



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION  
COUNCIL (TVET CDACC)**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**ELECTRICAL OPERATOR (POWER OPTION)**

**LEVEL 5**



**TVET CDACC  
P.O BOX 15745-00100  
NAIROBI**

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## **FOREWORD**

The provision of quality education and training is fundamental to the Government's overall strategy for social economic development. Quality education and training will contribute to achievement Kenya's development blue print and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for the purpose of developing a competency-based curriculum for Electrical Operation (Power option) Level 5. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a great role towards development of competent human resource for the engineering sector's growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING  
MINISTRY OF EDUCATION**

## **PREFACE**

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Electrical Engineering Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for an Electrical Operator (Power option) level 5. These standards will be the bases for development of a competency-based curriculum for Electrical Operation (Power Option) level 5. These Standards will also be the bases for assessment of an individual for competence certification.

The occupational standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, Electrical Engineering SSAC, expert workers and all those who participated in the development of these occupational standards.

**CHAIRPERSON,  
TVET CDACC**

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## **ACKNOWLEDGMENT**

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am sincerely thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to the engineering Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

**CHAIRPERSON**

**ELECTRICAL ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE**

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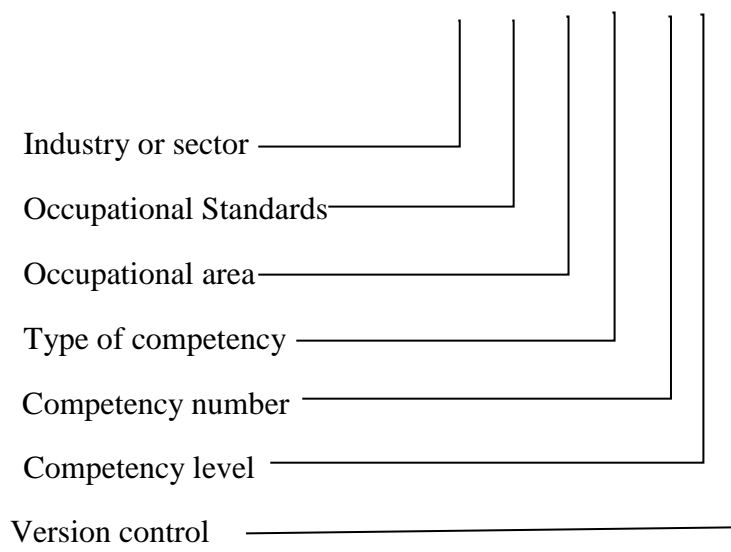
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## **ABBREVIATION AND ACRONYMS**

CAD	Computer Aided Design
CCTV	Closed Circuit Television
CDACC	Curriculum Development, Assessment and Certification Council
EHS	Environment, Health and Safety
HVAC	Heating, Ventilation and Air Conditioning
IBMS	Integrated Building Management System
IEE	Institute of Electrical Engineers
KEBS	Kenya Bureau of Standards
KP	Kenya Power
NCA	National Construction Authority
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
PV	Photo Voltaic
TVET	Technical and Vocational Education and Training
WIBA	Work injury benefits Act

## **KEY TO UNIT CODE**

**ENG/OS/PO/BC/01/5/ A**



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**OVERVIEW**



This course is designed to equip an Electrical operator with the competencies required to perform electrical installation, power line construction, electrical machine installation, electronics, security system installation, solar system installation and Electrical breakdown maintenance.

### **BASIC COMPETENCIES**

<b>Unit of Learning Code</b>	<b>Unit of Learning Title</b>
ENG/OS/PO/BC/01/5	Demonstrate communication skills
ENG/OS/PO/BC/02/5	Demonstrate digital literacy
ENG/OS/PO/BC/03/5	Demonstrate entrepreneurial skills
ENG/OS/PO/BC/04/5	Demonstrate employability skills
ENG/OS/PO/BC/05/5	Demonstrate environmental literacy
ENG/OS/PO/BC/06/5	Demonstrate occupational safety and health practices

### **COMMON COMPETENCIES**

<b>Unit of Learning Code</b>	<b>Unit of Learning Title</b>
ENG/OS/PO/CC/01/5	Apply Engineering mathematics
ENG/OS/PO/CC/02/5	Apply Electrical principles
ENG/OS/PO/CC/03/5	Apply workshop processes
ENG/OS/PO/CC/04/5	Prepare and interpret Technical Drawing

### **CORE COMPETENCIES**

<b>Unit of Learning Code</b>	<b>Unit of Learning Title</b>
ENG/OS/PO/CR/01/5	Perform Electrical Installation
ENG/OS/PO/CR/02/5	Install Electrical power lines
ENG/OS/PO/CR/03/5	Install Electrical machine
ENG/OS/PO/CR/04/5	Demonstrate understanding of Electronics
ENG/OS/PO/CR/05/5	Install security system
ENG/OS/PO/CR/06/5	Install Solar system
ENG/OS/PO/CR/07/5	Perform Electrical Breakdown maintenance

## **BASIC UNITS OF COMPETENCY**

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## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/PO/BC/01/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, contributing to the development of communication strategies, conducting workplace interviews, facilitating group discussions and representing the organisation

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements.  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Meet communication needs of clients and colleagues	1.1 Specific communication needs of clients and colleagues are identified and met based on workplace requirements 1.2 Different communication approaches are identified and applied according to clients' needs 1.3 Conflict is identified and addressed as per the standards of the organization
2. Contribute to the development of communication strategies	2.1 Strategies for internal and external dissemination of information are developed, promoted, implemented and reviewed as per organizations' strategic plan 2.2 Channels of communication are established and reviewed based on the workplace needs 2.3 Communication training needs are identified and provided according to SOPs 2.4 Work related network and relationship are maintained based on workplace requirements 2.5 Negotiation and conflict resolution strategies are maintained as per the workplace procedures
3. Conduct workplace interviews	3.1 <i><b>Communication strategies</b></i> are identified and employed in <i><b>interview situations</b></i> based on workplace requirements 3.2 Records of interviews are made and maintained in accordance with organizational procedures 3.3 Effective questioning, listening and nonverbal communication techniques are used based on needs
4. Facilitate group discussions	4.1 Mechanisms to enhance <i><b>effective group interaction</b></i> are identified and implemented according to workplace

	<p>requirements</p> <p>4.2 Strategies to encourage group participation are identified and used as per organizations' procedures</p> <p>4.3 Meetings objectives and agenda are set and followed based on workplace requirements</p> <p>4.4 Relevant information is provided and feedback obtained according to set protocols</p> <p>4.5 Evaluation of group communication strategies is undertaken in accordance with workplace guidelines</p> <p>4.6 Specific communication needs of individuals are identified and addressed as per individual needs</p>
5. Represent the organization	<p>5.1 Relevant presentation are researched and presented based on internal or external communication forums requirements Presentation is delivered in a clear and sequential manner as per the predetermined time</p> <p>5.2 Presentation is made as per appropriate media</p> <p>5.3 Difference views are respected based on workplace procedures</p> <p>5.4 Written communication is done as per organizational standards</p> <p>5.5 Inquiries are responded according to organizational standard</p>

## RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

Variable	Range
1. Communication strategies may include but not limited to:	<ul style="list-style-type: none"> <li>• Language switch</li> <li>• Comprehension check</li> <li>• Repetition</li> <li>• Asking confirmation</li> <li>• Paraphrase</li> <li>• Clarification request</li> <li>• Translation</li> <li>• Restructuring</li> <li>• Approximation</li> <li>• Generalization</li> </ul>
2. Effective group interaction may include but not	<ul style="list-style-type: none"> <li>• Identifying and evaluating what is occurring within an interaction in a non-judgmental way</li> <li>• Using active listening</li> </ul>

limited to:	<ul style="list-style-type: none"> <li>• Making decision about appropriate words, behavior</li> <li>• Putting together response which is culturally appropriate</li> <li>• Expressing an individual perspective</li> <li>• Expressing own philosophy, ideology and background and exploring impact with relevance to communication</li> <li>• Openness and flexibility in communication</li> </ul>
3. Interview situations may include but not limited to:	<ul style="list-style-type: none"> <li>• Establishing rapport</li> <li>• Eliciting facts and information</li> <li>• Facilitating resolution of issues</li> <li>• Developing action plans</li> <li>• Diffusing potentially difficult situations</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Active listening
- Giving/receiving feedback
- Interpretation of information
- Role boundaries setting
- Negotiation
- Communication

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Communication process
- Dynamics of groups and different styles of group leadership
- Communication skills relevant to client groups
- Flexibility in communication

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

1. Critical aspects of	Assessment requires evidence that the candidate: 1.1 Met communication needs of clients and colleagues
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Competency	<p>1.2 Contributed to the development of communication strategies</p> <p>1.3 Conducted interviews</p> <p>1.4 Facilitated group discussions</p> <p>1.5 Represented the organization</p>
2. Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place</p> <p>2.2 Materials relevant to the proposed activity or tasks</p>
3. Methods of Assessment	<p>Competency in this unit may be assessed through:</p> <p>3.1 Observation</p> <p>3.2 Oral questioning</p> <p>3.3 Written test</p> <p>3.4 Portfolio of Evidence</p> <p>3.5 Interview</p> <p>3.6 Third party report</p>
4. Context of Assessment	<p>Competency may be assessed:</p> <p>4.1 On the job</p> <p>4.2 Off the job</p> <p>4.3 During industrial attachment</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:**ENG/OS/PO/BC/02/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to demonstrate digital literacy. It involves identifying appropriate computer software and hardware, applying security measures to data, hardware, software in automated environment, applying computer software in solving tasks, applying internet and email in communication at workplace, applying desktop publishing in official assignment and preparing presentation packages.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function</p> <p>1. Identify appropriate computer software and hardware</p>	<p>These are assessable statements which specify the required level of performance for each of the elements.</p> <p><b><i>Bold and italicized terms are elaborated in the Range</i></b></p> <p>1.1 Concepts of ICT are determined in accordance with computer equipment</p> <p>1.2 Classifications of computers are determined in accordance with manufacturers specification</p> <p>1.3 <b><i>Appropriate computer software</i></b> is identified according to manufacturer's specification</p> <p>1.4 <b><i>Appropriate computer hardware</i></b> is identified according to manufacturer's specification</p> <p>1.5 Functions and commands of operating system are determined in accordance with manufacturer's specification</p>
<p>2. Apply security measures to data, hardware, software in automated environment</p>	<p>2.1 <b><i>Data security and privacy are classified</i></b> in accordance with the prevailing technology</p> <p>2.2 <b><i>Security threats</i></b> are identified, <b><i>and control measures</i></b> are applied in accordance with laws governing protection of ICT</p> <p>2.3 Computer threats and crimes are detected in accordance with Information security management guidelines</p> <p>2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT</p>
<p>3. Apply computer software in solving tasks</p>	<p>3.1 <b><i>Word processing concepts</i></b> are applied in resolving workplace tasks, report writing and documentation as per job requirements</p> <p>3.2 <b><i>Word processing utilities</i></b> are applied in accordance with</p>

	<p>workplace procedures</p> <p>3.3 Worksheet layout is prepared in accordance with work procedures</p> <p>3.4 Worksheet is build and data manipulated in the worksheet in accordance with workplace procedures</p> <p>3.5 Continuous data manipulated on worksheet is undertaken in accordance with work requirements</p> <p>3.6 Database design and manipulation is undertaken in accordance with office procedures</p> <p>3.7 Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures</p>
4. Apply internet and email in communication at workplace	<p>4.1 Electronic mail addresses are opened and applied in workplace communication in accordance with office policy</p> <p>4.2 Office internet functions are defined and executed in accordance with office procedures</p> <p>4.3 <b>Network configuration</b> is determined in accordance with office operations procedures</p> <p>4.4 Official World Wide Web is installed and managed according to workplace procedures</p>
5. Apply desktop publishing in official assignments	<p>5.1 Desktop publishing functions and tools are identified in accordance with manufactures specifications</p> <p>5.2 Desktop publishing tools are developed in accordance with work requirements</p> <p>5.3 Desktop publishing tools are applied in accordance with workplace requirements</p> <p>5.4 Typeset work is enhanced in accordance with workplace standards</p>
6. Prepare presentation packages	<p>6.1 Types of presentation packages are identified in accordance with office requirements</p> <p>6.2 Slides are created and formulated in accordance with workplace procedures</p> <p>6.3 Slides are edited and run in accordance with work procedures</p> <p>6.4 Slides and handouts are printed according to work requirements</p>

## RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.



Variable	Range
1. Appropriate computer hardware may include but not limited to:	<ul style="list-style-type: none"> <li>• Computer case</li> <li>• Monitor</li> <li>• keyboard</li> <li>• mouse</li> </ul>
2. Data security and privacy may include but not limited to:	<ul style="list-style-type: none"> <li>• Confidentiality of data</li> <li>• Cloud computing</li> <li>• Integrity -but-curious data surfing</li> </ul>
3. Security and control measures may include but not limited to:	<ul style="list-style-type: none"> <li>• Counter measures against cyber terrorism</li> <li>• Risk reduction</li> <li>• Cyber threat issues</li> <li>• Risk management</li> <li>• Pass wording</li> </ul>
4. Security threats may include but not limited to:	<ul style="list-style-type: none"> <li>• Cyber terrorism</li> <li>• Hacking</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Analytical skills
- Interpretation
- Typing
- Communication
- Basic ICT skills

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Software concept
- Functions of computer software and hardware
- Data security and privacy
- Computer security threats and control measures
- Technology underlying cyber-attacks and networks
- Cyber terrorism

- Computer crimes
- Detection and protection of computer crimes
- Laws governing protection of ICT
- Microsoft suite

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified and controlled security threats</li> <li>1.2 Detected and protected computer crimes</li> <li>1.3 Applied word processing in office tasks</li> <li>1.4 Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures</li> <li>1.5 Opened electronic mail for office communication as per workplace procedure</li> <li>1.6 Installed internet and World Wide Web for office tasks in accordance with office procedures</li> <li>1.7 Integrated emerging issues in computer ICT applications</li> <li>1.8 Applied laws governing protection of ICT</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Tablets</li> <li>2.2 Laptops</li> <li>2.3 Desktop computers</li> <li>2.4 Calculators</li> <li>2.5 Internet</li> <li>2.6 Smart phones</li> <li>2.7 Operation Manuals</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Written Test</li> <li>3.2 Observation</li> <li>3.3 Practical assignment</li> <li>3.4 Interview/Oral Questioning</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed in:</p> <ul style="list-style-type: none"> <li>4.1 Off the job</li> <li>4.2 On the job setting</li> <li>4.3 Industrial attachment</li> </ul>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## DEMONSTRATE ENTREPRENEURIAL SKILLS

UNIT CODE : ENG/OS/PO/BC/03/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship, and self-employment, identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation, developing business innovative strategies and developing business plan.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
1. Demonstrate understanding of an Entrepreneur	<ul style="list-style-type: none"><li>1.1 Entrepreneurs and Businesspersons are distinguished as per principles of entrepreneurship</li><li>1.2 <i>Types of entrepreneurs</i> are identified as per principles of entrepreneurship</li><li>1.3 Ways of becoming an Entrepreneur are identified as per principles of Entrepreneurship</li><li>1.4 <i>Characteristics of Entrepreneurs</i> are identified as per principles of Entrepreneurship</li><li>1.5 Factors affecting Entrepreneurship development are explored as per principles of Entrepreneurship</li></ul>
2. Demonstrate understanding of Entrepreneurship and self-employment	<ul style="list-style-type: none"><li>2.1 Entrepreneurship and self-employment are distinguished as per principles of entrepreneurship</li><li>2.2 Importance of self-employment is analysed based on business procedures and strategies</li><li>2.3 <i>Requirements for entry into self-employment</i> are identified according to business procedures and strategies</li><li>2.4 Role of an Entrepreneur in business is determined according to business procedures and strategies</li><li>2.5 Contributions of Entrepreneurs to National development are identified as per business procedures and strategies</li><li>2.6 Entrepreneurship culture in Kenya is explored as per business procedures and strategies</li><li>2.7 Born or made Entrepreneurs are distinguished</li></ul>

	as per entrepreneurial traits
3. Identify Entrepreneurship opportunities	<p>3.1 Sources of business ideas are identified as per business procedures and strategies</p> <p>3.2 Business ideas and opportunities are generated as per business procedures and strategies</p> <p>3.3 Business life cycle is analysed as per business procedures and strategies</p> <p>3.4 Legal aspects of business are identified as per procedures and strategies</p> <p>3.5 Product demand is assessed as per market strategies</p> <p>3.6 Types of <b>business environment</b> are identified and evaluated as per business procedures</p> <p>3.7 Factors to consider when evaluating business environment are explored based on business procedure and strategies</p> <p>3.8 Technology in business is incorporated as per best practice</p>
4. Create entrepreneurial awareness	<p>4.1 <b>Forms of businesses</b> are explored as per business procedures and strategies</p> <p>4.2 Sources of business finance are identified as per business procedures and strategies</p> <p>4.3 Factors in selecting source of business finance are identified as per business procedures and strategies</p> <p>4.4 <b>Governing policies</b> on Small Scale Enterprises (SSEs) are determined as per business procedures and strategies</p> <p>4.5 Problems of starting and operating SSEs are explored as per business procedures and strategies</p>
5. Apply entrepreneurial motivation	<p>5.1 <b>Internal and external motivation</b> factors are determined in accordance with motivational theories</p> <p>5.2 Self-assessment is carried out as per entrepreneurial orientation</p> <p>5.3 Effective communications are carried out in accordance with communication principles</p> <p>5.4 Entrepreneurial motivation is applied as per motivational theories</p>
6. Develop innovative business strategies	<p>6.1 Business innovation strategies are determined in accordance with the organization strategies</p> <p>6.2 Creativity in business development is</p>

	<p>demonstrated in accordance with business strategies</p> <p>6.3 <i>Innovative business strategies</i> are developed as per business principles</p> <p>6.4 Linkages with other entrepreneurs are created as per best practice</p> <p>6.5 ICT is incorporated in business growth and development as per best practice</p>
7. Develop Business Plan	<p>7.1 Identified Business is described as per business procedures and strategies</p> <p>7.2 Marketing plan is developed as per business plan format</p> <p>7.3 Organizational/Management plan is prepared in accordance with business plan format</p> <p>7.4 Production/operation plan in accordance with business plan format</p> <p>7.5 Financial plan is prepared in accordance with the business plan format</p> <p>7.6 Executive summary is prepared in accordance with business plan format</p> <p>7.7 Business plan is presented as per best practice</p>

## RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

1. Variable	Range
2. Types of entrepreneurs may include but not limited to:	<ul style="list-style-type: none"> <li>• Innovators</li> <li>• Imitators</li> <li>• Craft</li> <li>• Opportunistic</li> <li>• Speculators</li> </ul>
3. Characteristics of Entrepreneurs may include but not limited to:	<ul style="list-style-type: none"> <li>• Creative</li> <li>• Innovative</li> <li>• Planner</li> <li>• Risk taker</li> <li>• Networker</li> <li>• Confident</li> <li>• Flexible</li> <li>• Persistent</li> <li>• Patient</li> </ul>

	<ul style="list-style-type: none"> <li>• Independent</li> <li>• Future oriented</li> <li>• Goal oriented</li> </ul>
4. Requirements for entry into self-employment may include but not limited to	<ul style="list-style-type: none"> <li>• Technical skills</li> <li>• Management skills</li> <li>• Entrepreneurial skills</li> <li>• Resources</li> <li>• Infrastructure</li> </ul>
5. Internal and external motivation may include but not limited to:	<ul style="list-style-type: none"> <li>• Interest</li> <li>• Passion</li> <li>• Freedom</li> <li>• Prestige</li> <li>• Rewards</li> <li>• Punishment</li> <li>• Enabling environment</li> <li>• Government policies</li> </ul>
6. Business environment may include but not limited to:	<ul style="list-style-type: none"> <li>• External</li> <li>• Internal</li> <li>• Intermediate</li> </ul>
7. Forms of businesses may include but not limited to:	<ul style="list-style-type: none"> <li>• Sole proprietorship</li> <li>• Partnership</li> <li>• Limited companies</li> <li>• Cooperatives</li> </ul>
8. Governing policies may include but not limited to:	<ul style="list-style-type: none"> <li>• Increasing scope for finance</li> <li>• Promoting cooperation between entrepreneurs and private sector</li> <li>• Reducing regulatory burden on entrepreneurs</li> <li>• Developing IT tools for entrepreneurs</li> </ul>
9. Innovative business strategies may include but not limited to:	<ul style="list-style-type: none"> <li>• New products</li> <li>• New methods of production</li> <li>• New markets</li> <li>• New sources of supplies</li> <li>• Change in industrialization</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

## Required Skills

The individual needs to demonstrate the following skills:

- Analytical
- Management
- Problem-solving
- Root-cause analysis
- Communication

## Required Knowledge

The individual needs to demonstrate knowledge of:

- Decision making
- Business communication
- Change management
- Competition
- Risk
- Net working
- Time management
- Leadership
- Factors affecting entrepreneurship development
- Principles of Entrepreneurship
- Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
- Conflict resolution
- Health, safety and environment (HSE) principles and requirements
- Customer care strategies
- Basic financial management
- Business strategic planning
- Impact of change on individuals, groups and industries
- Government and regulatory processes
- Local and international market trends
- Product promotion strategies
- Market and feasibility studies
- Government and regulatory processes
- Local and international business environment
- Relevant developments in other industries
- Regional/ County business expansion strategies

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Distinguished entrepreneurs and business persons correctly</li> <li>1.2 Identified ways of becoming an entrepreneur appropriately</li> <li>1.3 Explored factors affecting entrepreneurship development appropriately</li> <li>1.4 Analysed importance of self-employment accurately</li> <li>1.5 Identified requirements for entry into self-employment correctly</li> <li>1.6 Identified sources of business ideas correctly</li> <li>1.7 Generated Business ideas and opportunities correctly</li> <li>1.8 Analysed business life cycle accurately</li> <li>1.9 Identified legal aspects of business correctly</li> <li>1.10 Assessed product demand accurately</li> <li>1.11 Determined Internal and external motivation factors appropriately</li> <li>1.12 Carried out communications effectively</li> <li>1.13 Identified sources of business finance correctly</li> <li>1.14 Determined Governing policy on small scale enterprise appropriately</li> <li>1.15 Explored problems of starting and operating SSEs effectively</li> <li>1.16 Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly</li> <li>1.17 Prepared executive summary correctly</li> <li>1.18 Determined business innovative strategies appropriately</li> <li>1.19 Presented business plan effectively</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace where assessment can take place</li> <li>2.2 Appropriately simulated environment where assessment can take place</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Written tests</li> <li>3.2 Oral questions</li> <li>3.3 Third party report</li> </ul>



		3.4 Interviews 3.5 Portfolio
4. Context of Assessment	of	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment		Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** ENG/OS/PO/BC/04/5/A

### Unit Description

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading small teams, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing workplace ethics.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements.  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Conduct self-management	1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 1.2 Emotional intelligence is demonstrated as per workplace requirements. 1.3 Individual performance is evaluated and monitored according to the agreed targets. 1.4 Assertiveness is developed and maintained based on the requirements of the job. 1.5 Accountability and responsibility for own actions are demonstrated based on workplace instructions. 1.6 Self-esteem and a positive self-image are developed and maintained based on values. 1.7 Time management, attendance and punctuality are observed as per the organization policy. 1.8 Goals are managed as per the organization's objective 1.9 Self-strengths and weaknesses are identified based on personal objectives
2. Demonstrate interpersonal communication	2.1 Writing skills are demonstrated as per communication policy 2.2 Negotiation and persuasion skills are demonstrated as per communication policy 2.3 Internal and external stakeholders' needs are identified and interpreted as per the communication policy 2.4 Communication networks are established based on

	<p>workplace policy</p> <p>2.5 Information is shared as per communication policy</p>
<p>3. Demonstrate critical safe work habits</p>	<p>3.1 Stress is managed in accordance with workplace policy.</p> <p>3.2 Punctuality and time consciousness is demonstrated in line with workplace policy.</p> <p>3.3 Personal objectives are integrated with organization goals based on organization's strategic plan.</p> <p>3.4 <b>Resources</b> are utilized in accordance with workplace policy.</p> <p>3.5 Work priorities are set in accordance to workplace goals and objectives.</p> <p>3.6 Leisure time is recognized and utilized in line with personal objectives.</p> <p>3.7 <b>Drugs and substances of abuse</b> are identified and avoided based on workplace policy.</p> <p>3.8 HIV and AIDS prevention awareness is demonstrated in line with workplace policy.</p> <p>3.9 Safety consciousness is demonstrated in the workplace based on organization safety policy.</p> <p>3.10 <b>Emerging issues</b> are identified and dealt with in accordance with organization policy.</p>
<p>4. Lead small teams</p>	<p>4.1 Performance targets for the <b>team</b> are set based on organization's objectives</p> <p>4.2 Duties are assigned in accordance with the organization policy.</p> <p>4.3 <b>Forms of communication</b> in a team are established according to organization's policy.</p> <p>4.4 Team performance is evaluated based on set targets as per workplace policy.</p> <p>4.5 Conflicts are resolved between team members in line with organization policy.</p> <p>4.6 Gender related issues are identified and mainstreamed in accordance workplace policy.</p> <p>4.7 Human rights and fundamental freedoms are identified and respected as Constitution of Kenya 2010.</p> <p>4.8 Healthy relationships are developed and maintained in line with workplace.</p>
<p>5. Plan and organize work</p>	<p>5.1 Task requirements are identified as per the workplace objectives</p> <p>5.2 Task is interpreted in accordance with safety (OHS), environmental requirements and quality requirements</p> <p>5.3 Work activity is organized with other involved personnel as per the SOPs</p>

