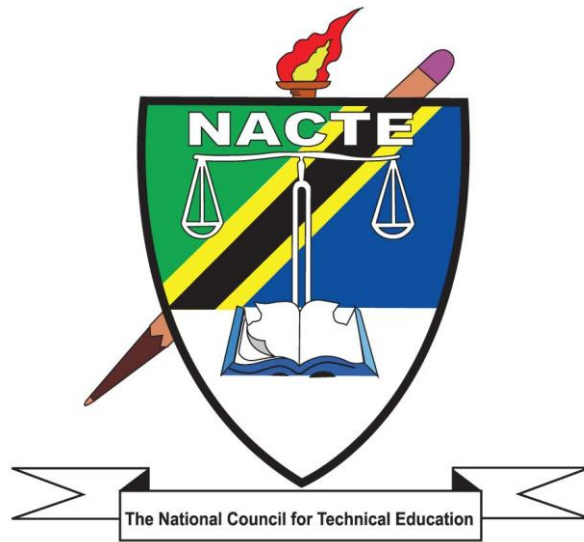


NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ELECTRICAL ENGINEERING TECHNICIAN

LEVEL: NTA 5

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FOREWORD

The National Council for Technical Education (NACTE) is a corporate body established by the National Council for Technical Education Act, Cap.129. The Act provides a legal framework for the Council to coordinate the provision of technical education and training in Tanzania. The mandate of NACTE is three-fold, namely; Regulatory, Quality Assurance and Policy Advisory.

In discharging its mandate, the Council has been charged with the responsibilities, among others, to:

- (a) assist technical institutions in the transmission of knowledge, principles and training in the field of technical education and training for the benefit of the people of Tanzania;
- (b) assist technical institutions in the overall development of the quality of education they provide and to promote and to maintain approved academic standards;
- (c) establish and make awards in technical education which are consistent in standard and comparable to related awards in Tanzania and internationally; and
- (d) ensure that the quality of education required for the awards is met and maintained throughout the duration of the delivery of the course.

In the course of execution of these responsibilities, the Council has been instituting various measures aiming at advancing the quality of training provided in technical institutions in respect of the changing demands of the labour market, both local and international.

To achieve the above obligation, NACTE, under the Ministry of Education, Science and Technology implemented the East Africa Skills for Transformation and Regional Integration Project (EASTRIP), a project aiming at promoting regional integration through supporting the regional corridors and sector markets, developing common standards and qualifications, and promoting mobility of students, faculty, and graduates. The project supports the Government of Tanzania to address shortage of skills in five sectors namely:

- (a) Energy;
- (b) Construction;
- (c) Information and Communication Technology (ICT);
- (d) Transportation; and
- (e) Agribusiness.

To address the skills, miss-match and shortage in the five (5) sectors in the country, the project funded, among others, a component of Development of Occupational Standards for Technical and Vocational Education and Training (TVET). In this regard, NACTE endeavoured to identify qualified and highly experienced experts in the five sectors from both the industry and training institutions to carry out the development of Occupational Standards. The exercise was carried out at Morogoro Teachers College – Morogoro from 16th July to 10th August, 2021. The output of the exercise is Occupational Standards for 12 occupations. Occupational standards for Electrical Engineering Technicians are among the occupational standards for 12 occupations which have been developed.

Since Occupational Standards are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills, attitudes and understanding in an occupation, it is the Council's expectations that the developed standards will form a robust base for decision making and provide explicit guidance to policy makers, curriculum developers, educators, employers and other stakeholders in matters related to manpower planning as well as execution of Technical and Vocational Education and Training undertakings.

Prof. J. W. Kondoro
Chairman

Dar es Salaam
October 2022

ACKNOWLEDGEMENT

The National Council for Technical Education (NACTE) is charged with the mandate to be the Quality Assurance organ of the Government in matters related to Technical and Vocational Education and Training (TVET) and production of qualified manpower for both local and international labour markets. In order to realize this obligation, NACTE endeavours to institute policies, guidelines and standards and to set the quality benchmarks for training institutions.

However, this is only possible if there is a strong base, linking the training institutions on one hand and the demands of the industry/labour market for relevant manpower on the other hand. Therefore, the Council undertook a step to develop Occupational Standards in sectors considered to be the engine to steer the country's desire to achieve an industrial economy. This exercise would not be a success without the input and support from our stakeholders. I am indebted to acknowledge some of them here.

I wish to acknowledge and appreciate the support from the Ministry of Education, Science and Technology through the East Africa Skills for Transformation and Regional Integration Project (EASTRIP) for the financial support which facilitated the preparation of this document. I wish also to appreciate Eng. Dir. Simon Baregu and Mrs Leah Lukindo for the tireless efforts and commitment in facilitating and guiding the standards development process, Ms. Eileen Tzamburakis and Ms. Chausiku Yakweli Ibrahim for compiling and type setting the final document; and the NACTE Secretariat for coordinating the whole activity.

