



REPUBLIC OF KENYA
NATIONAL OCCUPATIONAL STANDARDS
FOR
ELECTRICAL ENGINEERING TECHNICIAN (POWER OPTION)

KNQF LEVEL: 6

ISCED OCCUPATIONAL STANDARD CODE: 0713 554B



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PERFORM ELECTRICAL INSTALLATION

UNIT CODE: ENG/OS/PO/CR/01/6

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

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 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. Conduct site survey	2.1 The site is surveyed for suitability for the type of <i>installation</i> to be done as per the contract 2.2 Conditions of the site are evaluated according to the <i>established procedures</i> 2.3 Installation route is identified as per the standard operating procedure 2.4 Measurements are taken as per the expected installation. 2.5 Survey report is generated and shared with relevant parties according to the established procedures

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3. Design Electrical installation.	<p>3.1 Electrical installation is designed as per the size of the load.</p> <p>3.2 Wiring type is established as per the clients need.</p> <p>3.3 Electrical design is performed as per the type of the structure.</p> <p>3.4 Electrical design is performed as per the size of the structure.</p> <p>3.5 Electrical installation design is performed in line with the IEE regulation.</p> <p>3.6 Electrical installation design is performed in line with the national and international standards</p>
4. Prepare working drawings	<p>4.1 Installation design drawing is interpreted</p> <p>4.2 Symbols and nomenclatures are applied in accordance with British Standards [BS 3939]</p> <p>4.3 Drawing tools are applied as per the expected task</p> <p>4.4 Components and their ratings are identified</p> <p>4.5 Cable sizes and lengths are shown as per the design</p> <p>4.6 Power supply and distribution circuits are drawn as per the design</p> <p>4.7 Phase balancing of the loads is done as per the usage</p> <p>4.8 Cable routes are clearly indicated in line with design</p> <p>4.9 Working drawing is prepared per the design and any deviations shared with relevant parties</p>
5. Perform system sizing	<p>5.1 Load estimation is conducted according to the set <i>standard</i></p> <p>5.2 Type and size of protective devices is determined according to <i>IEE regulations</i></p> <p>5.3 Cable sizes are calculated for the estimated loads according to <i>IEE regulations</i></p> <p>5.4 System sizes are recorded and shared as per <i>established procedures</i></p>

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6. Plan for logistics	<p>6.1 <i>logistics</i> for the particular work and site is determined</p> <p>6.2 Logistics are reported and planned for with the relevant parties according to work schedule</p>
7. Prepare list of tools, equipment & materials.	<p>7.1 Tools, equipment and materials needed for the work are determined and list prepared as per established procedure</p> <p>7.2 Tools, equipment and materials are checked for <i>specifications</i> and functionality as per the standard operating procedure</p> <p>7.3 Tools, equipment and materials are assembled and stored as per the established procedure</p>
8. Prepare installation work plan	<p>8.1 Installation drawing is acquired as per <i>established procedure</i></p> <p>8.2 The scope of installation work is identified</p> <p>8.3 Work is undertaken as per the workplace procedures.</p> <p>8.4 Team members are identified according to the tasks</p> <p>8.5 <i>Work schedule</i> is prepared based on the scope and the working drawing</p> <p>8.6 Type of permit to work is identified as per the working station</p> <p>8.7 Permits issued bodies are identified</p> <p>8.8 Permit to work form is filled and submitted to the responsible body</p>
9. Establish installation team	<p>9.1 Communication protocol is designed and distributed among the team members</p> <p>9.2 Responsibilities are established and distributed among the team members</p> <p>9.3 Team familiarization is done according to the established procedure</p>
10. Prepare work site	<p>10.1 Special work, hazard and safety requirements are identified.</p>

