NATIONAL COUNCIL FOR TECHNICAL EDUCATION

NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR ELECTRICAL ENGINEERS

LEVEL: NTA 8

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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 12occupations. Occupational standards for Electrical Engineers 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 Mrs Leah Lukindo and Eng. Dr. Simon Baregu 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
1	Eng. Decklan P. Mhaiki	Chief Technical Advisor	Tanzania Electric Supply Company Limited (TANESCO)
2	Eng. Sophia Mgonja	Chief Technical Advisor	Tanzania Electric Supply Company Limited (TANESCO)
3	Eng. Msherwa John	Principal Coordinator	The National Council for

			Technical Education (NACTE)
4	Eng. Mary K. Mhayaya	Consulting Engineer	Tanzania Ports Authority (TPA)
5	Dir. Erick Mgaya	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	Chongqing Electric Power College	Wang Qiuhong	Professor / Power System Automation
2	Chongqing Electric Power College	Li Yan	Associate Professor / Power System Automation
3	Chongqing Electric Power College	Chen Lingxi	Lecturer / International Cooperation
4	Chongqing Electric Power College	Yang Qijun	Associate Professor / Power Supply and Utility Technology
5	Chongqing Electric Power College	Long Yang	Lecturer / Power Communication and Automation
6	Chongqing Electric Power	Xia Wei	Associate Professor / Engineering

	College		Management
7	Chongqing Electric Power College	Ma Zeju	Associate Professor / Power System Automation
8	Chongqing Electric Power College	Huang Ping	Associate Professor / Project Management
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10	Zibo Vocational Institute	Ma Wenying	Lecturer / Electrical Automation
11	Zibo Vocational Institute	Yang Bing	Associate Professor / Electrical Automation
12	Zibo Vocational Institute	Zhang Dedi	Associate Professor / Electrical Automation
13	Zibo Vocational Institute	Tao Nana	Lecturer / Mechanical and Electrical Integration
14	Zibo Vocational Institute	Han Meng	Lecturer / Mechanical and Electrical Integration
15	Zibo Vocational Institute	Dong Jian	Lecturer / Electrical Automation
16	Zibo Vocational Institute	Xu Yongpan	Assistant Professor / Mechanical and Electrical Integration
17	Liaocheng Vocational and Technical College	Ge Xufeng	Professor / Mechanical and Electrical Integration
18	Liaocheng Vocational and Technical College	He Lingyun	Lecturer / Mechanical and Electrical Integration
19	Liaocheng Vocational and Technical College	Zhao Xin	Lecturer / Electrical Automation
20	Liaocheng Vocational and Technical College	Wang Lina	Lecturer / Mechanical and Electrical Integration
21	Liaocheng Vocational and	Shi Yanting	Assistant Professor / Electrical

Technical College Automation

Dr. A. B. Rutayuga Dar es Salaam

Executive Secretary October 2022

ABREVIATIONS

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 Competence:	The application of knowledge and skills to perform consistently to the standards required in the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tool of assessment of the pre – scribed outcomes.
Performance Criteria:	It indicates the expected end results or outcome in form of

	evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	It is a set of statement, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Tasks:	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.
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.
Underpinning Knowledge:	This is crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and 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.

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 Engineer Occupation as 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 …… participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR ELECTRICAL ENGINEERS

These standards cover a broad range of duties and tasks that can be performed by an Electrical Engineer. 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 Engineer may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations other individuals may be employed or designated to perform specific tasks.

Electrical engineers usually do research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.

Electrical equipment is any item for such purposes as generation, conversion, transmission, distribution or utilization of electrical energy such as machines, transformers, and apparatus, measuring instruments, protective devices, wiring materials, accessories and appliances.
It is the job of electrical engineers to ensure the effective, safe, environmentally friendly and both economically and socially acceptable functioning of electrical systems and equipment. This Occupational Standards highlight core knowledge, skills, competences and personal attributes that Electrical Engineers must possess to be successful in their daily duties, that include:

a) Supervising maintenance of electrical systems
b) Supervising maintenance of electrical machines
c) Supervising installation of electrical machines and systems
d) Carrying out design of electrical systems
e) Carrying out design of electrical machines
f) Managing projects
g) Managing resources
h) Commissioning installed electrical machines and systems
i) Conducting applied research on electrical works

The Occupational standards have been clustered into NTA qualification levels i.e. NTA level 7 and 8.

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 STANDARDSFOR ELECTRICAL ENGINEERIS - NTA 8

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT DESIGN OF ELECTRICAL SYSTEMS	**DUTY NO.**	801
TASK TITLE	DESIGN ELECTRICAL SYSTEMS	**TASK NO.**	8011
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding to perform engineering design of electrical systems in factories and industries in accordance with the current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Computer, Design software, protractor, compass and ruler. **Materials:** Notepad, Drawing paper, pen and pencil.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Identify the need for the electrical system; 2. Prepare technical requirements for the system; 3. Analyse system technical requirements; 4. Prepare conceptual design of the system showing the broad functional outlines; 5. Prepare preliminary design of the system with detailed drawings; 6. Verify preliminary design with site conditions; 7. Prepare detailed design incorporating information on actual site conditions; 8. Prepare wiring diagrams for the system; 9. Select material for the design; 10. Perform material sizing; 11. Prepare the list of equipment materials 12. Evaluate system design; 13. Prepare design report.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Perform design of electrical systems; 1.2. Perform material sizing for the design. **2.0. Principles** The person must be able to explain the principles of: 2.1. Design of electrical systems; 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. Systems Engineering Theory; 34. Ohms Law; 3.5. Watt's Law; 3.6. Kirchhoff's Current Law; 3.7. Kirchhoff's Voltage Law; 3.8. Mesh Current Analysis; 3.9. Nodal Voltage Analysis; 3.10. Basic Knowledge of Motor and Electric Appliances; 3.11. Basic Knowledge of Firefighting, Earthing and Lighting Protection of Electric Appliances;

	3.12. Safety Distance and Safety Marks; 3.13 Knowledge for Type Selection of Common Electrical Equipment and Electrical Materials; 3.14. Electrical System Layout Design **4.0. Essential skills** 4.1. Measurements & instrumentation; 4.2. Graphic software for electrical design 4.3. Communication skills; 4.4. Punctuality; 4.5. Team Spirit; 4.6. Trustworthy; 4.7. Dedication; 4.8. Time management; 4.9. Materials science; 4.10. Computer skills; 4.11. Report writing skills; **5.0. Math Skills** 5.1. Design calculations, Material sizing estimation.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Design of the electrical system is performed/completed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation; 2. Safety operational parameters of system equipment; and 3. Safety and health legislations and regulations (OSHA).

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT DESIGN OF ELECTRICAL SYSTEMS	**DUTY NO.**	801
TASK TITLE	DEVELOP ELECTRICAL SYSTEMS	**TASK NO.**	8012
PERFORMANCE CRITERIA	The person carrying out this task must be able to develop electrical systems as per design specifications, 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, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Measuring instruments, Toolbox, Tape measure, Wire stripper, Plier, Conduit bender, Electric drill and Design instruction's manual and Computer. **Materials:** Insulation tape, Wires, Connectors, Cable lugs, Cable ties, Conduits and Other electrical &electronics accessories.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Read design specifications and requirements of systems as indicated in the design documents; 2. Determine the required materials needed for systems development; 3. Prepare material cost estimates and budget; 4. Procure materials; 5. Identify tools, equipment and measuring instruments to be used in the task; 6. Identify manpower to be engaged in the task; 7. Observe health and safety regulations; 8. Carry out installation, wiring and connection of electrical system 9. Develop the systems carefully avoiding possible damage of accessories; 10. Inspect the developed systems as appropriate and in accordance with design	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Develop electrical systems; 1.2. Interpret design systems layout drawings. **2.0. Principles** The person must be able to explain the principles of: 2.1. Installation and commissioning of electrical systems. **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; 3.4. Kirchhoff's Current Law; 3.5. Kirchhoff's Voltage Law; 3.6. Mesh Current Analysis; 3.7. Nodal Voltage Analysis; 3.8. Systems Development Procedures; 3.9. Basic Knowledge of Motor and Electric Appliances; 3.10. Basic Knowledge of Electrical Measurements; 3.11. Basic Knowledge of Electrical Safety; **4.0. Essential skills**

