

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**ELECTRONICS ARTISAN**

**KNQF LEVEL LEVEL 4**

**OCCUPATIONAL STANDARD ISCED CODE: 0714 354B**

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**FOREWORD**

The provision of quality education and training is fundamental to the government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training.

This policy document requires that training in TVET institutions be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery to allow for multiple entry and exit in TVET programmes. These reforms demand that industry takes a leading role in occupational standards development to ensure it addresses competence needs.

It is against this background that these Occupational Standards have been developed for a competency-based Electronics Artisan standard. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a key role towards development of competent human resource for the engineering sector’s growth and development.

**PREFACE**

Kenya Vision 2030 aims to transform Kenya into a newly industrializing middle-income country, providing high-quality life to all its citizens by the year 2030. Kenya intends to create globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through lifelong education and training. TVET has a responsibility to facilitate the process of inculcating knowledge, skills, and worker behaviour necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency-Based Education and Training (CBET).

TVET Act, CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform curriculum development, assessment, and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry, as well as increase the global competitiveness of the Kenyan labour force.

This occupational standard has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards .

**ACKNOWLEDGMENT**

This occupational standard has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the ………….. National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the ………….. sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this occupational standard will go a long way in ensuring that individuals aspiring to work in the ……………… Sector acquire competencies to perform their work more efficiently and effectively.

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**ABBREVIATIONS ANDACRONYMS**

A Control Version

BC Basic Competencies

CC Common Competencies

CDACC Curriculum Development, Assessment and Certification Council

CR Core Competencies

EE Electronics Engineering

EHS Environment, Health and Safety

ENG Engineering

ET Electronics Technician

IBMS Integrated Building Management System

IEE Institute of Electrical Engineers

KEBS Kenya Bureau of Standards

OS Occupational Standards

OSHA Occupational Safety and Health Act

PPE Personal Protective Equipment

TVET Technical and Vocational Education and Training

WIBA Work injury benefits Act

**KEY TO UNIT CODE**



**OVERVIEW**

This Electronics Level 4 occupational standard consists of competencies required to perform electrical installation, install power supply systems, apply electrical instrumentation and maintain Electrical and Electronic Equipment and Appliance.

Electronics Level 4 qualification comprises of the following core units:

**CORE UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| 0713 251 16A | Perform Electrical Installation I |
| 0713 251 17A | Perform Electrical and Electronics Equipment and Appliances Repairs |
| 0713 251 18A | Apply Electrical instrumentation |
| 0713 351 19A | Perform electrical installation II |
| 0713 351 20A | Install power supply systems |
| 0713 351 21A | Maintain Electrical and Electronic Equipment and Appliance |

# CORE UNITS OF COMPETENCY

## PERFORM ELECTRICAL INSTALLATION I

**UNIT CODE**: 0713 251 16A

**UNIT DESCRIPTION**

This unit specifies the competencies required for performing electrical installation. Competencies required includes; preparation of list of tools equipment and materials, perform piping and laying of cables, mounting of electrical components and terminating of electrical installation.

**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. Prepare of list of tools equipment and materials | * 1. Identified ***written communication methods*** are applied based on the workplace policy   2. Pathways of ***oral communication*** are established as per workplace policy.   3. Personal management is demonstrated through self-awareness, self-esteem, emotional intelligence, stress management and assertiveness based on scope of work.   4. Tools, equipment and materials are identified and list prepared as per established procedure   5. Tools, equipment and materials are checked for ***specifications*** as per their functionality   6. Tools, equipment and materials are assembled and stored as per established procedure |
| 1. Perform piping and laying of cables | * 1. Safety procedures are observed in adherence to OSHA   2. Tools are cleaned as per the workshop standard operating procedure   3. Tools are stored in their respective sections as per the workshop procedures   4. Piping is performed as per working drawing   5. Piping is performed in line with standard operating procedure   6. Number and size of cables are laid in a conduit as per the ***IEE regulations***   7. Cables, conduits, enclosures and support systems are installed as per the working drawing   8. Cables are drawn-in in line with standard operating procedures   9. Surface wiring is performed as in line with established **standard**. |
| 1. Perform mounting of electrical components | * 1. Components to be mounted are identified as per ***installation*** requirements   2. Components are mounted in adherence toIEE regulations   3. Components are mounted in line with standard operating procedure |
| 1. Terminate Electrical Installation | * 1. Personal finances are managed as per financial procedures and standards   2. Cable lugging and jointing is performed as per the standards operating procedure.   3. Cables are terminated as per the IEE regulations   4. Labelling of the cables is performed as per the complexity of the installation. |