	<p>5.4 Resources are mobilized, allocated and utilized to meet project goals and deliverables.</p> <p>5.5 Work activities are monitored and evaluated in line with organization procedures.</p> <p>5.6 Job planning is documented in accordance with workplace requirements.</p> <p>5.7 Time is managed achieve workplace set goals and objectives.</p>
6. Maintain professional growth and development	<p>6.1 Personal training needs are identified and assessed in line with the requirements of the job.</p> <p>6.2 <b>Training and career opportunities</b> are identified and utilized based on job requirements.</p> <p>6.3 Resources for training are mobilized and allocated based organizations and individual skills needs.</p> <p>6.4 Licensees and certifications relevant to job and career are obtained and renewed as per policy.</p> <p>6.5 Work priorities and personal commitments are balanced and managed based on requirements of the job and personal objectives.</p> <p>6.6 Recognitions are sought as proof of career advancement in line with professional requirements.</p>
7. Demonstrate workplace learning	<p>7.1 Learning opportunities are sought and managed based on job requirement and organization policy.</p> <p>7.2 Improvement in performance is demonstrated based on courses attended.</p> <p>7.3 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job</p> <p>7.4 Time and effort is invested in learning new skills based on job requirements</p> <p>7.5 Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.</p> <p>7.6 New systems are developed and maintained in accordance with the requirements of the job.</p> <p>7.7 Awareness of personal role in workplace <b>innovation</b> is demonstrated based on requirements of the job.</p>
8. Demonstrate problem solving skills	<p>8.1 Creative, innovative and practical solutions are developed based on the problem</p> <p>8.2 Independence and initiative in identifying and solving problems is demonstrated based on requirements of the job.</p> <p>8.3 Team problems are solved as per the workplace guidelines</p>

	<p>8.4 Problem solving strategies are applied as per the workplace guidelines</p> <p>8.5 Problems are analyzed and assumptions tested as per the context of data and circumstances</p>
9. Demonstrate workplace ethics	<p>9.1 Policies and guidelines are observed as per the workplace requirements</p> <p>9.2 Self-worth and professionalism is exercised in line with personal goals and organizational policies</p> <p>9.3 Code of conduct is observed as per the workplace requirements</p> <p>9.4 Integrity is demonstrated as per legal requirement</p>

## RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

Range	Variable
1. Drug and substance abuse may include but not limited to:	<p>Commonly abused</p> <ul style="list-style-type: none"> <li>• Alcohol</li> <li>• Tobacco</li> <li>• Miraa</li> <li>• Over-the-counter drugs</li> <li>• Cocaine</li> <li>• Bhang</li> <li>• Glue</li> </ul>
2. Feedback may include but not limited to:	<ul style="list-style-type: none"> <li>• Verbal</li> <li>• Written</li> <li>• Informal</li> <li>• Formal</li> </ul>
3. Relationships may include but not limited to:	<ul style="list-style-type: none"> <li>• Man/Woman</li> <li>• Trainer/trainee</li> <li>• Employee/employer</li> <li>• Client/service provider</li> <li>• Husband/wife</li> <li>• Boy/girl</li> <li>• Parent/child</li> <li>• Sibling relationships</li> </ul>
4. Forms of communication may include but	<ul style="list-style-type: none"> <li>• Written</li> <li>• Visual</li> <li>• Verbal</li> </ul>

not limited to:	<ul style="list-style-type: none"> <li>• Non verbal</li> <li>• Formal and informal</li> </ul>
5. Team may include but not limited to:	<ul style="list-style-type: none"> <li>• Small work group</li> <li>• Staff in a section/department</li> <li>• Inter-agency group</li> </ul>
6. Personal growth may include but not limited to:	<ul style="list-style-type: none"> <li>• Growth in the job</li> <li>• Career mobility</li> <li>• Gains and exposure the job gives</li> <li>• Net workings</li> <li>• Benefits that accrue to the individual as a result of noteworthy performance</li> </ul>
7. Personal objectives may include but not limited to:	<ul style="list-style-type: none"> <li>• Long term</li> <li>• Short term</li> <li>• Broad</li> <li>• Specific</li> </ul>
8. Trainings and career opportunities may include but not limited to:	<ul style="list-style-type: none"> <li>• Participation in training programs</li> <li>• Technical</li> <li>• Supervisory</li> <li>• Managerial</li> <li>• Continuing Education</li> <li>• Serving as Resource Persons in conferences and workshops</li> </ul>
9. Resource may include but not limited to:	<ul style="list-style-type: none"> <li>• Human</li> <li>• Financial</li> <li>• Hardware</li> <li>• Software</li> </ul>
10. Innovation may include but not limited to:	<ul style="list-style-type: none"> <li>• New ideas</li> <li>• Original ideas</li> <li>• Different ideas</li> <li>• Methods/procedures</li> <li>• Processes</li> <li>• New tools</li> </ul>
11. Emerging issues may include but not limited to:	<ul style="list-style-type: none"> <li>• Terrorism</li> <li>• Social media</li> <li>• National cohesion</li> <li>• Open offices</li> </ul>
12. Range of media for learning may include but not limited to:	<ul style="list-style-type: none"> <li>• Mentoring</li> <li>• peer support and networking</li> <li>• IT and courses</li> </ul>

## **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

### **Required Skills**

The individual needs to demonstrate the following skills:

- Communication
- Critical thinking
- Observation
- Organizing
- Negotiation
- Monitoring
- Evaluation
- Record keeping
- Problem solving
- Decision Making
- Resource utilization
- Resource mobilization

### **Required Knowledge**

The individual needs to demonstrate knowledge of:

- Work values and ethics
- Company policies
- Company operations, procedures and standards
- Occupational Health and safety procedures
- Fundamental rights at work
- Personal hygiene practices
- Workplace communication
- Concept of time
- Time management
- Decision making
- Types of resources
- Work planning
- Resources and allocating resources
- Organizing work
- Monitoring and evaluation
- Record keeping
- Workplace problems and how to deal with them
- Gender mainstreaming

- HIV and AIDS
- Drug and substance abuse
- Leadership
- Safe work habits
- Professional growth and development
- Technology in the workplace
- Emerging issues
- Social media
- Terrorism
- National cohesion

### EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

1. Critical aspects of Competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Conducted self-management</li> <li>1.2 Demonstrated interpersonal communication</li> <li>1.3 Demonstrated critical safe work habits</li> <li>1.4 Led small teams</li> <li>1.5 Planned and organized work</li> <li>1.6 Maintained professional growth and development</li> <li>1.7 Demonstrated workplace learning</li> <li>1.8 Demonstrated problem solving skills</li> <li>1.9 Demonstrated workplace ethics</li> </ul>
2. Resource Implications	The following resources should be provided: <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace where assessment can take place</li> <li>2.2 Appropriately simulated environment where assessment can take place</li> </ul>
3. Methods of Assessment	Competency in this unit may be assessed through: <ul style="list-style-type: none"> <li>3.1 Oral questioning</li> <li>3.2 Portfolio of evidence</li> <li>3.3 Third Party Reports</li> <li>3.4 Written tests</li> </ul>
4. Context of Assessment	Competency may be assessed: <ul style="list-style-type: none"> <li>4.1 On-the-job</li> <li>4.2 Off-the-job</li> <li>4.3 During Industrial attachment</li> </ul>
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.



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## DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE:** ENG/OS/PO/BC/05/5/A

### UNIT DESCRIPTION

This unit describes the competencies required to demonstrate understanding of environmental literacy. It involves controlling environmental hazard, controlling environmental pollution, complying with workplace sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs and monitoring activities on environmental protection/programs.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements.  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Control environmental hazard	1.1 <i><b>Storage methods</b></i> for environmentally <i><b>hazardous</b></i> materials are strictly followed according to environmental regulations and OSHS. 1.2 <i><b>Disposal methods</b></i> of hazardous wastes are followed always according to environmental regulations and OSHS. 1.3 <i><b>PPE</b></i> is used according to OSHS.
2. Control environmental Pollution control	2.1 Environmental pollution <i><b>control measures</b></i> are compiled following standard protocol. 2.2 Procedures for solid waste management are observed according to Environmental Management and Coordination Act 1999 2.3 Methods for minimizing <i><b>noise pollution</b></i> is complied with based on Noise and Excessive Vibration <i><b>Pollution and Control Regulations, 2009</b></i>
3. Demonstrate sustainable resource use	3.1 Methods for minimizing wastage are complied with. 3.2 Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing and reducing resource consumption are practiced as per the Environmental Management and Coordination Act 1999
4. Evaluate current practices in relation to resource usage	4.1 Information on resource efficiency <i><b>systems and procedures</b></i> are collected and provided to the work group where appropriate.

	<p>4.2 Current resource usage is measured and recorded by members of the work group.</p> <p>4.3 Current purchasing strategies are analyzed and recorded according to industry procedures.</p> <p>4.4 Current work processes to access information and data is analyzed following enterprise protocol.</p>
5. Identify Environmental legislations/conventions for environmental concerns	<p>5.1 Environmental <i>legislations/conventions</i> and local ordinances are identified according to the different <i>environmental aspects/impact</i></p> <p>5.2 <i>Industrial standard/environmental practices</i> are described according to the different environmental concerns</p>
6. Implement specific environmental programs	<p>6.1 Programs/Activities are identified according to organizations policies and guidelines.</p> <p>6.2 Individual roles/responsibilities are determined and performed based on the activities identified.</p> <p>6.3 Problems/constraints encountered are resolved in accordance with organizations' policies and guidelines</p> <p>6.4 Stakeholders are consulted based on company guidelines</p>
7. Monitor activities on Environmental protection/Programs	<p>7.1 Activities are periodically monitored and evaluated according to the objectives of the environmental Program</p> <p>7.2 Feedback from stakeholders are gathered and considered in proposing enhancements to the program based on consultations</p> <p>7.3 Data gathered are analyzed based on evaluation requirements</p> <p>7.4 Recommendations are submitted based on the findings</p> <p>7.5 Management support systems are set/established to sustain and enhance the program</p> <p>7.6 Environmental incidents are monitored and reported to concerned/proper authorities</p>

### RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
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1. PPE may include but not limited to:	<ul style="list-style-type: none"> <li>• Mask</li> <li>• Gloves</li> <li>• Goggles</li> <li>• Safety hat</li> <li>• Overall</li> <li>• Hearing protector</li> <li>• Safety boots</li> </ul>
2. Environmental pollution control measures may include but not limited to:	<ul style="list-style-type: none"> <li>• Methods for minimizing or stopping spread and ingestion of airborne particles</li> <li>• Methods for minimizing or stopping spread and ingestion of gases and fumes</li> <li>• Methods for minimizing or stopping spread and ingestion of liquid wastes</li> </ul>
3. Waste management procedures may include but not limited to:	<ul style="list-style-type: none"> <li>• Sorting</li> <li>• Storing of items</li> <li>• Recycling of items</li> <li>• Disposal of items</li> </ul>
4. Resources may include but not limited to:	<ul style="list-style-type: none"> <li>• Electric</li> <li>• Water</li> <li>• Fuel</li> <li>• Telecommunications</li> <li>• Supplies</li> <li>• Materials</li> </ul>
5. Workplace environmental hazards may include but not limited to:	<ul style="list-style-type: none"> <li>• Biological hazards</li> <li>• Chemical and dust hazards</li> <li>• Physical hazards</li> </ul>
6. Organizational systems and procedures may include but not limited to:	<ul style="list-style-type: none"> <li>• Supply chain, procurement and purchasing</li> <li>• Quality assurance</li> <li>• Making recommendations and seeking approvals</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Observation
- Measuring

- Writing
- Communication
- Analytical
- Monitoring
- Evaluation

### **Required Knowledge**

The individual needs to demonstrate knowledge of:

- Storage methods of environmentally hazardous materials
- Disposal methods of hazardous wastes
- Usage of PPE Environmental regulations
- OSHS
- Types of pollution
- Environmental pollution control measures
- Different solid wastes
- Solid waste management
- Different noise pollution
- Methods of minimizing noise pollution
- Solid Waste Act
- Methods of minimizing wastage
- Waste management procedures
- Economizing of resource consumption
- 3Rs principle
- Types of resources
- Techniques in measuring current usage of resources
- Calculating current usage of resources
- Types of workplace environmental hazards
- Environmental regulations
- Environmental regulations applying to the enterprise.
- Measurement and recording of current resource usage
- Analysis current work processes to access information and data Analysis of data and information
- Identification of areas for improvement
- Resource consuming processes
- Determination of quantity and nature of resource consumed
- Analysis of resource flow of different parts of the resource flow process
- Use/conversion of resources
- Causes of low efficiency of use
- Increasing the efficiency of resource use
- Inspection of resource use plans