specifications; 11. Clean tools and working area; 12. Store equipment and working tools; 13. Prepare report.	4.1. Communication skills; 4.2. Punctuality; 4.3. Team spirit; 4.4. Trustworthy; 4.5. Dedication; 4.6. Time management skills; 4.7. Computer skills; 4.8. Selection and use of electrical materials; 4.9. Report writing skills; 4.10. Interpretation of electrical systems layout; 4.11. Installation of electrical systems; 4.12. Measurements &instrumentation skills; 4.13. First aid for electric shock **5.0. Math Skills** 5.1. Material costs estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Development of electrical systems is performed as per design specifications, requirements, and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International colour code regulation; 2. Safe handling of equipment and tools; 3. Health and safety legislations and regulations (OSHA); 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT DESIGN OF ELECTRICAL SYSTEMS	**DUTY NO.**	801
TASK TITLE	TEST ELECTRICAL SYSTEMS	**TASK NO.**	8013
PERFORMANCE CRITERIA	The person carrying out this task must be able to test electrical systems 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, power meter & Phase tester), Toolbox, PLC Kit, Injection Kit, Protection relay test kit and Manufacturer's Instruction Manual. **Materials:** Notebook and pen		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Inspect the electrical system for compliance with design; 2. Identify testing tools and measuring equipment to be used during testing; 3. Carry out test to see if the ground system is properly connected; 4. Carry out resistance test (ohms); 5. Carry out test on the circuit breaker to check its functionality; 6. Carry out test on relays to check their functionalities; 7. Carry out voltage test for each battery cell and battery charger for DC systems; 8. Connect power supply to the electrical system; 9. Connect outlet or load on the electrical system; 10. Carry out measurement tests on the outlet or load end of the system for the required output; 11. Measure frequency, power (Watt); energy (kilowatt-hour) and power factor;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Test various electrical systems; 1.2. Use different types of electrical testing tools and measuring equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. Measuring electrical systems 2.2. Conduct the commissioning of electrical systems **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; 3.4. Kirchhoff's Current Law; 3.5. Kirchhoff's Voltage Law; 3.6. Faraday's Law 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; 3.9. Basic Knowledge of Motor and Electrical Appliances; 3.10. Basic Knowledge of Electrical Measurements; 3.11. Basic Knowledge of Electrical Safety; 3.12. System Switching and Control. **4.0. Essential skills** 4.1. Measurements & Instrumentation;

12. Carry out amperage test (electrical current) of the system; 13. Carry out accuracy test for measurement systems; 14. Analyze and troubleshoot the exceptions and faults of electrical systems 15. Commission the electrical system; 16. Observe health and safety precautions when the task is performed 17. Clean the testing tools and measuring equipment; 18. Store the testing tools & measuring equipment as well as the safety gears; 19. Handover the electrical systems to the client/end user; 20. Write technical report.	4.2. Electrical system layout interpretation; 4.3. Operation of electrical systems 4.4. Communication skills; 4.5. Punctuality; 4.6. Team Spirit; 4.7. Trustworthy; 4.8. Dedication; 4.9. Time Management Skills; 4.10. Computer skills; 4.11. Material Science; 4.12. Interpretation of test results of the system; 4.13. Suggestions for technological improvement of electrical systems; 4.14. Report writing Skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Testing of electrical systems 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 working tools and equipment; 3. Safe handling of measuring tools; 4. Knowledge on safety, health & environment; 5. Health and safety legislations and regulations (OSHA); 6. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT DESIGN OF ELECTRICAL MACHINES	**DUTY NO.**	802
TASK TITLE	DESIGN ELECTRICAL MACHINES	**TASK NO.**	8021
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding to perform engineering design of electrical machines in factories and industries 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:** Computer, design software, protractor, compass, ruler and drawing board. **Materials:** Notepad, drawing paper, pen and pencil.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Identify the need for the machine; 2. Prepare technical requirements for the machine; 3. Analyse technical requirements for the machine; 4. Prepare conceptual design of the machine showing the broad functional outlines; 5. Prepare preliminary design of the machine with detailed drawings; 6. Verify preliminary design for proper functionality; 7. Optimize the Design and prepare detailed design incorporating changes from the verification stage; 8. Prepare connection diagrams for the machine; 9. Select material for the parts of the machine; 10. Observe health and safety precautions when the task is performed 11. Perform material sizing; 12. Prepare specifications for the design; 13. Evaluate machine design;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Perform design of electrical machines; 1.2. Perform material sizing and select material type for the design. **2.0. Principles** The person must be able to explain the principles of: 2.1. Design of electrical machines; 2.2. Operation of electrical machines. **3.0. Theories** The person must be able to explain: 3.1. Basic Electrical Engineering Theories; 3.2. Machine Elements; 3.3. Ohms Law; 3.4. Watt's Law; 3.5. Kirchhoff's Current Law; 3.6. Kirchhoff's Voltage Law; 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis. 3.9. Electrical machines layout design & interpretation 3.10 Series and parallel connection of resistance, star triangle transformation of impedance; 3.11. Superposition theorem and Thevenin theorem of circuit analysis; 3.12. Sine quantity and its phasor expression method; 3.13 Power, power factor and electric energy of single-phase sinusoidal AC circuit;

14. Prepare design report.	3.14. Analysis of RLC series or parallel single-phase sinusoidal AC circuit; 3.15. Symmetric three-phase sine; 3.16. Connection of three-phase power supply and three-phase load; 3.17. Power and power factor of three-phase circuit; 3.18. Analysis of symmetrical three-phase circuit; 3.19. Basic concepts of magnetic field and magnetic circuit; 3.20. Magnetization curve and power loss of ferromagnetic materials; 3.21. Ampere loop law, Ohm law, Kirchhoff law and electromagnetic induction law of magnetic circuit 3.22. Motor structure and principle; **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; 4.10. Report writing skills. **5.0. Math Skills** 5.1. Design calculations; 5.2. Material sizing estimation.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Design of the electrical machine is performed/completed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation; 2. Safe operational parameters of system equipment; 3. Safety and health legislations and regulations (OSHA).

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT DESIGN OF ELECTRICAL MACHINES	**DUTY NO.**	802
TASK TITLE	TEST ELECTRICAL MACHINES	**TASK NO.**	8023
PERFORMANCE CRITERIA	The person carrying out this task must be able to test Electrical Machines 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, fual-phase voltammetry table clamp, and insulation resistance tester), Toolbox, PLC Kit, Injection Kit, Protection relay test kit and Manufacturer's Instruction Manual. **Materials:** Notebook and pen The task will be performed under minimal supervision of an experienced Electrical Engineer.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Inspect the electrical machine for compliance with design; 2. Identify testing and measuring equipment and instruments to be used during testing; 3. Observe health and safety precautions when the task is performed 4. Carry out test to see if the ground system of the machine is properly connected; 5. Conduct the winding DC resistance test and insulation resistance test; 6. Carry out test on the circuit breaker to check its functionality; 7. Carry out test on relays to check their functionalities; 8. Connect power to motor; 9. Connect outlet or load to the electrical machine; 10. Carry out test on the outlet or load end of the machine for voltage presence and if it is on the acceptable range; 11. Carry out amperage test	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Test various electrical machines; and 1.2. Identify and use different types of electrical measuring and testing instruments. **2.0. Principles** The person must be able to explain the principles of: 2.1. Measuring electrical machines 2.2. Testing electrical machines **3.0. Theories** The person must be able to explain: 3.1. DC circuit modelling and major component; 3.2. Current, voltage, resistance and power of DC circuits; 3.2. Ohms Law and 4. Kirchhoff's Laws; 3.3. Resistors in series and in parallel, and transformation between star connected and delta connected impedances; 3.4. Branch current method, mesh current analysis method and nodal voltage analysis method for circuit analysis; 3.5. Superposition theorem and Thevenin's theorem for circuit analysis; 3.6. Expression method of sinusoidal quantity and