In a very special way I wish further to extend my sincere gratitude to this team of wonderful experts who tirelessly dedicated their time and availed their invaluable intellect in the preparation of this document. I would like to recognise the colossal inputs of the following experts

S/N	Name	Designation	Organization
	Eng. Decklan P. Mhaiki	Chief Technical Advisor	Tanzania Electric Supply Company Limited (TANESCO)
	Eng. Sophia Mgonja	Chief Technical Advisor	Tanzania Electric Supply Company Limited

S/N	Name	Designation	Organization
	Eng. Msherwa John	Principal Coordinator	(TANESCO) The National Council for Technical Education (NACTE)
	Eng. Mary K. Mhayaya	Consulting Engineer	Tanzania Ports Authority (TPA)
	Dir. Erick Mgya	Senior Lecturer	Arusha Technical College (ATC)

In addition, the Council hopes to further enhance the internationalization of Occupational Standard and promote the modernization and internationalization of industries in Tanzania, so as to facilitate Tanzania's integration into the international market and tap its development potential. Therefore, the Council invited the China - Africa Vocational Education Alliance, China - Africa (Chongqing) Vocational Education Alliance, and Chinese vocational colleges to participate in the development, revision, and review of the Occupational Standard documents. It is firmly believed that they will provide strong support for the development of vocational education and related industries in Tanzania based on their rich experience in vocational education, relying on China's advanced and complete industrial chain as well as its status in the international market.

Therefore, I would like to express my heartfelt appreciation to this professional team composed of Chinese colleges, institutions and experts for their hard work and dedication. They've made great contributions to the compilation of this document. I would like to thank the following colleges and experts for their support.

S/N	Unit	Name	Title/Professional Field
1	Weifang Vocational College	Wang Liqing	Professor / Electrical Automation
2		Xie Yonghui	Professor / Electrical Automation
3		Peng Yue	Assistant Professor / Electrical Automation
4		Jiang Shaoyan	Lecturer / Control Theory and Control Engineering

5		Hou Xujie	Lecturer / Mechanical Manufacture and Automation
6		Sun Zongsheng	Assistant Professor / Mechanical Manufacture and Automation
7		Shang Debo	Professor / Mechanical Manufacture and Automation
1	Dongguan Polytechnic	Guo Xuan	Lecturer / Electrical Engineering
2		Wang Haibo	Senior Engineer / Electrical Engineering
3		Ding Dukun	Associate Professor / Electrical Engineering
4		Liu Shuiping	Associate Professor / Electrical Engineering
5		Deng Chan	Lecturer / Control Theory and Control Engineering
6		Fan Qiliang	Lecturer / Electrical Engineering
7		Liu Yujiao	Engineer / Control Theory and Control Engineering

Dr. A. B. Rutayuga
Executive Secretary

Dar es Salaam
October 2022

ABBREVIATIONS

ABC	Aerial Bundle Conductor
AC	Alternating Current
CAD	Computer Aided Design
CBET	Competence Based Education and Training
DC	Direct Current
GPS	Global Positioning Systems
HV	High Voltage
KVA	Kilo Volt Ampere
LV	Low Voltage
MV	Medium Voltage
NACTE	National Council for Technical Education
NOS	National Occupational Standards
OS	Occupational Standards
PLC	Programmable Logical Circuit
PPE	Personal Protective Equipment
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues
Competence:	The ability to use knowledge, understanding, practical and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based education:	An instructional program 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 analysis:	A process used to identify the tasks that are important to employees in any given occupation
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.
Occupational/job analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance criteria:	indicate the expected end results or outcome in form of evaluative statements.

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

1.0. INTRODUCTION

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

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

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

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The 10-year National Skills Development Strategy (2016-2026) was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes. These sectors include: Transport and logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of 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 Engineering 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 served to engage a

wide cross-section of experts in the occupation. The stakeholders' forum was attended by 100 participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR ELECTRICAL ENGINEERING TECHNICIANS

These standards cover a broad range of duties and tasks that can be performed by an Electrical Engineering Technician. However, the occupational standards are not meant to replace individual job descriptions, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Electrical Engineering 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.

An Electrical Engineering Technician is responsible for managing the electrical systems of an establishment, ensuring the safety of the network and cables to support daily operations. He/She performs all the duties related to installing and maintaining electrical equipment in homes, businesses, factories, and infrastructure.

Generally, an Electrical Engineering Technicians analyse schematics and specifications to construct electrical systems, run diagnostic tests, and perform repairs for any defects and inconsistencies. They assemble electrical equipment, replace malfunctioning components, upgrade systems, and advise management of high-quality electrical supplies. These Occupational Standards highlight core knowledge, skills, competences and personal attributes that an Electrical Technician must possess to successfully complete the duties assigned to him/her, which include:

- a) Performing maintenance of electrical systems
- b) Performing maintenance of electric machines
- c) Installing electrical systems
- d) Installing electrical machines
- e) Performing maintenance of electrical machines
- f) Performing maintenance of electrical systems
- g) Supervising subordinates
- h) Managing resources
- i) Working in compliance with OSHA's safety and health regulations

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

4.0. VALIDITY PERIOD

The occupational standards will be valid for 3-5 years due to the fast-changing nature of technology. The review will proceed in the same manner as the previous one, with new occupational standards being developed based on current labour market Information.