**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. written communication methods may include and not limited to: | * Memos * Letters * Notices * SMS |
| 1. Oral communication pathways may include and not limited to: | * Telephone calls * Face-to-face * Meetings * Interviews |
| 1. Installation may include but is not limited to: | * Domestic installation * Basic wiring diagrams * Piping * Laying of cables * Mounting of sockets, junction boxes, consumer units, switches * Wiring systems |
| 1. Established regulations may include but is not limited to: | * NEMA regulations * OSHA regulation * IEE regulations * EPRA regulations |
| 1. Standard may include but is not limited to: | * British Standard * KEBS standard |
| 1. IEE regulations may include but is not limited to: | * 17th Edition |
| 1. Specifications may include but is not limited to: | * Make / model * Size * Class |

**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 use of technical information including
* The importance of using the correct sources of technical information.
* Interpreting circuits, drawings, specifications and instructions

**FOUNDATION SKILLS**

**The individual needs to demonstrate the following foundation skills:**

* Communications (verbal and written);
* Time management;
* Problem solving
* Decision making;
* First aid;
* Planning;
* Negotiation

**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. Effected written communication based on workplace requirements.   2. Determined and prepared a list of tools, equipment and materials as per established procedure   3. Checked tools, equipment and materials for specifications and functionality as per the standard operating procedure   4. Laid number and size of cables in a conduit as per the IEE regulations   5. Drawn-in cables line with standard operating procedures   6. Mounted components in accordance to the working drawings   7. Terminated cables as per the IEE regulations   8. Performed labelling of the cables as per the complexity of the job.   9. Checked firmness of the installation as per established procedures   10. Performed short circuit test in adherence to IEE regulation |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied  including Measuring tape, calculator, stationery and cables, bending spring, draw wire, electrical accessories etc |
| 1. Methods of Assessment | Competency may be assessed through:   1. Observation 2. Oral questioning 3. Practical demonstration 4. Written tests |
| 1. Context of Assessment | Competency may be assessed   * 1. On the job   2. Off the job   3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## PERFORM ELECTRICAL AND ELECTRONIC EQUIPMENT AND APPLIANCES REPAIRS

**UNIT CODE**: 0713 251 17A

**UNIT DESCRIPTION**

This unit covers competencies required to perform electrical and electronic equipment and appliances repair. Competencies include: preparing a list of maintenance tools, equipment and materials, inspecting and testing faulty components, performing maintenance activities and conducting tests on repaired equipment and assemble repaired equipment and appliance

**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. Prepare a list of maintenance tools, equipment and materials | * 1. Types of ***materials*** are established in line with semiconductor theory   2. Types of diodes are identified as per their functionality.   3. ***Diodes*** characteristics are determined as per their properties   4. Maintenance tools, equipment and materials are identified in regard to maintenance activities to be performed   5. A list of tools, equipment and materials are prepared in line with established procedure   6. Tools and equipment and materials are checked for specifications and functionality as per operating procedures   7. Tools and equipment are calibrated in line with standard operating procedure. |
| 1. Inspect and test faulty components | * 1. Disassembling of ***electrical equipment and appliance*** is performed in line with manufacture’s manuals   2. Sorting of screws is performed in regard to standard operating procedures   3. Appliances are inspected in regard to established procedure   4. Tests to be performed are identified in regard to appliance functionality   5. Appliances are tested as per established procedures   6. Perform troubleshooting in line with established procedure   7. Testing is performed in adherence to safety standards |
| 1. Perform maintenance activities | * 1. System components to be repaired/replaced are identified based on the appliance functionality   2. Cleaning, soldering and tightening of components are performed as per standard operating procedure   3. Defective components/parts are repaired/replaced based on established procedures   4. Maintenance activities are carried out in adherence to OSHA standards   5. Waste materials are disposed in adherence to EHS regulations |
| 1. Perform tests on repaired equipment and appliances | * 1. Specific written communication strategies are identified based on workplace requirements.   2. Type of tests to be carried out are identified in line with maintenance activities   3. Components to be tested are identified based on the system functionality   4. Repaired/replaced components are tested in accordance to manufacturer’s manuals |
| 1. Assemble repaired equipment and appliance | * 1. Tightening of screws is performed in accordance with standard operating procedures   2. Connectors are patched as per manufacture’s manuals   3. Cable ties, silicon glue, super glue and insulating tapes are applied in binding cables as per standard operating procedures   4. Mounting of cooling components is performed in line with manufacture’s manuals |

