



**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**ELECTRICAL INSTALLATION ARTISAN**

**KNQF LEVEL 4**

**ISCED OCCUPATIONAL STANDARD CODE:07130454B**



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## APPLY ELECTRICAL PRINCIPLES

UNIT CODE:ENG/OS/EI/CC/03/4/B

### UNIT DESCRIPTION

This unit describes the competencies required to apply electrical principles. It involves using the concept of basic electrical quantities, concepts of D.C and A.C circuits in electrical installation, single phase electrical machine, earthing in electrical installations and applying capacitance and inductance

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	<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>
1. Use the concept of basic Electrical quantities	<p>1.1 Basic <b><i>SI units</i></b> in Electrical are identified as established standards</p> <p>1.2 <b><i>Quantities</i></b> of Charge, force, work and power are identified as per established standards</p> <p>1.3 Perform calculations involving electrical quantities i.e Current, Resistance and voltage as per established standards</p>
2. Use of D.C and A.C circuits in electrical installation	<p>2.1 Theory of conductors and insulators is determined as per established procedures</p> <p>2.2 Ohm's law is performed as per established procedures</p> <p>2.3 Calculations involving resistor connection is performed as per established procedures</p> <p>2.4 Color coding for fixed resistors is performed as per established standards</p> <p>2.5 Calculations involving parallel and series circuits are performed as per established standards</p> <p>2.6 Calculations involving R-L-C circuits are performed as per established standards</p> <p>2.7 Calculations involving DC and AC circuits. Network theorems are performed. E.g. Kirchoff's laws,</p> <p>2.8 Conversion of AC to DC and DC to AC are performed as per established standards</p> <p>2.9 Parallel resonance and Q-factor are determined as per established standards</p> <p>2.10 Power factor improvement is performed as per established standards</p>

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3. Use of single phase electrical machines	<p>3.1 <b><i>Single-phase electrical machines</i></b> are identified as per established standards</p> <p>3.2 Calculations involving single phase AC and DC Motors are performed per established standards</p> <p>3.3 Types of single phase transformers are identified as per established standards</p> <p>3.4 Calculations involving single AC and DC transformers are performed as per established standards</p> <p>3.5 Types of single phase generators are identified as per established standards</p> <p>3.6 Motor starting methods are identified as per established procedure</p> <p>3.7 DC motor speed control is established as per standard operating procedures</p>
4. Perform earthing in electrical installations	<p>4.1 Earthing types are identified as per established standards</p> <p>4.2 Earthing systems are identified as per established procedures</p> <p>4.3 Tests to determine the earthing system are performed as per established standards</p> <p>4.4 Test on an earthing system is performed in line with the IEE regulations</p>
5. Apply capacitance and inductance	<p>5.1 Sources of Electrostatic fields are identified as established procedures</p> <p>5.2 Dielectric materials are identified as per the established standards</p> <p>5.3 Calculations involving capacitor parameters are performed as per established standards</p> <p>5.4 Types of capacitors are identified as per established standards</p> <p>5.5 Concept of charge and electrostatic field is established as per established standards</p> <p>5.6 Calculations involving capacitors are performed as per established standards</p> <p>5.7 Concept of magnetic circuits is identified as per established procedure</p> <p>5.8 Parameters</p> <p>5.9 Calculations involving inductors are performed as per established procedures</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. 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>
3. Single phase electrical machines may include but not limited to	<ul style="list-style-type: none"><li>• Motors</li><li>• Generators</li><li>• Transformers</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
- logical thinking
- problem solving
- 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
- SI units of various electrical parameters

- Earthing testing
- Lightening 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: <ul style="list-style-type: none"> <li>1.1 Applied the correct SI units of Electrical quantities</li> <li>1.2 Stated, Calculated and related the quantities in Ohm's law</li> <li>1.3 Identified the components of an earthing system</li> <li>1.4 Stated and applied various laws in Electrical system</li> <li>1.5 Differentiated between AC and DC circuits.</li> <li>1.6 Applied correct formulas in the calculation of AC and DC machines</li> <li>1.7 Identified types of lightening arrestors and their applications</li> </ul>
2. Resource Implications	The following resources should be provided: <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place</li> <li>2.2 Measuring equipment</li> <li>2.3 Materials relevant to the proposed activity or tasks</li> </ul>
3. Methods of Assessment	Competency in this unit may be assessed through: <ul style="list-style-type: none"> <li>2.1 Observation</li> <li>2.2 Demonstration</li> <li>2.3 Oral Questioning</li> <li>2.4 Written tests</li> <li>2.5 Third party reports</li> </ul>
4. Context of Assessment	Competency may be assessed individually: <ul style="list-style-type: none"> <li>4.1 On-the-job,</li> <li>4.2 Off-the-job or a combination of these.</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.