5.0. OCCUPATIONAL STANDARDS

5.1. OCCUPATIONAL STANDARDS FOR ELECTRICAL ENGINEERING TECHNICIAN – NTA LEVEL 5

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALL ELECTRICAL MACHINES & SYSTEMS WITH LOAD NOT EXCEEDING 100KVA	DUTY NO	501
TASK TITLE	INSTALL ELECTRICAL MACHINES WITH LOAD NOT EXCEEDING 100KVA	TASK NO	5011
Performance Criteria	A person carrying out this task must be able apply knowledge and skills to install electrical machines in factories and industries as per client or contract specification in accordance with current version of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment P.P.E, Multi-meter, Combination Pliers, Voltage Tester, Hammer, Wire stripper, Ladder and Distribution boards. Materials: Insulation Material, Wires, Connectors, Conduits, Conduit Bender, Cable Lugs, Cable Ties and Other Electrical Accessories. The task will be performed with minimum supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Read technical specifications and requirements of machines as indicated in the installation instruction Manual; 2. Determine the required materials for machines installation according to the safe carrying capacity and wire specifications and models; 3. Select wire conduits, cable bridges, wiring ducts, etc. according to the actual conditions; 4. Identifvy tools, equipment and		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Install electrical machines; 1.2. Test installed electrical machines; and 1.3. Use cable trunking system in the installation of electrical machines. 2.0. Principles The person must be able to explain the principles of: 2.1. Installing electrical machines; 2.2. Earthing of electrical machines; and 2.3. Starting of electric machines. 3.0. Theories	

measuring instruments to be used during installation; - Observe health and safety precautions when performing the task - Compute the costs of materials required for installation; - Identify manpower to be engaged in the installation task; - Obtain work permit to commence the installation from relevant authorities; - Isolate electric power prior to commencing the installation process; - Install the machines according to technical requirements carefully avoiding possible damage; - Install cable and required accessories; - Confirm correctness of installation in accordance with technical requirement; - Request for inspection and testing of the electrical machine; - Clean the equipment, tools and working area; - Store equipment, tools and safety gears; - Dispose waste; - Test the installed electrical machines for the customer or final user department; and - Provide relevant documentation (Installation Drawings, and Instruction Manuals) to the supervisor.	The person must be able to explain: - Basic Theories of Electrical Engineering; - Network Analysis Theories; - Methods to select commonly used electrical wires and pipes; - Classification, performance and use of wires and cables; - Types and selection of accessories for electrical use; - Principle and classification of electrical machines' - Switching and controlling of electric machines; - Machines Installation Procedures; - Specifications for the construction and acceptance of grounding devices; - Technical specifications for electrical safety at the construction site; and - Electrical Installation/Power layout interpretation. 4.0. Essential skills - Use of electric tools, measurements & instrumentation; - Communication skills; - Punctuality; - Team spirit; - Trustworthy; - Dedication; - Time Management skills; - Materials science; - Computer skills; and - Report writing. 5.0. Math Skills - Material Costs Estimation; and - Circuit Parameters Calculation
Description of the end Product or Service:	Installation of electrical machines is performed as per manufacturer's technical specifications, and machines are functioning properly.
Circumstantial knowledge:	Detailed knowledge about: - International colour code regulation; - Safe handling of installation tools and equipment; - Health, safety and environment; - Making the working area safe and secure; and - Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALL ELECTRICAL MACHINES & SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	DUTY NO	501
TASK TITLE	INSTALL ELECTRICAL SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	TASK NO	5012
Performance Criteria	A person carrying out this task must be able apply knowledge and skills to install electrical systems with load not exceeding 100 KVA in factories and industries as per technical requirements and in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment (PPE), Measuring instruments (Digital Multi-meter & Phase tester), Electrician toolkit, PLC Kit, Vacuum cleaner, Injection Kit, Protection relay test kit and Instruction’s Manual. Materials: Insulation tape, Wires, Connectors, Conduits, Conduit Bender, Cable Lugs, Cable Ties and Other Electrical & Electronics Accessories. The task will be performed under minimal supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Read technical specifications and requirements of systems as indicated in the installation instruction Manual; 2. Review layout drawing of electrical systems; 3. Determine the required materials for systems installation according to the safe carrying capacity and wire specifications and models; 4. Identify tools, equipment and measuring instruments to be used during installation;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Install electrical systems; and 1.2. Test installed electrical systems. 2.0. Principles The person must be able to explain the principles of: 2.1. Installing electrical systems; 2.2. Grounding (neutralizing) electrical systems; and 2.3. Switching electrical systems. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering Theories; 3.2. Basic Theories of Electrical Engineering;	

