

NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING



FEBRUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

**OCCUPATION: ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE
TECHNICIAN**

LEVEL: NTA 4

TABLE OF CONTENT

CONTENTS

ABBREVIATIONS.....	ii
GLOSSARY OF TERMS.....	iii
1.0. INTRODUCTION.....	1
2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS	2
3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIANS	3
4.0. VALIDITY PERIOD	4
5.0. OCCUPATIONAL STANDARDS.....	4
5.1. OCCUPATIONAL STANDARDS FOR ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN – NTA 4.....	5
TABLE 1: DACUM CHARTS FOR ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN - NTA 4.....	27

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. They can also install, commission and repair electrical equipment on the installation and repair site, such as ordinary lighting equipment, cables, busbars, motors, switchgears, transformers, metering equipment, as well as the electrical equipment monitored by computers. 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 4

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DRAWINGS READING AND EQUIPMENT INSPECTION	DUTY NO.	401
TASK TITLE	IDENTIFICATION OF DRAWINGS AND OTHER TECHNICAL DATA	TASK NO.	4011
PERFORMANCE CRITERIA	The person performing this task must be able to identify equipment installation drawings, wiring diagrams and other engineering drawings according to the national standard drafting specification, as well as reading the installation plan and other technical data.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Computer, cad drawing software; 2. Printer, printing paper, folder, tape, signing pen; 3. Installation plan and drawings. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Accept the task disclosure, read the installation plan and drawings and check whether the drawings are complete according to the catalog; 2. Check whether the approval procedures of installation drawings are complete or with signature or stamp; 3. Check whether the drawings are the latest version; 4. Confirm with Party A or the design organization through the technical contact sheet when finding errors or having doubts about the drawing; 5. Sign for the data if all documents and drawings are correct; 6. Confirm the installation place, plane layout, outline dimension and name of equipment according to the general layout of the construction site, and clarify the situation of temporary facilities such as power supply, water source, tools and 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the approval procedures of drawings and confirm whether the drawings are the latest version; 1.2 Confirm the basic situation of equipment installation place and site 1.3 Read the drawings such as general layout, equipment installation drawings and wiring diagrams; 1.4 Identify the meanings of graphical and letter symbols in the drawings; 1.5 Identify the meaning of circuits and cable marks in the drawings. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Functions and principles of electrical equipment; 2.2 National standard drafting specification; 2.3 Computer drafting standard. 	

<p>material storage place on the installation site;</p> <p>7. Read the equipment installation drawings, wiring diagrams and structure diagrams of parts sequentially, and clarify the key technical points of equipment installation;</p> <p>8. Read the model, specification, number, distribution mode and purpose of wires in the drawings; read the cable model, specification, length, bracket form and cable path in the drawings;</p> <p>9. Confirm the key points, difficult points and construction precautions of construction drawings according to the design specification;</p> <p>10. Confirm the specification and model of construction equipment and materials.</p>	<p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <p>3.1 Management procedures for drawings and documents;</p> <p>3.2 Procedures for drawing change, approval and receiving/dispatching;</p> <p>3.3 Graphical/letter symbols, identification code and signs in the drawings;</p> <p>3.4 National standard for electrical drafting and graphical symbols;</p> <p>3.5 General rules and requirements of electrical drawings;</p> <p>3.6 Identification methods and key points of electrical drawings.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Electrical drawing reading skills;</p> <p>4.4 Report writing skills;</p> <p>4.5 Contrastive analysis skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Drawings and other technical data are read according to technical requirements and manufacturer's installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. General knowledge of electricity safety; 2. Technical data management system; 3. Occupational health and safety knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DRAWINGS READING AND EQUIPMENT INSPECTION	DUTY NO.	401
TASK TITLE	INSPECTION AND NUMBERING OF INSTALLATION EQUIPMENT	TASK NO.	4012
PERFORMANCE CRITERIA	The person performing this task must be able to check and number installation equipment according to the equipment list and installation drawings.		
RANGE STATEMENT	<p>The task can be performed on the installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <p>:</p> <ol style="list-style-type: none"> 1. Installation drawings, equipment list and installation instructions; 2. Screwdriver, needle-nose pliers, diagonal pliers, wallpaper knife, tape, marking pen, label, etc.; 3. Equipment inspection list, equipment acceptance and warehousing list and stockout list; 4. Safety protection articles (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare the equipment installation lists; 2. Prepare the equipment installation instructions; 3. Check the name, model and specification of installation equipment according to the equipment installation list; 4. Check the appearance quality of installation equipment, take pictures for signing and keeping record; 5. Check the specification, size and quantity of installation equipment components, parts, accessories and spare parts, as well as the missing parts, damage, deformation and rust according to the equipment list and installation instructions, keep record and sign the sheet; 6. Mark and number the installation equipment and components according to construction drawings 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the name, model and specification of installation equipment; 1.2 Check the appearance quality of installation equipment; 1.3 Check the parts, components, accessories and spare parts of installation equipment; 1.4 Fill in the equipment number. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Basic principles and operation specifications for goods piling; 2.2 Numbering principles for electrical equipment. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p>		