(electrical current) of the machine; 12. Measure frequency, power (Watt); energy (kilo Watt-hour) and power factor; 13. Commission the electrical machine; 14. Clean the testing and measuring equipment and instruments; 15. Store the testing & measuring equipment as well as the safety gears; 16. Handover the electrical machine to the client/end user; and 17. Write technical report. 18. Carry out voltage test for each battery cell and battery charger for DC machine 19. Connect power supply to the electrical machine;	phasor quantity; 3.7. Power, power factor and electric energy of Single-phase sinusoidal DC circuit; 3.10. Single-phase sinusoidal AC circuit RLC series/parallel analysis; 3.11. Symmetric three-phase sinusoidal quantity; 3.12. Connection of three-phase power supply and three-phase load; 3.13. Power and power factor of three-phase circuit; 3.14. Analysis of symmetrical three-phase circuits; 3.15. Basic concept of magnetic field and magnetic circuit; 3.16. Magnetization curves and power losses of ferromagnetic substances; 3.17. Ampere Circuit Law, Ohms Law, Kirchhoff's Laws of Magnetic Circuits and Faraday's Law 3.18. Motor structure and principle 3.19. Electrical system layout and interpretation; 3.20. Operation methods of electrical systems; 3.12. Operating principles of measuring instruments; **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; 4.10. Interpretation of test results of the machine; and 4.11. Report writing Skills; **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Test on electrical machines are 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.
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. Knowledge on safety, health & environment. 5. Health and safety legislations and regulations (OSHA); 6. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE PROJECTS	**DUTY NO.**	803
TASK TITLE	REVIEW PROJECT DOCUMENTS	**TASK NO.**	8031
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding to review project documents in factories and industries in accordance with standard principles and current versions of regulations & standards governing the project management field.		
RANGE STATEMENTS	The task will be performed in factories and industries. The person will perform this task independently. For successful performance of the task, the following will be required: **Tools and Equipment:** Computer. **Materials:** Notepad and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Obtain relevant project documents; 2. Review feasibility study report of the project; 3. Review contract document; 4. Review procurement requirements; 5. Review communication plan; 6. Review stakeholder management plan; 7. Review risk management plan; 8. Prepare project execution plan.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Review project documents; 1.2. Prepare a project execution plan. **2.0. Principles** The person must be able to explain the principles of: 2.1. Project Management Theories; 2.2. Project Management and Planning; **3.0. Theories** The person must be able to explain: 3.1. Project Management Theories; 3.2. Basic Electrical Engineering Theories. 3.3. Relevant rules and regulations; **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. Information management; 4.9. Computer skills; 4.10. Report writing skills. **5.0. Math Skills** 5.1. Design calculations, 5.2. Material sizing estimation

	5.3. Cost accounting
DESCRIPTION OF THE END PRODUCTS / SERVICE	All relevant project documents are reviewed prior to start of project execution in line with best practices in the project management field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Structure of contracts; 2. Cost accounting 3. Preparation methods of project documents 4. Safety and health legislations and regulations (OSHA).

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE PROJECTS	**DUTY NO.**	803
TASK TITLE	PREPARE PROJECT SCHEDULE	**TASK NO.**	8032
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding to prepare project schedules in accordance with standard principles and current versions of regulations & standards governing the project management field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Computer and project management/scheduling software. **Materials:** Notepad and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Obtain information on project activities; including the contract documents and requirements, project management and planning documents, resources, conditions, etc.; 2. Organise activities in terms of time required to start and finish; 3. Determine the duration of each activity; 4. Determine dependencies of activities on starting and ending times; 5. Develop project schedule; 6. Determine the critical path of the project; 7. Estimate resource requirement for each activity; 8. Review available resources; 9. Load resources on each activity in the project schedule chart; 10. Review project schedule considering availability of resources; 11. Revise project schedule as per resource availability; 12. Determine final critical path for the project.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Prepare a project schedule; 1.2. Determine the critical path on a project schedule; 1.3. Carry out resource loading and levelling on a project schedule 1.4. Cover basic contents in the scheduled plan of the project; 1.5. Common methods for preparing the scheduled plan of the project; **2.0. Principles** The person must be able to explain the principles of: 2.1. Project scheduling; 2.2. Managing resources. **3.0. Theories** The person must be able to explain: 3.1. Project Scheduling Theory; 3.2. Resource Management Theory 3.3. Basic Electrical Engineering Theories; 3.4. Systems Engineering Theory. **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; 4.7. Materials science;

	4.8. Computer skills 4.9. Report writing skills. **5.0. Math Skills** 5.1. Scheduling calculations, 5..2. Material estimation.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Project schedule is prepared as per standard principles and approved rules and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Resources allocation; 2. Safety and health legislations and regulations (OSHA).

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE PROJECTS	**DUTY NO.**	803
TASK TITLE	MONITOR THE PERFORMANCE OF A PROJECT	**TASK NO.**	8033
PERFORMANCE CRITERIA	The person carrying out this task must be able to monitor the performance of a project in factories, industries and construction sites in accordance with standard principles and current versions of regulations & standards governing the project management field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE) such as safety boots, safety goggle, gloves, hearing protection, helmets, safety belt, testing tools, measuring equipment, electrician's tool kit, computer and software packages. **Materials:** Notebook, manuals and drawings		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Monitor the procurement/supply of resources and services for the project; 2. Monitor quality of works; 3. Monitor project costs; 4. Monitor project schedule; 5. Monitor resources; 6. Create deliverables and milestones; 7. Monitor tasks to be completed; 8. Control changes in the project; 9. Manage stakeholders' requirements; 10. Monitor and manage risks; 11. Meet regularly with project team members and stakeholders; 12. Arrange site meetings; 13. Update status of project; 14. Report project performance periodically.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Control quality of works; 1.2. Manage stakeholders; 1.3. Manage project risks; 1.4. Monitor projects; 1.5. Follow up and guide the continuous improvement of the project management performance. **2.0. Principles** The person must be able to explain the principles of: 2.1. Project Management 2.2. Risk Management; 2.3. Stakeholders Management. **3.0. Theories** The person must be able to explain: 3.1. Project Management Theory; 3.2 Acceptance Scheme **4.0. Essential skills** 4.1. Communication skills 4.2. Punctuality 4.3. Team Spirit 4.4. Trustworthy 4.5. Dedication

	4.6. Leadership skills 4.7. Time Management skills 4.8. Computer skills 4.9. Report writing skills. **5.0. Math Skills:** 5.1. Material costs estimation and Project status estimation 5.2. Weight conversion
DESCRIPTION OF THE END PRODUCTS / SERVICE	Monitoring of project is performed as per standard principles and approved rules and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**1. Detailed knowledge about:** 2. Safe handling of working tools and equipment; 3. Safe handling of measuring tools; 4. Health and safety legislations and regulations (OSHA); 5. Waste disposal methods; 6. Knowledge of electrical fire fighting and first aid; 7. Operating instructions for electrical safety; 8. On-site civilized production and quality management; 9. Knowledge of project technical management 10. Knowledge of project schedule management 11. Knowledge of project risk management 12. Evaluation methods of the project.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE PROJECTS	**DUTY NO.**	803
TASK TITLE	OVERSEE PROJECT CONCLUSION AND CLOSURE	**TASK NO.**	8034
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding in factories, industries and construction sites to close the project in accordance with the regulations and standards governing the project management field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Computer. **Materials:** Notepad and Pens.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Verify that final delivery is complete; 2. Notify client/end user of project completion; 3. Handover project output to client/end user; 4. Review all contracts and documentation; 5. Finalise payment issues; 6. Release personnel & equipment; 7. Clear with legal counsel any outstanding legal matters; 8. Prepare final report; 9. Monitor warranty issues; 10. Prepare after-warranty performance report; 11. Verify whether the project quality conform to the standard.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Close a project and communicate with clients for the implementation plan of the project; 1.2. Monitor warranty issues. 1.3 Review electrical engineering quantity and report the budget as required; 1.4 Accept, assist in payment collection, offer after-sales services, etc. **2.0. Principles** The person must be able to explain the principles of: 2.1. Project Management; 2.2. Project conclusion 2.3. Contract Management, 2.4. Operation of electrical systems; 2.5 Project implementation **3.0. Theories** The person must be able to explain: 3.1. Project Management Theories; 3.2. Process flow of the project; 3.3. Solutions for the project; **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;