5. Observe health and safety precautions when performing the task 6. Compute the costs of materials required for installation; 7. Determine the personnel to be allocated for the installation; 8. Obtain work permit to commence the installation from relevant Authority; 9. Isolate electrical power prior to commencing the installation process; 10. Install the systems carefully avoiding possible damage; 11. Install the electrical systems as required; 12. Install cable and required accessories; 13. Conform the installation correctness according to the technical requirements; 14. Perform inspection and testing of the electrical system; 15. Clean equipment, tools and working area; 16. Store equipment, tools and safety gears; 17. Dispose of wastes; 18. Test the installed electrical systems for the customer or final user department; and 19. Provide relevant documentation (Installation drawings) to supervisor.	3.3. Network Analysis Theories; 3.4. Ohms Law; 3.5. Kirchhoff's Current Law; 3.6. Kirchhoff's Voltage Law; 3.7. Faraday's Law 3.8. Switching and control of systems; 3.9. Systems Installation Procedures; 3. 10. Electrical Installation/Power layout interpretation; and 3.11. Operation of electrical systems. 3.12. Electrical control scheme analysis method; and 3.13. Electrical wiring diagram mapping procedure and analysis method 4.0. Essential skills: 4.1. Measurements & instrumentation; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; 4.8. Computer skills; 4.9. Material science; and 4.11. Report writing skills. 5.0. Math Skills: 5.1. Material Costs Estimation 5.2. Circuit Parameters Calculation
Description of the end Product or Service:	Installation of electrical systems are performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field, and systems are functioning properly.
Circumstantial knowledge:	Detailed knowledge about: 1. International Colour code regulation; 2. Safe handling of tools and equipment; 3. Knowledge on safety, health & environment; and 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALL ELECTRICAL MACHINES & SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	DUTY NO	501
TASK TITLE	CONSTRUCT ELECTRICAL POWER LINES WITH LOW AND MEDIUM VOLTAGE	TASK NO	5013
Performance Criteria	The person carrying out this task must be able to construct Electrical Power Lines with low and medium voltage in accordance to construction practice and specifications as well as in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in various outdoor areas where electrical power lines need to be constructed. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment (PPE), Multi-meter, Ladder, Spikes, Linesmen Toolbox, Measuring equipment & instruments, Global Positioning System (GPS), Rollers, Ropes, Wire stringing machine, Phase Rotation Meter, Voltage detector and Compression tool. Materials: Conductor, Connectors, Insulators, Stay wire, Earth Wire, Earth Mast, Poles, Base Plate, Drum Jack, Tension Clamps, Aerial Bundle Conductor (ABC), Clamps and Other Accessories. The task will be performed under supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Interpret line drawings for low - and medium-voltage power lines; 2. Specify the construction plan and construction method; 3. Obtain survey results of the line route 4. Collect the required materials from the warehouse; 5. Reasonably select tools, electrical appliances, wires and accessories to be used in the construction process 6. Follow the safety principles of electrical equipment layout and wiring; 7. Observe health and safety precautions when performing the		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Excavate holes for poles erection; 1.2. Safely erect poles; 1.3. String conductors safely without damage; 1.4. Fix conductors on insulators or clamps; and 1.5. Terminate conductor. 2.0. Principles The person must be able to explain the principles of: 2.1. Constructing overhead electrical power lines. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering; 3.2. Network Analysis Theories; 3.3. Ohms Law; 3.4. Watt’s Law	

task 8. Clear the line route from any vegetation; 9. Excavate pole and stay holes; 10. Dress poles with fittings; 11. Erect poles; 12. Erect and assemble stays and insulators; 13. Backfill & compact the holes; 14. String conductor; 15. Fix conductors on insulator or clamps; 16. Terminate conductor; 17. Perform lightning protection and grounding; 18. Clean site properly; 19. Return all remaining materials to store; 20. Store equipment, tools and safety gears; 21. Prepare “As-Built Drawings”; 22. Assist inspection and energization of the line; 23. Clear all snags if any; and 24. Write report 25. Provide relevant documents (installation drawings and instructions) to the supervisor; and 26. Perform project acceptance and handover.	3.5. Kirchhoff’s Current Law; 3.6. Kirchhoff’s Voltage Law; 3.7. Faraday’s Law; 3.8. Construction of power lines; 3.9. Structure of overhead lines; 3.10 Type and selection of overhead line conductors; 3.11 Selection of electric circuit appliances and accessories; 3.12 Lightning protection and grounding of overhead lines; 3.13 Requirements and construction specifications for overhead lines; 3.14 Technical requirements for earthwork engineering; and 3.15. Safety specifications for overhead line erection; and 3.16 Power line construction report 4.0. Essential skills 4.1. Communication skills; 4.2. Punctuality; 4.3. Team Spirit; 4.4. Trustworthy; 4.5. Dedication; 4.6. Time management skills; 4.7. Materials science; 4.8. Computer skills; 4.9. Report writing skills; and 4.10. Use of measuring instruments and construction equipment; and 4.11. Interpretation of technical drawing. 5.0. Math Skills 5.1. Material Costs Estimation 5.2. Calculation of the Cross-Sectional Area of Wires
Description of the end Product or Service:	Construction of electrical power line is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical distribution field.
Circumstantial knowledge:	Detailed knowledge about: 1. International Colour code regulation 2. Safe handling of construction tools & equipment 3. Health, safety and environment; and 4. Waste disposal Methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALL ELECTRICAL MACHINES & SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	DUTY NO	501
TASK TITLE	INSTALL ELECTRICAL POWER CABLES WITH LOW AND MEDIUM VOLTAGE	TASK NO	5014
Performance Criteria	The person carrying out this task must be able to install Electrical Power Cables with Low and medium voltage in accordance with installation best installation practices and specifications as well as in accordance with the latest applicable regulations and standards as the basis for governing the electrical field.		
Range Statements	The task will be performed in various outdoor areas where electrical power cables need to be installed. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment (PPE), Multi-meter, Ladder, Cablemen Toolbox, Measuring equipment & instruments, Global Positioning System (GPS), Ropes, Phase Rotation Meter, Voltage detector and Compression tool. Materials: Power Cable, Connectors, Cable Lugs, Termination Kits, Cable Joint Connectors, Sand, Tape, Clamps and Other Accessories. The task will be performed under supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Obtain survey results of the power cable; 2. Interpret drawing for the power cable route; 3. Select materials required from store; 4. Identify tools and equipment to be used during installation of the power cable; 5. Observe health and safety precautions when performing the task 6. Identify personnel to be engaged in the installation task; 7. Route confirmation on site shall avoid the locations to be excavated as far as possible; ensure the shortest route of cables under the condition of all safety		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Excavate cable trench; 1.2. Install cables correctly and safely without damage; 1.3. Select and use correct cable accessories according to the type and size of the cable; 1.4. Make cable joints and termination correctly according to drawing; and 1.5. Correctly use tools for each joint or termination. 2.0. Principles The person must be able to explain the principles of: 2.1. Installing underground electrical power cables safely. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering; 3.2. Network Analysis Theories;	

