaft fits, structural parts and other non-standard parts.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Polish the burrs of parts, polish the surface of parts; 1.2 Drill, tap, and position; 1.3 Install and inspect seals; 1.4 Install and match holes and shafts; 1.5 Clean and lubricate parts. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Safety operations of operating machines and tools; 2.2 Basic operation specifications for fitters; 2.3 Underpinning knowledge and skills of parts maintenance. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Assembly requirements for threaded fasteners;

	3.2 Parts assembly drawings and technical requirements; 3.3 The effect of deburring, polishing and lubrication on assembly; 3.4 Trimming, drilling, tapping, sealing and other basic fitter operation theories; 3.5 Theories of installation of structural parts, fasteners and connectors; 3.6 Interpretation of parts details and technical requirements; 3.7 Interpretation of assembly requirements of structural parts. **4.0 Essential Skills** 4.1 Skills to read engineering technical drawings; 4.2 Safety consciousness; 4.3 Particularity; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Each part of the machine (machinery) body is deburred, cleaned, lubricated, polished, and simple parts and structural parts are installed.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION OF TYPICAL COMPONENTS	**DUTY NO.**	402
TASK TITLE	INSTALLATION QUALITY INSPECTION	**TASK NO.**	4023
PERFORMANCE CRITERIA	The person performing this task must be able to check the assembly quality in accordance with the machine (machinery) body or parts and the requirements of the installation procedures.		
RANGE STATEMENT	The task can be performed on the installation site under the supervision of a Senior Technician or a Mechanical Engineer. The tools and equipment to be used include: 1. Horizontal goniometer; 2. Vibration measuring instrument; 3. Torque wrench; 4. Pressure tester; 5. Torque tester; 6. Vernier caliper, micrometer, inside micrometer, angle gauge and other tools.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify the technical requirements for the assembly of the body and parts; 2. Detect overall flexibility; 3. Detect overall functionality; 4. Detect sealing performance; 5. Detect the flexibility of mating parts; 6. Detect brake performance; 7. Detect transmission performance; 8. Detect hydraulic system; 9. Detect fastener pre-tightening force; 10. Detect the position of mating parts; 11. Detect surface finish; 12. Detect vibratility; 13. Detect the smoothness of operation; 14. Detect durability; 15. Detect overload performance; 16. Detect output performance	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Understand the technical parameters of the product; 1.2 Detect functionality of the product; 1.3 Detect product performance parameter; 1.4 Detect assembly quality; 1.5 Check the appearance; 1.6 Check the durability test for 24 or 48 hours; 1.7 Check the appearance of paint, logo, etc. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Technical specifications for structural parts assembly; 2.2 Product functions and parameters. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Parts assembly drawings and technical requirements; 3.2 Various checking procedures and methods; 3.3 Methods of obtaining performance parameters;

parameter.	3.4 Evaluation methods for endurance, smoothness, braking, etc. **4.0 Essential Skills** 4.1 Skills to read engineering technical drawings; 4.2 Teamwork skills; 4.3 Communication skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The technical detection of the machine (machinery) body is completed to ensure that the assembly quality meets the technical performance requirements, that the functions are normal and the output parameters meet the requirements, and that the appearance quality meets the user requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Emergency rescue skills.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FABRICATION AND INSTALLATION OF METAL STRUCTURES	**DUTY NO.**	403
TASK TITLE	PREPARATION FOR THE ASSEMBLY	**TASK NO.**	4031
PERFORMANCE CRITERIA	The person performing this task must be able to combine several parts into assemblies and components through various forms, and finally complete the metal structure tooling or process for assembly preparation in accordance with the maintenance manuals and prescribed requirements.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of an Engineer or a Senior Technician. The tools and equipment to be used include: 1. Safety work clothing and safety devices; 2. Operation data; 3. Workplace; 4. Assembly material; 5. Assembly toolbox.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Interpret assembly drawings of metal parts; 2. Select tools and tooling for the procedure; 3. Prepare parts to be installed in accordance with procedure guidance documents; 4. Check the completeness and neatness of drawings and the completeness of process information records; 5. Check whether the parts placement and metal component assembly are carried out in the specified workplace, and the site for the whole machine placement and assembly must be clearly planned until the end of the whole project, and all workplaces must be kept neat, standardized and orderly; 6. Check whether the assembly materials specified in the assembly process are in place on time, if some non-deterministic materials are not in place, the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare parts to be installed in accordance with procedure guidance documents. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Structure and working principle of metal parts; 2.2 Specification for the maintenance of metal parts. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Identification of faults in assembler parts; 3.2 Identification of external defects in casting (forging) and metal processing parts; 3.3 Preventive maintenance plan; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills;

operation order can be changed, and then fill out a material reminder to the purchasing department; 7. Understand the structure of the equipment, assembly technology and process requirements before checking the assembly; 8. Check the integrity of other accessories of the operating parts; 9. Observe safety regulations and workplace cleanliness while performing tasks; 10. Store tools and equipment technical data safely.	4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical parts installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FABRICATION AND INSTALLATION OF METAL STRUCTURES	**DUTY NO.**	403
TASK TITLE	ASSEMBLY	**TASK NO.**	4032
PERFORMANCE CRITERIA	The person performing this task must be able to assemble several parts by combining them into assemblies and components through the procedure in accordance with the equipment maintenance manual and in accordance with the specified requirements.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of an Engineer or a Senior Technician. The tools and equipment to be used include: 1. Metal equipment; 2. Installation manual; 3. Process requirements; 4. Assembly technology; 5. Assembly toolbox.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Repair metal shaft and hole mating parts; 2. Install the metal structure at the construction site, adjust the assembly position, and meet the requirements of metal assembly and other equipment action; 3. Complete the production and assembly of metal parts and other typical structures, including fittings and connections and mechanical parts, etc.; 4. Install the mechanical body peripheral parts of metal structures in accordance with requirements, such as no blockage or leakage in the gas circuit of fittings; 5. Observe safety regulations and workplace cleanliness while performing tasks; 6. Store tools and assemble technical data safely.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the function of the metal components and the interconnection between them, determine the assembly method, sequence and preparation tools in accordance with the assembly process specification, perform deburring, burring, cleaning, measuring, scraping and repairing of the parts; 1.2 Check the two stages of component assembly and total assembly; 1.3 Check the mutual position and fit clearance of each mechanism during the adjustment and commissioning stage to coordinate the work of each mechanism; check the geometric accuracy of the tooling; make a comprehensive checking in accordance with the technical requirements after understanding the structure, assembly technology and process requirements of the equipment; 1.4 Check the test report after the assembly is complete, and make a summary of the problems that occurred during the assembly process; contact the designer to update the drawings for subsequent errors. **2.0 Principles** The person performing this task must be able to explain the following principles:

	2.1 Geometric accuracy of the assembly; 2.2 Troubleshooting of common faults after assembly; 2.3 Working principles of the assembly; 2.4 Troubleshooting of common faults after assembly. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Identification of faults in assembler parts; 3.2 Identification of external defects in casting (forging) and metal processing parts; 3.3 Preventive maintenance plan; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical parts installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FABRICATION AND INSTALLATION OF METAL STRUCTURES	**DUTY NO.**	403
TASK TITLE	INSTALLATION QUALITY INSPECTION	**TASK NO.**	4033
PERFORMANCE CRITERIA	The person performing this task must be able to analyze the causes of problems such as accuracy deviation, vibration, noise, etc. arising in the assembly and adjustment of new products, and make suggestions for improvement in accordance with the assembly technical documents.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of a Test Engineer or a Senior Experimentalist. The tools and equipment to be used include: 1. Safety devices for checking; 2. Workplace; 3. Assembly material; 4. Technical document for assembly; 5. Testing toolbox.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Adjust the unqualified installation; 2. Check whether the safety protection in the whole machine system meets the requirements; 3. Sort the metal structure materials; 4. Observe safety regulations and workplace cleanliness while performing tasks; 5. Store tools and equipment technical data safely.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the application of quality control, lean production management and other methods, and fill in the debugging records; 1.2 Check the different engineering application requirements, add additional control functions to the standard engineering documents, and verify the effectiveness of these functions; 1.3 Check and analyze the linkage driving method between the metal parts and each component to solve the error fault arising from the fault signal of the metal parts; 1.4 Check and adjust parameters such as acceleration and deceleration to improve the motion characteristics of metal component assembly; 1.5 Check the integrity of other accessories of the operating parts. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Routine knowledge of quality checking; 2.2 Experimental methods for quality checking