<p>and equipment installation instructions;</p> <p>7. Arrange, summarize, filing and record the technical data and quality certification materials of equipment and components;</p> <p>8. Plan the piling place of installation equipment and components, and keep record for warehousing. Store the small instruments, fragile objects and easily-lost small parts of equipment separately, and paste labels for avoiding mixing or loss;</p> <p>9. Fill in the check list and record of installation equipment and sign the sheet.</p>	<p>3.1 Drawing reading;</p> <p>3.2 Functions and principles of electrical equipment;</p> <p>3.3 Inspection and numbering of installation equipment and components.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Basic computer operation skills;</p> <p>4.4 Report writing skills;</p> <p>4.5 Site planning skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The installation equipment is checked and numbered according to technical requirements and manufacturer's installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <p>1. Safety operation specification;</p> <p>2. Installation site management method;</p> <p>3. Management procedures for equipment unpacking and acceptance;</p> <p>4. Occupational health and safety knowledge.</p>

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DRAWINGS READING AND EQUIPMENT INSPECTION	DUTY NO.	401
TASK TITLE	INSPECTION AND NUMBERING OF INSTALLATION MATERIALS	TASK NO.	4013
PERFORMANCE CRITERIA	The person performing this task must be able to check and number the installation materials according to electrical drafting specifications, technical requirements and material lists.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <p>:</p> <ol style="list-style-type: none"> 1. Installation material lists, instructions and function tables; 2. Installation drawings and technical scheme; 3. Marking pen, label, tape, vernier caliper, micrometer caliper and electronic scale; 4. Material check list, material acceptance and warehousing list and stockout list; 5. Safety protection articles (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare the installation material list; 2. Prepare the installation material instructions and function tables; 3. Check the materials according to installation material list and confirm the variety and quantity of materials; 4. Check the appearance of materials according to material lists and instructions, and confirm that the appearance is complete without damage; 5. Check and confirm the functions of materials are normal according to the material lists and manual instructions; 6. After inspection, submit a non-conformance document and report timely; 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Read the installation drawings; 1.2 Understand the installation technical scheme; 1.3 Inspect basic requirements for installation material; 1.4 Carry out appearance inspection; 1.5 Carry out functional inspection. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Functions and principles of electrical components; 2.2 Material identification and numbering principles; 2.3 Material storage principle; 2.4 Functions and principle of installation materials; 2.5 Numbering and identification principle of installation materials. 2.6 Warehouse management principle and specification 	