	4.7. Materials science; 4.8. Computer skills, including office software, identification and drawing of CAD and electrical drawings, report production, etc.; 4.9. Report writing skills; 4.10. Put an end to waste and develop cost and saving consciousness 4.11. Adhere to fairness and justice, and stamp out corruption and bribery **5.0. Math Skills** 5.1. Project Costs calculations. **6.0. Innovation Capacity** 6.1 Product Technology Upgrading Ability
DESCRIPTION OF THE END PRODUCTS / SERVICE	Project is properly closed and project output handed to client/end user as per standard principles and approved rules and regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety and health legislations and regulations (OSHA); 2. Waste disposal methods. 3. Network environment construction and application on the client's site; 4. Get familiar with the manufacturing process of the equipment manufacturing industry, be able to give early warning of the possible risks of equipment manufacturing and parts manufacturing and formulate countermeasures; 5. Report writing skills, for example, preparing project daily report and project risk analysis and reporting to the superior in time.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE RESOURCES	**DUTY NO.**	804
TASK TITLE	SUPERVISE SUBORDINATES	**TASK NO.**	8041
PERFORMANCE CRITERIA	A person carrying out this task must be able to apply knowledge, skills and understanding to supervise subordinates at work place in factories, industries and construction sites in accordance with standard principles and current versions of regulations & standards governing supervision.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Measuring Instruments and computer. **Materials:** Notebook and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Prepare work plan and arrange the personnel, materials, machines, tools and fund resources according to the work plan; 2. Provide work plan to subordinates and monitor the working progress; 3. Clarify the purpose of assignments; 4. Provide detailed directions and instructions; 5. Follow up and coordinate all kinds of problems in work, and work with the subordinates to complete tasks; 6. Review the subordinates' work regularly; 7. Monitor adherence to safety quality and technical standards during work; 8. Provide mentorship to subordinates 9. Hold regularly scheduled supervision meetings on aspects of safety, quality and schedule; 10. Build teamwork at work place; 11. Motivate subordinates;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Effectively supervise subordinates to enhance optimum performance **2.0. Principles** The person must be able to explain the principles of: 2.1. Leadership; 2.2. Motivation; 2.3. Team Building; 2.4. Mentorship. **3.0. Theories** The person must be able to explain: 3.1. Models of Supervision; 3.2. Leadership Theory; 3.3. Motivation Theory; 3.4. Mentoring Theory; 3.5. Hierarchy of Needs Theory. **4.0. Essential skills** 4.1. Leadership Skills; 4.2. Interpersonal Skills; 4.3. Communication Skills; 4.4. Mentoring Skills; 4.5. Judgmental Skills; 4.6. Technical Skills; 4.7. Punctuality; 4.8. Team Spirit;

12. Appraise performance of subordinates.	4.9. Trustworthy; 4.10. Dedication; 4.11. Time Management; 4.12. Computer skills; 4.13. Report writing Skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Supervision of subordinates is performed as per standard principles and approved rules & regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of working tools and equipment; 2. Safe handling of measuring tools; 3. Health and safety legislations and regulations (OSHA); 4. Waste disposal methods; 5. Quality and technical standads.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE RESOURCES	**DUTY NO.**	804
TASK TITLE	PARTICIPATE IN PROCUREMENT	**TASK NO.**	8042
PERFORMANCE CRITERIA	A person carrying out this task should be able to apply knowledge, skills, and understanding to participate in procurement activities in factories and industries as per standard principles in procurement and in line with the current procurement laws and regulations.		
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:** Computer. **Materials needed:** Notepad and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Supervise collection of information on procurement needs; 2. Supervise preparation of Bill of Quantities (BOQ); 3. Review BOQ; 4. Supervise preparation of cost estimates; 5. Review cost estimates; 6. Supervise preparation of technical specifications; 7. Review technical specifications; 8. Submit requirements and technical specifications to procurement unit; 9. Participate in tender evaluations; 10. Participate in contract negotiations 11. Supervise contract execution.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: **2.0. Principles** The person must be able to explain the principles of: 1. Procurement of Goods, Works and Services; 2. Prepare technical specifications for procurement purposes; 3. Analyse bills of material and drawings to understand key requirement. **3.0. Theories** The person must be able to explain: 3.1. Supply Chain Management Theory; 3.2. Procurement Management Theory; 3.3. Current Public Procurement Act and its Regulations. **4.0. Essential skills** 4.1. Verbal & Written Communication Skills; 4.2. Punctuality; 4.3. Trustworthy; 4.4. Dedication; 4.5. Integrity; 4.6. Time Management; 4.7. Proficiency with personal computers and networking, specifically Microsoft Excel; 4.8. Report writing Skill. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Appropriate goods, works and services acquired as per standard principles and approved rules & regulations.

CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Health and safety legislations and regulations (OSHA); 2. Rules and regulations for biding and tendering 3. Procurement procedures; 4. Rules and regulation of contracts 5. Institutional Operations.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE RESOURCES	**DUTY NO.**	804
TASK TITLE	MANAGE MATERIALS	**TASK NO.**	8043
PERFORMANCE CRITERIA	The person carrying out this task must be able to manage materials in factories, industries and construction sites in accordance with standard principles and current versions of regulations & standards governing the material management field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction site. For successful performance of the task, the following will be required: **Tools and Equipment:** Measuring instruments and computer. **Materials:** Notebooks and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**PRACTICAL PERFORMANCE**
The person performing this task must be able do the following: 1. Supervise inspection of materials for quality control; 2. Project materials requirements for work at hand 3. Supervise storage of materials; 4. Approve documents for requisition of materials from store; 5. Reconcile materials used at site and those collected from store; 6. Make sure that the ledger records are completed; 7. Prepare a report.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Control quality of materials; 1.2. Reconcile materials used at site with the ones collected from store. **2.0. Principles** The person must be able to explain the principles of: 2.1. Materials Management **3.0. Theories** The person must be able to explain: 3.1. Supply Chain Management Theory; 3.2. Reasons for and purpose of materials management process. **4.0. Essential skills** 4.1. Communication skills; 4.2. Punctuality; 4.3. Team Spirit; 4.4. Trustworthy; 4.5. Dedication; 4.6. Basic Material Science; 4.7. Time Management Skills; 4.8. Computer Skills; 4.9. Report writing Skills. **5.0. Math Skills** 5.1. Material Costs Estimation.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Management of materials is performed in accordance with standard principles and approved rules &

	regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of different materials; 2. Safety and health legislations and regulations (OSHA); 3. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE RESOURCES	**DUTY NO.**	804
TASK TITLE	MANAGE TOOLS & EQUIPMENT	**TASK NO.**	8044
PERFORMANCE CRITERIA	The person carrying out this task must be able to manage tools & equipment at work place in factories, industries and construction sites as per standard principles and manufacturer's recommendations.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (P.P.E.), Computer, printer **Materials:** Notebooks and pens		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
1. The person performing this task must be able do the following: 2. Keep the equipment warehouse clean and orderly; 3. Set up an equipment ledger; 4. Set up the collection account of tools and equipment; 5. Supervise the efficiency and safety during operation with tools and equipment; 6. Carry out the configuration, use, maintenance, entry/exit management of construction tools according to the project demands; 7. The project management unit shall ensure that the performance and condition of the construction machines and facilities in use are qualified, maintain and repair them regularly, and form operation and use records; 8. Organize examination and evaluation for the configuration, use, maintenance, technical and safety measures, use efficiency and use cost of the construction tools and facilities of the project.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Manage tools and equipment; 1.2. Properly store tools and equipment; 1.3. Monitor usage of tools and equipment; **2.0. Principles** The person must be able to explain the principles of: 2.1. Management of tools and equipment **3.0. Theories** The person must be able to explain: 3.1. Inventory management theories. **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. Computer skills; 4.8. Report writing Skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Tools & Equipment are properly managed, used and stored in line with manufacturers' instructions. Proper documentation of available resources is

	available.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of measuring equipment; 2. Safe handling of tools 3. Safety and health legislations and regulations (OSHA); 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE RESOURCES	**DUTY NO.**	804
TASK TITLE	MANAGE BUDGET	**TASK NO.**	8045
PERFORMANCE CRITERIA	The person carrying out this task must be able to manage a budget at the workplace in accordance with standard principles and current versions of regulations & standards governing the financial management field.		
RANGE STATEMENTS	The task will be performed in factories, industries and construction sites. For successful performance of the task, the following will be required: **Tools and Equipment:** Computer, financial regulations and accounting instructions. **Materials:** Notebooks and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Supervise the fund flow; 2. Make budget for special tasks, check actual and budgeted expenses, find out the deviations and analyse the cause; 3. The project management unit shall control the use of funds according to the fund use plan to save the cost, set up the account according to the provisions of the accounting system, record the income and expenditure of the project fund and carry out financial accounting to calculate the profits and loss; 4. Arrange daily meetings; 5. Prepare weekly, monthly and annual reports; 6. Know the price of on-site equipment and the expense of the whole process 7. Conduct examination and evaluation of the financial statement and economic benefits according to the cost accounting and analysis of the project.	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Track expenses; 1.2. Control budget. **2.0. Principles** The person must be able to explain the principles of: 2.1. Financial Management; 2.2. Transparency and Accountability. **3.0. Theories** The person must be able to explain: 3.1. Financial Management Theory **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. Computer Skills; 4.8. Report writing Skills. 4.9. Basic finance. **5.0. Math Skills** 5.1. Financial cost estimation **6.0 Basis for Budget Preparation**

	6.1.Contract documents; 6.2. Project management implementation plan; 6.3. Relevant design documents; 6.4. Price information; 6.5 Relevant norms; 6.6 Cost data of similar projects.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Management of budget is performed in accordance with standard principles and approved rules & regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** Financial and accounting regulation of the organization

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMMISSION INSTALLED ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	805
TASK TITLE	COMMISSION INSTALLED ELECTRICAL MACHINES	**TASK NO.**	8051
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to commission installed electrical machines in factories and industries as per technical requirements and in accordance with standard principles and current versions of regulations & 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), Computer, Application software, Measuring instruments (Digital Multi-meter & Phase tester), Electrician toolkit, PLC Kit, Injection Kit, Protection relay test kit and Manufacturer's Instruction Manual. **Materials:** Oil, Fuel, Grease, Notebook and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Inspect the electrical machine for compliance with installation drawings and instructions; 2. Identify testing and measuring equipment to be used during testing; 3. Observe health and safety precautions when the task is performed; 4. Check whether there is electric leakage on the motor shell or poor earthing; 5. Carry out test to see if the ground system of the machine is properly connected; 6. Carry out resistance test (ohms); 7. Carry out tests on the power supply circuit breaker to check its functionality; 8. Carry out tests on relays to check their functionalities; 9. Carry out voltage test for each battery cell and battery charger	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Commission various electrical machines; and 1.2. Identify and use different types of electrical testing and measuring equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. Measuring electrical machines; and 2.2. Testing electrical machines. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering Theories; 3.2. Network Analysis Theories; 3.3. Ohms Law; 3.4. Kirchhoff's Current Law; 3.5. Kirchhoff's Voltage Law; 3.6. Faraday's Law 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; 3.9. Switching and control of systems; 3.10. Power layout interpretation;

for DC powered/controlled machines; 10. Connect power supply to the electrical machine; 11. Run the electrical machine with no load for a while; 12. Connect outlet or load to the electrical machine; 13. Carry out test on the outlet or load end of the machine for voltage presence and correctness; 14. Carry out amperage test (electrical current) of the machine; 15. Measure frequency, power (Watt), energy (kilowatt-hour) and power factor; 16. Clean the testing and measuring equipment; 17. Store the testing, measuring equipment and safety gears; 18. Handover the electrical machine to the client/end user; 19. Write technical report.	3.11. Operation of Electrical Systems. **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; 4.10. Interpretation of test results of the machine; 4.11. Report writing skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Installed electrical machine commissioned and properly functioning as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
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. Knowledge on safety, health & environment; 5. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMMISSION INSTALLED ELECTRICAL MACHINES AND SYSTEMS COMMISSION INSTALLED ELECTRICAL MACHINES AND SYSTEMS	**DUTY NO.**	805
TASK TITLE	COMMISSION INSTALLED ELECTRICAL SYSTEMS	**TASK NO.**	8052
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to commission installed electrical systems in factories and industries as per technical requirements and in accordance with standard principles and current versions of regulations & 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), Computer, Application software, Measuring instruments (Digital Multi-meter & Phase tester), Electrician toolkit, PLC Kit, Injection Kit, Protection relay test kit and Manufacturer's Instruction Manual. **Materials:** Notebook and pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Inspect the electrical system for compliance with installation drawings and instructions; 2. Observe health and safety precautions when the task is performed 3. Identify testing tools and measuring equipment to be used during testing; 4. Carry out test to see if the ground system is properly connected; 5. Carry out resistance test (ohms); 6. Carry out test on the power supply circuit breaker(s) to check functionality; 7. Carry out test on relays to check their functionalities; 8. Carry out voltage test for each battery cell and battery charger	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Test various electrical systems; and 1.2. Use different types of electrical testing tools and measuring equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. Measuring electrical systems; 2.2. Testing electrical systems. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering Theories; 3.2. Network Analysis Theories; 3.3. Ohms Law; 3.4. Kirchhoff's Current Law; 3.5. Kirchhoff's Voltage Law; 3.6. Faraday's Law 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; 3.9. Switching and control of systems;

for DC powered/controlled systems; 9. Connect power supply to the electrical system; 10. Connect outlet or load on the electrical system; 11. Carry out measurement tests on the outlet or load end of the system for the required output; 12. Measure frequency, power (Watt), energy (kilowatt-hour) and power factor; 13. Carry out amperage tests (electrical current) of the system; 14. Carry out accuracy tests for measurement systems; 15. Clean the testing tools and measuring equipment; 16. Store the testing tools, measuring equipment and safety gears; 17. Handover the electrical systems to the client/end user; 18. Write technical report.	3.10. Power layout interpretation; 3.11. Operation of Electrical Systems **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; 4.10. Interpretation of test results of the system; 4.11. Report writing Skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Installed electrical system commissioned and properly functioning as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation; 2. Safe handling of tools and equipment; 3. Knowledge on safety, health & environment; 4. Waste disposal methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMMISSION INSTALLED ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	805
TASK TITLE	COMMISSION CONSTRUCTED ELECTRICAL POWER LINES	**TASK NO.**	8053
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to commission constructed electrical power lines in accordance with standard principles and 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 have been constructed. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Computer, Multi-meter, Ladder, Spikes, Linesmen toolkit, Measuring equipment & instruments, Global Positioning System (GPS), Rollers, Ropes, Wire stringing machine, Phase rotation meter, Voltage detector and Compression tool. **Materials:** Notebook, pen, Mutton cloth, Conductor, Connectors, Insulators, Stay wire, Earth wire, Earth mast, Poles, Base plate, Drum jack, Tension clamps, Aerial Bundle Conductor (ABC), Clamps and other accessories.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Confirm that all workers, material, tools, equipment and any temporary earthing on any part of the entire length of line are removed; 2. Confirm that right of way/way leave for the new power line is clear from any vegetation; 3. Confirm that the ground clearance of the entire new constructed line is in accordance to the permissible minimum ground clearances; 4. Confirm that earthing of steel structures is in accordance with the specifications and resistance within acceptable level; 5. Confirm that all protective systems for the line are operative;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Commission new constructed power line safely; 1.2. Measure earthing resistance; 1.3. Check the protective system functionality; 1.4. Measure voltage of charged line safely; 1.5. Check the phase sequence of the line. **2.0. Principles** The person must be able to explain the principles of: 2.1. Commissioning overhead distribution electrical power lines. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network analysis; 3.3. Ohms law; 3.4. Kirchhoff's current law; 3.5. Kirchhoff's voltage law; 3.6. Mesh current analysis;

