PERFORM ELECTRICAL INSTALLATION

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

UNIT DESCRIPTION

This unit specifies competencies required for performing electrical installation. Competencies required includes; conducting site survey, performing system sizing, designing installation, 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

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicised terms are elaborated in the Range)***
1. Conduct site survey	1.1 The site is surveyed for suitability of the type of ***installation*** to be performed in line with contract 1.2 Conditions of the site are evaluated according to the ***established procedures*** 1.3 Installation route is identified as per the standard operating procedure 1.4 Measurements are taken as per expected installation. 1.5 Survey report is generated and shared with relevant parties according to the established procedures
2. Perform system sizing	2.1 Load estimation is conducted according to the set ***standard*** 2.2 Type and size of protective devices is determined according to **IEE regulations** 2.3 Cable sizes are calculated for the estimated loads in line with **IEE regulations** 2.4 System sizes are recorded and shared as per ***established procedures***

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicised terms are elaborated in the Range)***
3. Design Electrical installation.	3.1 Electrical installation is designed as per the size of the load. 3.2 Wiring type is established in accordance with client's needs. 3.3 Electrical design is performed in line with the installation location 3.4 Electrical design is performed as per the size of the structure. 3.5 Electrical installation design is performed in adherence to IEE regulations. 3.6 Electrical installation design is performed in line with the national and international standards
4. Prepare working drawings	4.1 Installation design drawing is interpreted as per the design 4.2 Symbols and nomenclatures are applied in accordance with British Standards [BS 3939] 4.3 Drawing tools are applied as per the expected task 4.4 Components and their ratings are identified as per their applications 4.5 Cable sizes and lengths are shown as per the design 4.6 Power supply and distribution circuits are drawn in accordance with the design 4.7 Phase balancing of the loads is performed according to the usage 4.8 Cable routes are clearly indicated in line with design 4.9 Working drawing is prepared as per the design and any deviations shared with relevant parties
5. Plan for logistics	5.1 ***logistics*** for the particular work and site is determined according to nature of work 5.2 Logistics are reported and planned for with the relevant parties according to work schedule
6. Prepare list of tools, equipment and materials.	6.1 Tools, equipment and materials needed for the work are determined and list prepared as per established procedure

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicised terms are elaborated in the Range)***
	6.2 Tools, equipment and materials are checked for ***specifications*** and functionality as per the standard operating procedure 6.3 Tools, equipment and materials are assembled and stored in line with established procedure
7. Prepare installation work plan	7.1 Installation drawing is acquired as per ***established procedure*** 7.2 The scope of installation work is identified as per activities to be performed 7.3 Work is undertaken as per the workplace procedures. 7.4 Team members are identified according to the tasks 7.5 ***Work schedule*** is prepared basing on the scope and the working drawing 7.6 Type of permit to work is identified as per EPRA regulations 7.7 Permits issuing bodies are identified in accordance to permits required for the work 7.8 Permit to work form is filled and submitted to the responsible body as per standard operating procedures
8. Establish installation team	8.1 Communication protocol is designed and distributed among the team members as per work place communication hierarchy 8.2 Responsibilities are established and distributed among the team members in accordance with their expertise 8.3 Team familiarization is done according to the established procedure
9. Prepare work site	9.1 Special work, hazard and safety requirements are identified in line with nature of work to be performed 9.2 Identified hazards and safety issues are mitigated according to ***OSHA*** (Occupational Safety and Health Act 9.3 Work plan is confirmed in accordance with legislative and regulatory requirements and

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicised terms are elaborated in the Range)***
	standard operating procedures. 9.4 Work site is prepared for accessibility of ***utilities*** in accordance with nature of work to be performed
10. Perform installation	10.1 Installation procedures and technical standards are applied in line with established standards 10.2 Working drawing is implemented as per installation requirements 10.3 Safety procedures are adhered to for each activity in accordance to OSHA regulations 10.4 Accidents and incidents are recorded and reported as per standard operating procedures 10.5 Cables, conductors, conduits, enclosures and support systems are installed as per the working drawing 10.6 Cables are drawn-in in line with standard operating procedures. 10.7 Number and size of cables are laid in a conduit as per the IEE regulations
11. Terminate installation	11.1 Cable lugging is performed as per the standards operating procedure. 11.2 Cables are terminated in accordance with IEE regulations 11.3 Labelling of cables is performed basing on the complexity of the job.
12. Inspect and test electrical installation	12.1 Type of tests are identified as per nature of installation 12.2 Test is performed in line the IEE regulations 12.3 Firmness of the installation is established as per standard operating procedure 12.4 Continuity test is performed as per standard operating procedure 12.5 Ring circuit test is performed as per the standard operating procedure 12.6 Earth continuity test is performed in accordance IEE regulations 12.7 Short circuit test is performed in accordance IEE regulation

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicised terms are elaborated in the Range)***
	12.8 Earth resistance test is performed in line with IEE regulations 12.9 Open circuit test is performed as per standard operating procedure
13. Prepare tenders and service contracts	13.1 Laws of contracts and tendering are adhered to in line with established standards 13.2 Types and forms of contracts are identified as per the nature of contract 13.3 Types of tenders are identified basing on established standards 13.4 Tender estimating is performed in line with the tendering laws 13.5 Statutory documents in contract and tendering are identified as per established standards

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 not limited to:	• Domestic installation • Commercial installation • Industrial Installation • Street lighting • Security • IBMS (integrated building Management system)
2. Established Procedures may include but not limited to:	• Company rules • Procedures mentioned in contract
3. Design may include but not limited to:	• Electrical design for lighting and power • Electrical design for switchgear • Electrical design for alarm systems
4. Standards may include but not limited to:	• IEE standard • British Standard • KEBS standard
5. IEE regulations may	• 17th Edition

Variable	Range
include but not limited to:	
6. Logistics may include but not limited to:	• Personnel, Finance and input materials • Transport and storage • Communications • Security
7. Specifications may include but not limited to:	• Tolerance/ range • Make / model • Size • Class
8. Regulations and legislative requirements may include but not limited to:	• KPLC procedures • County bylaws • Energy Act, 2006 • National Construction Authority Act • OSHA
9. Work schedule may include but not limited to:	• Gantt chart • Block
10. Permit to work may include but not limited to:	• KPLC permit • Gate Pass • Daily work permit • Work Tag
11. Utilities may include but not limited to:	• Water • electrical power • toilets • 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).
- 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

FOUNDATION SKILLS

The individual needs to demonstrate the following foundation skills:

- Communications (verbal and written);
- Proficient in electrical principles
- 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.