**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. Materials may include but is not limited to: | * Insulators * Conductors * Semiconductors |
| * + - 1. Diodes may include but is not limited to: | * Photo diode * Zener diodes * Light emitting diode * Schottky diodes |
| * + - 1. Electrical and electronic equipment and appliances may include but is not limited to: | * Radio * Television * Mobile phones * Set top boxes * Iron box * Electric kettles * Instant shower * Refrigerator * Air conditioning systems * Microwave * Washing machine * Blenders |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of

* Troubleshooting techniques
* Repair/replacing of system components techniques
* Causes of system failures
* Knowledge in basic electricity
* Electrical safety and precautious measures
* Electrical shock prevention measures
* Performance monitoring techniques

**FOUNDATION SKILLS**

***The individual needs to demonstrate the following additional skills:***

* Communications (verbal and written);
* Computer literacy
* Electrical principles
* Physics
* Analytical skills
* Planning;
* Decision making;
* Report writing;
* Time management
* Faults troubleshooting
* Problem solving;

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified different semiconductor material   2. Identified special semiconductor devices   3. Identified maintenance tools, equipment and materials in regard to maintenance activities to be performed   4. Checked tools and equipment and materials for specifications and functionality as per operating procedures   5. Performed disassembling of equipment and appliance in line with manufacture’s manuals   6. Inspected appliances are in regard to established procedure   7. Tested appliances in line with established procedures   8. Performed testing in adherence to safety standards   9. Repaired/replaced defective components/parts based on established procedures   10. Identified type of tests to be carried out in line with maintenance activities   11. Tested repaired/replaced components in accordance to manufacturer’s manuals   12. Patched connectors as per manufacture’s manuals   13. Mounting of cooling components is performed in line with manufacture’s manuals   14. Disposed waste materials are adherence to EHS regulations   15. Carried out maintenance activities in adherence to OSHA standards |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied  Included: radio, television, mobile phones, set top boxes, switches, iron boxes, refrigerator etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed   * 1. On the job   2. Off the job   3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## APPLY ELECTRICAL INSTRUMENTATION

**UNIT CODE**: 0713 251 18A

**UNIT DESCRIPTION**

This unit covers the competencies required to apply electrical instrumentation. Competencies include; demonstrating understanding of measurements, applying electrical instruments, measuring electrical quantities and performing maintenance of electrical instruments.

**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. Demonstrate understanding of electrical measurements | * 1. Electrical symbols are identified as per standard operating procedures   2. Electrical units are identified in accordance with engineering practices   3. Conversions of units is performed in line with standard operating procedure |
| 1. Apply electrical instruments | * 1. A range of mathematical and problem-solving processes are selected and used   2. Calculation performed with positive and negative numbers   3. Meters are classified based on their functionality   4. Analogue meters are applied in line with standard operating procedures   5. Digital multimeters are applied in accordance with standard operating procedure   6. Clamp ammeters are applied as per standard operating procedure   7. Megohmmeters are applied as based on their functionality |
| 1. Measure electrical quantities | * 1. Perform measurement of resistance as per standard operating procedures   2. Determine the resistance value for various resistors based on their colour coding.   3. High resistance measurement is performed as per standard operating procedures   4. Perform measurement of voltage based on standard operating procedure   5. Perform measurement of current as per standard operating procedure   6. Measurement of insulation resistance is performed in line with standard operating procedures   7. Safety standards are observed when performing electrical measurements in accordance to OSHA regulations |
| 1. Perform maintenance of electrical instruments | * 1. Instruments to be repaired are identified in line with established procedure   2. Cleaning, soldering and tightening of components are performed as per standard operating procedure   3. Defective parts are repaired/replaced based on standard operating procedure   4. Repaired system components are configured in accordance to the instrument functionality   5. Maintenance activities are carried out in adherence to OSHA standards   6. Waste materials are disposed in adherence to EHS regulations   7. Repaired components are tested in regard to manufacturer’s manuals |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Analogue instruments
* Digital instruments
* Measurement
* Maintenance activities