requirements are met; avoid heating pipes; it is strictly prohibited to choose the sections crossed by combustible gas or liquid pipelines. 8. Clear the cable route from all vegetations; 9. Excavate trench for the power cable; 10. Spread sand on the trench; 11. Lay underground cable on the trench (remember to leave a slack at the adjacent side); 12. Apply cable joint connector where necessary; 13. Cover the trench with sand; 14. Cover the whole length of the cables with protective plates made of concrete; 15. . Fill in soft soil or sand; 16. Choose the surface materials according to the actual situation 17. Complete the cable installation; 18. Test cable conductor continuity; 19. Test the power cable insulation resistance; 20. Clean site; 21. Return all remaining materials to store; 22. Clean and set the equipment, tools and safety gears; 23. Prepare “As-Built Drawings”; 24. Request for inspection, final testing and energization of the power cable; 25. Clear all snags if any; and 26. Write report	3.3. Ohms Law; 3.4. Kirchhoff’s Current Law; 3.5. Kirchhoff’s Voltage Law; 3.6. Faraday’s Law; 3.7. Interpretation of technical drawing; 3.8. Types and use of construction tools; 3.9. Classification, performance and use of cables; 3.10. Selection and installation of cable terminals and connectors; 3.11. Specifications for construction and acceptance of cable installation; and 3.12. Technical specifications for electrical safety on the construction site. 4.0. Essential skills 4.1. Communication skills; 4.2. Punctuality; 4.3. Team spirit; 4.4. Trustworthy; 4.5. Dedication; 4.6. Time management skills; 4.7. Materials science; 4.8. Computer skills; and 4.9. Report writing. 5.0. Math Skills 5.1. Material costs estimation 5.2. Circuit parameters calculation
Description of the end Product or Service:	Installation of electrical power cable is performed as per technical requirement and complies with the latest applicable electrical field regulations and standards.
Circumstantial knowledge:	Detailed knowledge about: 1. International colour code regulation for various types of cables; 2. Safe handling of installation tools & equipment; 3. Health, safety and environment; and 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE ON ELECTRICAL SYSTEMS WITH LOAD NOT EXCEEDING 100KVA	DUTY NO	502
TASK TITLE	PERFORM CORRECTIVE MAINTENANCE ON ELECTRICAL SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	TASK NO	5021
Performance Criteria	A person carrying out this task must be able to apply knowledge and skills to perform corrective maintenance on electrical systems with load not exceeding 100 KVA in factories and industries as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment needed: Personal Protective Equipment (PPE), Measuring equipment & instruments (Digital Multi-meter, Megger tester & Phase tester), simulators, Electrician toolkit, PLC Kit, Vacuum cleaner and cable fault locator, spikes, wire stringing machine, Voltage detector, compression tool, Manufacture Instruction’s Manual, Injection Kit, Protection relay test kit, conduit bender, coil winding machine and Infrared camera. Materials needed: Lubricants, mutton cloth, oil, silica gel, wire, connectors, conduit, conduit bender, cable lugs and cable ties. The task will be performed under supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Identify malfunction of electrical system; 2. Determine the cause of the malfunction; 3. Troubleshoot the electrical system; 4. Test the repaired electrical system; 5. Identify tools, equipment and measuring instruments to be used during corrective maintenance; 6. Observe health and safety precautions when performing the task 7. Isolate power supply faulty electrical system;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Performing corrective maintenance of electrical systems; 1.2. Test electrical systems. 2.0. Principles The person must be able to explain the principles of: 2.1. Troubleshooting and repair of electrical systems 2.2. Isolation of electrical systems for safety of personnel and equipment 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering Theories; 3.2. Network Analysis Theories;	

8. Read drawing layout of electrical systems; 9. Estimate the cost of maintenance and repair; 10. Describe the sequence of activities by considering priorities; 11. Confirm that all required resources material, labour, equipment and tools are available; 12. Decide when to do the work; 13. Communicate with sections that will be affected with shutdown during corrective maintenance; 14. In the maintenance of electrical systems, carry out repair of the electrical system while adhering to safety rules; 15. Request for inspection and testing of the electrical systems; 16. Clean tools and working area; 17. Store tools and safety gears; and 18. Prepare report.	3.3. Ohms Law; 3.4. Watt's Law; 3.5. Faraday's Law 3.6. Kirchhoff's Current Law; 3.7. Kirchhoff's Voltage Law; and 3.8 Principles and selection of commonly used low-voltage appliances used for electrical systems; 3.9 Installation, inspection, troubleshooting and replacement of low-voltage appliances commonly used in electrical systems; and 3.10. Electrical systems power layout interpretation. 4.0. Essential skills 4.1. Use of measurements & instrumentation and electric tools; 4.2. Communication skills; 4.3. Punctuality; 4..4. Team spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management; 4.8. Materials science; 4.9. Computer skills; and 4.10. Report writing. 5.0. Math Skills 5.1. Material costs estimation 5.2.Circuit parameters calculation
Description of the end Product or Service:	The corrective maintenance is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field and the electrical systems are functioning properly.
Circumstantial knowledge:	Detailed knowledge about: 1. International Colour code regulation; 2. Safe handling of tools and equipment; 3. Health, safety and environment; and 4. Waste disposal Methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE ON ELECTRICAL MACHINES WITH LOAD NOT EXCEEDING 100 KVA	DUTY NO	502
TASK TITLE	PERFORM CORRECTIVE MAINTENANCE ON ELECTRICAL MACHINES WITH LOAD NOT EXCEEDING 100 KVA	TASK NO	5022
Performance Criteria	A person carrying out this task must be able to apply knowledge and skills to perform corrective maintenance on Electrical Machines in factories and industries as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment needed: Personal Protective Equipment (PPE), Measuring equipment & instruments (Digital Multi-meter, Megger tester & Phase tester), simulators, Toolbox, ladder, Vacuum cleaner, compression tool, Manufacture Instruction’s Manual, Injection Kit, Protection relay test kit, conduit bender and coil winding machine. Materials needed: Lubricants, mutton cloth, oil, silica gel, insulation material, varnish, paint, wire, connectors, cable lugs and cable ties. The task will be performed under minimal supervision of an Electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Identify malfunction of electrical machine; 2. Identify tools and measuring instruments to be used during corrective maintenance; 3. Observe health and safety precautions when performing the task 4. Isolate part of the electrical machine with fault; 5. Review layout drawing of electrical machine; 6. Investigate the cause of failure; 7. Determine the maintenance plan; 8. Develop the maintenance process; 9. Estimate the maintenance cost;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Procedures on performing corrective maintenance of electrical machines; 1.2. How to find the cause of electrical machine failure; 1.3. How to test electrical machines; and 1.4. How to determine the electrical machine maintenance plan. 2.0. Principles The person must be able to explain the principles of: 1.1. Troubleshooting and repair of electrical machines; 1.2. Isolation of electrical systems and machines for safety of personnel and equipment. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering Theories;	

10. Confirm that all required resources material, labour, equipment and tools are available; 11. Communicate with sections that will be affected with shutdown during corrective maintenance 12. Carry out overhaul of the electrical machine according to the maintenance plan to fix the malfunction. 13. Request for testing of electrical machine and approval for restoration power for the affected areas; 14. Clean tools and working area; 15. Store tools and safety gears; and 16. Prepare a maintenance report.	3.2 Basic knowledge of electric machine; 3.3 Common failures of electric machines; 3.4 Diagnosis and maintenance of electric machine failures; 3.5 Maintenance of electric machines; 3.6 Electrical instruments for electric machine testing; 3.7 Tools and equipment commonly used for assembly and disassembly of electric machines; 3.8. Basic mechanical elements; 3.9. Ohms Law 3.10. Watt's Law 3.11. Kirchhoff's Current Law 3.12. Kirchhoff's Voltage Law 3.13. Machine technology 3.14 Electrical systems power layout interpretation 4.0. Essential skills 4.1. Use of Measurements & Instrumentation; 4.2. Communication Skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time Management; 4.8. Materials science; 4.9. Computer skills; and 4.10. Report writing Skills; 5.0. Math Skills 5.1. Material Costs Estimation
Description of the end Product or Service:	The corrective maintenance is done in accordance with the current versions of regulations and standards governing the electrical field and the electrical machine is functioning properly.
Circumstantial knowledge:	Detailed knowledge about: 1. International Colour code regulation; 2. Safe handling of working tools and equipment; 3. Safe handling of measuring tools; 4. Health, safety and environment; and 5. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE ON ELECTRICAL SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	DUTY NO	503
TASK TITLE	PERFORM PREVENTIVE MAINTENANCE ON ELECTRICAL SYSTEMS WITH LOAD NOT EXCEEDING 100 KVA	TASK NO	5031
Performance Criteria	A person carrying out this task must be able to apply knowledge and skills to perform preventive maintenance on Electrical Systems with load not exceeding 100 KVA in factories and industries as per preventive maintenance schedule and in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment (PPE), Measuring equipment & instruments (Digital Multi-meter, Megger tester & Phase tester), Toolbox, PLC Kit, Vacuum cleaner and Manufacture Instruction’s Manual, Secondary Current Injection Tester, Protection relay test kit and Infrared camera. Materials: Mutton cloth The task will be performed under minimal supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Review preventive maintenance Plan/check list; 2. Identify tools, equipment and measuring instruments to be used during preventive maintenance; 3. Observe health and safety precautions when performing the task 4. Review drawing layout of electrical systems; 5. Determine the required materials for preventive maintenance; 6. Prepare the working areas to be safe and ready for preventive maintenance;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Performing preventive maintenance of electrical systems; and 1.2. Test electrical systems. 2.0. Principles The person must be able to explain the principles of: 2.1. In order to ensure the safety of personnel, safety measures shall be taken at the maintenance site, and the provisions of "Safety Measures for Electrical Maintenance" shall be strictly followed. 2.2. Operation of electrical system. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering Theories; 3.2. Network Analysis Theories; 3.3. Ohms Law;	

7. Request for ‘permit to work’ before commencement of the preventive maintenance; 8. Identify the correct means of electrical isolation prior to preventive maintenance process; 9. Request for inspection and testing of the electrical systems including panels, cabling system, distribution systems, insulation medium, power meter, protectives devices & relay; 10. Clean with mutton cloth and vacuum cleaner; 11. Clean tools and working area; 12. Store tools and safety gears; and 13. Prepare report.	3.4. Watt’s Law; 3.5. Faraday’s Law; 3.6. Kirchhoff’s Current Law; 3.7. Kirchhoff’s Voltage Law; 3.8. Purpose of performing preventive maintenance; and 3.9. Electrical systems power layout interpretation. 4.0. Essential skills 4.1. Measurements & instrumentation; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management; 4.8. Materials science; 4.9. Computer skills; and 4.10. Report writing skills. 5.0. Math Skills 5.1. Material costs estimation
Description of the end Product or Service:	Preventive maintenance is done in accordance with the current versions of regulations and standards governing the electrical field and the electrical systems are functioning properly with minimum disturbance.
Circumstantial knowledge:	Detailed knowledge about: 1. International Colour code regulation; 2. Safe handling of tools and equipment; 3. Knowledge on safety, health & environment; and 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE ON ELECTRICAL MACHINES WITH LOAD NOT EXCEEDING 100 KBA	DUTY NO	503
TASK TITLE	PERFORM PREVENTIVE MAINTENANCE ON ELECTRICAL MACHINES WITH LOAD NOT EXCEEDING 100KVA	TASK NO	5032
Performance Criteria	The person carrying out this task should be able to perform preventive maintenance on electrical machines with load not exceeding 100 KVA in factories and industries as per preventive maintenance schedule and in accordance with the current versions of regulations and standards governing the electrical field.		
Range Statements	The task will be performed in factories and industries. For successful performance of the task, the following will be required: Tools and Equipment: Personal Protective Equipment (PPE), Measuring equipment & instruments (Digital Multi-meter, Megger tester & Phase tester), Toolbox (Combination Pliers, Screw Drivers& Spanners), Vacuum cleaner, Manufacturer Instruction’s Manual, Current Injection Tester, Protection relay test kit, and ladder Materials: Note book, Mutton cloth, oil, Silica gel and diesel. The task will be performed under minimal supervision of a senior electrical technician.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able do the following: 1. Review Preventive Maintenance plan/checklist by following manufactures guidelines on maintenance schedule for specific equipment; 2. Identify tools, equipment and measuring instruments to be used during preventive maintenance of specific machines; 3. Observe health and safety standards when performing the task 4. Review layout drawing of electrical machines; 5. Determine required materials for preventive maintenance; 6. Identify manpower to be engaged in preventive maintenance;		Detailed knowledge about: 1.0. Methods This person performing this task must be able to explain how to: 1.1. Perform preventive maintenance of electrical machines; 1.2. Test electrical machines. 2.0. Principles The person must be able to explain the principles of: 2.1. In order to ensure the safety of personnel, safety measures shall be taken at the maintenance site, and the provisions of "Safety Measures for Electrical Maintenance" shall be strictly followed. 2.2. Operation of electrical machines. 3.0. Theories The person must be able to explain: 3.1. Basic Electrical Engineering Theories; 3.2. Network Analysis Theories;	

7. Observe health and safety regulations; 8. Prepare the working areas to be safe and ready for preventive maintenance work; 9. Request for permit of work before commencement preventive maintenance work; 10. Isolate electric power supply to respective area prior to preventive maintenance process; 11. Carry out preventive maintenance on the electrical machines; 12. Clean the electrical machine; 13. Request for inspection and testing of the electrical machine; 14. Clean tools and working area; 15. Store tools and safety gears; and 16. Prepare Report.	3.3. Ohms Law; 3.4. Watt's Law; 3.5. Faraday's Law 3.6. Kirchhoff's Current Law; 3.7. Kirchhoff's Voltage Law; 3.7. Basics of Machine Elements; 3.8. Interpretation of Technical Drawing; 3.9. Basic Material Science; 3.10. Purpose of performing preventive maintenance; and 3.11. Operation of Electrical Machines. 4.0. Essential skills 4.1. Measurements & instrumentation; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management; 4.8. Materials science; 4.9. Computer skills; and 4.10. Report Writing. 5.0. Math Skills 5.1. Material Costs Estimation
Description of the end Product or Service:	The preventive maintenance is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field and the electrical machines are functioning properly with minimum disturbance.
Circumstantial knowledge:	Detailed knowledge about: 1. International colour code regulation; 2. Safe handling of tools and equipment; 3. Health, safety and environment; and 4. Waste disposal methods.

TABLE NO. 1: DACUM CHART FOR ELECTRICAL ENGINEERING LEVEL 5

DUTIES	TASKS	ENABLERS
1.0. Install Electrical Machines & Systems with load not exceeding 100 KVA	1.1. Install electric machines with load not exceeding 100 KVA 1.2. Install electrical systems with load not exceeding 100 KVAQ 1.3. Construct low- and medium- voltage power lines and install low- and medium-voltage power cables 1.4 Install low- and medium-voltage power cables	Generic Skills and Knowledge • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Use of manufacturer's manual • Skills and knowledge on: • taking measurements & measuring units • instrumentation • Computer programming languages • Machine elements • Interpretation of technical drawing • Basic Material science • Circuit parameters calculation Tools and Equipment • Personal Protective Equipment (PPE) such as Safety boots, safety goggle, gloves, hearing protection, helmets. • Measuring equipment & instruments • Toolbox • PLC Kit • Vacuum cleaner • Current injection tester • Cable fault locator • Oven • Protection relay test kit • Simulators • Ladders • Spikes • Rollers • Ropes • Wire stringing machine • Wire conduits • Cable bridges • Wiring ducts • Insulators • Infrared camera • Voltage detector • Compression tool • Computer

DUTIES	TASKS	ENABLERS
		• Software (AutoCAD & ArchiCAD) Materials • Lubricants, grease, mutton cloth, oil, silica gel, diesel, varnish, insulation material, coil winding machine, wires, connectors, conduits, conduit bender, cable lugs and cable ties. Worker Behaviours • Team spirit, trustworthy, time management and dedication
2.0. Perform Maintenance on Electrical Systems with load not exceeding 100 KVA	2.1. Troubleshoot electrical systems with load not exceeding 100 KVA 2.2. Perform Corrective Maintenance on Electrical machines with load not exceeding 100 KVA	• Generic Skills and Knowledge • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Use of manufacturer's manual • Skills and knowledge on: ✓ taking measurements & measuring units ✓ instrumentation ✓ Computer programming languages • Machine elements • Interpretation of technical drawing • Basic Material science Tools and Equipment • Personal Protective Equipment (PPE) such as Safety boots, Safety goggles, Gloves, Hearing Protection, Helmets, Safety belt. • Measuring equipment & instruments • Toolbox • PLC Kit • Vacuum cleaner • Current injection tester • Cable fault locator • Oven • Protection relay test kit • Simulators

DUTIES	TASKS	ENABLERS
		• Ladders • Spikes • Rollers • Ropes • Wire stringing machine • Infrared camera • Voltage detector • Compression tool Materials • Lubricants, grease, mutton cloth, oil, silica gel, diesel, varnish, insulation material, coil winding machine, wires, connectors, conduits, conduit bender, cable lugs and cable ties. Worker Behaviours • Team spirit, trustworthy, time management and dedication
3.0. Perform Preventive Maintenance on Electrical Systems & Systems with load not exceeding 100 KVA	3.1. Perform Preventive Maintenance on Electrical Systems with load not exceeding 100 KVA 3.2. Perform Preventive Maintenance on Electrical Machines with load not exceeding 100 KVA	Generic Skills and Knowledge • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Use of manufacturer's manual • Skills and knowledge on: ✓ taking measurements & measuring units ✓ instrumentation ✓ Computer programming languages • Machine elements • Interpretation of technical drawing • Basic Material science Tools and Equipment • Personal Protective Equipment (PPE) such as Safety boots, Safety goggle, Gloves, Hearing Protection, Helmets, Safety belt. • Measuring equipment & instruments • Electrician Toolkit • Soldering Iron • PLC Kit • Vacuum cleaner

DUTIES	TASKS	ENABLERS
		• Secondary current injection tester • Current injection tester • Cable fault locator • Oven • Protection relay test kit • Simulators • Ladders • Spikes • Rollers • Ropes • Wire stringing machine • Infrared camera • Voltage detector • Compression tool Materials • Lubricants, grease, mutton cloth, oil, silica gel, diesel, varnish, insulation material, coil winding machine, wires, solder wire, connectors, conduits, conduit bender, cable lugs and cable ties. Worker Behaviours • Team spirit, trustworthy, time management and dedication