- Regulations/licensing requirements
- Determine benefit/cost for alternative resource sources
- Benefit/costs for different alternatives
- Components of proposals
- Criteria on ranking proposals
- Regulatory requirements
- Proposals for improving resource efficiency
- Implementation of resource efficiency plans
- Procedures in monitor implementation
- Adjustments of implementation plan
- Inspection of new resource usage

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Controlled environmental hazard</li> <li>1.2 Controlled environmental pollution</li> <li>1.3 Demonstrated sustainable resource use</li> <li>1.4 Evaluated current practices in relation to resource usage</li> <li>1.5 Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.</li> <li>1.6 Described industrial standard environmental practices according to the different environmental issues/concerns.</li> <li>1.7 Resolved problems/ constraints encountered based on management standard procedures</li> <li>1.8 Implemented and monitored environmental practices on a periodic basis as per company guidelines</li> <li>1.9 Recommended solutions for the improvement of the Program</li> <li>1.10 Monitored and reported to proper authorities any environmental incidents</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Workplace with storage facilities</li> <li>2.2 Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)</li> <li>2.3 PPE</li> <li>2.4 Manuals and references</li> <li>2.5 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection</li> </ul>

	2.6 Case studies/scenarios relating to environmental Protection
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Interview/Third Party Reports 3.5 Portfolio of evidence
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/OS/PO/BC/06/5/A

### UNIT DESCRIPTION

This unit specifies the competencies required to identify workplace hazards and risk, identify and implement appropriate control measures and implement OSH programs, procedures and policies/ guidelines

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements.  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Identify workplace hazards and risk	1.1 <i><b>Hazards</b></i> in the workplace are identified <i><b>based their indicators</b></i> 1.2 Risks and hazards are evaluated based on legal requirements. 1.3 <i><b>OSH concerns</b></i> raised by workers are addressed as per legal requirements.
2. Control OSH hazards	2.1 Hazard prevention <i><b>and control measures</b></i> are implemented as per legal requirement. 2.2 Risk assessment is conducted and a risk matrix developed based on likely impact. 2.3 <i><b>Contingency measures</b></i> , including <i><b>emergency procedures</b></i> during workplace <i><b>incidents and emergencies</b></i> are recognized and established in accordance with organization procedures.
3. Implement OSH programs	3.1 Company OSH program are identified, evaluated and reviewed based on legal requirements. 3.2 Company OSH programs are implemented as per legal requirements. 3.3 Workers are capacity built on OSH standards and procedures as per legal requirements 3.4 <i><b>OSH-related records</b></i> are maintained as per legal requirements.



## RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
1. Hazards may include but are not limited to:	<ul style="list-style-type: none"><li>• Physical hazards</li><li>• Biological hazards</li><li>• Chemical hazards</li><li>• Ergonomics</li><li>• Psychological factors</li><li>• Physiological factors</li><li>• Safety hazards</li><li>• Unsafe workers' act</li></ul>
2. Indicators may include but are not limited to:	<ul style="list-style-type: none"><li>• Increased of incidents of accidents, injuries</li><li>• Increased occurrence of sickness or health complaints/ symptoms</li><li>• Common complaints of workers related to OSH</li><li>• High absenteeism for work-related reasons</li></ul>
3. Evaluation and/or work environment measurements may include but are not limited to:	<ul style="list-style-type: none"><li>• Health Audit</li><li>• Safety Audit</li><li>• Work Safety and Health Evaluation</li><li>• Work Environment Measurements of Physical and Chemical Hazards</li></ul>
4. OSH issues and/or concerns may include but are not limited to:	<ul style="list-style-type: none"><li>• Workers' experience/observance on presence of work hazards</li><li>• Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks)</li><li>• Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines</li></ul>
5. Prevention and control measures may include but are not limited to:	<ul style="list-style-type: none"><li>• Eliminate the hazard</li><li>• Isolate the hazard</li><li>• Substitute the hazard with a safer alternative</li><li>• Use administrative controls to reduce the risk</li><li>• Use engineering controls to reduce the risk</li><li>• Use personal protective equipment</li><li>• Safety, Health and Work Environment Evaluation</li><li>• Periodic and/or special medical examinations of workers</li></ul>

<p>6. Safety gears /PPE (Personal Protective Equipment's) may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Arm/Hand guard, gloves</li> <li>• Eye protection (goggles, shield)</li> <li>• Hearing protection (ear muffs, ear plugs)</li> <li>• Hair Net/cap/bonnet</li> <li>• Hard hat</li> <li>• Face protection (mask, shield)</li> <li>• Apron/Gown/coverall/jump suit</li> <li>• Anti-static suits</li> <li>• High-visibility reflective vest</li> </ul>
<p>7. Appropriate risk controls</p>	<ul style="list-style-type: none"> <li>• Eliminate the hazard altogether</li> <li>• Isolate the hazard from anyone who could be harmed</li> <li>• Substitute the hazard with a safer alternative</li> <li>• Use administrative controls to reduce the risk</li> <li>• Use engineering controls to reduce the risk</li> <li>• Use personal protective equipment</li> </ul>
<p>8. Contingency measures may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Evacuation</li> <li>• Isolation</li> <li>• Decontamination</li> <li>• Emergency personnel</li> </ul>
<p>9. Emergency procedures may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Fire drill</li> <li>• Earthquake drill</li> <li>• Basic life support/CPR</li> <li>• First aid</li> <li>• Spillage control</li> <li>• Decontamination of chemical and toxic</li> <li>• Disaster preparedness/management</li> <li>• Set of fire-extinguisher</li> </ul>
<p>10. Incidents and emergencies may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Chemical spills</li> <li>• Equipment/vehicle accidents</li> <li>• Explosion</li> <li>• Fire</li> <li>• Gas leak</li> <li>• Injury to personnel</li> <li>• Structural collapse</li> <li>• Toxic and/or flammable vapors emission.</li> </ul>

<p>11. OSH-related Records may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Medical/Health records</li> <li>• Incident/accident reports</li> <li>• Sickness notifications/sick leave application</li> <li>• OSH-related trainings obtained</li> </ul>
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## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Communication
- Interpersonal
- Presentation
- Risk assessment
- Evaluation
- Critical thinking
- Problem solving
- Negotiation

### Required Knowledge

The individual needs to demonstrate knowledge of:

- General OSH Principles
- Occupational hazards/risks recognition
- OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
- National OSH regulations; company OSH policies and protocols
- Systematic gathering of OSH issues and concerns
- General OSH principles
- National OSH regulations
- Company OSH and recording protocols, procedures and policies/guidelines
- Training and/or counseling methodologies and strategies

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified hazards in the workplace based their indicators</li> <li>1.2 Evaluated workplace hazards based on legal requirements.</li> <li>1.3 Addressed OSH concerns raised by workers as per legal requirements.</li> <li>1.4 Implemented hazard prevention and control measures as per legal requirement.</li> <li>1.5 Conducted risk assessment as per legal requirement.</li> <li>1.6 Developed risk matrix based on likely impact.</li> <li>1.7 Recognized and established contingency measures in accordance with organization procedures.</li> <li>1.8 Identified, evaluated and reviewed company OSH program based on legal requirements.</li> <li>1.9 Implemented company OSH programs as per legal requirements.</li> <li>1.10 Capacity built workers on OSH standards and procedures as per legal requirements</li> <li>1.11 Maintained OSH-related records as per legal requirements.</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace where assessment can take place</li> <li>2.2 Appropriately simulated environment where assessment can take place</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Observation</li> <li>3.2 Oral questioning</li> <li>3.3 Written test</li> <li>3.4 Portfolio of Evidence</li> <li>3.5 Interview</li> <li>3.6 Third party report</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed:</p> <ul style="list-style-type: none"> <li>4.1 On-the-job</li> <li>4.2 Off-the –job</li> <li>4.3 During Industrial attachment</li> </ul>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## COMMON UNITS OF COMPETENCY

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## APPLY ENGINEERING MATHEMATICS

**UNIT CODE:**ENG/OS/PO/CC/01/5/A

### UNIT DESCRIPTION

This unit describes the competencies required by an Electrical Technician to apply a wide range of engineering mathematics in their work. This includes applying algebraic functions, applying trigonometry and hyperbolic functions, Complex numbers, coordinate geometry, carrying out binomial expansion, calculus, Statistics, Vector theory, Matrix and Numerical methods in solving problems, Concepts of probability for work, performing commercial calculations, Performing estimations, measurements and calculations of quantities

<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range.</b></i>
1. Apply Algebra	1.1 Calculations involving Indices are performed as per the concept 1.2 Calculations involving Logarithms are performed as per the concept 1.3 Scientific calculator is used in solving mathematical problems in line with manufacturer's manual 1.4 Simultaneous equations are performed as per the rules 1.5 Quadratic equations are calculated as per the concept
2. Apply Trigonometry and hyperbolic functions	2.1 Calculations are performed using trigonometric rules 2.2 Calculations are performed using <i><b>hyperbolic functions</b></i>
3. Apply complex numbers	3.1 Complex numbers are represented using Argand diagrams 3.2 Operations involving complex numbers are performed 3.3 Calculations involving complex numbers are performed using De Moivre's theorem
4. Apply Coordinate Geometry	1.1 Polar equations are calculated using coordinate geometry 1.2 Graphs of given polar equations are drawn using

	<p>the Cartesian plane</p> <p>1.3 Normal and tangents are determined using coordinate geometry</p>
5. Carry out Binomial Expansion	<p>5.0 Roots of numbers are determined using binomial theorem</p> <p>5.1 Errors of small changes are determined using binomial theorem</p>
6. Apply Calculus	<p>6.0 Derivatives of functions are determined using Differentiation</p> <p>6.1 Derivatives of hyperbolic functions are determined using Differentiation</p> <p>6.2 Derivatives of inverse trigonometric functions are determined using Differentiation</p> <p>6.3 Rate of change and small change are determined using Differentiation.</p> <p>6.4 Calculation involving stationery points of functions of two variables are performed using differentiation.</p> <p>6.5 Integrals of algebraic functions are determined using integration</p>
7. Apply Statistics	<p>7.1 Identification, Collection and Organization of data is performed</p> <p>7.2 Interpretation, analysis and presentation of data in appropriate format is performed</p> <p>7.3 Mean, median ,mode and Standard deviation are obtained from given data</p> <p>7.4 Calculations are performed based on Laws of probability</p> <p>7.5 Calculation involving probability distributions , mathematical expectation sampling distributions are performed</p>
8. Apply vector theory	<p>8.1 Calculations involving vector algebra, dot and cross products using vector theory</p> <p>8.2 Gradient, Divergence and Curl are obtained</p> <p>8.3 Vector calculations are performed using Green's theorem</p> <p>8.4 Vector calculations are performed using Stoke's theorem</p> <p>8.5 Conservative vector fields and line and surface integrals are obtained using Gauss's theorem</p>
9. Apply Matrix	<p>1.1 Determinant and inverse of 3x3 matrix are obtained</p> <p>1.2 Solutions of simultaneous equations are obtained</p> <p>1.3 Calculation involving Eigen values and Eigen</p>

	vectors are performed
10. Apply Numerical methods	1.4 Roots of polynomials are obtained using iterative numerical methods 1.5 Interpolation and extrapolation are performed using numerical methods
11. Apply concepts of probability for work	1.6 Probability events are determined from dependent, independent and mutually exclusive 1.7 Counting is done using permutation, combination, tree diagrams and Venn diagrams techniques
12. Perform commercial calculations	1.8 Exchange rates calculations are done using devaluation and revaluation 1.9 Sales, stock turnover and profit and loss are determined 1.10 Incomes, salaries and wages are calculated
13. Perform estimations, measurements and calculations of quantities	1.11 Measurement information in workplace is extracted and interpreted 1.12 Appropriate workplace measuring tools and equipment are identified and selected 1.13 Conversions are performed between units of measurement 1.14 Measurements are estimated and taken 1.15 Length, width, height, perimeter, area and angles of <i>figures</i> are calculated 1.16 Volume and surface area of figures are calculated 1.17 Information is recorded using mathematical language and symbols appropriate for the task

### RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
1. Hyperbolic functions may include but not limited to:	<ul style="list-style-type: none"> <li>• Sinh x</li> <li>• Cosh x</li> <li>• Cosec x</li> <li>• Coth x</li> <li>• Tanh x</li> <li>• Sech x</li> </ul>
2. Figures may include but not limited to:	<ul style="list-style-type: none"> <li>• Triangles</li> <li>• Squares</li> <li>• Rectangles</li> </ul>



	<ul style="list-style-type: none"> <li>• Circles</li> <li>• Spheres</li> <li>• Cylinders</li> <li>• Cubes</li> <li>• Polygons</li> <li>• Cuboids</li> <li>• Pyramids</li> </ul>
3. Quantities may include but not limited to:	<ul style="list-style-type: none"> <li>• Weight,</li> <li>• Mass</li> <li>• Area</li> <li>• Volume</li> <li>• Length</li> <li>• Width</li> <li>• Depth</li> <li>• Perimeter</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Applying fundamental operations (addition, subtraction, division, multiplication)
- Using and applying mathematical formulas
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

### Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied Trigonometry and hyperbolic functions</li> <li>1.2 Applied complex numbers</li> <li>1.3 Determined angles and length in triangles</li> <li>1.4 Applied Calculus</li> <li>1.5 Applied Vector theory</li> <li>1.6 Applied Matrix</li> <li>1.7 Identified and selected measuring equipments</li> <li>1.8 Collected, Analyzed and presented data</li> <li>1.9 Applied Numerical methods</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>1.10 Access to relevant workplace or appropriately simulated environment where assessment can take place</li> <li>1.11 Measuring equipment</li> <li>1.12 Materials relevant to the proposed activity or tasks</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> <li>1.13 Direct Observation</li> <li>1.14 Demonstration with Oral Questioning</li> <li>1.15 Written tests</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed individually in the actual workplace or through accredited institution or during industrial attachment.</p>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## PERFORM WORKSHOP PROCESS

**UNIT CODE:** ENG/OS/PO/CC/02/6/A

### UNIT DESCRIPTION

This unit covers the competencies required to perform workshop processes. Competencies include applying workshop Safety, use of workshop tools, instruments and equipments, preparation of workshop materials, preparation of workshop for Electrical installation practicals, Storage of Electrical tools and materials after practicals and troubleshoot and repair workshop tools and equipment.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
<p>These describe the key outcomes which make up workplace function.</p>	<p><i>(Bold and italicised terms are elaborated in the Range)</i></p>
<p>1. Apply workshop safety</p>	<p>1.1 Proper use of PPE is adhered to as per standard operating procedure</p> <p>1.2 Workshop rules are followed as per standard operating procedure</p> <p>1.3 Proper use of safety equipments are followed as per the manufacturer's recommendations</p> <p>1.4 First Aid procedures are adhered to</p>
<p>2. Use workshop tools, Instruments and equipments</p>	<p>2.1 <b><i>Workshop tools</i></b>, Instruments and equipments are Identified</p> <p>2.2 Tools, Instruments and equipments are used as per the manufacture's manuals</p> <p>2.3 Calibration of workshop instruments are performed as per the standard operating procedure</p> <p>2.4 Proper handling of workshop tools, Instruments and equipments should be followed</p> <p>2.5 Care and Maintenance of workshop tools, Instruments and equipments should be adhered too</p>
<p>3 Prepare workshop tools and instruments for an Electrical installation practical e.g.</p>	<p>3.1 List of required tools and instruments are prepared</p> <p>3.2 Issuing of required tools and instruments is performed</p> <p>3.3 Confirmation of the issued tools and instruments is performed</p> <p>3.4 Functioning of the issued tools and instruments is checked in line with the standard operating procedure</p> <p>3.5 Sharpening of the cutting tools is performed</p>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>(Bold and italicised terms are elaborated in the Range)</i>
These describe the key outcomes which make up workplace function.	
4 Prepare workshop for an Electrical practical	<p>4.1 Practical working section is arranged as per the number of practicals to be carried out.</p> <p>4.2 Power supply availability in every practical section is confirmed as per the practical to be carried out</p> <p>4.3 Tools and materials required are supplied as per the practical to be carried out.</p>
5 Store Electrical tools and materials after practicals	<p>5.1 Tools are checked against the issuing list after practicals</p> <p>5.2 Tools are stored out as per their standard operating procedure</p> <p>5.3 Tools are cleaned as per the workshop standard operating procedure</p> <p>5.4 Waste materials are disposed as per the EHS</p> <p>5.5 Tools are stored in their respective sections as per the workshop procedures</p>
6 Troubleshoot and repair/replace workshop tools and equipment	<p>6.1 Faulty tools are identified as per their expected functioning</p> <p>6.2 Faulty component are diagnosed as per the fault diagnosis procedures</p> <p>6.3 Repair/Replace faulty components as per the expected functioning</p> <p>6.4 Repaired/Replaced tool are tested as per the expected functioning.</p>

## **RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

<b>Variable</b>	<b>Range</b>
1. Workshop tools may include but is not limited to:	<ul style="list-style-type: none"> <li>• Pliers</li> <li>• Hacksaws</li> <li>• Hammer</li> <li>• Spirit levels</li> <li>• Phase Tester</li> <li>• Side cutters</li> </ul>

Variable	Range
2. Manual may include but is not limited to:	<ul style="list-style-type: none"> <li>• Operational</li> <li>• Installation</li> <li>• Commissioning</li> <li>• Technical specification /data sheet</li> </ul>
3. Parameters may include but is not limited to:	<ul style="list-style-type: none"> <li>• Light intensity</li> <li>• Sound</li> <li>• Speed</li> <li>• Efficiency</li> <li>• Temperature</li> <li>• Electrical quantities e.g. Voltage, current and resistance levels</li> <li>• Expected output</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Analytical
- Faults troubleshooting;
- Problem solving;
- Planning;
- Decision making;
- First aid;
- Report writing;

### Required Knowledge

- How to find, interpret and use sources of technical information for workshop practical activities
- The importance of using the correct sources of technical information.
- The purpose of and how to use identification codes.
- The individual needs to demonstrate the following knowledge:
- The manufacturer's manual about the operation of various workshop tools and instruments

- The legal and statutory requirements relating to electrical Workshop operation activities.
- workplace procedures relevant to:
  - health and safety;
  - the environment (including waste disposal);
  - appropriate personal and protective equipment;
- Appropriate use of service manuals
- Workplace procedures for:
- Fault identification and diagnosis
- Appropriate use of tools and equipment;
- Repairing, modifying or replacing defective parts or components.
- Reporting of technical challenges
- The importance of documenting workshop practical activities and information.
- The importance of working within agreed timelines and sharing progress reports.
- The importance of reporting anticipated delays to relevant parties promptly.

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1 Critical Aspects of Competency	<p><b>Assessment requires evidence that the candidate:</b></p> <ul style="list-style-type: none"> <li>1.1 Adhered to the proper use of PPE</li> <li>1.2 Observed the workshop rules</li> <li>1.3 Performed the First Aid procedures in the workshop</li> <li>1.4 Observed workshop procedures in the storage of tools</li> <li>1.5 Safely used testing equipment and tools</li> <li>1.6 Observed EHS in the waste disposal</li> <li>1.7 Properly demonstrated care and maintenance of workshop tools</li> <li>1.8 Obtained, recorded and interpreted test results</li> <li>1.9 Identified faulty tools and instruments</li> <li>1.10 Repaired/Replaced faulty tools</li> </ul>
2 Resource Implications	<p><b><i>The following resources must be provided:</i></b></p> <ul style="list-style-type: none"> <li>2.1 Electrical installation tool kit</li> <li>2.2 Testing equipment</li> <li>2.3 Measuring equipment</li> <li>2.4 First Aid kit</li> </ul> <p>Resources the same as that of workplace are advised to be applied</p>
3 Methods of	<p><b>Competency may be assessed through:</b></p>

Assessment	3.1 Oral test 3.2 Observation 3.3 Practical demonstration
4 Context of Assessment	Competency may be assessed individually in the actual workplace or through a simulated work place setting or during industrial attachment.
5 Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## APPLY ELECTRICAL PRINCIPLES

UNIT CODE:ENG/OS/PO/CC/03/5/A

### UNIT DESCRIPTION

This unit describes the competencies required by a technician in order to apply a wide range of Electrical principles in their work; use the concept of basic Electrical quantities, use the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, understanding of three phase power supply, use of power factor in electrical installation, use of earthing in Electrical installations, apply lightning protection measures and application of electromagnetic field theory

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range.</b></i>
1. Use the concept of basic Electrical quantities	1.1 Basic <b><i>SI units</i></b> in Electrical are identified 1.2 <b><i>Quantities</i></b> of Charge, force, work and power are identified 1.3 Perform calculations involving Ohm's law i.e Current, Resistance and voltage 1.4 Calculations involving various electrical quantities are performed 1.5 Electrical quantities measuring instruments are identified
2. Use the concepts of D.C and A.C circuits in electrical installation	2.1 Calculations involving parallel and series circuits are performed 2.2 Calculations involving Network theorems are performed. E.g. Kirchhoff's laws, Superposition, Thevinin's, Norton's 2.3 Photovoltaic solar system is identified 2.4 AC to DC and DC to AC conversion is performed
3. Use of basic electrical machine	3.1 Types of various electrical machines are identified 3.2 Operations involving single phase and three phase AC and DC Motors are performed 3.3 Calculations involving single and three phase AC and DC transformers are performed 3.4 Operations involving single and three phase generators are performed 3.5 AC and DC machines are applied as per their functions
4. Demonstrate understanding of three phase power supply	4.1 Connections of three phase power supply are performed as per the standard operating procedure 4.2 Calculations involving three phase power supply connections are performed 4.3 Measurements of three phase power supply is performed



<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <b><i>Bold and italicized terms are elaborated in the Range.</i></b>
	4.4 Interconnections of three phase power supply are performed as per the nature of the load.
4. Use of power factor in electrical installation	4.1 Power triangle is identified i.e. Active, Apparent and reactive power 4.2 The use of power factor is performed 4.3 Calculations involving power factor correction is performed 4.4 Methods of power factor correction are applied
5. Use of earthing in Electrical installations	2.1 Earthing types are identified 2.2 Earthing points on Electrical installation are identified 2.3 Calculation involved in determining the earthing type is performed 2.4 Test on an earthing system is performed in line with the IEE regulations
6. Apply lightning protection measures	6.1 Types of lightening strokes are identified 6.2 Components of lightening protection system are identified 6.3 Test to be carried out in lightening protection system are established 6.4 Application of lightening protection system is determined
7. Apply Electromagnetic field Theory	7.1 Electromagnetic radiation sources are identified 7.2 Detectors of Electromagnetic radiations are determined 7.3 Electromagnetic waves are applied 7.4 Electromagnetics Laws are Identified 7.5 Behaviours and effects of Electromagnetic waves are established

### **RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

<b>Variable</b>	<b>Range</b>
1. SI unit may include but not limited to:	<ul style="list-style-type: none"> <li>• Power – Watts (W)</li> <li>• Current – Amperes (A)</li> <li>• Resistance – Ohms(<math>\Omega</math>)</li> <li>• Voltage – Volts (V)</li> </ul>
2. Quantities may include but not limited to:	<ul style="list-style-type: none"> <li>• Charge</li> <li>• Force</li> <li>• Work</li> <li>• Power</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required Skills

The individual needs to demonstrate the following skills:

- Apply basic Electrical formulas
- Use of basic Electrical instruments
- Perform various unit conversions of Electrical quantities
- Electrical earthing
- Lightning arrestors
- Power factor correction
- logical thinking
- problem solving
- applying statistics
- drawing graphs
- Using different measuring tools

### Required knowledge

The individual needs to demonstrate knowledge of:

- Electrical power calculations
- Various laws in Electrical engineering
- Electrical formulas
- Power triangle
- SI units of various electrical parameters
- Earthing testing
- Lightning arrestor testing
- Selecting the correct type of electrical machines for various uses
- Types and purpose of measuring instruments
- Units of measurement and abbreviations

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

1 Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied the correct SI units of Electrical quantities 1.2 Stated, Calculate and relates the quantities in Ohm's law 1.3 Identified the components of an earthing system 1.4 Stated and apply various laws in Electrical system 1.5 Demonstrated understanding of three phase systems 1.6 Differentiated between AC and DC network 1.7 Applied correct formulas in the calculation of AC and DC machines 1.8 Used power triangle in calculating power factor 1.9 Applied various methods in power factor correction
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		1.10 Identified types of lightening arrestors and their applications
2. Resource Implications		The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring equipment 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	of	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Written tests
4. Context of Assessment	of	Competency may be assessed individually in the actual workplace or through accredited institution or during industrial attachment.
5. Guidance information for assessment	for	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## PREPARE AND INTERPRET TECHNICAL DRAWINGS

**UNIT CODE:** ENG/OS/PO/CC/04/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select; use and maintain drawing equipment and materials, producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawing, and producing electrical drawings.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function.</p>	<p>These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i></p>
<p>1. Use and maintain drawing equipment and materials</p>	<p>1.1 <b>Drawing equipment</b> are identified and gathered according to task requirements</p> <p>1.2 <b>Drawing materials</b> are identified and gathered according to task requirements</p> <p>1.3 Drawing equipment are used and maintained as per manufacturer's instructions</p> <p>1.4 Drawing materials are used as per workplace procedures</p> <p>1.5 Waste materials are disposed in accordance with workplace procedures and <b>environmental legislations</b></p> <p>1.6 <b>Personal Protective Equipment</b> is used according to occupational safety and health regulations</p>
<p>2. Produce plane geometry drawings</p>	<p>2.1 Different types of lines used in drawing and their meanings are identified according to standard drawing conventions</p> <p>2.2 Different types of <b>geometric forms</b> are constructed according to standard conventions</p> <p>2.3 Different types of angles are constructed according to principles of trigonometry</p> <p>2.4 Different types of angles are measured using appropriate measuring tools</p> <p>2.5 Angles are bisected according to standard conventions</p> <p>2.6 Freehand sketching of different types of geometric forms, tools, equipment, diagrams is conducted</p>
<p>3. Produce solid geometry drawings</p>	<p>3.1 Drawings of patterns are interpreted according to standard conventions</p> <p>3.2 Patterns are developed in accordance with standard</p>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <b><i>(Bold and italicised terms are elaborated in the Range)</i></b>
	conventions
4. Produce orthographic and pictorial drawings	4.1 Symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions 4.2 First and third angle orthographic drawings are interpreted and produced in accordance with the standard conventions 4.3 Orthographic elevations are dimensioned in accordance with standard conventions 4.4 Isometric drawings are interpreted and produced in accordance with standard conventions 4.5 Assembly drawing is produced and interpreted in line with the operating standards
5. Produce electrical drawings	5.1 Electrical symbols and abbreviations are identified and their meaning interpreted according to BS 3939 5.2 <b><i>Electrical drawings</i></b> are produced in accordance with BS 3939

### **RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

<b>Variable</b>	<b>Range</b>
1. Drawing equipment may include but is not limited to:	<ul style="list-style-type: none"> <li>• Drawing boards, T and set squares, drawing sets</li> </ul>
2. Drawing materials may include but is not limited to:	<ul style="list-style-type: none"> <li>• Drawing papers, pencils, erasers, masking tapes, paper clips</li> </ul>
3. Environmental legislations may include but is not limited to:	<ul style="list-style-type: none"> <li>• EMCA 1999</li> </ul>
4. Personal Protective Equipment may include but is not limited to:	<ul style="list-style-type: none"> <li>• Dust coats, closed leather shoes</li> </ul>
5. Geometric forms may include but is not limited	<ul style="list-style-type: none"> <li>• Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci</li> </ul>

to:	
6. Standard conventions may include but is not limited to:	<ul style="list-style-type: none"> <li>• Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends)</li> <li>• Drawing scale (paper size and drawing symbols)</li> <li>• International drawing standards</li> </ul>
7. Electrical drawings may include but is not limited to:	<ul style="list-style-type: none"> <li>• Block, schematic, circuit, line and wiring diagrams</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required skills

The individual needs to demonstrate the following skills:

- Critical thinking
- Drawing
- Interpretation
- Drawing equipment handling
- Analysis and synthesis
- Communication
- Inter personal

### Required knowledge

The individual needs to demonstrate knowledge of:

- Drawing equipment and materials
- Freehand sketching
- Lettering
- Geometrical constructions
- Types of drawings
- Types of lines
- Isometric drawing conventions, features, characteristics, components
- Orthographic drawing conventions, features, characteristics, components
- Sketches and drawings of simple patterns

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects	Assessment requires evidence that the candidate:
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of Competency	<ul style="list-style-type: none"> <li>1.1 Applied and adhered to safety procedures</li> <li>1.2 Cared and maintained drawing equipment</li> <li>1.3 Interpreted circuit, assembly and lay out diagrams</li> <li>1.4 Applied appropriate technical standards, used proper tools and equipment for a given task</li> <li>1.5 Produced sketches and drawings</li> <li>1.6 Produced electrical drawings</li> </ul>
2. Resource Implications	<p>Resources the same as that of workplace are advised to be applied.</p> <ul style="list-style-type: none"> <li>2.1 Drawing room</li> <li>2.2 Drawing equipment and materials</li> <li>2.3 Computers</li> </ul>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Practical tests</li> <li>3.2 Observation</li> </ul>
4. Context of Assessment	<p>Competency may be assessed individually in the actual workplace or a simulated work place setting</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

**CORE UNITS OF COMPETENCY**

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## PERFORM ELECTRICAL INSTALLATION

UNIT CODE: ENG/OS/PO/CR/01/5/A

### UNIT DESCRIPTION

This unit specifies the competencies required for performing electrical installation. Competencies required includes; applying EHS Standards, preparation of working drawings, preparation of list of tools equipments, perform marking, piping and fixing accessories, performing installation, terminating installation, testing installation.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Apply EHS standards	1.1 <i>Safety regulations</i> are applied as per the EHS 1.2 Occupational health and safety standards are applied 1.3 <i>Good housekeeping</i> practices are applied 1.4 Accident and incidents are recorded and reported as per the working organization structure. 1.5 First aid is applied as per the as per OSHA
2. Prepare working drawings	2.1 Installation design drawing is interpreted 2.2 Symbols and nomenclatures are applied in accordance with British Standards [BS 3939] 2.3 Drawing tools are applied as per the expected task 2.4 Components and their ratings are identified 2.5 Cable sizes and lengths are shown as per the design 2.6 Power supply and distribution circuits are drawn as per the design 2.7 Phase balancing of the loads is done as per the usage 2.8 Cable routes are clearly indicated in line with design 2.9 Working drawing is prepared per the design and any deviations shared with relevant parties
3. Prepare list of tools, equipment & materials.	3.1 Tools, equipment and materials needed for the work are determined and list prepared as per established procedure 3.2 Tools, equipment and materials are checked for

<p><b>ELEMENT</b></p> <p>These describe the key outcomes which make up workplace function.</p>	<p><b>PERFORMANCE CRITERIA</b></p> <p>These are assessable statements which specify the required level of performance for each of the elements  <i>(Bold and italicised terms are elaborated in the Range)</i></p>
	<p><i>specifications</i> and functionality as per their the standard operating procedure</p> <p>3.3 Tools, equipment and materials are assembled and stored as per the established procedure</p>
<p>4. Perform marking, piping and fixing of accessories</p>	<p>4.1 Marking, piping and fixing tools are identified as per the nature of the job</p> <p>4.2 Marking is performed as per the working drawing</p> <p>4.3 Marking is performed in line with establishes procedures and standards</p> <p>4.4 Marking positions are performed as per the IEE regulations</p> <p>4.5 Conduits are laid in line with standard operating procedures</p> <p>4.6 Accessories are fixed as per the established procedure</p>
<p>5. Perform installation</p>	<p>5.1 Installation procedures and technical standards are applied</p> <p>5.2 Working drawing is implemented</p> <p>5.3 Safety procedures are adhered to for each activity</p> <p>5.4 Cables, conductors, conduits, enclosures and support systems are installed as per the working drawing</p> <p>5.5 Cables are drawn-in in line with standard operating procedures.</p> <p>5.6 Number and size of cables are laid in a conduit is performed as per the IEE regulations</p>
<p>6. Terminate installation</p>	<p>6.1 Cable lugging is performed as per the standards operating procedure.</p> <p>6.2 Cables are terminated as per the IEE regulations</p> <p>6.3 Labelling of the cables is performed as per the complexity of the job.</p>
<p>7. Test installation</p>	<p>7.1 Type of tests are identified</p> <p>7.2 Test is performed as per the IEE regulations</p> <p>7.3 Firmness of the installation is established</p> <p>7.4 Continuity test is performed</p> <p>7.5 Insulation resistance test is performed as per the IEE regulations</p>

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
	7.6 Ring circuit test is performed as per the standard operating procedure 7.7 Earth continuity test is performed as per the IEE regulations 7.8 Short circuit test is performed as per the IEE regulation

### RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

<b>Variable</b>	<b>Range</b>
1. Installation may include but is not limited to:	<ul style="list-style-type: none"> <li>• Domestic installation</li> <li>• Commercial installation</li> <li>• Industrial Installation</li> <li>• Street lighting</li> <li>• Security</li> <li>• IBMS (integrated building Management system)</li> </ul>
2. Established Procedures may include but is not limited to:	<ul style="list-style-type: none"> <li>• Company rules</li> <li>• Procedures mentioned in contract</li> </ul>
3. Design may include but is not limited to:	<ul style="list-style-type: none"> <li>• Electrical design for lighting and power</li> <li>• Electrical design for switchgear</li> <li>• Electrical design for alarm systems</li> </ul>
4. Standard may include but is not limited to:	<ul style="list-style-type: none"> <li>• IEE standard</li> <li>• British Standard</li> <li>• KEBS standard</li> </ul>
5. IEE regulations may include but is not limited to:	<ul style="list-style-type: none"> <li>• 17th Edition</li> </ul>
6. Logistics includes but not limited to	<ul style="list-style-type: none"> <li>• Personnel, Finance and input materials</li> <li>• Transport and storage</li> <li>• Communications</li> <li>• Security</li> </ul>
7. Specifications may include but is not limited to:	<ul style="list-style-type: none"> <li>• Tolerance/ range</li> <li>• Make / model</li> </ul>

Variable	Range
	<ul style="list-style-type: none"> <li>• Size</li> <li>• Class</li> </ul>
8. Regulations and legislative requirements may include but is not limited to:	<ul style="list-style-type: none"> <li>• KPLC procedures</li> <li>• County bylaws</li> <li>• Energy Act, 2006</li> <li>• National Construction Authority Act</li> <li>• OSHA</li> </ul>
9. Work schedule may include but is not limited to:	<ul style="list-style-type: none"> <li>• Gantt chart</li> <li>• Block</li> </ul>
10. Permit to work may include but is not limited to:	<ul style="list-style-type: none"> <li>• KPLC permit</li> <li>• Gate Pass</li> <li>• Daily work permit</li> <li>• Work Tag</li> </ul>
11. Utilities may include but is not limited to:	<ul style="list-style-type: none"> <li>• Water, electrical power, toilets and communication</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Problem solving;
- Negotiation;
- Decision making;
- First aid;
- Report writing;
- Planning;

### Required knowledge

- The individual needs to demonstrate the following knowledge:
- The manufacturer's warranty requirements relating to electrical installation systems and related components.
- The legal requirements relating to electrical installations
- Kenyan legislation and workplace procedures relevant to:
  - Health and safety;
  - Environment (including waste disposal);
  - Appropriate personal protective equipment (PPE).

- Workplace procedures for:
- Work place communication;
- Time management
- Materials management
- The importance of documentation and keeping records
- The relationship between time and costs
  - The importance of using the correct sources of technical information.
- Interpreting circuits, drawings, specifications and instructions
- Preparing work plans in accordance with legislative and regulatory requirements and standard operating procedures and health and safety requirements

### EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Applied work health and safety procedures</li> <li>1.2 Interpreted the design and prepared a working drawing</li> <li>1.3 Applied appropriate standard</li> <li>1.4 Determined types and sizes of materials and equipment and protective devices</li> <li>1.5 Measurement were we taken at the site</li> <li>1.6 Load was calculated as per the scope of the installation</li> <li>1.7 Phases were balanced as per the expected load</li> <li>1.8 Cables and accessories were installed as per the IEE regulation</li> <li>1.9 Cables were terminated as per the IEE regulation</li> <li>1.10 Installation was tested and results documented</li> </ul>
2. Resource Implications	The following resources must be provided: Resources same as that of workplace are advised to be applied including Measuring tape, pegs, calculator, stationery, accessories and cables
3. Methods of Assessment	Competency may be assessed through: <ul style="list-style-type: none"> <li>3.1 Observation</li> <li>3.2 Oral questioning</li> <li>3.3 Practical demonstration</li> <li>3.4 Written tests</li> </ul>
4. Context of Assessment	Competency may be assessed individually in the actual workplace and simulated setting of the actual work place or during industrial attachment
5. Guidance information for	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

assessment	
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## INSTALL ELECTRICAL POWER LINES

**UNIT CODE:** ENG/OS/PO/CR/02/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to install Electrical power lines and cables: The competencies include; Erect transmission poles, mount transmission cables, terminate conductors and finally test and inspect electrical installation.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Erect transmission lines support	1.1 Supports are erected as per the location's soil profile. 1.2 Supports are erected as per the weight of the conductor. 1.3 Supports are erected as per established procedures and standards 1.4 Supports are erected as per the conductors' voltage.
2. Mount transmission lines	2.1 Transmission lines are mounted in consideration of the balance between tension and sag of the conductors 2.2 Spacing between conductors is determined as per line voltage 2.3 Transmission line are mounted as per the type of the conductors 2.4 Tension of transmission line is performed as per fluctuations of the weather condition. 2.5 Cross arms are mounted in line with the spacing between conductors. 2.6 Conductors are mounted as per the types of insulators used. 2.7 Transmission system is earthed as per the established procedures and standards 2.8 Lightning arrestors are mounted on the power lines as per the <i>established procedures</i> and standards

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
3. Terminate conductors	3.1 Conductors are terminated as per the line voltage. 3.2 Transmission line is terminated as per the type of conductors 3.3 Different types of joint terminations are identified. 3.4 Transmission line is terminated as per the <b>IEE</b> regulation 3.5 Transmission line is terminated as per end point load. 3.6 Transmission line is terminated as per the type of transmission.
4. Test and inspect installation	4.1 Type of tests are identified 4.2 Test is performed as per the IEE regulations 4.3 Firmness of the transmission line established 4.4 Continuity test is performed 4.5 Short circuit test is performed 4.6 Insulation test is performed as per the IEE regulations 4.7 Earth continuity test is performed as per the IEE regulations

### **RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

<b>Variable</b>	<b>Range</b>
1. Established Procedures may include but is not limited to:	<ul style="list-style-type: none"> <li>• Company rules</li> <li>• Procedures mentioned in contract</li> </ul>
2. Regulations and legislative requirements may include but is not limited to:	<ul style="list-style-type: none"> <li>• KPLC procedures</li> <li>• County bylaws</li> <li>• Energy Act, 2006</li> <li>• National Construction Authority Act</li> <li>• OSHA</li> </ul>

### **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

#### **Required skills**



The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Problem solving;
- Negotiation;
- Decision making;
- First aid;
- Report writing;

**Required knowledge**

The individual needs to demonstrate the following knowledge:

- The manufacturer's warranty requirements relating to transmission lines construction components and equipments.
- The legal requirements relating to electrical line construction
- Kenyan legislation and workplace procedures relevant to:
  - Health and safety;
  - Environment (including waste disposal);
  - Appropriate personal protective equipment (PPE).
- Workplace procedures for:
  - Work place communication;
  - Time management
  - Materials management
- The importance of documentation and keeping records
- The relationship between time and costs
- The importance of using the correct sources of technical information.
- Interpreting circuits, drawings, specifications and instructions
- Preparing work plans in accordance with legislative and regulatory requirements and standard operating procedures and health and safety requirements
- Importance of contractual agreements
- Necessary insurance and policies including security bonds, performance bonds, contractors all risks
- Insurance of contractors' work
- Keeping records of income
- Financial statements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Span length was determined as per the weight of the conductor, height and type of the support
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	<p>1.2 Supports were erected in line with the conductors voltage</p> <p>1.3 Balance between tension and sag of the conductors was performed</p> <p>1.4 Lightening arrestors were mounted on the power line</p> <p>1.5 Transmission line was earthed</p> <p>1.6 Continuity, short circuit and insulation test performed after line construction.</p>
2. Resource Implications	<p>The following resources must be provided:</p> <p>Resources same as that of workplace are advised to be applied including conductors, supports, transformers, cross arms calculator, stationery</p>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Observation</p> <p>3.2 Oral questioning</p> <p>3.3 Practical demonstration</p>
4. Context of Assessment	<p>Competency may be assessed individually in the actual workplace and simulated setting of the actual work place</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## INSTALL ELECTRICAL MACHINE

**UNIT CODE:** ENG/OS/PO/CR/03/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to Install Electrical Machine. Competencies include; mounting electrical machine, mounting machine control panel, laying machine cables, termination of an installation of Electrical machine and testing of Electrical machine installation.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Mounting Electrical machine	1.1 Machine is mounted as per its size 1.2 Machine is mounted as per its load 1.3 Machine is mounted in line with OSHA 1.4 Machine earthing is performed in line with the IEE regulation
2. Mount Machine control panel	2.1 Control panel is mounted as per the load and functions of the machine 2.2 Components on the control panel are mounted as per standard operating procedure 2.3 <b>Components</b> on the control panel are spaced as per machine rating and environmental conditions 2.4 Components on the control panel are wired as per the design 2.5 Control panel is aesthetically wired as per the standard operating procedure 2.6 Components on the control panel are labelled as per their functions. 2.7 Control panel is enclosed as per the OSHA
3. Lay machine cables	3.1 Machine cables are laid as per the IEE regulations 3.2 Cables laying system is as per the <b>EHS</b> regulations 3.3 Cables are colour coded as per the IEE regulations 3.4 Firmness of the cables are installed as per the standard operating procedure 3.5 Cables are segregated as per the standard operating procedure
4. Terminate Electrical machine Installation	4.1 Cable lugging is performed as per the standards operating procedure. 4.2 Cables are terminated as per the IEE regulations 4.3 Cables are terminated in the connector as per the <b>load size</b>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
5. Test Electrical machine installations	5.1 Type of tests are identified 5.2 Test is performed as per the IEE regulations 5.3 Firmness of the installation is established 5.4 Continuity test is performed 5.5 Insulation resistance test is performed as per the IEE regulations 5.6 Earth test is performed as per the IEE regulations 5.7 On load and off load tests are performed

## RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

<b>Variable</b>	<b>Range</b>
1. Installation may include but is not limited to:	<ul style="list-style-type: none"> <li>• Machine installation</li> <li>• Commercial installation</li> <li>• Industrial Installation</li> <li>• Power Generator</li> <li>• Security</li> <li>• Power transmission and distribution</li> </ul>
2. Load size may include but is not limited to:	<ul style="list-style-type: none"> <li>• 32A</li> <li>• 80A</li> <li>• 100A</li> <li>• 180A</li> </ul>
3. Components may include but is not limited to:	<ul style="list-style-type: none"> <li>• Switches</li> <li>• Circuit breakers</li> <li>• Fuses</li> <li>• Termination blocks</li> </ul>
4. EHS regulation (Environment, Health and Safety) regulation may include but is not limited to:	<ul style="list-style-type: none"> <li>• EMCA 1999 Act</li> <li>• OSHA</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written);

- Proficient in logistic management;
- Time management;
- Meeting organization;
- Analytical
- Faults troubleshooting;
- Planning;
- Decision making;
- First aid;
- Report writing;
- Problem solving;
- Management

### Required knowledge

- The individual needs to demonstrate the following knowledge:
- The manufacturer's warranty requirements relating to electrical installation systems and related components.
- Legal requirement related to electrical machine installations
- Specification (manuals for the system)
- Legislation and workplace procedures relevant to:
  - Health and safety;
  - The environment (including waste disposal);
  - Appropriate PPEs (personal and protection equipment).
- Workplace procedures for:
  - Recording system installation and maintenance work
- Timely reporting of work.
- The importance of documentation and record keeping
- The importance of time management
- The relationship between time and costs.
- The importance of efficiency
- How to read, interpret and implement drawings for machine installation and maintenance activities
- The importance of using the correct sources of technical information.

### EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Applied and adhered to safety procedures</li> <li>1.2 Components on the control panel were wired as per the design</li> </ul>
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	<p>1.3 Cable lugging was performed before termination of the machine cables</p> <p>1.4 Applied appropriate standards</p> <p>1.5 Machine load size was considered in the design of the machine layout</p> <p>1.6 Insulation, short circuit and continuity tests were performed after machine installation</p>
2. Resource Implications	<p><b>The following resources must be provided:</b></p> <p>2.1 Installation tools</p> <p>2.2 Electrical machine to be installed</p> <p>2.3 Designing tools</p> <p>2.4 Machine installation site</p> <p>2.5 Stationery</p>
3. Methods of Assessment	<p><b>Competency may be assessed through:</b></p> <p>3.1 Oral questioning</p> <p>3.2 Practical demonstration</p> <p>3.3 Observation</p>
4. Context of Assessment	<p>Competency may be assessed individually in</p> <p>4.1 The actual workplace or</p> <p>4.2 Simulated work place environment</p> <p>4.3 During industrial attachment</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## DEMONSTRATE UNDERSTANDING OF ELECTRONICS

**UNIT CODE:** ENG/OS/PO/CR/04/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to demonstrate understanding of Electronics. Competencies includes; Apply semiconductor theory, applying semiconductor diodes, demonstrating understanding of transistors, applying special semiconductor devices, and Performing rectification.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Apply semiconductor theory	1.1 Types of <b>materials</b> are established in line with semiconductor theory 1.2 Semiconductor materials are identified as per their electrical conductivity properties
2. Apply semiconductor diodes	2.1 Types of diodes are identified as per their functionality 2.2 <b>Diodes</b> characteristics are determined as per their properties 2.3 Forward and reverse bias characteristics are established as per the properties of the semiconductor material
3. Demonstrate understanding of transistors	3.1. <b>Transistors</b> are identified as per their characteristics 3.2. NPN and PNP are determined as per their operation 3.3. P and N channels are identified as per their operation 3.4. <b>Biasing</b> and determination of gain of transistors is performed as per their standard operating procedure 3.5. Transistor configuration is performed as per their application
4. Apply special semiconductor devices	4.1. Special semiconductor devices are identified as per their operation 4.2. Special semiconductors are applied as per their standard operating procedure 4.3. Types of special semiconductor devices are identified
5. Perform rectification	5.1 Types of rectifiers are identified as per their

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
	functions 5.2 Classes of rectifiers are identified as per their input voltage 5.3 Applications of rectifiers are established

## **RANGE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

<b>Variable</b>	<b>Range</b>
1. Materials may include but is not limited to:	<ul style="list-style-type: none"> <li>• Insulators</li> <li>• Conductors</li> <li>• Semiconductors</li> </ul>
2. Diodes may include but is not limited to:	<ul style="list-style-type: none"> <li>• Photo diodes</li> <li>• Laser</li> <li>• Zener diodes</li> <li>• Light emitting diode</li> <li>• Schottky diodes</li> </ul>
3. Transistors may include but is not limited to:	<ul style="list-style-type: none"> <li>• BJTs</li> <li>• FETs</li> </ul>
4. Biasing may include but is not limited to:	<ul style="list-style-type: none"> <li>• Forward bias</li> <li>• Reverse bias</li> </ul>
5. Amplifiers may include but is not limited to:	<ul style="list-style-type: none"> <li>• RC coupled amplifiers</li> <li>• Small signal amplifiers</li> <li>• Power amplifiers</li> <li>• Tuned amplifier</li> <li>• Wide band amplifiers</li> <li>• Op-Amp amplifiers</li> </ul>
6. Oscillators may include but is not limited to:	<ul style="list-style-type: none"> <li>• Tuned collector</li> <li>• RC phase shift</li> <li>• Colpits</li> <li>• Hartley</li> <li>• Crystal</li> </ul>



Variable	Range
	<ul style="list-style-type: none"> <li>• Blocking</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

### Required skills

The individual needs to demonstrate the following skills:

- Amplifier construction
- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Analytical
- Problem solving;
- Planning;
- Decision making;
- First aid;
- Electronics biasing

### Required knowledge

The individual needs to demonstrate the following knowledge:

- The manufacturer's warranty requirements relating to electronic materials
- The legal and statutory requirements relating to Electronics
- workplace procedures relevant to:
  - Health and safety;
  - The environment (including waste disposal);
  - Appropriate personal and protective equipment;
  - Workplace procedures for:
    - Appropriate use of tools and equipment
    - Electronics operations
    - Reporting of technical challenges
  - The importance of documenting Electronics operations manuals
  - The importance of working within agreed timelines and sharing progress reports.
  - The relationship between time and costs.
  - The importance of reporting anticipated delays to relevant parties promptly

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	<p><b>Assessment requires evidence that the candidate:</b></p> <ul style="list-style-type: none"> <li>1.1 Identified different semiconductor material</li> <li>1.2 Demonstrated understanding in biasing of semiconductor materials</li> <li>1.3 Identified special semiconductor devices</li> <li>1.4 Performed forward and reverse biasing of semiconductor materials</li> <li>1.5 Identified different types of transistors</li> <li>1.6 Demonstrated understanding of rectification.</li> </ul>
2. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>2.1 Stationeries</li> <li>2.2 Reference materials</li> <li>2.3 Practical materials</li> <li>2.4 Measuring instruments</li> <li>2.5 Tools</li> </ul> <p>Resources the same as that of workplace are advised to be applied</p>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Oral test</li> <li>3.2 Written test</li> <li>3.3 Observation</li> <li>3.4 Practical demonstration</li> </ul>
4. Context of Assessment	<p>Competency may be assessed individually in the actual workplace or through a simulated work place setting</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## INSTALL SECURITY SYSTEMS

**UNIT CODE:** ENG/OS/PO/CR/05/5/A

### UNIT DESCRIPTION

This unit covers the competencies required in installing of security systems. Competencies includes; Marking out of security systems zones, laying system cables, mounting accessories, terminate system cables and testing of the system.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Mark out security system zones	1.1 Type of the security system is identified as per design 1.2 Marking, piping and fixing tools are identified as per the nature of the job 1.3 Marking is performed as per the design drawing 1.4 Marking is performed in line with establishes procedures and standards 1.5 <b>Marking points and zones</b> are performed as per the design
2. Lay system cables	2.1 Cable types are identified 2.2 Cables are laid as per the IEE regulations 2.3 Cables laying system is as per the environmental condition 2.4 Firmness of the cables are installed as per the standard operating procedure 2.5 Cables are segregated as per the standard operating procedure
3. Mount accessories	3.1 Accessories are labelled as per their functions. 3.2 Accessories are wired as per the design 3.3 Control panel is mounted as per the standard operating procedure 3.4 Accessories are mounted as per the system design 3.5 Control panel is <b>enclosed</b> as per the OSHA
4. Terminate system cables	4.1 Cable lugging is performed as per the standards operating procedure. 4.2 Cables are terminated as per the IEE regulations 4.3 Cables are terminated in the connector as per the

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
	design
5. Test security system	5.1 Type of <i>tests</i> are identified 5.2 Test is performed as per the IEE regulations 5.3 Firmness of the installation is established 5.4 Continuity test is performed 5.5 Insulation resistance test is performed as per the IEE regulations

### **RANGE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

<b>Variable</b>	<b>Range</b>
1. Mark out points and zones may include but is not limited to:	<ul style="list-style-type: none"> <li>• Switch points</li> <li>• Socket points</li> <li>• Lighting points</li> <li>• Installation points</li> <li>• System control point</li> </ul>
2. Enclosed may include but is not limited to:	<ul style="list-style-type: none"> <li>• Metal case</li> <li>• Wooden case</li> <li>• Plastic case</li> </ul>
3. Tests may include but is not limited to:	<ul style="list-style-type: none"> <li>• Continuity</li> <li>• Insulation resistance</li> <li>• Short circuit</li> <li>• Firmness</li> <li>• Sound</li> <li>• Speed</li> <li>• Efficiency</li> <li>• Expected output</li> </ul>
4. Regulatory parties may include but is not limited to:	<ul style="list-style-type: none"> <li>• County Governments</li> <li>• ERC (Energy Regulatory Commission)</li> <li>• MSK (Music Copyright of Kenya)</li> <li>• NCA (National Construction Authority)</li> <li>• National Environment Management Authority (NEMA)</li> <li>• Communications Authority of Kenya (CAK)</li> <li>• Kenya Civil Aviation Authority (KCAA)</li> </ul>

## **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

### **Required skills**

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Analytical
- Faults troubleshooting
- Problem solving;
- Planning;
- Decision making;
- First aid;
- Report writing;

### **Required knowledge**

The individual needs to demonstrate the following knowledge:

- The manufacturer's warranty requirements relating to installation of security systems related components.
- The legal requirements relating to commissioning activities for electrical installation systems and components.
- Legislation and workplace procedures relevant to:
  - Environment, health and safety;
  - Appropriate PPE (Personal Protective Equipment)
  - Observe County Government bylaws
  - ERC (Energy Regulatory Commission) regulations
  - NEMA
  - CAK
- The importance of documenting security system installation information
- The importance of working to agreed timelines
- The relationship between time and costs
- How to prepare, interpret and use sources of technical information for scheduled security system installation activities
- The importance of using the correct sources of technical information.
- The purpose of and how to use identification codes (e.g. colour codes).
- How the system operates
- The operating specifications and tolerances for different types of installed systems
- The hazards associated with operating the system.

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Security system was wired as per the IEE regulations</li> <li>1.2 Marking of the components position was performed before fixing</li> <li>1.3 Cables were segregated in line with standard operating procedure</li> <li>1.4 Accessories were labelled after the installation of the system</li> <li>1.5 Cables were terminated in the connectors as per the design</li> <li>1.6 Insulation, continuity, short circuit and firmness tests were performed.</li> <li>1.7 Applied appropriate safety standards</li> <li>1.8 Applied appropriate technical standards</li> <li>1.9 Identified and used appropriate tools and equipment</li> </ul>
<p>2. Resource Implications</p>	<ul style="list-style-type: none"> <li>2.1 Testing equipment and tools</li> <li>2.2 Electrical power</li> <li>2.3 Stationery</li> <li>2.4 Cameras</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Oral questioning</li> <li>3.2 Practical demonstration</li> <li>3.3 Observation</li> </ul>
<p>4. Context of Assessment</p>	<p>4.1 Competency may be assessed individually in the actual workplace or through simulated work environment or during industrial attachment</p>
<p>5. Guidance information for assessment</p>	<p>5.1 Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## INSTALL SOLAR SYSTEMS

**UNIT CODE:** ENG/OS/CR/CR/06/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to install solar system. Competencies includes; Mounting solar panel, fixing solar system components, laying cables, terminating electrical and testing of a solar installation system.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Mount solar Panel	1.1 <b><i>Slanting angle</i></b> is adhered to in solar panel installation 1.2 Solar panel positioning is determined by the expected output 1.3 Solar panel connections are determined by the expected output.
2. Fix solar system components	2.1 Charger controller is mounted as per the design 2.2 Solar batteries are installed as per the design 2.3 Power diodes are fixed as per the design 2.4 Inverter is installed as per the design
3. Lay Electrical cables	3.1 Cable draw- in tools are identified 3.2 Cables are drawn-in in line with standard operating procedures. 3.3 Number and size of cables laid in a conduit is as per the IEE regulations 3.4 Labelling of the cables is performed as per the complexity of the job.
4. Terminate Electrical cables	4.1 Cable lugging is performed as per the standards operating procedure. 4.2 Cables are terminated as per the IEE regulations
5. Test solar system installation	5.1 Type of <b><i>tests</i></b> are identified 5.2 Test is performed as per the IEE regulations 5.3 Firmness of the installation is established 5.4 Continuity test is performed 5.5 Insulation resistance test is performed as per the IEE regulations

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Mount solar Panel	1.1 <b><i>Slanting angle</i></b> is adhered to in solar panel installation 1.2 Solar panel positioning is determined by the expected output 1.3 Solar panel connections are determined by the expected output.
	5.6 Ring circuit test is performed as per the standard operating procedure 5.7 Earth continuity test is performed as per the IEE regulations

## **RANGE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

<b>Variable</b>	<b>Range</b>
1. Slanting angle may include but is not limited to:	<ul style="list-style-type: none"> <li>• Panel installation angle</li> <li>• Mounting position</li> </ul>
2. Testing may include but is not limited to:	<ul style="list-style-type: none"> <li>• Insulation test</li> <li>• Ring circuit test</li> <li>• Short circuit test</li> <li>• Firmness</li> <li>• Earth continuity</li> </ul>

## **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

### **Required skills**

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Analytical
- Faults troubleshooting;
- Problem solving;



- Planning;
- Decision making;

### Required knowledge

The individual needs to demonstrate the following knowledge:

- The manufacturer's warranty requirements relating to solar system installation and components.
- The legal and statutory requirements relating to solar installation activities.
- workplace procedures relevant to:
  - ✓ Health and safety;
  - ✓ The environment (including waste disposal);
  - ✓ Appropriate personal and protective equipment;
- Appropriate use of service and maintenance manuals
- Workplace procedures for:
  - ✓ Solar panel installation
  - ✓ Installation of Solar components
  - ✓ Batteries installation
  - ✓ Reporting of technical challenges
- The importance of documenting installation information.
- The importance of working within agreed timelines and sharing progress reports.
- The relationship between time and costs.
- The importance of reporting anticipated delays to relevant parties promptly
- How to find, interpret and use sources of technical information for solar installation activities
- The importance of using the correct sources of technical information.
- The purpose of and how to use identification codes.

### EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	<b>Assessment requires evidence that the candidate:</b> 1.1 Panel installed in maximum output slanting angle 1.2 Charger controller mounted as per the design 1.3 Cable was lugged after installation 1.4 Safely used testing equipment and tools 1.5 Obtained, recorded and interpreted test results 1.6 Repaired and maintained a system
2. Resource	<b><i>The following resources must be provided:</i></b>

Implications	2.1 Solar installation tool kit 2.2 Testing equipment 2.3 Measuring equipment Resources the same as that of workplace are advised to be applied
2. Methods of Assessment	<b>Competency may be assessed through:</b> 2.1 Oral test 2.2 Observation 2.3 Practical demonstration
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through a simulated work place setting
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## PERFORM ELECTRICAL BREAKDOWN MAINTENANCE

UNIT CODE: ENG/OS/PO/CR/07/5/A

### UNIT DESCRIPTION

This unit covers the competencies required to perform Electrical breakdown maintenance. Competencies includes; identifying system failure, preparing list of tools, equipment and materials, troubleshooting cause of failure, repairing the system, testing the system and documenting maintenance report.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Identify system failure	1.1 Information about the <i>failure</i> is obtained from the user, as per set procedures. 1.2 System <i>manuals</i> are referred to in identifying test points and measured parameters as per standard operating procedure.
2. Prepare list of tools, equipment & materials	2.1 Maintenance tools, equipment and materials are identified 2.2 Specifications and functionality of tools, equipment and materials are checked in accordance with the applicable technical and safety standards
3. Troubleshoot cause of failure	3.1 Safety procedures are applied in accordance with the safety standards 3.2 System trouble shooting is conducted in accordance with the set procedure 3.3 System failure results are recorded as per established procedure. 3.4 <i>Parameters</i> are compared against the standard values 3.5 Decision is made and recommendations are recorded as per the system functionality
4. Repair the system	4.1 Safety precautions are adhered to in line with standard operating procedures. 4.2 System is repaired or replaced in accordance with maintenance manual. 4.3 Repair activities are recorded according to the established procedure

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicised terms are elaborated in the Range)</i>
	4.4 Waste materials are disposed in line with the EHS
5. Test the system	5.1 Appropriate tests and test points are identified 5.2 Safety procedures are adhered to 5.3 System is tested as per standard operating procedures 5.4 Test results are recorded according to the established procedures 5.5 Parameters are compared against the standard values
6. Document maintenance report	6.1 Maintenance report is prepared according to approved format 6.2 Maintenance report is shared with the relevant parties 6.3 Filing of maintenance report is performed as per the standard operating procedure

### **RANGE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

<b>Variable</b>	<b>Range</b>
1. Failure may include but is not limited to:	<ul style="list-style-type: none"> <li>• Partial</li> <li>• Total</li> </ul>
2. Manual may include but is not limited to:	<ul style="list-style-type: none"> <li>• Maintenance</li> <li>• Operational</li> <li>• Installation</li> <li>• Commissioning</li> <li>• Technical specification /data sheet</li> </ul>
3. Parameters may include but is not limited to:	<ul style="list-style-type: none"> <li>• Currents</li> <li>• Voltage</li> <li>• Resistance</li> <li>• Temperature</li> <li>• Capacitance</li> </ul>

Variable	Range
	<ul style="list-style-type: none"> <li>• Light intensity</li> <li>• Sound</li> <li>• Speed</li> <li>• Efficiency</li> </ul>

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

#### Required skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Analytical
- Faults troubleshooting;
- Problem solving;
- Planning;
- Decision making;
- First aid;
- Report writing;

#### Required knowledge

- The individual needs to demonstrate the following knowledge:
- The manufacturer's warranty requirements relating to maintenance activities for the electrical installation systems and related components.
- The legal and statutory requirements relating to electrical maintenance activities.
- workplace procedures relevant to:
  - health and safety;
  - the environment (including waste disposal);
  - appropriate personal and protective equipment;
- Appropriate use of service and maintenance manuals
- Workplace procedures for:
  - Fault identification and diagnosis
  - Appropriate use of tools and equipment;
- Repairing, modifying or replacing defective parts or components
- The importance of documenting maintenance information.
- The importance of working within agreed timelines and sharing progress reports.
- The relationship between time and costs.

- Recording electrical maintenance activities
- Reporting of technical challenges
- The importance of reporting anticipated delays to relevant parties promptly.

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

1. Critical Aspects of Competency	<p><b>Assessment requires evidence that the candidate:</b></p> <ul style="list-style-type: none"> <li>1.1 Identified the cause of failure</li> <li>1.2 Repaired the fault on the system</li> <li>1.3 Tested the system functionality</li> <li>1.4 Identified and used appropriate maintenance tools and materials</li> <li>1.5 Obtained, recorded and interpreted test results</li> <li>1.6 Maintenance report was prepared and filed</li> <li>1.7 Adhered to EHS in waste disposal</li> </ul>
2. Resource Implications	<p><b><i>The following resources must be provided:</i></b></p> <ul style="list-style-type: none"> <li>2.1 Electrical toolkit</li> <li>2.2 Testing equipment</li> <li>2.3 Measuring equipment</li> </ul> <p>Resources the same as that of workplace are advised to be applied</p>
3. Methods of Assessment	<p><b>Competency may be assessed through:</b></p> <ul style="list-style-type: none"> <li>3.1 Written test</li> <li>3.2 Oral test</li> <li>3.3 Observation</li> <li>3.4 Practical demonstration</li> </ul>
4. Context of Assessment	<p>Competency may be assessed individually in the actual workplace or through a simulated work place setting</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>