**FOUNDATION SKILLS**

The individual needs to demonstrate the following additional skills:

* OSHA, WSHA, EHS standards and industry safety procedures and regulations
* Operate test equipment and interpret results
* Troubleshooting
* Read and understand
* Symbols and schematics

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified electrical units in accordance with engineering practices   2. Performed conversions of units based on standard operating procedure   3. Performed calculation using positive and negative numbers   4. Performed conversions between units of measurement   5. Used problem solving processes to undertake the task   6. Applied analogue ammeters in line with standard operating procedures   7. Applied clamp ammeters as per standard operating procedure   8. Classified meters are based on their functionality   9. Performed measurement of resistance as per standard operating procedures   10. Performed high resistance measurement in line with operating procedures   11. Performed measurement of current as per standard operating procedure   12. Performed cleaning, soldering and tightening of components based on standard operating procedure   13. Configured instruments in accordance to the instrument functionality   14. Tested repaired components are in accordance to manufacturer’s manuals |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied  Included: Digital and analogue instruments etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed   * 1. On the job   2. Off the job   3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## 

## PERFORM ELECTRICAL INSTALLATION II

**UNIT CODE:** 0713 351 19A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform an electrical installation work.

Installation work includes applying EHS standards, preparing working drawings, assembling tools, equipment and materials, performing electrical installation, terminating installation, inspecting and testing installation

**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. Apply EHS standards | * 1. Appropriate ***safety regulations*** are applied as per OSHA   2. ***Good housekeeping*** practices are applied as per standard operating procedures   3. Accidents, incidents and near misses are reported as per standard operating procedures   4. First aid is applied as per standard operating procedures |
| 1. Prepare working drawings | * 1. Design drawing is interpreted as per established standards   2. Symbols and nomenclatures are applied in accordance with British Standards [BS 3939]   3. Appropriate drawing tools are applied as per established standards   4. Components and their ratings are identified as per established procedure   5. Cable sizes and lengths are marked as per established procedures   6. ***Power supply*** and distribution circuits are drawn using line diagrams   7. Cable routes are indicated as per established procedures   8. ***Working drawing*** is prepared and any deviations from design drawing are shared with relevant parties as per the standard operating procedures |
| 1. Assemble tools, equipment & materials | * 1. Tools, equipment and materials are checked for the proper specifications and functionality as per established standards   2. Tools, equipment and materials are used as per established procedure   3. Tools and equipment are calibrated as per established standards   4. Tools, equipment and materials are assembled and stored as per the established procedure |
| 1. Perform electrical installation | * 1. Installation safety procedures are observed as per established standards   2. Working drawing is implemented as per established procedure   3. ***Installation*** is performed in line with IEE and other applicable standards   4. Cables, conductors, conduits, enclosures and support systems are installed to specifications using appropriate techniques, tools and equipment as per the working drawing   5. Labelling of the installation for identification is performed as per established standards   6. Disposal of waste materials is performed in line with environmental regulations |
| 1. Terminate installation | * 1. Cable lugging is performed as per the standards operating procedure.   2. Cables are terminated in accordance with IEE regulations   3. Labelling of the cables is performed as per the complexity of the job. |
| 1. Inspect and test installation | * 1. Type of tests are identified in line with installation parameters   2. Test is performed as per the IEE regulations   3. Firmness of the installation is established in line with standard operating procedures   4. Continuity test is performed as per standard operating procedure   5. Insulation resistance test is performed as per the IEE regulations   6. Ring circuit test is performed as per the standard operating procedure   7. Earth continuity test is performed as per the IEE regulations   8. Short circuit test is performed as per the IEE regulation |

**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. Safety regulations may include but is not limited to: | * IEE regulations * Occupational Safety and Health Act (OSHA) * Work injury benefits Act (WIBA) |
| * + - 1. Good housekeeping may include but is not limited to: | * Adequate ventilation * Adequate lighting * clean and dry surfaces in the workplace * Avoid oil spillage * Tools in the appropriate storage place * Proper waste disposal in the designated places |
| * + - 1. Working drawings may include but is not limited to: | * Lighting and small power * Power distribution * Fire alarm and detection * Burglar alarm * CCTV * Access control * Electric fence |
| 1. Power supply may include but is not limited to: | * Single phase, 2 wire * Single phase 3 wire * 3phase 4wire * 3phase 5 wire * Dc: 2 wire and 3 wire |
| 1. Installation may include but is not limited to: | * Domestic installation * Commercial installation * Industrial Installation * Agriculture/ horticulture * Power Generator * Security * Water heating installations * Power transmission and distribution * IBMS (integrated building Management system) |