<p>7. Identify and number the installation materials according to installation drawing and technical scheme;</p> <p>8. Store the installation materials in warehouse according to characteristics and confirm the storage date.</p>	<p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <p>3.1 Equipment name and functions of electric symbols;</p> <p>3.2 Inspection system of installation materials;</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork spirit;</p> <p>4.3 Report writing skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The installation materials are checked and numbered according to technical requirements and manufacturer's installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Installation engineering materials; 2. Warehouse management knowledge; 3. Occupational health and safety knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DRAWINGS READING AND EQUIPMENT INSPECTION	DUTY NO.	401
TASK TITLE	PREPARATION OF INSTALLATION TOOLS	TASK NO.	4014
PERFORMANCE CRITERIA	The person performing this task must be able to check and prepare tools according to technical requirements.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Installation tools list; 2. Mechanical tools (screwdriver, wrench, wire stripper, crimping pliers, etc.); 3. Measuring tools (multimeter, clamp ammeter, voltage tester, etc.); 4. Electric tools (cutting machine, electric wrench, etc.); 5. Safety protection articles (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare a tools list according to the installation plan and technical requirements; 2. Prepare the safety protection articles and tools according to the occupational hazard analysis and labour safety protection measures specified in the installation plan; 3. Confirm the site environment (requirements for power supply, static electricity, high altitude falling and protection) according to the installation plan and technical requirements, and ensure the tools are used normally in the construction environment; 4. Confirm the mechanical tools (screwdriver, wrench, wire stripper, crimping pliers, etc.) are complete in appearance and normal in function; 5. Confirm the mechanical tools (screwdriver, wrench, wire stripper, crimping pliers, etc.) are 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1. Understand the installation technical scheme; 1.2 Choose suitable tools; 1.3 Use measuring instruments and tools; 1.4 Analyse and plan the protective measures for fire, electricity and high altitude work on site. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Equipment name and functions of electric symbols; 2.2 General rules of electrical diagrams; 2.3 Functions and principle of electrical components. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Graphical and letter symbols in installation drawings; 3.2 Connection relationship and meaning of mark of electrical diagrams; 		

<p>in validity period, and replace the tools which reach the scrap period;</p> <p>6. Check whether the measuring tools (multimeter, clamp ammeter, etc.) are complete in appearance and normal in function;</p> <p>7. Check whether the measuring tools (multimeter, clamp ammeter, etc.) are in validity period, and replace the tools which reach the scrap period;</p> <p>8. Check whether the electric tools are completed in appearance and normal in function;</p> <p>9. Check whether the electric tools are in validity period and replace the tools which reach the scrap period.</p>	<p>3.3 Using instructions and requirements of mechanical tools;</p> <p>3.4 Using instructions and requirements of measuring tools;</p> <p>3.5 Using instructions and requirements of electric tools;</p> <p>3.6 Using instructions and requirement of safety protection articles.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork spirit;</p> <p>4.3 Report writing skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The tools are checked and prepared according to technical requirements and manufacturer's installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. General knowledge of electricity safety; 2. Industrial safety knowledge; 3. Occupational health and safety knowledge; 4. Safe operation of operation tools.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ELECTRICAL EQUIPMENT INSTALLATION	DUTY NO.	402
TASK TITLE	INSPECTION AND PREPARATION BEFORE INSTALLATION	TASK NO.	4021
PERFORMANCE CRITERIA	The person performing this task must be able to check and prepare electrical equipment before assembly according to electrical equipment installation manual, safety regulations and technical requirements.		
RANGE STATEMENT	<p>The task can be performed on the construction site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Common lifting tools (jack, manual hoist, pulley, steel wire rope, etc.); 2. Sweeping tools (dust collector, vacuum oil filter, vacuum pump, dry air generator, vacuum gauge, vacuum injection hose, torque wrench, etc.); 3. Inspection tools (wrench, pliers, tramegger, earth resistance meter, etc.); 4. Safety protection articles (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare design drawings, construction specifications and safety measures; 2. Contact with the responsible persons for technology, installation, safety and quality, as well as the technicians; 3. Prepare machine tools according to installation requirements, and check and maintain the performance and state; 4. Prepare all installation materials. 5. Check whether the equipment has deformation, damage or parts falling; 6. Check the construction of large/medium-sized equipment foundation; 7. When placing large/medium-sized equipment, check whether the foundation level and center line meet the requirements of 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the appearance, structure and size of equipment; 1.2 Judge whether the equipment is damped; 1.3 Check the troubleshooting condition of electrical equipment body and accessories after unpacking inspection; 1.4 Check the construction quality of large/medium-sized equipment foundation. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Inspection and installation procedures of electrical equipment; 2.2 Specifications for installation and acceptance of electrical equipment; 2.3 Safety procedures for electric power construction; 2.4 Specifications for installation process control. 		

<p>manufacturer and design drawings, and ensure there is no deviation between the center lines of foundation and body marked in design drawings;</p> <p>8. Prepare the site before installation;</p> <p>9. Check whether the field safety measures and occupational health protection measures are taken, and whether there are notices about the safety and occupational health hazards;</p> <p>10. Check whether the safety protection equipment and facilities are complete and normal; whether the labour protection articles and safety tools are complete and normal;</p> <p>11. Check the troubleshooting conditions of equipment body and components after unpacking inspection.</p>	<p>2.5 Basic knowledge of part processing drawings;</p> <p>2.6 Basic knowledge of power transformation secondary control circuit;</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <p>3.1 Using instructions and operation precautions for tools, machinery and instruments;</p> <p>3.2 Varieties and purposes of common equipment, tools and auxiliary materials.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Electrical drawing reading skills;</p> <p>4.3 Teamwork skills;</p> <p>4.4 Report writing skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Inspection and preparation are completed before assembly according to technical requirements and manufacturer's maintenance manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Occupational health and safety knowledge; 4. Waste treatment method.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ELECTRICAL EQUIPMENT INSTALLATION	DUTY NO.	402
TASK TITLE	CABLE LINE CONSTRUCTION	TASK NO.	4022
PERFORMANCE CRITERIA	The person performing this task must be able to perform cable line construction according to electrical equipment installation manual, safety regulations and technical requirements.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Cable pay-off stand (jack), pulley bracket, AC welding machine and withstand voltage testing equipment; 2. Insulation resistance meter, digital multimeter, steel tape, level gauge; 3. Electric saw, steel saw, hydraulic pliers, cable cutter, electric dryers, walkie-talkie, cutter, hammer, steel shovel, metal cutting machine, pipe bender, bracing wire, abrader, etc.; 4. Safety protection articles such as safety helmet, work clothes and protective gloves. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Check the cable construction environment, such as lighting and ventilation; 2. Check the design drawings as well as the underground utilities distribution and soil conditions on the construction site; 3. Take protective measures such as fireproof, waterproof and anti-collapse measures for cable detection and installation; 4. Install the pay-off tools and carry cables before cable line construction; 5. Carry out cable heating; 6. Lay the buried cables; 7. Lay cables along the cable rack and bridge; 8. Fabricate the low-voltage cable terminals and joints; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the cables and conduct insulation or withstand voltage testing; 1.2 Make preparation before cable line construction; 1.4 Lay the cable support and bridge; 1.5 Lay the cables; 1.6 Fabricate the cable terminals and joints. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Specifications for cable line construction and acceptance; 2.2 Safety procedures for electric power construction; 2.3 Specifications for cable construction process. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p>		

<p>9. Conduct withstand voltage, leakage current and insulation resistance tests on cables;</p> <p>10. Before/after test or when changing the test lead, fully discharge the tested cable (or testing equipment), and install a temporary grounding wire on tested cable after test;</p> <p>11. During withstand voltage test and phasing, conduct short circuit ground on the other two phases of cable;</p> <p>12. Excavate the cable trench;</p> <p>13. Place the pulley and cable trench wall support;</p> <p>14. Install grounding electrode and busbar;</p> <p>15. Fabricate the steel wire gauze of traction cable;</p> <p>16. Use communication tools, make regular cord fastener and install cable signs.</p>	<p>3.1 Cable line construction procedures;</p> <p>3.2 Theoretical knowledge of cable test;</p> <p>3.3 Using knowledge of tools and equipment;</p> <p>3.4 Cable laying knowledge.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Electrical drawing reading skills;</p> <p>4.3 Teamwork skills;</p> <p>4.4 Report writing skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Cable line construction is completed according to technical requirements and manufacturer's maintenance manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety knowledge; 5. Waste treatment method.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ELECTRICAL EQUIPMENT INSTALLATION	DUTY NO.	402
TASK TITLE	INSTALLATION OF DISTRIBUTION CABINET (PANEL)	TASK NO.	4023
PERFORMANCE CRITERIA	The person performing this task must be able to install distribution cabinet (panel) according to technical requirements and manufacturer's installation manual.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Hydraulic forklift and crane; 2. AC welding machine, impact drill, mobile power panel, theodolite and dust collector; 3. Socket wrench, torque wrench and ratchet wrench; 4. Scaffold, suspender, steel tape, short wooden block, slotted/cross; screwdriver, circular/flat file, crow bar, hammer, steel washer, etc.; 5. Vernier caliper, angle rule and level ruler. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Take health and safety precautions when performing the task; 2. Choose suitable tools and equipment; 3. Check the levelness and non-straightness of foundation channel steel, find the highest point and mark the altitude difference; 4. Carry the panel/cabinet with cart on site, and arrange them sequentially according to the drawings; 5. Conduct unpacking inspection, and check whether the equipment model, specification and quantity are consistent with the design drawing and delivery list; 6. Installation of panel/cabinet: Align and install the first panel with a plumb bob and level ruler 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the foundation; 1.2 Carry the panel/cabinet; 1.3 Unpack for inspection; 1.4 Place and install the panel/cabinet. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Installation principle of cabinet (panel); 2.2 Basic knowledge of distribution cabinet; <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Basic knowledge of distribution cabinet; 3.2 Application field of distribution cabinet; 3.3 Using knowledge of tools and equipment; 		

<p>according to the design position and dimension, assemble other switch cabinets according to the first cabinet, and align and arrange the panels tightly and sequentially;</p> <p>7. After installing high voltage cabinet, conduct an overall inspection and arrange the tools orderly on the construction site.</p>	<p>3.4 Installation process and standard of foundation profile steel;</p> <p>3.5 Installation process and standard of panel/cabinet.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Customer service skills;</p> <p>4.3 Teamwork skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The distribution cabinet (panel) is installed according to technical requirements and manufacturer's installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Correct operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ELECTRICAL EQUIPMENT INSTALLATION	DUTY NO.	402
TASK TITLE	INSTALLATION OF SWITCHGEAR	TASK NO.	4024
PERFORMANCE CRITERIA	The person performing this task must be able to install switchgear according to technical requirements and manufacturer's installation manual.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Torque wrench, socket wrench, box-end wrench, monkey wrench, suspender and crane; 2. Theodolite, level ruler, thermometer; 3. SF6 leak detector, tilting level and experimental instruments (vacuum circuit breaker is unnecessary); 4. Relief valve and 1 set of inflation joint and device (vacuum circuit breaker is unnecessary). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Take health and safety precautions when performing the task; 2. Choose suitable tools and equipment; 3. Install embedded bolts; 4. Install bracket and base; 5. Lift the circuit breaker body 6. Install the linkage and accessories; 7. Charge the air (vacuum circuit breaker is unnecessary); 8. Wiring and test; 9. After installing the switchgear, conduct an overall inspection and arrange the tools orderly on the construction site. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Take safety precautions; 1.2 Install and lift the switchgear body and accessories; 1.3 Carry out equipment wiring and test. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Installation process of circuit breaker; 2.2 Installation process and standard of circuit breaker. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Installation operation of circuit breaker; 3.2 Structure of circuit breaker; 3.3 Use of tools and equipment. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills. 	