6. Inform the concerned authorities: 7. Obtain approval before charging the line; 8. Charge the new constructed power line with no load; 9. Keep the new power line charged without load for a while; 10. Carry out final inspection and monitoring of the new line while it is charged without load; 11. Measure voltage on the sending end and receiving end; 12. Measure the phase sequence of the new line; 13. Declared that the new power line is ready for use if neither insulation breakdown nor protective system actions has occurred; 14. Connect load; 15. Hand over for operation in writing; 16. Observe health and safety precautions when the task is performed 17. Prepare technical report including a snag list.	3.7. Nodal voltage analysis; 3.8. Faraday's law. **4.0. Essential skills** 4.1. Commissioning of power lines skills; 4.2. Measurements & Instrumentation skills; 4.3. Communication skills; 4.4. Punctuality; 4.5. Team Spirit; 4.6. Trustworthy; 4.7. Dedication; 4.8. Time management skills; 4.9. Materials science; 4.10. Computer skills; 4.11. Report writing skills; 4.12. Interpretation of technical drawing; 4.13. Pole climbing skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Commissioning of constructed 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. Knowledge on safety, health & environment; 4. Waste disposal Methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMMISSION INSTALLED ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	805
TASK TITLE	COMMISSION CONSTRUCTED ELECTRICAL POWER CABLES	**TASK NO.**	8054
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to commission installed electrical power cables in accordance with standard principles and current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in various outdoor areas where electrical power cables need to be installed to connect new loads. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Multi-meter, Computer, Ladder, Linesmen Toolkit, 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.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Confirm that all workers have left, and material, tools and equipment on any part of the entire length of the cable are removed; 2. Confirm that all protective systems for the cable are operative; 3. Compare cable data with drawings and specifications; 4. Inspect exposed sections of cable for any physical damage; 5. Inspect shield grounding, cable supports, and terminations; 6. Perform continuity measurements of the cable; 7. Perform an insulation-resistance test individually on each conductor with all other conductors and shields grounded; 8. Inform the concerned authorities and obtain approval before charging the cable; 9. Charge the new constructed power cable without any load;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Commission new constructed power cable safely; 1.2. Measure insulation-resistance; 1.3. Check the protective system functionality; 1.4. Measure voltage of charged cable safely. **2.0. Principles** The person must be able to explain the principles of: 2.1. Commissioning underground electrical power cables. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network analysis; 3.3. Ohms law; 3.4. Kirchhoff's current law; 3.5. Kirchhoff's voltage law; 3.6. Mesh current analysis; 3.7. Nodal voltage analysis; 3.8. Faraday's law. **4.0. Essential skills** 4.1. Commissioning of power cables skills; 4.2. Measurements & instrumentation skills;

10. Keep the new power cable charged without load for a while; 11. Measure voltage on the sending end and receiving end; 12. Check the phase sequence of the power cable; 13. Declared that the new power cable is ready for use if no evidence of distress or insulation failure is observed or protective system action has occurred; 14. Connect load; 15. Hand over for operation in writing; 16. Observe health and safety precautions when the task is performed 17. Prepare technical report including a snag list.	4.3. Communication skills; 4.4. Punctuality; 4.5. Team Spirit; 4.6. Trustworthy; 4.7. Dedication; 4.8. Time management skills; 4.9. Materials science; 4.10. Computer skills; 4.11. Report writing skills; 4.12. Interpretation of technical drawing. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Commissioning of constructed electrical power cable is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation for various types of cables; 2. Safe handling of installation tools & equipment; 3. Knowledge on safety, health & environment; 4. Waste disposal.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT APPLIED RESEARCH ON ELECTRICAL ENGINEERING WORKS	**DUTY NO.**	806
TASK TITLE	IDENTIFY BACKGROUND INFORMATION OF THE OBSERVED CHALLENGE	**TASK NO.**	8061
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to identify information of the observed challenges in factories, industries and various outdoor areas in accordance with standard principles and current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in industries, factories and various outdoor areas. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Multi-meter, Computer, Ladder, Linesmen/ electrician's Toolkit, Measuring equipment & instruments, Global Positioning System (GPS), , Combination Pliers, Voltage Tester, Hammer, Wire stripper, Phase Rotation Meter, Voltage detector, simulators and Compression tool, Insulation resistance tester, and Distribution boards. **Materials:** Notebook, Pen, mutton cloth and testing fuel if necessary.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Review the reported challenge; 2. Listen to the explanation of the challenge from operators/user department; 3. Observe and inspect the challenge physically; 4. Identify the problem by checking readings on measuring instruments; 5. Examine the history and nature of the observed challenge; 6. Categorise challenges/failures observed; 7. Confirm component ratings of machines and system; 8. Review the protection and control principles applicable; 9. Prepare preliminary report on the observed challenge and recommendations	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Conduct applied research in problem solving **2.0. Principles** The person must be able to explain the principles of: 2.1. Applied research in electrical engineering; 2.2. Operation of electrical systems and machines. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network Analysis; 3.3. Ohms Law; 3.4. Watt's Law; 3.5. Kirchhoff's Current Law; 3.6. Kirchhoff's Voltage Law; 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; 3.9. Electronic circuit design. 3.10. Electrical machine technology

10. Observe health and safety precautions when the task is performed	3.11. Simulation of electrical systems; 3.12. Mathematical modelling of electrical systems; 3.13. Protection and control of electrical systems. **4.0. Essential skills** 4.1. Measurements & instrumentation skills; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; 4.8. Materials science; 4.9. Computer skills; 4.10. Report writing skills; 4.11. Interpretation of technical drawing; 4.12. Knowledge on safety, health & environment; 4.13. Problem solving skills. **5.0. Math Skills** 5.1. Numerical analysis skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Identification of background information for the observed challenge in industries, factories and various outdoor areas is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation for various types of cables; 2. Safe handling of installation tools & equipment 3. Knowledge on safety, health & environment; 4. Waste disposal; 5. Protection and control principle of electrical eystems.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT APPLIED RESEARCH ON ELECTRICAL ENGINEERING WORKS	**DUTY NO.**	806
TASK TITLE	COLLECT DATA	**TASK NO.**	8062
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to collect data for the observed challenges in factories, industries and various outdoor areas in accordance with standard principles and current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in industries, factories and various outdoor areas. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Multi-meter, Computer, Ladder, Linesmen/ electrician's Toolkit, Measuring equipment & instruments, Global Positioning System (GPS), Combination Pliers, Voltage Tester, Hammer, Wire stripper, Phase Rotation Meter, Voltage detector, simulators and Compression tool, Insulation resistance tester, Distribution boards. **Materials:** Notebook, Pen, mutton cloth and testing fuel if necessary.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Review the preliminary report on the observed challenge; 2. Visit site; 3. Diagnose the failures at specific part of the system or machine; 4. Provide in detail the background history and nature of the observed challenge; 5. Collect data concerning the challenges; 6. Review the literatures and manuals for the specific electrical systems or machines; 7. Examine the opinion and recommendations of user department; 8. Compare the data of recommendations from the user department and reviewed literatures/manuals; 9. Analyse the collected data;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Conduct applied research in problem solving; 1.2. Prepare bill of quantities for electrical systems, or machines. **2.0. Principles** The person must be able to explain the principles of: 2.1. Operation of electrical systems and machines. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network Analysis; 3.3. Ohms Law; 3.4. Watt's Law; 3.5. Kirchhoff's Current Law; 3.6. Kirchhoff's Voltage Law; 3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; 3.9. Electronic circuit design. 3.10. Electrical machine technology 3.11. Simulation of electrical systems;

10. Identify the analysed challenge/problem; 11. Identify the source of the challenge observed; 12. Analyse various faults prevalent in the system or machine; 13. Prepare technical requirement for rectification of the challenges observed; 14. Identify direct cost and indirect cost; 15. Prepare Bill of Quantities for the rectification of the observed challenges; 16. Prepare detailed technical report on the agreed solutions. 17. Observe health and safety precautions when the task is performed	3.12. Mathematical modelling of electrical systems; 3.13. Protection and control of electrical systems. **4.0. Essential skills** 4.1. Measurements & instrumentation skills; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; 4.8. Materials science; 4.9. Computer skills; 4.10. Report writing skills; 4.11. Interpretation of technical drawing; 4.12. Knowledge on safety, health & environment; 4.13. Problem solving skills. **5.0. Math Skills** 5.1. Numerical analysis skills; 5.2. Material Costs Estimation.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Collection of Data for the observed challenge in industries, factories and various outdoor areas is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation for various types of cables; 2. Safe handling of tools & equipment; 3. Knowledge on safety, health & environment; 4. Waste disposal; 5. Protection and control of the equipment.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT APPLIED RESEARCH ON ELECTRICAL ENGINEERING WORKS	**DUTY NO.**	806
TASK TITLE	PROVIDE SOLUTION TO THE CHALLENGE IDENTIFIED	**TASK NO.**	8063
PERFORMANCE CRITERIA	A person carrying out this task should be able to apply knowledge, skills and understanding to provide solution to the challenges identified in engineering works in factories, industries and various outdoor areas in accordance with standard principles and current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in factories, industries and various outdoor areas. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Multi-meter, Computer, Ladder, Linesmen/ electrician's Toolkit, Measuring equipment & instruments, Global Positioning System (GPS), Design software, Combination Pliers, Voltage Tester, Hammer, Wire stripper, Phase Rotation Meter, Voltage detector, simulators and Compression tool, Insulation resistance tester, and Distribution boards. **Materials:** Notebook, Pen, pencil, Drawing paper, mutton cloth and testing fuel if necessary.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Review detailed technical report on data collection; 2. Identify the challenges on electrical engineering works; 3. Evaluate the root course on challenges facing the electrical engineering works; 4. Analyse technical requirements; 5. Prepare preliminary design of the system with detailed drawings to solve the challenges; 6. Verify preliminary design with site conditions; 7. Prepare detailed design incorporating information obtain from site; 8. Prepare wiring diagrams for the system solutions;	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Perform applied research on electrical engineering works; 1.2. Evaluate root cause of the challenges facing electrical engineering works. **2.0. Principles** The person must be able to explain the principles of: 2.1. Applied research in electrical engineering; 2.2. Operation of electrical systems and machines. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network Analysis; 3.3. Ohms Law; 3.4. Watt's Law; 3.5. Kirchhoff's Current Law; 3.6. Kirchhoff's Voltage Law;

9. Perform material sizing 10. Select material for the solution; 11. Identify manpower for carrying out the solution work; 12. Schedule the work; 13. Rectify the challenge observed; 14. Prepare task implementation report. 15. Observe health and safety precautions when the task is performed	3.7. Mesh Current Analysis; 3.8. Nodal Voltage Analysis; and 3.9. Electronic circuit design. 3.10. Electrical machine technology 3.11. Research methodology; 3.12. Fault analysis **4.0. Essential skills** 4.1. Measurements & instrumentation skills; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; **5.0. Math Skills** 5.1. Design calculations 5.2. Material sizing estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Provided solution to the challenges identified in electrical engineering works completed as per technical requirement and in accordance with the standards governing the applied research on electrical engineering works.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation for various types of cables; 2. Safe handling of installation tools & equipment 3. Knowledge on safety, health & environment; 4. Waste disposal.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE INSTALLATION OF ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	807
TASK TITLE	SUPERVISE INSTALLATION OF ELECTRICAL SYSTEMS	**TASK NO.**	8071
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to supervise installation of electrical systems in factories and industries as per client/contract specifications and in accordance with standard principles and current versions of regulations & 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, Toolbox and Instruction's Manual. **Materials:** Insulation tape, Wires, Connectors, Conduits, Conduit bender, Cable lugs, Cable ties, Other electrical & electronics accessories, mutton cloth, Notebook and Pen.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Prepare work plan for installation of electrical systems; 2. Provide work plan to subordinates; 3. Verify tools and measuring instruments to be used during installation; 4. Review & approve the costs of materials required for installation; 5. Review & approve manpower to be engaged in the installation task; 6. Monitor adherence to safety standards during work; 7. Acquire work permit to commence the installation; 8. Monitor the isolation of electrical power prior to commencing the installation process, where necessary; 9. Monitor the installation of the electrical systems in accordance with technical	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Effectively supervise installation of electrical systems. **2.0. Principles** The person must be able to explain the principles of: 2.1. Installing electrical systems; 2.2. Earthing of electrical systems. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Switching and controlling of electric systems; 3.3. Systems installation procedures; 3.4. Electrical installation/power layout interpretation; 3.5. Network analysis; 3.6. Ohms law; 3.7. Kirchhoff's current law; 3.8. Kirchhoff's voltage law; 3.9. Mesh current analysis; 3.10. Nodal voltage analysis. **4.0. Essential skills** 4.1. Measurements & instrumentation skills;

requirements; 10. Monitor the installation of the cables and required accessories; 11. Monitor the testing process in accordance with technical requirements; 12. Monitor cleaning of equipment, tools and working area; 13. Monitor dispose of wastes; 14. Monitor storage of equipment, tools and safety gears; 15. Commission and provide clear accurate information to the client/end user department; 16. Provide relevant documentation (installation drawings, instruction manuals & commissioning report) to the client/end user department; 17. Handover the installed systems to the client/end user.	4.2. Leadership skills; 4.3. Interpersonal skills; 4.4. Communication skills; 4.5. Judgmental skills; 4.6. Punctuality; 4.7. Team spirit; 4.8. Trustworthy; 4.9. Dedication; 4.10. Time management; 4.11. Computer skills; 4.12. Report writing skills. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Supervision of installation of electrical systems is performed as per standard principles and approved rules & regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. International Colour code regulation; 2. Health, safety & environment; 3. Safe handling of equipment and tools; 4. Waste disposal.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE INSTALLATION OF ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	807
TASK TITLE	SUPERVISE CONSTRUCTION OF ELECTRICAL POWER LINES	**TASK NO.**	8072
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to monitor construction of Electrical Power Lines in accordance with standard principles and 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, Computer, Ladder, Spikes, Linesmen toolkit, Measuring equipment & instruments, Global Positioning System (GPS), Rollers, Ropes, Wire stringing machine, Phase rotation meter, Voltage detector and Compression tool. **Materials:** Notebook, pen, mutton cloth, Conductor, Connectors, Insulators, Stay wire, Earth Wire, Earth Mast, Poles, Base Plate, Drum Jack, Tension Clamps, Aerial Bundle Conductor (ABC), Clamps and Other Accessories.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Review and approve drawing for the line route for LV & MV power lines; 2. Review & approve Bill of Quantities (BOQ); 3. Review & approve cost estimates; 4. Monitor collection of materials required from store; 5. Monitor identification of tools and equipment to be used during construction; 6. Review & approve list of manpower to be engaged in construction task; 7. Monitor adherence to health and safety regulations; 8. Monitor clearance of line route from any vegetation; 9. Countercheck excavated pole	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Countercheck dimensions of excavated holes for poles & stays; 1.2. Safely erect poles; 1.3. String conductors safely without damage; 1.4. Use GPS for surveying; 1.5. Fix conductors on insulators or clamps; 1.6. Terminate conductor. **2.0. Principles** The person must be able to explain the principles of: 2.1. Constructing overhead electrical power lines safely. **3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network analysis; 3.3. Ohms law; 3.4. Kirchhoff's current law;

and stay holes dimensions; 10. Monitor poles dressing with fittings; 11. Monitor erection of poles; 12. Monitor erection and assembling of stays; 13. Administer backfilling & compaction of the holes; 14. Oversee stringing of conductor; 15. Monitor fixing of conductors on insulator or clamps; 16. Oversee termination of conductor; 17. Oversee cleaning of site; 18. Monitor return of all remaining materials to store; 19. Monitor storage of equipment, tools and safety gears; 20. Review & approve "As-Built Drawings"; 21. Inspect the constructed power line; 22. List spotted snags if any; 23. Monitor connection of power to the new line; 24. Review the written report.	3.5. Kirchhoff's voltage law; 3.6. Mesh current analysis; 3.7. Nodal voltage analysis 3.8. Construction of power lines; 3.9. Pole climbing; 3.10. Faraday's law. **4.0. Essential skills** 4.1. Measurements & Instrumentation skills; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; 4.8. Materials science; 4.9. Computer skills; 4.10. Report writing skills; 4.11. Interpretation of technical drawing; **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Supervision of 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; 4. Waste disposal Methods.

OCCUPATION	ELECTRICAL ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE INSTALLATION OF ELECTRICAL MACHINES & SYSTEMS	**DUTY NO.**	807
TASK TITLE	SUPERVISE CONSTRUCTION OF ELECTRICAL POWER CABLES	**TASK NO.**	8074
PERFORMANCE CRITERIA	The person carrying out this task should be able to apply knowledge, skills and understanding to monitor installation of electrical power cables in accordance with standard principles and current versions of regulations and standards governing the electrical field.		
RANGE STATEMENTS	The task will be performed in outdoor areas where electrical power cables need to be installed to connect new loads. For successful performance of the task, the following will be required: **Tools and Equipment:** Personal Protective Equipment (PPE), Multi-meter, Computer, Ladder, Linesmen Toolkit, 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.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able do the following: 1. Review & approve drawing for the power cable route; 2. Review & approve Bill of Quantities (BOQ); 3. Review and approve cost estimates; 4. Oversee collection of materials required from store; 5. Monitor identification of tools and equipment to be used during installation of the power cable; 6. Approve list of identified manpower to be engaged in the installation task; 7. Monitor health and safety regulations; 8. Oversee clearance of cable route from any vegetation; 9. Countercheck dimensions of excavated trench for the power	**Detailed knowledge about:** **1.0. Methods** This person performing this task must be able to explain how to: 1.1. Countercheck dimensions of the excavated 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 terminations correctly according to drawing; 1.5. Correctly use tools for each joint or termination; 1.6. Test cable. **2.0. Principles** The person must be able to explain the principles of: 2.1. Installing underground electrical power cables safely; 2.2. Termination of power cables; 2.3. Jointing of power cables.

cable; 10. Oversee spread of sand on the trench; 11. Monitor laying of underground cable on the trench (confirm that slack is also included on the length of the cable); 12. Oversee the process of cable jointing where necessary; 13. Monitor backfilling & compaction of the trench; 14. Monitor termination of the cable; 15. Monitor testing of the power cable for continuity; 16. Monitor testing of the power cable insulation; resistance; 17. Oversee cleaning of site; 18. Oversee return of all remaining materials to store; 19. Monitor storage of equipment, tools and safety gears; 20. Review and approve "As-Built Drawings"; 21. Inspect the power cable terminal points; 22. Connect power to the cable; 23. List down snags if any; 24. Review the written report.	**3.0. Theories** The person must be able to explain: 3.1. Electrical Engineering; 3.2. Network analysis; 3.3. Ohms law; 3.4. Kirchhoff's current law; 3.5. Kirchhoff's voltage law; 3.6. Mesh current analysis; 3.7. Nodal voltage analysis; 3.8. Faraday's law 3.9. Installation of power cables; 3.10. Cable termination and joints. **4.0. Essential skills** 4.1. Measurements & instrumentation skills; 4.2. Communication skills; 4.3. Punctuality; 4.4. Team Spirit; 4.5. Trustworthy; 4.6. Dedication; 4.7. Time management skills; 4.8. Materials science; 4.9. Computer skills; 4.10. Report writing skills; and 4.11. Interpretation of technical drawing. **5.0. Math Skills** 5.1. Material Costs Estimation
DESCRIPTION OF THE END PRODUCTS / SERVICE	Supervision of installation of electrical power cable is performed as per technical requirement and in accordance with the current versions of regulations and standards governing the electrical field.
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; 4. Waste disposal.

TABLE NO. 1: DACUM CHART FOR ELECTRICAL ENGINEERING - LEVEL 8

DUTIES	TASKS	ENABLERS
1.0. Carry out Design of Electrical Systems	1.1. Design Electrical Systems 1.2. Develop Electrical Systems 1.3. Test Electrical Systems	**Generic Skills and Knowledge** • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Skills and knowledge on: ✓ taking measurements & measuring units ✓ instrumentation ✓ Design Application Software • 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. • Measuring equipment & instruments • Electrician Toolkit • Computer • Application software **Materials** • Drawing paper, pencil, ruler, Parts, Electrical components and accessories **Worker Behaviours** • Team spirit, trustworthy, time management and dedication
2.0. Carry out Design of Electrical Machines	2.1. Design Electrical Machines 2.2. Develop Electrical Machines 2.3. Test Electrical Machines	**Generic Skills and Knowledge** • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Skills and knowledge on: ✓ taking measurements & measuring units ✓ instrumentation • Machine elements • Interpretation of technical drawing • Basic Material science

DUTIES	TASKS	ENABLERS
		Tools and Equipment • Personal Protective Equipment (PPE) such as Safety boots, safety goggle, gloves, hearing protection, helmets. • Measuring equipment & instruments • Electrician Toolkit • Computer • Application software **Materials** • Drawing paper, pencil, ruler, Parts, Electrical components and accessories **Worker Behaviours** • Team spirit, trustworthy, time management and dedication
3.0. Manage Projects	3.1. Review Project Documents 3.2. Prepare Project Schedule 3.3. Monitor the Performance of the Project 3.4. Oversee Project Conclusion and Closure	**Generic Skills and Knowledge** • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Skills and knowledge on: ✓ taking measurements & measuring units ✓ instrumentation ✓ Project Management • 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 • Toolbox • Laptop • Software packages **Materials** • Manuals, drawings

DUTIES	TASKS	ENABLERS
		Worker Behaviours • Team spirit, confidentiality, honest, time management, ability to work under pressure and dedication
4.0. Manage Resources	4.1. Supervise Subordinates 4.2. Participate in Procurement 4.3. Manage Materials 4.4. Manage Tools & Equipment 4.5. Manage Budget 4.6. Supervise Subordinates 4.7. Participate in Procurement 4.8. Manage Materials 4.9. Manage Tools & Equipment 4.10. Manage Budget	**Generic skills and knowledge** • Using communication skills to work with others, reporting to superiors • Knowledge on safety, health & environment • Management skills ✓ Decision Making skills ✓ Interpersonal skills ✓ Conflict Resolution skills ✓ Time management skills ✓ Mentorship skills **Tools and Equipment** • Measuring instruments • Software packages • Laptop **Materials** • Standard manuals • Notebooks **Worker behaviours** • Team spirit, corporative, trustworthy and commitment
5.0. Commission Installed Electrical Machines & Systems	5.1. Commission Installed Electrical Machines 5.2. Commission Installed of Electrical Systems 5.3. Commission Constructed Electrical Power Lines 5.4. Commission Constructed Electrical 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 **Tools and Equipment** • Personal Protective Equipment (PPE) such as Safety boots, safety

DUTIES	TASKS	ENABLERS
		goggle, gloves, hearing protection, helmets. • Measuring equipment & instruments • Electrician Toolkit • PLC Kit • Vacuum cleaner • Computer • Application software **Materials** • Lubricants, grease, mutton cloth, oil, silica gel, diesel **Worker Behaviours** • Team spirit, trustworthy, time management and dedication
6.0. Conduct Applied Research on Electrical Engineering Works	6.1. Identify Background Information of the Observed Challenge 6.2. Collect Data 6.3. Provide Solution to the Challenge Identified	**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: ✓ Creativity ✓ Innovative ✓ 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. • Measuring equipment & instruments • Electrician Toolkit • PLC Kit • Vacuum cleaner • Computer • Application software **Materials** • Lubricants, grease, mutton cloth, oil, silica gel, diesel **Worker Behaviours** • Team spirit, trustworthy, time management and dedication

DUTIES	TASKS	ENABLERS
7.0. Supervise installation of Electrical Systems	7.1. Supervise installation of Electrical Machines 7.2. Supervise installation of Electrical Systems 7.3. Supervise construction of Electrical Power Lines	**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. • Measuring equipment & instruments • Toolbox • PLC Kit • Vacuum cleaner **Materials** • Lubricants, grease, mutton cloth, oil, silica gel, diesel **Worker Behaviours** • Team spirit, trustworthy, time management and dedication