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	<p>10.2 Identified hazards and safety issues are mitigated according to <i>OSHA</i> (Occupational Safety and Health Act)</p> <p>10.3 Work plan is confirmed in accordance with legislative and regulatory requirements and standard operating procedures.</p> <p>10.4 Work site is prepared for accessibility of <i>utilities</i></p>
11. Perform marking, piping and fixing of accessories	<p>11.1 Marking, piping and fixing tools are identified as per the nature of the job</p> <p>11.2 Marking is performed as per the working drawing</p> <p>11.3 Marking is performed in line with establishes procedures and standards</p> <p>11.4 Marking positions are performed as per the IEE regulations</p> <p>11.5 Conduits are laid in line with standard operating procedures</p> <p>11.6 Accessories are fixed as per the established procedure</p>
12. Perform installation	<p>12.1 Installation procedures and technical standards are applied</p> <p>12.2 Working drawing is implemented</p> <p>12.3 Safety procedures are adhered to for each activity</p> <p>12.4 Cables, conductors, conduits, enclosures and support systems are installed as per the working drawing</p> <p>12.5 Cables are drawn-in in line with standard operating procedures.</p> <p>12.6 Number and size of cables are laid in a conduit is performed as per the IEE regulations</p> <p>12.7 Insulation resistance test is performed as per the IEE regulations</p>
13. Terminate installation	<p>13.1 Cable lugging is performed as per the standards operating procedure.</p> <p>13.2 Cables are terminated as per the IEE regulations</p>

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	<p>13.3 Labelling of the cables is performed as per the complexity of the job.</p> <p>13.4 Insulation is performed as per the IEE regulation</p>
14. Test installation	<p>14.1 Type of tests are identified</p> <p>14.2 Test is performed as per the IEE regulations</p> <p>14.3 Firmness of the installation is established</p> <p>14.4 Continuity test is performed</p> <p>14.5 Ring circuit test is performed as per the standard operating procedure</p> <p>14.6 Earth continuity test is performed as per the IEE regulations</p> <p>14.7 Short circuit test is performed as per the IEE regulation</p> <p>14.8 Earth resistance test is performed</p> <p>14.9 Open circuit test is performed</p>
15. Prepare tenders and service contracts	<p>15.1 Laws of contracts and tendering are adhered to</p> <p>15.2 Types and forms of contracts are identified</p> <p>15.3 Type of tenders are identified</p> <p>15.4 Tender estimating is performed in line with the tendering laws</p> <p>15.5 Statutory documents in contract and tendering are identified</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. Installation may include but is not limited to:	<ul style="list-style-type: none">• Domestic installation• Commercial installation• Industrial Installation• Street lighting• Security• IBMS (integrated building Management system)
2. Established Procedures may include but is not limited to:	<ul style="list-style-type: none">• Company rules• Procedures mentioned in contract
3. Design may include but is not limited to:	<ul style="list-style-type: none">• Electrical design for lighting and power• Electrical design for switchgear• Electrical design for alarm systems
4. Standard may include but is not limited to:	<ul style="list-style-type: none">• IEE standard• British Standard• KEBS standard
5. IEE regulations may include but is not limited to:	<ul style="list-style-type: none">• 17th Edition
6. Logistics includes but not limited to may include but is not limited to:	<ul style="list-style-type: none">• Personnel, Finance and input materials• Transport and storage• Communications• Security

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

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

- 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).
- 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

FOUNDATION SKILLS

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

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 Applied work health and safety procedures 1.2 Interpreted the design and prepared a working drawing 1.3 Applied appropriate standard 1.4 Determined types and sizes of materials and equipment and protective devices 1.5 Demonstrated knowledge of logistics to the given task 1.6 Survey report was generated and shared with the relevant parties 1.7 Measurement were we taken at the site 1.8 Installation planning was performed as per the scope of the work 1.9 Electrical design was performed as per the installation scope 1.10 Load was calculated as per the scope of the installation 1.11 Phases were balanced as per the expected load 1.12 Cables and accessories were installed as per the IEE regulation 1.13 Cables were terminated as per the IEE regulation 1.14 Installation was tested and results documented
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: 3.1 Observation 3.2 Oral questioning 3.3 Practical Tests
4. Context of Assessment	Competency may be assessed 4.1 On job 4.2 Off 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.