DESCRIPTION OF THE END PRODUCT / SERVICE	Switchgear is installed according to technical requirements and manufacturer's installation manual.
CIRCUMSTANTIAL KNOWLEDGE:	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Correct operation of measuring instruments; 4. Occupational health and safety; 5. Equipment installation knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL LIGHTING EQUIPMENT	DUTY NO.	403
TASK TITLE	INSTALLATION AND REPAIR OF ORDINARY LIGHTING BOX	TASK NO.	4031
PERFORMANCE CRITERIA	The person performing this task must be able to read the electrical lighting diagram based on relevant knowledge and skills, and install, commission and repair lighting box according to the technical requirements and indexes in electrical lighting design diagrams.		
RANGE STATEMENT	<p>The task can be performed on installation site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Electrical measuring instruments (multimeter, voltage tester, tramegger, etc.); 2. Soldering iron, soldering tin and insulation tape; 3. Wires, switch, socket and other devices; 4. Wiring duct, drilling equipment and ladder; 5. Base plate for fixing devices, expansion pipe, etc.; 6. Safety protection tools (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Read the electrical lighting diagrams; 2. Take safety precautions and labour protection articles of operators according to the construction environment. (Aerial work, lifting, fire work, etc.); 3. Choose suitable tools and equipment; 4. Bend the wire protection pipes such as steel pipe and hard plastic pipe; 5. Cut and thread the protective pipes; 6. Identify the positions of devices, and draw lines and drill holes for positioning according to the construction drawing; 7. Fix the plastic wiring duct; 8. Complete pipe connection, open laying on bracket or concealed laying in the wall; 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Prefabricate and process the wires and pipes; 1.2 Determine the position of lighting box and arrange it properly; 1.3 Lay and connect the pipes; 1.4 Penetrate the wiring tubes and connect the wires; 1.5 Weld the grounding wire. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Principles for vertical and horizontal alignment; 2.2 Wire connection process and standard; 2.3 Causes of lighting faults. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Reading of electrical lighting diagrams; 	

<p>9. Make wiring terminals; 10. Connect the electrical circuits and weld the grounding wire; 11. Analyse the fault phenomenon; 12. Analyse and judge the fault points with the electroprobe and the multimeter; 13. Ensure all materials are used up after completion, clear up the site, restore the safety and isolation measures and keep the field operation environment normal.</p>	<p>3.3 Connection method and quality requirement of wires; 3.4 Fault detection, analysis and treatment points.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills; 4.2 Teamwork spirit; 4.3 Use of tools and instruments; 4.4 Computer skills; 4.5 Report writing skills; 4.6 Fault analysis and detection skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The ordinary lighting box is installed and repaired according to technical requirements and installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Occupational health and safety knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALLATION AND REPAIR OF ELECTRICAL LIGHTING EQUIPMENT	DUTY NO.	403
TASK TITLE	INSTALLATION AND REPAIR OF ORDINARY LAMPS	TASK NO.	4032
PERFORMANCE CRITERIA	The person performing this task must be able to check and assemble lamps with relevant knowledge and skills according to technical requirements and indexes, and installing, commissioning and repairing common lamps.		
RANGE STATEMENT	<p>The task can be performed on the construction site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Multimeter, electroprobe, tape and level ruler; 2. Soldering iron, soldering tin and insulation tape; 3. Wires, switch, socket and other devices; 4. Wire strippers, needle-nose pliers, crimping pliers, screwdrivers, electric drills and ladders; 5. Safety protection tools (safety helmet, work clothes, etc.). 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Read the electrical lighting diagrams; 2. Take safety precautions and labour protection articles of operators according to the construction environment. (Aerial work, lifting, fire work, etc.); 3. Choose suitable tools and equipment; 4. Check the appearance of lamps and the internal wiring; 5. Assemble and install the lamps; 6. Install the switches and sockets; 7. Make wiring terminals; 8. Complete the wiring insulation 9. Before power-on test, check whether the safety measures for charging test of equipment are taken. Check the wiring diagram and connect the wires correctly; Check whether the safety 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Read the electrical lighting diagrams; 1.2 Assemble the lamps; 1.3 Install ordinary lamps; 1.4 Install switches and sockets; 1.5 Power on the lamps for trial operation. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Principles for vertical and horizontal alignment; 2.2 Fault phenomenon and causes. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Reading of electrical lighting diagrams; 3.2 Selection of wiring mode; 	

<p>measures for electric shock in equipment testing area are taken;</p> <p>10. Power on for trial operation;</p> <p>11. Install the artificial grounding electrode;</p> <p>12. Conduct fault detection analysis and removal on lamp wires;</p> <p>13. Ensure all materials are used up after completion, clear up the site, restore the safety and isolation measures and keep the field operation environment normal.</p>	<p>3.3 Selection basis of wires and switches;</p> <p>3.4 Fault detection and analysis method.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork spirit;</p> <p>4.3 Use of tools and instruments;</p> <p>4.4 Computer skills;</p> <p>4.5 Report writing skills;</p> <p>4.6 Fault detection and analysis skills of ordinary lamps.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Ordinary lamps are installed and repaired according to technical requirements and installation manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Occupational health and safety knowledge.

OCCUPATION	ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	ELECTRICAL TESTING	DUTY NO.	404
TASK TITLE	DETERMINATION OF INSULATION RESISTANCE	TASK NO.	4041
PERFORMANCE CRITERIA	The person performing this task must be able to determine insulation resistance according to the electrical equipment installation manual, safety regulations and technical requirements.		
RANGE STATEMENT	<p>The task can be performed on the testing site under the supervision of senior technicians or electrical engineers.</p> <p>The tools and equipment needed include:</p> <ol style="list-style-type: none"> 1. Safety protection articles such as safety helmet and work clothes; 2. Tramegger; 3. Wires, alligator clip, probe, etc.; 4. Insulation tape, monkey wrench, etc. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Power off the tested equipment, remove or disconnect the external wires; 2. Before test, discharge the tested equipment, and the equipment with high electric capacity (such as generators, cables, large/medium-sized transformers and capacitors) shall be fully discharged (no less than 5 min); 3. Clean the insulation surface of tested equipment with a piece of dry, clean and soft cloth, and use cleaner in appropriate time if necessary; 4. Record the temperature of tested equipment, ambient temperature, humidity, weather conditions, testing date and testing instruments; 5. Identify the terminal "E", "L" and "G" on the insulation resistance meter, and connect the wires correctly; 6. Before test, check the insulation resistance meter; 7. Before measurement, check the appearance and interior of measuring instrument, including open- 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Choose measuring instruments correctly; 1.2 Check the measuring instruments; 1.3 Discharge the tested equipment and check before test; 1.3 Connect wires correctly; 1.4 Operate the instrument and read it correctly; 1.5 Discharge the equipment after measurement, maintain the measuring instruments and clear up the site. <p>2.0 Principle</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Specification for field insulation test; 2.2 Safety procedures for electric power construction. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following contents:</p> <ol style="list-style-type: none"> 3.1 Basic knowledge of insulation resistance; 		

<p>circuit/short-circuit test and pointer resetting;</p> <p>8. Test the insulation resistance of electrical equipment correctly and keep record on verification evaluation form correctly;</p> <p>9. Test the grounding resistance of electrical equipment correctly and keep record on the verification evaluation form correctly;</p> <p>10. After reading, remove the wires in correct sequence and stop operation;</p> <p>11. After powering off the insulation resistance meter, keep the tested equipment short-circuited, discharged and grounding;</p> <p>12. Ensure all materials are used up after completion, clear up the site, restore the safety and isolation measures and keep the field operation environment normal.</p>	<p>3.2 Procedures for determining insulation resistance;</p> <p>3.3 Using method of measuring instruments and safety precautions.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Electrical drawing reading skills;</p> <p>4.3 Teamwork skills;</p> <p>4.4 Report writing skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Insulation resistance is determined according to technical requirements and manufacturer's maintenance manual.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE:</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Safety analysis on operation site; 2. Safe operation of operation tools; 3. Safety operation of measuring instruments; 4. Occupational health and safety knowledge.

TABLE 1: DACUM CHARTS FOR ELECTRICAL EQUIPMENT INSTALLATION AND MAINTENANCE TECHNICIAN - NTA 4

DUTIES	TASKS	ENABLERS
1.0 Drawings reading and equipment inspection	1.1 Identification of drawings and other technical data. 1.2 Inspection and numbering of installation equipment. 1.3 Inspection and numbering of installation materials. 1.4 Preparation of installation tools.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and report to the superiors • Use of electrical drawing standard manual • Understanding of equipment installation instructions • Understanding of technical drawings • Use and maintenance of installation tools <p>Tools and equipment</p> <ul style="list-style-type: none"> • Mechanical tools (screwdriver, wrench, wire stripper, crimping pliers, etc.) • Measuring instruments (multimeter, clamp ammeter, voltage tester, tramegger, etc.) • Electric tools (cutting machine, electric drill, electric wrench, etc.) • Computer, CAD drawing software <p>Materials</p> <ul style="list-style-type: none"> • Insulation tape • Printing paper and label <p>Requirements for employees Teamwork spirit, responsibility, integrity, time management and commitment</p>

<p>2.0 Electrical equipment installation</p>	<p>2.1 Inspection and preparation before installation.</p> <p>2.2 Cable line construction.</p> <p>2.3 Installation of distribution cabinet (panel).</p> <p>2.4 Installation of switchgear.</p>	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and report to the superiors □ • Use of electrical equipment installation manual • Use of cable construction manual • Understanding of technical drawings • Use and maintenance of installation tools • Cable laying mode • Installation of distribution cabinet (panel) • Installation of switchgear <p>Tools and equipment</p> <ul style="list-style-type: none"> • Safety protection articles such as safety helmet and work clothes • Measuring instruments (multimeter, tramegger, voltage tester, earth resistance meter, steel tape, level gauge, theodolite, level ruler, thermometer, etc.) • Lifting tools (jack, manual hoist, pulley, steel wire rope, crane, etc.) • Sweeping tools (dust collector, vacuum oil filter, vacuum pump, dry air generator, vacuum gauge, vacuum injection hose, torque wrench, etc.) • Mechanical tools (socket wrench, torque wrench, ratchet wrench, short wooden block, slotted/cross screwdriver, circular/flat file, crow bar, hammer, box-end wrench, monkey wrench, etc.) • SF6 leak detector, tilting level, relief valve, withstand voltage testing equipment, inflation joint/device • Electric saw, steel saw, hydraulic pliers, cable cutter, electric dryers, cutter, hammer, steel shovel, metal cutting machine, pipe bender, bracing wire, abrader, hydraulic forklift, crane, AC welding machine, impact drill, mobile power panel, theodolite, etc.
--	--	---

		<ul style="list-style-type: none"> • Scaffold, suspender, steel tape, Vernier caliper, angle rule and level ruler <p>Materials</p> <ul style="list-style-type: none"> • Some qualified channel steel and galvanized flat steel • Screws, washers, spring washers, anchor bolts and steel gaskets • Crimping terminals, plastic pipe, electrical tape, antirust paint, electrode, calcium carbide, oxygen, cement, sand, soldering tin and flux • Wires and cables <p>Requirements for employees Teamwork spirit, responsibility, integrity, time management and commitment</p>
--	--	---

DUTIES	TASKS	ENABLERS
3.0 Installation and repair of electrical lighting equipment	3.1 Installation and repair of ordinary lighting box. 3.2 Installation and repair of ordinary lamps.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and report to the superiors • Use of electrical lighting manual • Understanding of technical drawings • Use and maintenance of installation tools • Selection of wires, switches and lamps • Wiring mode of circuits <p>Tools and equipment</p> <ul style="list-style-type: none"> • Mechanical tools (screwdriver, wrench, wire stripper, crimping pliers, etc.) • Electrical measuring instruments (multimeter, voltage tester, etc.) • Electric soldering iron • Drilling equipment • Operation safety equipment such as baseplate for fixing devices and expansion pipes <p>Materials</p> <ul style="list-style-type: none"> • Soldering tin • Insulation tape • Wires, switch, socket and other devices • Wiring duct <p>Requirements for employees Teamwork spirit, responsibility, integrity, time management and commitment</p>
4.0 Electrical testing	4.1 Determination of insulation resistance.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Cooperating with others using communication skills and report to the superiors • Use of electrical equipment manual • Wiring, probe arrangement and instrument operation • Equipment short-circuit discharge

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> • Operation and correct reading of measuring instruments • Measurement method and safety precautions for flammable/explosive places or place near the high voltage overhead line <p>Tools and equipment</p> <ul style="list-style-type: none"> • Screwdriver and wrench • Safety protection articles such as safety helmet and work clothes • Measuring instruments such as tramegger, ground resistance, DC generator, DC resistance tester and voltage tester <p>Materials</p> <ul style="list-style-type: none"> • Insulation tape • Wires, alligator clip, probe, etc. <p>Requirements for employees Teamwork spirit, responsibility, integrity, time management and commitment</p>