	parameters; 2.3 Quality standard knowledge. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Identification of faults in assembler parts; 3.2 Identification of external defects in casting (forging) and mechanical processing parts; 3.3 Preventive maintenance plan; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical parts installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT INSTALLATION	**DUTY NO.**	404
TASK TITLE	MACHINE ASSEMBLY	**TASK NO.**	4041
PERFORMANCE CRITERIA	The person performing this task must be able to assemble several parts by combining them into assemblies and components through the procedure in accordance with the equipment maintenance manual and in accordance with the specified requirements.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Operation data; 2. Workplace; 3. Assembly material; 4. Assembly toolbox.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Read the assembly drawings of mechanical parts; 2. Read the assembly process documents of mechanical parts; 3. Select tools and tooling according to the process; 4. Prepare parts to be assembled according to the assembly drawings and process instruction documents; 5. Observe safety regulations and workplace cleanliness while performing tasks; 6. Store tools and equipment technical data safely.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the completeness and neatness of drawings and the completeness of process information records; 1.2 Check whether the parts placement and parts assembly are carried out in the specified work place, and the site of the whole machine placement and assembly must be clearly planned until the end of the whole project, and fill in the material reminder to the purchasing department; 1.3 Understand the structure of the equipment, assembly technology and process requirements before checking the assembly; 1.4 Check the integrity of other accessories of the operating parts. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Checking of pressure gauge range, accuracy, mechanical and inspection marks; 2.2 Method of large gear and transmission equipment installation. **3.0 Theories** The person performing this task must be able to explain

	the following: 3.1 Identification of faults in assembler parts; 3.2 Identification of external defects in casting (forging) and metal processing parts; 3.3 Preventive maintenance plan; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical parts installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT INSTALLATION	**DUTY NO.**	404
TASK TITLE	ELECTRICAL ASSEMBLY	**TASK NO.**	4042
PERFORMANCE CRITERIA	The person performing this task must be able to rectify the electrical component parameters, combine several electrical components into component parts through the process and perform electrical assembly in accordance with the electrical equipment maintenance manual and schematic diagram.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of an Engineer or a Senior Technician. The tools and equipment to be used include: 1. Electrical Equipment; 2. Installation manual; 3. Process requirements; 4. Assembly technology; 5. Electrical assembly toolbox.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Read the process guidance document for electrical assembly; 2. Read the robot electrical general assembly drawings; 3. Read the robot hydraulic and pneumatic schematic diagram; 4. Troubleshoot safety hazards in all functional modules of the electrical system; 5. Observe safety regulations and workplace cleanliness while performing tasks; 6. Store tools and assemble technical data safely.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the electrical cabinet assembly drawings and the structure of the tooling, the function of the parts and the interconnection between them, determine the assembly method, sequence and preparation tools in accordance with the assembly process specification; 1.2 Detect and complete the circuit assembly, cable connection between distribution board, electrical cabinet, demonstration box, servo drive, and mechanical parts; 1.3 Check the two stages of component assembly and total assembly; 1.4 Check the electrical assembly application site to complete the electrical installation of the machine and the electrical interconnection of other equipment; 1.5 Check the electrical connections at the machine application site, make a summary of the problems that occur during the electrical assembly process, and contact the designer to update the drawings for subsequent errors. **2.0 Principles** The person performing this task must be able to explain the following principles:

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Defects in the assembly of electrical components; 3.2 Adjustment of unqualified installation; 3.3 Conformity of safety protection in the whole machine system; 3.4 Preventive maintenance plan for the use of tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical installation and debugging manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT INSTALLATION	**DUTY NO.**	404
TASK TITLE	INSTALLATION QUALITY INSPECTION	**TASK NO.**	4043
PERFORMANCE CRITERIA	The person performing this task must be able to detect the whole machine performance indicators such as the diagnostic range performed by each module on the safety circuit, analyze the machine operation status through the operation data, and determine the causes of noise, vibration, overload and other abnormalities generated by the parameter checking in accordance with the technical documents, process guidance documents.		
RANGE STATEMENT	The task can be performed in the assembly workshop under the supervision of a Test Engineer or a Senior Experimentalist. The tools and equipment to be used include: 1. Safety device; 2. Workplace; 3. Process document; 4. Technical document; 5. Testing toolbox.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Adjust the unqualified installation; 2. Check whether the safety protection in the whole machine system meets the requirements; 3. Diagnose the safety circuits of each module of the mechanical system; 4. Observe safety regulations and workplace cleanliness while performing tasks; 5. Store tools and equipment technical data safely.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the application of quality control, lean production management and other methods to perform unit-level management and operation of mechanical systems; 1.2 Check the different engineering application requirements, add additional control functions to the standard engineering documents, and verify the effectiveness of these functions; 1.3 Check and analyze the driving method betweet the mechanical system and each component to solve the driver error or error fault arising from the fault signal; 1.4 Check and adjust parameters such as acceleration and deceleration to improve the motion characteristics of mechanical assembly; 1.5 Check the integrity of other accessories of the operating parts. **2.0 Principles** The person performing this task must be able to explain

	the following principles: 2.1 Routine knowledge of quality checking; 2.2 Experimental methods for quality checking parameters; 2.3 Quality standard knowledge. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Identification of faults in assembler parts; 3.2 Identification of external defects in casting (forging) and metal processing parts; 3.3 Preventive maintenance plan; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The assembly preparation is inspected in accordance with the typical parts installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT DEBUGGING	**DUTY NO.**	405
TASK TITLE	PERFORMANCE DEBUGGING	**TASK NO.**	4051
PERFORMANCE CRITERIA	The person performing this task must be able to perform a trial operation and debugging in accordance with the purpose and type of the equipment to make the equipment operate properly.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Machine (machinery) body to be debugged; 2. Operation manual; 3. Operating tools; 4. Load.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools/equipment for the task; 2. Lubricate the equipment; 3. Check the equipment energization; 4. Check whether the system parameters meet the requirements; 5. Check whether the components are operating properly; 6. Check whether the equipment meets the installation standards; 7. Check whether the equipment meets the acceptance standards; 8. Check to see if there is anything left; 9. Comply with safety regulations when performing tasks; 10. Clean the workplaces; 11. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check whether the equipment operation is normal or not; 1.2 Check whether the system parameter settings are correct; 1.3 Use testing tools to achieve optimal performance; 1.4 Check the accessories. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Signal detection; 2.2 Electrical control; 2.3 Equipment technical conditions and specifications, safety precautions. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Equipment commissioning process; 3.2 Equipment fault handling methods; 3.3 Optimal equipment performance; 3.4 Precautions during construction; 3.5 Use of proper tools and equipment. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment is operated and debugged according to the equipment type and technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT DEBUGGING	**DUTY NO.**	405
TASK TITLE	CONTROL SYSTEM DEBUGGING	**TASK NO.**	4052
PERFORMANCE CRITERIA	The person performing this task must be able to perform a trial operation and debugging in accordance with the purpose and type of the equipment to make the equipment operate properly.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Machine (machinery) body to be debugged; 2. Equipment user manual; 3. Electrical drawing; 4. Anti-static device; 5. Circuit maintenance toolbox.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools/equipment for the task; 2. Read electrical drawings; 3. Check whether the instruments conform to the requirements; 4. Inspect the equipment for normal operation; 5. Observe various motion pictures and alarm messages; 6. Detect signal transmission; 7. Detect feedback signals; 8. Debug system parameters; 9. Perform joint debugging of instrument control system; 10. Check wiring of the electrical control cabinet; 11. Comply with safety regulations when performing tasks; 12. Clean the workplace; 13. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 2.1 Perform system debugging; 2.2 Check signal transmission status; 2.3 Check whether the control cabinet is connected correctly; 2.4 Check control parameters; 2.5 Avoid electrostatic hazards; 2.6 Reach operational standards. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of the control system; 2.2 Instrument circuit debugging and individual control circuit debugging methods; 2.3 Connection and difference between electrical control and PLC control. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Debugging method of control system; 3.2 Treatment methods of common faults debugging; 3.3 Electrical schematic diagram; 3.4 Testing data and alarm messages.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The control system is debugged in accordance with the machine functions and customer requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT DEBUGGING	**DUTY NO.**	405
TASK TITLE	JUDGMENT, ANALYSIS AND HANDLING OF ABNORMALITIES	**TASK NO.**	4053
PERFORMANCE CRITERIA	The person performing this task must be able to make accurate judgments and propose solutions based on abnormal situation during the debugging of mechanical equipments.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Machine (machinery) body to be debugged; 2. Electrical schematic diagram; 3. Circuit testing tool; 4. Anti-static device.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools/equipment for the task; 2. Read electrical drawings; 3. Read structural schematic diagrams; 4. Accurately determine abnormal conditions in equipment operation; 5. Check connection mechanism; 6. Check protection appliances; 7. Check the safety hazards of the equipment; 8. Check the electrical faults of the equipment; 9. Check the mechanical faults of the equipment; 10. Requirements for operating environment of equipment; 11. Comply with safety regulations when performing tasks; 12. Clean the workplaces; 13. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Judge abnormal conditions; 1.2 Check abnormal conditions; 1.3 Propose solutions to abnormal conditions; 1.4 Check the environmental requirements. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Judgment method of abnormal conditions of mechanical equipment; 2.2 Electrical drawing principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Judgment method of abnormal conditions of mechanical equipment; 3.2 Causes of equipment abnormalities; 3.3 Corresponding solutions for abnormalities; 3.4 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills;

	4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Abnormalities in equipment are judged and solutions are proposed in accordance with the equipment type and purpose.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	GENERAL EQUIPMENT DEBUGGING	**DUTY NO.**	405
TASK TITLE	TROUBLESHOOTING	**TASK NO.**	4054
PERFORMANCE CRITERIA	The person performing this task must be able to diagnose faults and propose solutions based on equipment phenomena.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Machine (machinery) body to be debugged; 2. Maintenance manual; 3. Maintenance toolbox; 4. Safety warning sign.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools/equipment for the task; 2. Check the transmission device; 3. Inspect the ventilation system; 4. Check the lubrication system; 5. Check protection appliances; 6. Check the fastening bolts; 7. Check the nameplate voltage; 8. Check the running voice; 9. Inspect whether there is abnormal smell; 10. Comply with safety regulations when performing tasks; 11. Clean the workplaces; 12. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Handle faults; 1.2 Inspect the electrical circuit; 1.3 Inspect the mechanical fault; 1.4 Judge faults predictively; 1.5 Prevent faults. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Fault handling process; 2.2 Principles of fault cause analysis; 2.3 Working principles of control components. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Fault handling process; 3.2 Preventative maintenance plan; 3.3 Use of proper tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Teamwork skills;

	4.5 Report writing skills; 4.6 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The fault is checked and removed in time according to the maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE AND UPKEEP OF GENERAL EQUIPMENT	**DUTY NO.**	406
TASK TITLE	OPERATION AND MAINTENANCE OF MACHINE SYSTEMS	**TASK NO.**	4061
PERFORMANCE CRITERIA	The person performing this task must be able to handle abnormal situations in the operation of the equipment in a timely manner to ensure normal operation of the equipment, extend its service life, save usage costs and avoid accidents.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Safety work clothing and safety devices; 2. Safety devices and warning signs; 3. Maintenance tools and manuals; 4. Auxiliary tools; 5. Maintenance and repair consumables.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools; 2. Maintain power transmission devices; 3. Perform routine maintenance; 4. Replace and repair vulnerable components; 5. Check maintenance manual; 6. Comply with safety regulations when performing tasks; 7. Clean the workplaces; 8. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Maintain equipment; 1.2 Judge faults; 1.3 Remove faults; 1.4 Dismantle equipment; 1.5 Assembly equipment; 1.6 Check the accessories. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Assembly principles of the equipment; 2.2 Mechanical maintenance process preparation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Equipment operating principles; 3.2 Preventative maintenance plan; 3.3 Use of proper tools and equipment. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Computer skills; 4.3 Information searching skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Equipment maintenance status is checked in accordance with the equipment maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE AND UPKEEP OF GENERAL EQUIPMENT	**DUTY NO.**	406
TASK TITLE	DATA ACQUISITION	**TASK NO.**	4062
PERFORMANCE CRITERIA	The person performing this task must be able to acquire data on the operational status of mechanical equipment, predict faults, and propose or optimize maintenance and repair programs.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Operating equipment; 2. Sensor; 3. Data collection platform (LDP); 4. Data analysis platform.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check the operating status of the device; 2. Install the sensor; 3. Debug PLC; 4. Maintain signal transmission; 5. Use the data collection platform (LDP); 6. Analyze the collected data; 7. Optimize the maintenance program; 8. Observe safety regulations and workplace cleanliness.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Install the sensor; 1.2 Collect data; 1.3 Transmit signals; 1.4 Write PLC program; 1.5 Use the data collection platform (LDP); 1.6 Analyze data; 1.7 Conduct regular monitoring; 1.8 Track and monitor; 1.9 Accept monitoring. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Data acquisition principles; 2.2 Methods of collecting data for analysis. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Working principle of the sensor; 3.2 Data acquisition principles. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Computer skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The reliability of monitoring and diagnosis technology of mechanical equipment is improved by using advanced means.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE AND UPKEEP OF GENERAL EQUIPMENT	**DUTY NO.**	406
TASK TITLE	STATISTICAL ANALYSIS	**TASK NO.**	4063
PERFORMANCE CRITERIA	The person performing this task must be able to statistically analyze the fault rate based on the number of devices and device types.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Mechanical equipment; 2. Computer; 3. Testing tools.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select operating tools/equipment for the task; 2. Count the number and type of equipment; 3. Analyze the probability of faults; 4. Use testing tools; 5. Check the maintenance situation; 6. Count the installers; 7. Analyze cost control; 8. Analyze quality control; 9. Analyze safety risk; 10. Analyze statistical data.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyze cost; 1.2 Analyze safety risk; 1.3 Count the probability of faults; 1.4 Analyze quality control; 1.5 Use testing tools. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Statistical analysis principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of data statistics; 3.2 Principles of data analysis; 3.3 Preventative maintenance plan. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Customer service skills; 4.4 Report writing skills; 4.5 Tool and instrument operation skills.
DESCRIPTION OF THE END	The fault rate and safety risks of electromechanical

PRODUCT / SERVICE	equipment are reduced based on statistical analysis.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

OCCUPATION	MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE AND UPKEEP OF GENERAL EQUIPMENT	**DUTY NO.**	406
TASK TITLE	GUIDANCE AND MANAGEMENT	**TASK NO.**	4064
PERFORMANCE CRITERIA	The person performing this task must be able to maintain the mechanical equipment and perform management and instruction.		
RANGE STATEMENT	The task can be performed in the workshop under the supervision of a Senior Technician or an Engineer. The tools and equipment to be used include: 1. Mechanical equipment; 2. Maintenance and repair record card; 3. Information-based management system; 4. Safety warning sign.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare equipment management system; 2. Classify and manage equipment; 3. Manage the spare parts; 4. Determine the fault of mechanical equipment; 5. Guide the maintenance of mechanical parts; 6. Guide the upkeep of mechanical parts; 7. Guide the maintenance of electrical system; 8. Guide the maintenance of safety protection device; 9. Guide the maintenance of transmission mechanism; 10. Guide the maintenance of braking system; 11. Be familiar with the precautions during the repair and maintenance process of general mechanical equipment; 12. Manage equipment with information technology; 13. Comply with safety regulations when performing tasks.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare equipment management system; 1.2 Classify and manage equipment; 1.3 Manage spare parts; 1.4 Maintain electrical system; 1.5 Maintain transmission mechanism; 1.6 Manage with information technology. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Management methods for mechanical equipment; 2.2 Equipment management rules; 2.3 Equipment use environment and physical condition requirements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Equipment maintenance methods; 3.2 The content of equipment management; 3.3 Equipment management system. **4.0 Essential Skills** 4.1 Communication skills;

	4.2 Asset management skills; 4.3 Computer skills; 4.4 Tool and instrument operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Mechanical equipment is managed to maximize its efficacy.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Maintenance operation processes and procedures (MOPP); 3. Waste disposal methods.

TABLE 1: DACUM CHARTS FOR MECHANICAL EQUIPMENT INSTALLATION TECHNICIAN - NTA 4

DUTY TITLE	TASK TITLE	ENABLERS
1.0 Preparations before operation	1.1 Machine (machinery) body inspection. 1.2 Mechanical system inspection of peripheral equipment. 1.3 Hazard identification and risk assessment. 1.4 Safety requirements and protective measures.	**General skills and knowledge** · Competence in communicating with others · Mastery of safety regulations · Potential risk assessment of peripheral equipment · Maintenance manual inquiry · Interpretation of technical drawings · Familiarity with equipment structure **Tools and equipment** · Mechanical equipment · Fitter tools · Safety warning sign · Circuit testing tool · Anti-static device · Safety protective suit **Materials** · Oil paint · Safety warning sign · Lubricating grease · Marker pens **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
2.0 Installation of typical components	2.1 Preparation for the assembly. 2.2 Assembly. 2.3 Installation quality inspection.	**General skills and knowledge** · Competence in communicating with others · Interpretation of engineering drawings · Use of product manuals · Familiarity with equipment structure · Use of assembly tools · Operation methods of small machine tools · Installation and debugging methods of typical parts · Identification of assembly defects

		Tools and equipment · Mechanical equipment · Fitter tools · Safety warning sign · Circuit testing tool · Anti-static device · Safety protective suit **Materials** · Washing gasoline · Lubricating oil · Lubricating grease · Sandpaper and other consumables **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
3.0 Fabrication and installation of metal structures	3.1 Preparation for the assembly. 3.2 Assembly. 3.3 Installation quality inspection.	**General skills and knowledge** · Competence in communicating with others · Interpretation of engineering drawings · Use of product manuals · Familiarity with metal structure production process · Use of production tools · Familiarity with metal structure assembling and debugging methods · Use of assembly tools · Identification of assembly defects **Tools and equipment** · Fitter tools · Safety warning sign · Circuit testing tool · Anti-static device · Safety protective suit **Materials** · Oil paint · Safety warning sign · Lubricating grease · Marker pens **Requirements for employees**

		· Teamwork spirit, integrity, time management and commitment
4.0 General equipment installation	4.1 Machine assembly. 4.2 Electrical assembly. 4.3 Installation quality inspection.	**General skills and knowledge** · Competence in communicating with others · Interpretation of engineering drawings · Use of product manuals · Familiarity with general equipment structure · Use of assembly tools · Identification of assembly defects **Tools and equipment** · Mechanical equipment to be installed · Fitter tools · Safety warning sign · Circuit testing tool · Anti-static device · Safety protective suit **Materials** · Oil paint · Safety warning sign · Lubricating grease · Marker pens **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
5.0 General equipment debugging	5.1 Performance debugging. 5.2 Control system debugging. 5.3 Judgment, analysis and handling of abnormalities. 5.4 Troubleshooting.	**General skills and knowledge** · Competence in communicating with others · Mechanical and electrical schematic diagram inquiry · Interpretation of technical drawings · Signal detection **Tools and equipment** · Mechanical equipment to be debugged · Testing tools · Maintenance toolbox · Anti-static device

		· Safety warning sign **Materials** · New spare parts in compliance with technical specifications **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
6.0 Maintenance and upkeep of general equipment	6.1 Operation and maintenance of machine systems. 6.2 Data acquisition. 6.3 Statistical analysis. 6.4 Guidance and management.	**General skills and knowledge** · Competence in communicating with others · Maintenance manual inquiry · Interpretation of technical drawings · Familiarity with equipment structure **Tools and equipment** · Mechanical equipment · Maintenance toolbox · Safety warning sign · Testing tools · Anti-static device · Safety protective suit **Materials** · Lubricating grease · Lubricating oil · New spare parts in compliance with technical specifications **Requirements for employees** · Teamwork spirit, integrity, time management and commitment