NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

AC	Alternating Current
CBET	Competency Based Education and Training
DC	Direct Current
KVA	Kilovolt-Ampere
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PPE	Personal Protective Equipment
TA	Current Transformer
TET	Technical Education and Training
TV	Voltage Transformer
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 Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tool of assessment of the pre – scribed outcomes.
Performance Criteria:	Indicate the expected end results or outcome in form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	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:	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. This process is also sometimes referred to as validation.
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by 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 Electrical Equipment Installation and Maintenance 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. NACTVET 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 Electrical Equipment Installation and Maintenance Technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of …….. online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they 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 ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by an Electrical Equipment Installation and Maintenance 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 Electrical Equipment Installation and Maintenance 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 Electrical Equipment Installation and Maintenance Technicians shall install, commission and repair electrical equipment according to drawing and technical data under the supervision of electrical engineers. Technicians are capable of installing, commissioning and repairing the electrical equipment such as ordinary lighting equipment, cable, busbar, motor, switchgear, transformer, metering equipment, as well as the electrical equipment monitored by computer on installation and maintenance site. Generally, the Electrical Equipment Installation and Maintenance Technician performs the following responsibilities:

a) Drawings reading and equipment inspection

b) Electrical equipment installation

c) Installation and repair of ordinary electrical lighting equipment

d) Electrical testing

e) Preparation before construction

f) Electrical equipment installation and maintenance

g) Metering equipment installation and repair

h) Electrical commissioning

i) Electrical equipment installation and repair in special places

j) Electrical equipment commissioning and repair

k) Metering equipment testing and verification

l) Trial operation of electrical equipment

The Occupational standards have been clustered into NTA qualification levels i.e. NTA level 4-6.

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 ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN – NTA 5.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATION BEFORE CONSTRUCTION	**DUTY NO.**	501
TASK TITLE	SAFETY MEASURES AND RISK SPOT ANALYSIS	**TASK NO.**	5011
PERFORMANCE CRITERIA	The person performing this task must be able to complete safety measures and risk spot analysis according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Grounding wire; 2. Electroprobe; 3. Safety sign; 4. Safety rope; 5. Safety helmet.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1 Prevent electric shock: Before working, recheck the safety measures, test the equipment voltage and ensure there is no electrical risk; 2 Prevent mechanical injury: Wear work clothes and other protective articles correctly before entering the site, avoid injury due to falling components and carry the components with special tools; 3 Prevent lifting injury: Check whether the lifting tools and load capacity are consistent with the site condition, the power supply is reliable and the steel wire rope is intact; 4 Prevent wrong working position: Check whether the equipment number and name are consistent with the equipment to be repaired (or installed) in workplace;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify the risk spots on construction site; 1.2 Prevent and control the risk spots. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Rules for safety distance of electrical equipment; 2.2 Regulations for installation and commissioning of electrical equipment; 2.3 Regulations for maintenance of electrical equipment. **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Safety education and training contents before construction; 3.2 Basic construction conditions and requirements on construction site;

5 Prevent injury caused by high falling objects: Wear safety helmet correctly, observe whether there are high falling objects and take protective measures timely; 6 Prevent dangerous mental state: Carry out risk spot analysis before working and prohibit the personnel whose mental/physical condition is unsuitable for working from operation; pay attention to the mental and physical condition of operation personnel during working; if abnormal, prohibit them from working continuously.	3.3 Organizational and technical measures for ensuring safety; 3.4 Requirements and specifications for using tools on construction site. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Safety measures and risk spot analysis shall be completed according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATION BEFORE CONSTRUCTION	**DUTY NO.**	501
TASK TITLE	PREPARATION OF CONSTRUCTION CONDITIONS	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to conduct general inspection on the construction conditions of electrical equipment installation according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Multimeter, clamp ammeter, tramegger, electric energy meter, etc.; 2. Electroprobe, needle-nose pliers, wire stripper, electric screwdriver, etc.; 3. Common cutting tools; 4. Electric drill, press pliers, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check whether the doors and windows of distribution room are installed according to the design document; 2. Check whether the embedded parts and reserved holes on the construction site meet the requirements of the design document; 3. Check whether the wastewater and waste gas treatment facilities and measures on construction site are perfect; 4. Check whether the solid waste treatment facilities and measures on construction site are perfect; 5. Check whether the dust control facilities and measures on the construction site are perfect; 6. Check whether the measures for controlling equipment noise and vibration on the construction site are perfect; 7. Check whether the site installation space meets the requirement for equipment handling and lifting;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check the facilities on installation site; 1.2 Check the construction environment on installation site; 1.3 Check the instruments and devices for construction measurement and inspection. **2.0. Principle** The person performing this task must be able to explain the following principles: 2.1 Regulations for construction conditions and operation environment inspection; 2.2 Regulations for construction conditions and environmental protection; 2.3 Specifications for verification of measuring instruments and devices. **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Electric safety of electrical equipment installation;

