



**COMPETENCY BASED CURRICULUM**  
**FOR**  
**ELECTRICAL ENGINEERING (POWER OPTION)**

**KNQF LEVEL: 6**

**ISCED PROGRAMME CODE: 0713 554B**



TVET CDACC  
P.O BOX 15745-00100  
NAIROBI

# **ELECTRICAL INSTALLATION**

**UNIT CODE:** ENG/CU/PO/CR/01/6/B

## **Relationship to Occupational Standards**

This unit addresses the unit of competency: Perform Electrical Installation

**Duration of Unit:** 120 hours

## **Unit Description**

This unit specifies the competencies required for performing electrical installation.

Competencies required includes; applying EHS Standards, conducting site survey, designing installation, performing system sizing, preparation of working drawings, planning for logistics, preparation of list of tools equipments and materials, preparation of installation work plan, establishment of installation team, preparation of work site, marking, piping and fixing accessories, performing installation, terminating installation testing and inspecting installation and finally preparation of tenders and service contracts.

## **Summary of Learning Outcomes**

1. Apply EHS Standards
2. Conduct site survey
3. Design Electrical installation
4. Perform system sizing
5. Prepare working drawings
6. Plan for logistics
7. Prepare list of tools, equipment and materials
8. Prepare installation work plan
9. Establish installation team
10. Prepare work site
11. Perform marking, pipe and fixing of accessories
12. Perform Electrical Installation
13. Terminate Electrical Installation
14. Test and Inspect Electrical Installation
15. Prepare Tenders and Service contract

## Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Apply EHS standards	<ul style="list-style-type: none"> <li>• Relevant clauses in appropriate Acts e.g.               <ul style="list-style-type: none"> <li>• Occupational safety and health act (OSHA)</li> <li>• Work injury benefits act (WIBA)</li> <li>• Environment management and coordination Act (EMCA)</li> </ul> </li> <li>Relevant regulations:               <ul style="list-style-type: none"> <li>• IEE regulations</li> <li>• KPLC by-laws</li> <li>• County by-laws</li> </ul> </li> <li>• Causes of accidents and sources of danger e.g burns, cuts, electric shock, falling from heights, falling objects, noise, dust, chemicals</li> <li>• Meaning of term PPE</li> <li>• Purpose of PPE</li> <li>• Types of PPE</li> <li>• Safe and correct handling, use, maintenance and storage of different types of PPE</li> <li>• Classes of fires and fire fighting equipment</li> <li>• First aid procedures               <ul style="list-style-type: none"> <li>• Rescuing electric shock victim</li> <li>• Methods of resuscitation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> <li>• Observation</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
2. Conduct site survey	<ul style="list-style-type: none"> <li>• Type of installations               <ul style="list-style-type: none"> <li>• Domestic installations</li> <li>• Industrial installations</li> <li>• Commercial installations</li> </ul> </li> <li>• Type of building e.g.               <ul style="list-style-type: none"> <li>• Permanent building</li> <li>• Semi-permanent buildings</li> </ul> </li> <li>• Utilities available               <ul style="list-style-type: none"> <li>• Water</li> <li>• Electricity</li> <li>• Communication e.g. Phones</li> <li>• Installation conditions e.g. temperature, humidity, moisture</li> </ul> </li> <li>• Taking measurements on site               <ul style="list-style-type: none"> <li>• Length e.g. conduits size</li> <li>• Total area</li> <li>• Temperature</li> <li>• Humidity</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Observation</li> <li>• Oral questioning</li> </ul>
3. Design Electrical Installation	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Types of wiring systems</li> <li>• Factors to consider in designing Electrical installation e.g.               <ul style="list-style-type: none"> <li>• Load size</li> <li>• Structure</li> <li>• Clients need</li> </ul> </li> <li>• Types of supply</li> <li>• DC, Single phase and three phase</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Observation</li> <li>• Oral questioning</li> </ul>
4. Perform system sizing	<ul style="list-style-type: none"> <li>• Introduction to standards               <ul style="list-style-type: none"> <li>• IEE regulations.</li> <li>• Kenya bureau of standards (KEBS)</li> <li>• British standards</li> <li>• KPLC by-laws</li> <li>• ERC regulations</li> <li>• County by-laws</li> <li>• National Construction Authority (NCA)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Observation</li> <li>• Oral questioning</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• Reference to relevant IEE regulation tables</li> <li>• Load Estimation e.g.               <ul style="list-style-type: none"> <li>• Factor of simultaneity (Ks)</li> <li>• Factor of utilization (Ku)</li> </ul> </li> <li>• Determining cable:               <ul style="list-style-type: none"> <li>✓ Types</li> <li>✓ Ratings</li> <li>✓ sizes</li> <li>✓ Insulation type</li> </ul> </li> <li>• Protective devices               <ul style="list-style-type: none"> <li>✓ Types</li> <li>✓ Ratings</li> </ul> </li> <li>• Reference to relevant regulations</li> </ul>	
5.Prepare working drawing	<ul style="list-style-type: none"> <li>• Working drawings               <ul style="list-style-type: none"> <li>• Meaning of working drawings</li> <li>• Identification and care of drawing instruments and equipment</li> <li>• Identification of drawing paper sizes</li> <li>• Drawing various types of lines</li> <li>• Drawing title block</li> <li>• Drawing standard electrical symbols</li> <li>• Conversion of scales</li> <li>• Interpretation of orthographic projections</li> <li>• Dimensioning of drawings</li> <li>• Drawing of electrical diagrams</li> </ul> </li> <li>• Block</li> <li>• Circuits</li> <li>• Schematic</li> <li>• Wiring</li> <li>• Line</li> <li>• Reading and Interpretation of architectural drawings</li> <li>• Reading and Interpretation of electrical drawings</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questioning</li> <li>• Practical tests</li> <li>• Written tests</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• Use of Computer Aided Design (CAD) applications e.g. AutoCAD</li> </ul>	
6. Plan for logistics	<ul style="list-style-type: none"> <li>• Transport for:               <ul style="list-style-type: none"> <li>• Materials and their safety</li> <li>• Personnel</li> </ul> </li> <li>• Storage of materials on site</li> <li>• Site security</li> <li>• Human resource               <ul style="list-style-type: none"> <li>• Skills required</li> </ul> </li> <li>• Communication               <ul style="list-style-type: none"> <li>• Purpose</li> <li>• Modes</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> </ul>
7. Prepare list of tools, equipment and materials	<ul style="list-style-type: none"> <li>• Identification of tools and materials e.g.               <ul style="list-style-type: none"> <li>• Cutting tools</li> <li>• Measuring tools</li> <li>• Measuring equipment</li> <li>• Cables and conductors</li> <li>• Crimping tools</li> <li>• Conduits</li> <li>• Trunking</li> <li>• Consumables</li> </ul> </li> <li>• Types, application, care, maintenance and storage of:               <ul style="list-style-type: none"> <li>• Tools e.g.</li> <li>• Cable strippers</li> <li>• Pliers</li> <li>• Screw drivers</li> <li>• Hammers</li> <li>• Chisels</li> <li>• Allen keys</li> <li>• Electrician knives</li> <li>• Crimping tools</li> <li>• Bending springs</li> <li>• Steel tapes</li> <li>• Draw wires</li> <li>• Hack saws</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written tests</li> <li>• Observation</li> <li>• Practicals</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• Drills</li> <li>• Equipment e.g.</li> <li>• Stock and die</li> <li>• Vice</li> <li>• Materials e.g.               <ul style="list-style-type: none"> <li>✓ Cables</li> <li>✓ Fittings</li> <li>✓ Accessories</li> </ul> </li> <li>• Assemble tools, equipment and materials</li> <li>• Inventory management</li> </ul>	
8. Prepare installation work plan	<ul style="list-style-type: none"> <li>• Identification of scope of installation work</li> <li>• Identify installation team</li> <li>• Meaning of terms</li> <li>• Preparation of work schedules               <ul style="list-style-type: none"> <li>• Bar charts</li> <li>• Gantt charts</li> <li>• Critical path networks</li> </ul> </li> <li>• Raise the necessary permit and licences</li> <li>• Permit to work               <ul style="list-style-type: none"> <li>• Types of permits e.g. Gate pass, Name tags</li> <li>• Sources and application procedures in acquiring the permits</li> </ul> </li> <li>• Classes of ERC licences C2, C1, B, A2, A1</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> <li>• Observation</li> </ul>
9. Establish installation team	<ul style="list-style-type: none"> <li>• Team building               <ul style="list-style-type: none"> <li>• Team members familiarization</li> <li>• Collaboration</li> <li>• Task distribution</li> <li>• Communication protocol</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> </ul>
10. Prepare work site	<ul style="list-style-type: none"> <li>• Identification of hazards and safety requirements for the site</li> <li>• Reference to relevant regulations e.g.               <ul style="list-style-type: none"> <li>• Occupational Safety and Health Act (OSHA)</li> <li>• County by-laws</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>Utilities               <ul style="list-style-type: none"> <li>Access roads</li> <li>Water</li> <li>Electricity</li> </ul> </li> </ul>	
11. Perform marking, piping and fixing of accessories	<ul style="list-style-type: none"> <li>Meaning of marking, piping, fixing and accessories in electrical installation</li> <li>Importance of marking</li> <li>Tools used in marking</li> <li>Accessories used in Electrical installation e.g.               <ul style="list-style-type: none"> <li>Lamp holders</li> <li>Conduits</li> <li>Ceiling roses</li> <li>Patress</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Written tests</li> <li>Observation</li> <li>Oral questioning</li> <li>Practical tests</li> </ul>
12. Perform electrical installation	<ul style="list-style-type: none"> <li>Meaning of terms</li> <li>Single phase and three phase installation               <ul style="list-style-type: none"> <li>Domestic Installation</li> <li>Industrial Installation</li> <li>Commercial Installation                   <ul style="list-style-type: none"> <li>➤ Phase/load balancing</li> </ul> </li> </ul> </li> <li>Cables and cable joints</li> <li>Wiring systems and accessories               <ul style="list-style-type: none"> <li>Meaning of terms</li> <li>Types and applications e.g.                   <ul style="list-style-type: none"> <li>Conduits</li> <li>Cable trays</li> <li>Cable ducts</li> <li>Trunkings</li> </ul> </li> </ul> </li> <li>Preparation of wiring systems</li> <li>Marking out, cutting, bending, threading, chiselling, trenching</li> <li>Draw –in/Lay of cables routes               <ul style="list-style-type: none"> <li>Cable Identification</li> </ul> </li> <li>Installation of final circuits               <ul style="list-style-type: none"> <li>Lighting circuits</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Written tests</li> <li>Observation</li> <li>Oral questioning</li> <li>Practical test</li> </ul>



Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• One way, two way, intermediate</li> <li>• Dimmer switches</li> <li>• Looping in methods at ceiling rose, joint boxes, switches</li> <li>• Power circuits               <ul style="list-style-type: none"> <li>• Radial circuits, ring circuits</li> </ul> </li> <li>• Water heating circuits</li> <li>• Electric cooker circuits</li> <li>• Call and alarm circuits               <ul style="list-style-type: none"> <li>• Bell circuits</li> <li>• Intruder alarm circuits</li> <li>• Fire alarm circuits</li> </ul> </li> </ul>	
13. Terminate Electrical installation	<ul style="list-style-type: none"> <li>• Meaning of Terms</li> <li>• Importance of termination</li> <li>• Cable labelling</li> <li>• Cable lugging</li> <li>• Tools used in cable termination e.g.               <ul style="list-style-type: none"> <li>• Crimping tool</li> <li>• Strip Knife</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> <li>• Practical tests</li> <li>• Observation</li> </ul>
14. Test and inspect Electrical installation	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Types of tests e.g.               <ul style="list-style-type: none"> <li>• Earth continuity tests</li> <li>• Ring circuit test</li> <li>• Insulation tests</li> <li>• Short circuit tests</li> <li>• Open circuit test</li> </ul> </li> <li>• Testing tools e.g.               <ul style="list-style-type: none"> <li>• Multimeter</li> <li>• Insulation tester</li> <li>• Ohmmeter</li> </ul> </li> <li>• Importance of installation testing</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> <li>• Observation</li> </ul>

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
15. Prepare tenders and service contracts	<ul style="list-style-type: none"> <li>• Sources of law</li> <li>• Law of tort</li> <li>• Laws of contract and tendering</li> <li>• Types and forms of contract</li> <li>• Types of tenders</li> <li>• Tender estimation and costing</li> <li>• Statutory documents in contracts and tendering</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Observation</li> <li>• Oral questioning</li> </ul>

#### **Suggested Methods of Instruction**

- Demonstration by trainer
- Practice by the trainee
- Field trips
- On-job-training
- Discussions

#### **Recommended Resources**

<b>Tools</b> <ul style="list-style-type: none"> <li>• Measuring tools</li> <li>• Cutting tool</li> <li>• Drawing tools</li> <li>• Drilling tools</li> <li>• Fastening tools</li> </ul>	<b>Materials and supplies</b> <ul style="list-style-type: none"> <li>• Stationery</li> <li>• Assorted Cables</li> <li>• Assorted protective devices</li> <li>• Pipes and trunkings</li> <li>• Cable lugs</li> <li>• Joints</li> <li>• Accessories</li> </ul>
<b>Equipment</b> <ul style="list-style-type: none"> <li>• PPEs (Personal Protective Equipment)</li> <li>• Measuring equipment</li> <li>• Communication equipment</li> </ul>	<b>Reference materials</b> <ul style="list-style-type: none"> <li>• Standards</li> <li>• County by-laws</li> <li>• Occupational Safety and Health Act (OSHA)</li> <li>• National Environmental Management Authority (NEMA) regulations</li> <li>• National Construction Authority (NCA) regulations</li> <li>• IEE</li> <li>• tables</li> </ul>