**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;
* The environment (including waste disposal);
* Appropriate personal protective equipment (PPE).
* Workplace procedures for:
* Work place communication;
* Time management
* Team building and team work
* Notifying danger and hazard zones to workers
* 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, standard operating procedures and health and safety requirements
    - Referring and applying adjustable codes, numbers and standards at different circumstances

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Communications (verbal and written);
* Time management;
* Technical drawing;
* circuit tracing;
* Use of measuring tools & equipment
* Problem solving;
* Decision making;
* Planning;
* First aid;
* Report writing;
* Creativity
* Customer care

**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. Applied and adhered to safety procedures   2. Interpreted layouts/ circuit diagrams correctly   3. Applied appropriate technical standards   4. Used proper tools and equipment for a given task   5. Demonstrated safe selection, placing and wiring of cables/ wires, fixtures and fittings   6. IEE regulations were observed during installation   7. Installed functional electrical systems |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied.   * 1. Electrical installation tool kit, calculator, stationery   2. Electrical installation materials   3. Testing equipment   4. Storage facility |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral Questioning   2. Practical Tests   3. Written tests |
| 1. Context of Assessment | Competency may be assessed   1. On job 2. Off job 3. During Industrial Attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL POWER SUPPLY SYSTEMS

**UNIT CODE:** 0713 351 20A

**UNIT DESCRIPTION**

This unit covers competencies required for installing power supply systems. Competencies include; identifying power supply system components, assembling tools, equipment and materials, installing power supply system, testing installed power supply system.

E**LEMENTS 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. Identify power supply system components | * 1. Power supply system components are identified as per DC input/output current and voltage   2. Power supply system components are identified as per AC input/output current and voltage   3. Power supply system components are identified in consideration of expected load on the system   4. Power supply system components are selected in consideration of environmental factors at the installation site   5. Power supply protection components are identified in line with input and output requirements |
| 1. Assemble tools, equipment and materials | * 1. Tools, equipment and materials are identified as per the tasks to be carried out   2. Tools, equipment and materials are assembled basing on their functionality   3. Tools, equipment and materials are assembled in line with safety standards   4. Tools, equipment and materials are assembled in accordance with precision required (digital instruments and analogue)   5. Printed circuit board are identified as per circuit design |
| 1. Install power supply system | * 1. Power supply system is installed in accordance with IEE regulations   2. Power supply system is installed in accordance with OSHA regulations   3. Power supply system is installed in line with standard operating procedures   4. Earthing/grounding of power supply system is performed as per IEE regulations   5. Maintenance activities are carried out as per IET regulations.   6. Waste disposal ‘is performed in line with established regulations |
| 1. Test power supply system | * 1. Power supply system components are tested in line with IEE regulations   2. Power supply system components are tested as per component parameters   3. Power supply system is tested based on expected functionality   4. Power supply system is tested in consideration of safety standards required |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Transformers
* Rectifiers
* Filters
* Inverters, converters
* Silicon controlled rectifiers
* Electrical standards
* Types of power supply systems
* Electrical design software
* Design tools
* Printed circuit boards and mother boards

**FOUNDATION SKILLS**

The individual needs to demonstrate the following additional skills:

* Electrical fabrication
* Electrical codes
* Knowledge of power supply systems
* Teamwork
* Soldering
* Decision making;
* Knowledge of “normal” electricity usage
* Environmental regulations
* Read and understand plans and symbols

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | ***Assessment requires evidence that the candidate:***   * 1. Identified power supply system components as per DC input/output current and voltage   2. Identified power supply system components in consideration of expected load on the system   3. Selected power supply system components in consideration of environmental factors at the installation site   4. Identified tools, equipment and materials as per the tasks to be carried out   5. Assembled tools, equipment and materials basing on their functionality   6. Identified printed circuit board as per circuit design   7. Installed power supply system is in accordance with OSHA regulations   8. Performed earthing/grounding of power supply system as per IEE regulations   9. Carried out Maintenance activities as per IET regulations   10. Tested tower supply system components in line with IEE regulations   11. Tested power supply system in consideration of safety standards require |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied  Included: Soldering tools and materials, sizing tools, transformers, resistors, PCBs, capacitors, diodes, batteries, cables. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Written tests   3. Practical demonstration   4. Observation |
| 1. Context of Assessment | Competency may be assessed   1. On job 2. Off job 3. During Industrial Attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## **MAINTAIN ELECTRICAL AND ELECTRONIC EQUIPMENT AND APPLIANCES**