8. Check whether the foundation of parking and operation site of transportation and lifting machinery is firm or not; 9. Check whether the isolation measures for preventing high falling objects on the construction site are perfect; 10. Check whether the transportation and lifting machinery is qualified after detection; 11. Check whether the instruments and devices for construction measurement and inspection are in validity period.	3.2 Environmental protection of electrical equipment installation site; 3.3 Construction technology of electrical equipment installation; 3.4 Verification of measuring instruments and devices; 3.5 Electrical drawing reading. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Preparation before electrical equipment installation shall be completed according to technical requirements and manufacturer's maintenance manual
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PREPARATION BEFORE CONSTRUCTION	**DUTY NO.**	501
TASK TITLE	SPECIFIC MEASURES FOR CONSTRUCTION PREPARATION	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to conduct general inspection on construction equipment and materials according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Multimeter, clamp ammeter, tramegger, electric energy meter, etc.; 2. Electroprobe, needle-nose pliers, wire stripper, electric screwdriver, etc.; 3. Common cutting tools; 4. Electric drill, press pliers, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. After electrical equipment, materials and accessories arrive at the site, check whether the packaging and sealing are in good condition; 2. Check whether the specification, model, quantity and accessories of equipment, special tools and spare parts meet the requirements of the design document and the contract; 3. Check whether the equipment nameplate, technical document, delivery test report, qualification certificate and packing list are complete or not; 4. Check whether the equipment and accessories have concavity, scratch, rust or deformation; 5. Check whether the surface of energized part is smooth and flat or has cracks, wrinkles, inclusions, deformation or warp; 6. Check whether the oil-filled electric equipment leaks oil or not;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the sealing condition of equipment and facilities; 1.2 Check the arrival condition of equipment and facilities; 1.3 Check the technical data of equipment and facilities; 1.3 Check the appearance and technical indexes of equipment and facilities; 1.4 Check the on-site storage condition of electrical equipment. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Regulations for inspection of electrical equipment and accessories before installation; 2.2 Regulations for storage of electrical equipment and accessories.

7. Check whether the pressure of gas insulated electrical equipment meets the requirements of the technical document； 8. Check whether the sealing gasket/grease, cleaner and lubricating grease meet the requirements of the technical document； 9. Check whether the insulator and insulating sleeve has cracks or damage and whether the casting has sand holes; whether the filler in bonding area is complete and the bonding is firm; and whether the bonding surface between insulating part and flange is coated with waterproof sealant 10. Check whether the fasteners of hot galvanized/stainless steel products are sufficient 11. Arrange the equipment storage identification in flat place free of accumulated water or corrosive gas, and tack the products according to the stacking layers； 12. Store the equipment, accessories or materials which have damp-proof/rain-proof requirement indoors； 13. Ensure that the storage period and measures of equipment and devices before installation meet the requirements of technical document； 14. Store the consumables such as sealing grease and cleaning paper in packaging box or indoors； 15. Place the porcelain parts and insulators stably without tilting or collision.	**3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Theoretical knowledge of electrical equipment； 3.2 Storage requirements of electrical equipment. **4.0 Essential Skills** 4.1 Communication skills； 4.2 Electrical drawing reading skills； 4.3 Teamwork skills； 4.4 Report writing skills； 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and storage of electrical equipment and accessories shall be completed according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site； 2. Safety operation of operation tools； 3. Safety operation of measuring instruments； 4. Occupational health and safety； 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION AND MAINTENANCE OF TRANSFORMER	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to install or maintain transformer according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Ammeter/voltmeter, etc.; 2. High-voltage insulating rod; 3. Voltage tester; 4. High-voltage phasing tester; 5. Insulating gloves and boots; 6. Insulating mat and cover; 7. Temporary barrier and fence; 8. Bamboo (wooden) ladder and safety rope and net; 9. Pedal and climber; 10. Wrench; 11. Crane and sling chain.		

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 working tools 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Check the suspended core of transformer under the guidance; 8. Dry the transformer under the guidance;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools; 1.2 Check the appearance; 1.3 Check the body; 1.4 Install the equipment; 1.5 Identify and treat the faults; 1.6 Complete site clearing and engineering handover. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for transformer operation; 2.2 Specifications for transformer installation. **3.0 Theories**

9. Assist the lifting workers for secondary handling and in-place installation of transformer; 10. Install the transformer accessories; 11. Phase the transformer; 12. Conduct delivery test on transformer under the guidance; 13. Complete color marking of transformer under the guidance; 14. Clean the surface and coating primer, finish and protective paint of transformer under the guidance; 15. Clean the equipment and its installation position; 16. Install and fix the equipment according to construction drawing; 17. Complete grounding of equipment components; 18. Complete site clearing; 19. Complete engineering handover.	The person performing this task must be able to explain the following contents: 3.1 Underpinning knowledge of transformer; 3.2 Common faults of transformer. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The transformers shall be installed and maintained according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION AND MAINTENANCE OF MOTORS	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to install motors according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Infrared thermometer; 2. Insulated clamp; 3. Voltage tester; 4. Insulating gloves and boots; 5. Temporary barrier and fence; 6. Crane, sling chain and cord fastener; 7. Wrench; 8. Ammeter/voltmeter, etc.		

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 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Test the insulating strength of motor; 8. Complete wiring of DC motor; 9. Judge the initial and tail ends of stator winding of three-phase asynchronous motor;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools; 1.2 Check the appearance; 1.3 Check the body; 1.4 Install the equipment; 1.5 Identify and treat the faults; 1.6. Complete site clearing and engineering handover **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for motor operation; 2.2 Specifications for motor installation **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Underpinning knowledge of motor; 3.2 Common faults of motor.

10. Complete Y-△ wiring of motor; 11. Clean the surface and coat the primer, finish and protective paint of motor; 12. Clean the equipment and its installation position; 13. Install and fix the equipment according to construction drawing; 14. Complete grounding of equipment components; 15. Complete site clearing; 16. Complete engineering handover.	**4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The motors shall be installed and maintained according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION AND MAINTENANCE OF BUSBARS	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to install busbars according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Ammeter/voltmeter, etc.; 2. High-voltage insulating rod; 3. Voltage tester; 4. Insulating gloves and boots; 5. Insulating mat and cover; 6. Temporary barrier and fence; 7. Bamboo (wooden) ladder and safety rope and net; 8. Pedal and climber; 9. 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. Choose suitable working tools; 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Complete the installation of supporting insulator; 8. Complete correction, measurement, cutting, bending, drilling, contact machining and welding of busbar; 9. Complete fixing of busbar, installation of compensation	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools; 1.2 Check the appearance; 1.3 Check the body; 1.4 Install the equipment; 1.5 Identify and treat the faults; 1.6 Complete site clearing and engineering handover. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for busbar operation; 2.2 Specifications for busbar installation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Underpinning knowledge of busbar;

device, bolt connection and color mark painting; 10. Clean the surface of busbar; 11. Clean the equipment and its installation position; 12. Install and fix the equipment according to construction drawing; 13. Complete grounding of equipment components; 14. Complete site clearing; 15. Complete engineering handover.	3.2 Common faults of busbar. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The busbars shall be installed and maintained according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION AND MAINTENANCE OF LIGHTNING PROTECTION AND GROUNDING DEVICES	**TASK NO.**	5024
PERFORMANCE CRITERIA	The person performing this task must be able to install lightning protection and grounding devices according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Ammeter/voltmeter, etc.; 2. High-voltage insulating rod ; 3. Voltage tester; 4. Insulating gloves and boots; 5. Insulating mat and cover; 6. Temporary barrier and fence; 7. Bamboo (wooden) ladder and safety rope and net; 8. Pedal and climber; 9. 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. Choose suitable working tools; 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Complete installation of artificial grounding electrode;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools; 1.2 Check the appearance; 1.3 Check the body; 1.4 Install the equipment; 1.5 Identify and treat the faults; 1.6 Complete site clearing and engineering handover. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for operation of lighting protection and grounding devices; 2.2 Specifications for installation of lighting protection and grounding devices.

8. Complete installation of natural fundamental grounding electrode; 9. Complete installation of grounding trunk line; 10. Complete fabrication and installation of lightning rod; 11. Complete open/concealed laying of lightning lead; 12. Complete installation of lightning conduction and strip; 13. Clean the equipment and its installation position; 14. Install and fix the equipment according to construction drawings; 15. Complete grounding of equipment components; 16. Complete site clearing; 17. Complete engineering handover.	**3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Underpinning knowledge of lighting protection and grounding devices; 3.2 Common faults of lighting protection and grounding devices. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The lighting protection and grounding devices shall be installed and maintained according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF METERING EQUIPMENT	**DUTY NO.**	503
TASK TITLE	INSTALLATION AND REPAIR OF CURRENT TRANSFORMER	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to install and repair current transformers according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Common tools such as screwdriver, needle-nose pliers, diagonal pliers, wire stripper and cold compression pincers; 2. One anti-creeping and anti-short-circuit power strip; 3. Personal protective articles such as insulating shoes and gloves, work clothes and safety belt; 4. Multimeter, pressure gauge, thermometer and voltage tester.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following operation: 1. Observe the preventive measures for health and safety during working; 2. Choose suitable working tools; 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Clean the equipment and its installation position; 8. Install the fasteners and brackets according to construction drawings; 9. Complete grounding of equipment components;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools 1.2 Check the appearance 1.3 Check the body 1.4 Install the equipment 1.5 Identify and treat the faults 1.6 Complete site clearing and engineering handover **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for operation of current transformer 2.2 Specifications for installation of current transformer **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Underpinning knowledge of current transformer; 3.2 Common faults of current transformer.

10. Check and arrange the tools; 11. Clear the construction site; 12. Complete engineering handover.	**4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The current transformers shall be installed and repaired according to technical requirements and manufacturer's maintenance manual
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF METERING EQUIPMENT	**DUTY NO.**	503
TASK TITLE	INSTALLATION AND REPAIR OF VOLTAGE TRANSFORMER	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to install and repair voltage transformer according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Common tools such as screwdriver, needle-nose pliers, diagonal pliers, wire stripper and cold compression pincers; 2. One anti-creeping and anti-short-circuit power strip; 3. Personal protective articles such as insulating shoes and gloves, work clothes and safety belt; 4. Multimeter, pressure gauge, thermometer and voltage tester.		

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 working tools; 3. Ensure the equipment model is correct and attached with complete accessories and qualification certificate; 4. Check the appearance of equipment; 5. Check the seal, pressure and oil level of equipment; 6. If abnormality is found, check the body according to equipment document under the guidance of manufacturer's technicians; 7. Clean the equipment and its installation position; 8. Install the fasteners and brackets according to construction drawings; 9. Complete grounding of equipment components;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools; 1.2 Check the appearance; 1.3 Check the body; 1.4 Install the equipment; 1.5 Identify and treat the faults; 1.6 Complete site clearing and engineering handover. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for operation of voltage transformer; 2.2 Specifications for installation of voltage transformer. **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Underpinning knowledge of voltage transformer; 3.2 Common faults of voltage transformer.

10. Check and arrange the tools; 11. Clear the construction site; 12. Complete engineering handover.	**4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The voltage transformers shall be installed and repaired according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND REPAIR OF METERING EQUIPMENT	**DUTY NO.**	503
TASK TITLE	INSTALLATION AND REPAIR OF METERING INSTRUMENT	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to install and repair the measuring instruments according to technical requirements and manufacturer's product manual.		
RANGE STATEMENT	The measuring instruments shall be installed and repaired on the installation and maintenance site under the supervision of electrical engineers. The tools and equipment needed include: 1. Common tools such as screwdriver, needle-nose pliers, diagonal pliers and wire stripper; 2. One anti-creeping and anti-short-circuit power strip; 3. Personal protective articles such as insulating shoes and gloves, work clothes and safety belt; 4. Multimeter, tramegger, electroprobe and clamp meter.		

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 and equipment for task; 3. Check whether the appearance, certificate and sealing property of measuring instrument meet the specifications and requirements; 4. Check whether the parameters of measuring instrument meet the requirements; 5. Test the insulating property of measuring instrument; 6. Install the fasteners and brackets; 7. Install the test junction box; 8. Install and fix the measuring instrument; 9. Check the configuration, polarity and secondary wiring of current	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable instrument; 1.2 Measure the insulation resistance of instrument; 1.3 Install the instrument; 1.4 Judge and treat the faults of instrument. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Installation process of instrument; 2.2 Cabling and wiring principles for instrument installation. **3.0 Theories** The person performing this task must be able to explain the following contents: 3.1 Purpose of instrument; 3.2 Working principle and type of instrument; 3.3 Inspection method of instrument;

transformer and voltage transformer; 10. Conduct wiring according to the installation wiring diagram; 11. Disassemble, clean, assemble and replace the instrument; 12. Clear up the tools, equipment and workplace.	3.4 Installation method of instrument; 3.5 Judgment and treatment method of instrument faults. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The instruments shall be installed and maintained according to technical requirements and manufacturer's installation and maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTRICAL COMMISSIONING	**DUTY NO.**	504
TASK TITLE	VERIFICATION OF ENGINEERING INSTRUMENTS	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to verify the ammeter, voltmeter, power meter, power factor meter and electric energy meter according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Instruments to be verified such as ammeter, voltmeter, electric energy meter and power meter; 2. Needle-nose pliers, wire stripper, electric screwdriver, etc.; 3. Field calibrator of ammeter, adjustable power supply, standard resistor, power source, adjuster, etc.; 4. Electroprobe, insulating shoes, etc.; 5. Lead seal, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Confirm whether the field condition meets the verification requirements of instruments; 2. Check whether the certificates of instruments are in validity period; 3. Check whether the seal, shell and terminal button of instruments are intact; 4. Check whether the equipment and accessories have concavity, scratch, rust or deformation; 5. Check whether the difference between display time of instruments and standard time is in a specified scope; 6. Read the values of instruments correctly; 7. Verify the circuit wiring of instruments according to drawings;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the working environment of instrument verification site; 1.2 Check the appearance of instruments; 1.3 Check the reading of instruments; 1.4 Check the wiring of instrument verification circuits; 1.5 Check the inspection error. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Ammeter inspection procedures; 2.2 Voltmeter inspection procedures; 2.2 Electric energy meter inspection procedures; 2.4 Power meter verification procedures; 2.5 Basic knowledge of instruments. **3.0 Theories**

8. Check whether the certificates of instrument verification devices are in validity period; 9. Operate the instrument verification devices correctly; 10. Set the parameters of instrument verification devices correctly; 11. Standardize the recording of verification data; 12. Check the error; 13. Remove the testing wires correctly and restore the site.	The person performing this task must be able to explain the following contents: 3.1 Instrument installation and repair knowledge; 3.2 Judgment and treatment method of instrument faults. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3. Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The ammeter, voltmeter, power meter, power factor meter and electric energy meter shall be verified according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTRICAL COMMISSIONING	**DUTY NO.**	504
TASK TITLE	COMMISSIONING OF GENERAL ELECTRICAL EQUIPMENT	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to test the AC/DC motor according to technical requirements and manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the production and operation field under the supervision of an Electrical Engineer. The tools and equipment needed include: 1. Testing instruments; 2. Needle-nose pliers, wire stripper, electric screwdriver, etc.; 3. Safety protection articles; 4. Multimeter, clamp ammeter, tramegger, etc.;		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Measure the insulation resistance of DC motor excitation winding, armature, excitation circuit and all connecting equipment; 2. Measure the DC resistance of DC motor excitation winding and variable resistor; 3. Measure the DC motor, adjust the motor brush and keep its neutrality in magnetic field; 4. Measure the insulation resistance and absorption ratio of AC motor winding; 5. Measure the insulation resistance of variable resistor, starting resistor and field suppressing resistor of AC motor; 6. Conduct idling inspection and no-load current measurement on AC/DC motor; 7. Check the polarity and its connection correctness of AC/DC motor winding; 8. Check whether the control apparatus meets the assembly requirements;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Measure the insulation resistance and DC resistance of some DC motor parts; 1.2 Adjust the neutrality of DC motor brush in magnetic field; 1.3 Measure the insulation resistance and absorption ratio of AC motor winding; 1.4 Measure the insulation resistance of some AC motor parts; 1.5 Check the idling of AC/DC motor and measure the no-load current; 1.6 Check the polarity and its connection correctness of AC/DC motor winding; 1.7 Complete inspection of control apparatus. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Test procedures for DC motor; 2.2 Test procedures for AC motor; 2.3 Test procedures for control apparatus. **3.0 Theories**

9. Check whether the cabling of control apparatus meets the requirements of the design document; 10. Check whether the control apparatus meets the testing requirement; 11. Check whether the control apparatus meets the power-on inspection requirement; 12. Operate the testing equipment correctly; 13. Standardize the recording of test data.	The person performing this task must be able to explain the following contents: 3.1 Knowledge of DC motor test; 3.2 Knowledge of AC motor test; 3.3 Knowledge of insulation resistance and absorption ratio test; 3.4 Knowledge of DC resistance measurement; 3.5 Principles of control apparatus. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Electrical drawing reading skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Climbing operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The ammeter, voltmeter, power meter, power factor meter and electric energy meter shall be verified according to technical requirements and manufacturer's maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE:	**Detailed knowledge about:** 1. Safety analysis on construction site; 2. Safety operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation and maintenance plan.

TABLE 1: DACUM CHARTS FOR ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Preparation before construction	1.1 Safety measures and risk spot analysis. 1.2 Preparation of construction conditions. 1.3 Specific measures for construction preparation.	**General skills and knowledge** · Communication skills · Electrical drawing reading skills · Report writing skills · Climbing operation skills · Electricity safety of electrical equipment installation · Environmental protection of electrical equipment installation site · Construction technology of electrical equipment installation **Tools and equipment** · Multimeter, clamp ammeter, tramegger, electric energy meter, etc. · Electroprobe, needle-nose pliers, wire stripper, electric screwdriver, etc. · Common cutting tools · Electric drill, press pliers, etc. **Materials** · Insulation tape · Wires, switch, socket and other devices **Requirements for employees** Passion and dedication, unity and cooperation, honesty and trustworthiness, diligence and thrift, safe production

DUTIES	TASKS	ENABLERS
2.0 Installation and repair of electrical equipment	2.1 Installation and maintenance of transformers. 2.2 Installation and maintenance of motors. 2.3 Installation and maintenance of busbars. 2.4 Installation and maintenance of lightning protection and grounding devices.	**General skills and knowledge** · Communication skills · Electrical drawing reading skills · Report writing skills · Climbing operation skills · Specifications for installation and operation of electrical equipment · Structure and principle of electrical equipment **Tools and equipment** · Ammeter/voltmeter, etc. · High-voltage insulating rod · Voltage tester · Insulating gloves and boots · Insulating mat and cover · Temporary barrier and fence · Bamboo (wooden) ladder and safety rope and net · Pedal and climber · Wrench **Materials** · Insulation tape · Wires, switch, socket and other devices **Requirements for employees** Passion and dedication, unity and cooperation, honesty and trustworthiness, diligence and thrift, safe production

DUTIES	TASKS	ENABLERS
3.0 Installation and repair of metering equipment	3.1 Installation and repair of current transformers. 3.2 Installation and repair of voltage transformers. 3.3 Installation and repair of metering instruments.	**General skills and knowledge** · Communication skills · Electrical drawing reading skills · Report writing skills · Climbing operation skills · Structure and principles of current transformers and instruments · Current transformer wiring and mechanical drawing reading knowledge **Tools and equipment** · Common tools such as screwdriver, needle-nose pliers, diagonal pliers and wire stripper · One anti-creeping and anti-short-circuit power strip · Personal protective articles such as insulating shoes and gloves, work clothes and safety belt · Multimeter, tramegger, electroprobe and clamp meter **Materials** · Insulation tape · Wires, switch, socket and other devices **Requirements for employees** Passion and dedication, unity and cooperation, honesty and trustworthiness, diligence and thrift, safe production

DUTIES	TASKS	ENABLERS
4.0 Electrical commissioning	4.1 Verification of engineering instruments. 4.2 Commissioning of general electrical equipment.	**General skills and knowledge** · Communication skills · Electrical drawing reading skills · Report writing skills · Climbing operation skills · Principles of verifying circuit · Measured data processing **Tools and equipment** · Multimeter, clamp ammeter, tramegger, electric energy meter, etc. · Electroprobe, needle-nose pliers, wire stripper, electric screwdriver, etc. · Common cutting tools · Electric drill, press pliers, etc. **Materials** · Insulation tape · Wires, switch, socket and other devices **Requirements for employees** Passion and dedication, unity and cooperation, honesty and trustworthiness, diligence and thrift, safe production.