## **ELECTRICAL TRANSMISSION POWER LINES**

**UNIT CODE:** ENG/CU/PO/CR/02/6/B

### **Relationship to Occupational Standards**

This unit addresses the unit of competency: Install Electrical power line

**Duration of Unit:** 190 hours

### **Unit Description**

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

### **Summary of Learning Outcomes**

1. Design transmission lines
2. Erect transmission lines support
3. Mount transmission lines
4. Terminate transmission line
5. Test and inspect installation

### **Learning Outcomes, Content and Suggested Assessment Methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Design transmission lines	<ul style="list-style-type: none"><li>• Meaning of transmission line</li><li>• Types of transmission line</li><li>• Classification of transmission line e.g.<ul style="list-style-type: none"><li>• High Voltage and Low voltage<ul style="list-style-type: none"><li>➤ Overhead and Underground cables</li></ul></li><li>• Short</li><li>• Medium</li><li>• Long</li></ul></li><li>• Elements of a transmission line</li><li>• Transmission line designs;<ul style="list-style-type: none"><li>• Mechanical</li><li>• Electrical</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Observation</li><li>• Oral questioning</li><li>• Written tests</li></ul>

Learning Outcome	Content	Suggested Assessment Methods
2. Erect transmission line support	<ul style="list-style-type: none"> <li>• Meaning of transmission line support</li> <li>• Types of supports</li> <li>• Material used in manufacturing of transmission line supports e.g. <ul style="list-style-type: none"> <li>• Concrete</li> <li>• Steel</li> <li>• Wooden</li> </ul> </li> <li>• Erecting of transmission line support</li> <li>• Application of transmission line</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> </ul>
3. Mount transmission line	<ul style="list-style-type: none"> <li>• Types of transmission line conductors</li> <li>• Equipments used in mounting transmission lines e.g <ul style="list-style-type: none"> <li>• Climbers</li> <li>• Drilling Machine</li> </ul> </li> <li>• Transmission line spacing and corona effects</li> <li>• Tension and sag in transmission line</li> <li>• Components used in mounting. transmission lines e.g. <ul style="list-style-type: none"> <li>• Cross arms</li> <li>• Transformers</li> <li>• Isolators</li> <li>• Insulators</li> <li>• Danger plates</li> <li>• Lightning arrestors</li> <li>• Anti-climbing wire</li> <li>• Cables</li> <li>• Bolts and Nuts</li> </ul> </li> <li>• Components used in transmission line protection e.g. <ul style="list-style-type: none"> <li>• Switch gear</li> <li>• Fuses</li> <li>• Isolators</li> <li>• Circuit breakers</li> </ul> </li> <li>• Transmission line protection <ul style="list-style-type: none"> <li>• Earthing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questioning</li> <li>• Written tests</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>Lightening arrestors</li> <li>Surge diverters</li> </ul>	
4. Terminate transmission line	<ul style="list-style-type: none"> <li>Meaning of transmission line termination</li> <li>Types of transmission e.g. AC and DC</li> <li>End point loads <ul style="list-style-type: none"> <li>Type of loads</li> </ul> </li> <li>Cable joints <ul style="list-style-type: none"> <li>Types of cable joints</li> </ul> </li> <li>Components used in line termination e.g. <ul style="list-style-type: none"> <li>Lugs</li> <li>Fuses (Droppers)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Observation</li> <li>Oral questioning</li> <li>Written tests</li> </ul>
5. Test and inspect transmission installation	<ul style="list-style-type: none"> <li>Meaning of testing in line transmission</li> <li>Types of tests in line transmission e.g. <ul style="list-style-type: none"> <li>Continuity test</li> <li>Short circuit test</li> <li>Insulation test</li> <li>Earth continuity test</li> </ul> </li> <li>Voltage regulation testing and efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Written tests</li> <li>Oral questioning</li> <li>Practical tests</li> </ul>

### Suggested Methods of Instruction

- Discussions
- Site visits
- On-job-training
- Charts and Audio-visual presentations

### Recommended Resources

<b>Equipment</b> <ul style="list-style-type: none"> <li>Computers</li> <li>Printers</li> <li>Cameras</li> <li>Phones</li> </ul>	<b>Reference materials</b> <ul style="list-style-type: none"> <li>Manufacturers' catalogues</li> <li>Working drawings</li> <li>EMCA Act</li> <li>OSHA</li> <li>County by-laws</li> </ul>
<b>Materials and supplies</b> <ul style="list-style-type: none"> <li>Stationery</li> </ul>	