**UNIT CODE:** 0713 351 21A

**UNIT DESCRIPTION**

This unit covers competencies required to perform electrical and electronic equipment and appliance maintenance. Competencies include: assembling maintenance tools, equipment and materials, inspecting and testing faulty components, performing maintenance activities ,performing tests on repaired equipment and appliances and assembling repaired equipment and appliances

**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)*** |
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| 1. Assemble maintenance tools, equipment and materials | * 1. Maintenance tools, equipment and materials are identified in regard to maintenance activities to be performed   2. A list of tools, equipment and materials are prepared in line with established procedure   3. Tools and equipment and materials are checked for specifications and functionality as per operating procedures   4. Tools and equipment are calibrated in line with standard operating procedure. |
| 1. Inspect and test faulty components | * 1. Disassembling of equipment and appliance is performed in line with manufacture’s manuals   2. Sorting of screws is performed in regard to standard operating procedures   3. Appliances are inspected in regard to established procedure   4. Tests to be performed are identified in regard to appliance functionality   5. Appliances are tested as per established procedures   6. Perform troubleshooting in line with established procedure   7. Testing is performed in adherence to safety standards |
| 1. Perform maintenance activities | * 1. ***System components*** to be repaired/replaced are identified based on the appliance functionality   2. Cleaning, soldering and tightening of components are performed as per standard operating procedure   3. Defective components/parts are repaired/replaced based on established procedures   4. Maintenance activities are carried out in adherence to OSHA standards   5. Waste materials are disposed adherence to EHS regulations |
| 1. Perform tests on repaired equipment and appliances | * 1. Type of tests to be carried out are identified in line with maintenance activities   2. Components to be tested are identified based on the system functionality   3. Repaired/replaced components are tested in accordance to manufacturer’s manuals |
| 1. Assemble repaired equipment and appliance | * 1. Tightening of screws is performed in accordance with standard operating procedures   2. Connectors are patched as per manufacture’s manuals   3. Cable ties, silicon glue, super glue and insulating tapes are applied in binding cables as per standard operating procedures   4. Mounting of cooling components is performed in line with manufacture’s manuals |

**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.

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| System components | * Radio * Television * Mobile phones * Set top boxes * Iron box * Electric kettles * Printers * Photocopiers * Microwaves * Instant shower * Refrigerator * Air conditioning systems * Microwave * Washing machine * Blenders |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Troubleshooting techniques
* Repair/replacing of system components techniques
* Causes of system failures
* Knowledge in basic electricity
* Electrical safety and precautious measures
* Electrical shock prevention measures
* Performance monitoring techniques

**FOUNDATION SKILLS**

The individual needs to demonstrate the following additional skills:

* Communications (verbal and written);
* Computer literacy
* Electrical principles
* Physics
* Analytical skills
* Planning;
* Decision making;
* Report writing;
* Time management
* Faults troubleshooting
* Problem solving;

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

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| 1. Critical Aspects of Competency | ***Assessment requires evidence that the candidate:***   * 1. Identified maintenance tools, equipment and materials in regard to maintenance activities to be performed   2. Checked tools and equipment and materials for specifications and functionality as per operating procedures   3. Performed disassembling of equipment and appliance in line with manufacture’s manuals   4. Inspected appliances are in regard to established procedure   5. Tested appliances in line with established procedures   6. Performed testing in adherence to safety standards   7. Repaired/replaced defective components/parts based on established procedures   8. Identified type of tests to be carried out in line with maintenance activities   9. Tested repaired/replaced components in accordance to manufacturer’s manuals   10. Patched connectors as per manufacture’s manuals   11. Mounting of cooling components is performed in line with manufacture’s manuals   12. Disposed waste materials are adherence to EHS regulations   13. Carried out maintenance activities in adherence to OSHA standards |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied  Included: radio, television, mobile phones, set top boxes, switches, iron boxes, refrigerator etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed   1. On job 2. Off job 3. During Industrial Attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |