

CORE UNITS OF LEARNING

ELECTRICAL INSTALLATION

UNIT CODE: ENG/CU/ET/CR/01/6/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Electrical Installation

Duration of Unit: 180 hours

Unit Description

This unit specifies competencies required for performing electrical installation. Competencies required includes; conducting site survey, designing installation, performing system sizing, preparation of working drawings, planning for logistics, preparation of list of tools equipment and materials, preparation of installation work plan, establishment of installation team, preparation of work site, performing installation, terminating installation, inspecting and testing installation and finally preparation of tenders and service contracts.

Summary of Learning Outcomes

1. Conduct site survey
2. Perform system sizing
3. Design electrical installation
4. Prepare working drawings
5. Plan for logistics
6. Prepare list of tools, equipment and materials
7. Prepare installation work plan
8. Establish installation team
9. Prepare work site
10. Perform electrical installation
11. Terminate electrical installation
12. Inspect and test electrical installation
13. Prepare tenders and service contract

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Conduct site survey	<ul style="list-style-type: none"> • Type of installations <ul style="list-style-type: none"> • Domestic installations • Industrial installations • Commercial installations • Type of building e.g. <ul style="list-style-type: none"> • Permanent building • Semi-permanent buildings • Utilities available <ul style="list-style-type: none"> • Water • Electricity • Communication • Installation conditions e.g. temperature, humidity, moisture • Taking measurements on site <ul style="list-style-type: none"> • Length e.g. conduits size • Total area • Temperature • Humidity • Preparation of site survey report 	<ul style="list-style-type: none"> • Written tests • Observation • Oral questioning • Practical tests
2. Perform system sizing	<ul style="list-style-type: none"> • Introduction to standards <ul style="list-style-type: none"> • IEE regulations. • Kenya bureau of standards (KEBS) • British standards • KPLC by-laws • ERC regulations • County by-laws • National Construction Authority (NCA) • Reference to relevant IEE regulations eg <ul style="list-style-type: none"> • EPRA • Load Estimation e.g. 	<ul style="list-style-type: none"> •

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> • Factor of simultaneity (Ks) • Factor of utilization (Ku) • Determining cable : <ul style="list-style-type: none"> • Types • Ratings • sizes • Insulation type • Protective devices <ul style="list-style-type: none"> • Types • Ratings • Reference to relevant regulations 	
3. Design Electrical Installation	<ul style="list-style-type: none"> • Meaning of terms • Types of wiring systems • Factors to consider in designing Electrical installation e.g. <ul style="list-style-type: none"> • Load size • Structure • Clients need • Types of supply • DC , AC Single phase and three phase 	<ul style="list-style-type: none"> • Written tests • Observation • Oral questioning
4. Prepare working drawing	<ul style="list-style-type: none"> • Working drawings <ul style="list-style-type: none"> • Meaning of working drawings • Drawing of electrical diagrams • Block • Circuits • Schematic • Wiring • Line • Reading and Interpretation of architectural drawings • Reading and Interpretation of electrical drawings • Use of Computer Aided Design 	<ul style="list-style-type: none"> • Observation • Oral questioning • Practical tests • Written tests

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

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

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> • Occupational Safety and Health Act (OSHA) • County by-laws • Utilities <ul style="list-style-type: none"> • Access roads • Water • Electricity 	
10. Perform electrical installation	<ul style="list-style-type: none"> • Meaning of terms • Single phase and three phase installation <ul style="list-style-type: none"> • Domestic Installation • Industrial Installation • Commercial Installation <ul style="list-style-type: none"> ➤ Phase/load balancing • Cables and cable joints • Wiring systems and accessories <ul style="list-style-type: none"> • Meaning of terms • Types and applications e.g. • Conduits • Cable trays • Cable ducts • Trunkings <ul style="list-style-type: none"> • Preparation of wiring systems • Marking out, cutting, bending, threading, chiselling, trenching • Draw –in/Lay of cables routes <ul style="list-style-type: none"> • Cable Identification • Installation of final circuits <ul style="list-style-type: none"> • Lighting circuits <ul style="list-style-type: none"> • One way, two way, intermediate • Dimmer switches • Looping in methods at ceiling rose, joint boxes, switches • Power circuits <ul style="list-style-type: none"> • Radial circuits, ring circuits 	<ul style="list-style-type: none"> • Written tests • Observation • Oral questioning • Practical test

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> • Water heating circuits • Electric cooker circuits • Call and alarm circuits <ul style="list-style-type: none"> • Bell circuits • Intruder alarm circuits • Fire alarm circuits • EHS standards 	
11. Terminate Electrical installation	<ul style="list-style-type: none"> • Meaning of Terms • Importance of termination • Types of terminations • Cable labeling • Cable lugging • Tools used in cable termination e.g. <ul style="list-style-type: none"> • Crimping tool • Strip Knife 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Practical tests • Observation
12. Inspect and test Electrical installation	<ul style="list-style-type: none"> • Meaning of terms • Types of tests e.g. <ul style="list-style-type: none"> • Earth continuity tests • Ring circuit test • Insulation tests • Short circuit tests • Open circuit test • Testing tools e.g. <ul style="list-style-type: none"> • Multimeter • Insulation tester • Ohmmeter • Importance of installation testing • IEE regulations 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Observation

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

Suggested Methods of Instruction

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

Recommended Resources

Tools

- Measuring tools
- Cutting tool
- Drawing tools
- Drilling tools
- Fastening tools

Materials and supplies

- Stationery
- Assorted Cables
- Assorted protective devices
- Pipes and trunkings
- Cable lugs
- Joints
- Accessories

Equipment

- PPEs (Personal Protective Equipment)
- Measuring equipment
- Communication equipment

Reference materials

- Standards
- County by-laws
- Occupational Safety and Health Act (OSHA)
- National Environmental Management Authority (NEMA) regulations
- National Construction Authority

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