

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**ELECTRONICS ARTISAN**

**LEVEL 3**



TVET CDACC

P.O BOX 15745-00100

NAIROBI

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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 blue print 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 and this resulted to the formulation of the Policy Framework for Reforming Education and Training. 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 be competency based, Curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in Curriculum development to ensure the Curriculum addresses its competence needs. It is against this background that these Occupational Standards was developed for the purpose of developing a competency-based Curriculum for Electronics Level 3. 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 great role towards development of competent human resource for the Engineering Sector’s growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING MINISTRY OF EDUCATION**

**PREFACE**

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Electrical and Electronics Engineering Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for an Electronics. These standards will be the basis for development of a competency-based Curriculum for Electronics level 3. These Standards will also be the basis for assessment of an individual for competence certification.

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, Electrical and Electronics Engineering SSAC, expert workers and all those who participated in the development of these Occupational Standards.

**CHAIRPERSON, TVET CDACC**

**ACKNOWLEDGMENT**

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am sincerely thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to the Electrical and Electronics Engineering Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

**CHAIRPERSON ELECTRICAL AND ELECTRONICS ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE**

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**ACRONYMNS AND ABBREVIATIONS**

A Control Version

BC Basic Competencies

CC Common Competencies

CDACC Curriculum Development, Assessment and Certification Council

CR Core Competencies

EA Electronics

EHS Environment, Health and Safety

ENG Engineering

EPRA Energy and petroleum regulatory Authority

IBMS Integrated Building Management System

IEC International Electrical Commission

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

**KEY TO UNIT CODE**

 ENG/OS/EA/BC/01/3/A

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

 Control Version

**OVERVIEW**

Electronics Atrisan Level 3 qualification consists of competencies that a person must achieve to enable him/her to be certified as an Electronics Artisan

An Electronics Artisan Level 3 person will carry out Electronics duties using a given design and customer’s requirements. This work demands the individual reads and interprets drawings in Electrical and electronics sector, Perform Electrical Installation, Perform Electrical and Electronics Equipment and Appliances Repairs, Apply Electrical instrumentation so that the he/she can maintain Electronics system according to the national and international standards.

Thus, the units of competency comprising Electronics Artisan level 3 qualifications include the following basic, common and core competencies:

**BASIC UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/EA/BC/01/3/A | Demonstrate communication skills |
| ENG/OS/EA/BC/02/3/A | Demonstrate entrepreneurial skills |
| ENG/OS/EA/BC/03/3/A | Demonstrate employability skills |
| ENG/OS/EA/BC/04/3/A | Demonstrate environmental literacy |
| ENG/OS/EA/BC/05/3/A | Demonstrate occupational safety and health practices |
| ENG/OS/EA/CC/06/3/A | Demonstrate Digital Literacy |

**COMMON UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/EA/CC/01/3/A | Demonstrate understanding of Electronics |
| ENG/OS/EA/CC/02/3/A | Apply mathematics |
| ENG/OS/EA/CC/03/3/A | Perform workshop processes |
| ENG/OS/EA/CC/04/3/A | Apply Electrical principles |
| ENG/OS/EA/CC/05/3/A | Prepare and interpret Technical Drawings |

**CORE UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/EA/CR/01/3/A | Perform Electrical Installation |
| ENG/OS/EA/CR/02/3/A | Perform Electrical and Electronics Equipment and Appliances Repairs |
| ENG/OS/EA/CR/03/3/A | Apply Electrical instrumentation |

**BASIC UNITS OF COMPETENCY**

## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/EA/BC/01/3/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate communication skills. It involves obtaining and conveying workplace information, speaking English at a basic operational level, participating in workplace meetings and discussions, and completing relevant work-related documents.

**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 italicized terms*** ***are elaborated in the Range*** |
| 1. Obtain and convey workplace information
 | 1. Specific and relevant information is accessed from ***appropriate sources*** based on standard procedures
2. Effective questioning, active listening and speaking skills are used to gather and convey information based on communication needs
3. Appropriate ***medium*** is used to transfer information and ideas in accordance with workplace guidelines
4. Appropriate non- verbal communication is used as per the communication needs
5. Appropriate lines of communicationwith supervisors and colleagues are identified and followed based on workplace requirements
6. Location and storage of information is undertaken according to workplace procedures
7. Personal interaction is carried out clearly and concisely according to workplace requirements
 |
| 1. Speak English at a basic operational level
 | * 1. Participation in simple conversations with work colleagues is undertaken based on familiar topics
	2. Simple verbal instructions and requests are responded to according to workplace guidelines
	3. ***Routine procedures*** are provided in accordance with workplace policy
	4. Likes, dislikes and preferences are expressed based on individual preference
	5. Different forms of expression in English are identified in line with workplace requirements
 |
| 1. Participate in workplace meetings and discussions
 | * 1. Team meetings are attended on time according to schedules
	2. Own opinions are clearly expressed and those of others are listened to in accordance with workplace guidelines
	3. Meeting inputs are provided based on the meeting purpose and established ***protocols***
	4. ***Workplace interactions*** are conducted as per organizations’ code of conduct
	5. Work-related questions are asked and responded based on set protocols
	6. Meetings outcomes are interpreted and implemented as per organizations’ objectives
 |
| 1. Complete relevant work-related documents
 | * 1. Range of forms relating to conditions of employment are completed according to workplace procedures
	2. Workplace data is recorded based on workplace requirements
	3. Errors in recording information are identified and acted upon in accordance with workplace policies
	4. Reporting requirements are completed according to organizational guidelines
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Appropriate Sources may include but not limited to:
 | * Various department heads,
* organization documents
 |
| 1. Medium may include but not limited to:
 | * Method of communication
* Physical media
* Mechanical media
 |
| 1. Routine procedures may include but not limited to:
 | * Day to day activities
 |
| 1. Protocols may include but not limited to:
 | * Procedures for doing a task
 |
| 1. Workplace interactions may include but not limited to:
 | * Official inter relations
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical
* Active Listening
* Communication
* writing
* Interpretation
* Basic Information Technology (IT)

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Minutes writing
* Report writing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:1. Prepared written communication following standard format of the organization
2. Accessed information using communication equipment
3. Spoken English at a basic operational level
4. Made use of relevant terms as an aid to transfer information effectively
5. Conveyed information effectively adopting the formal or informal communication
 |
| 1. Resource Implications
 | The following resources should be provided: 1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Direct Observation
	2. Interview
	3. Written test
 |
| 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. |

## DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:** ENG/OS/EA/BC/02/3/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate digital literacy in a working environment. It entails identifying computer software and hardware, applying security measures to data, hardware, software, applying computer software in solving tasks and applying internet and email in communication at workplace.

**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 italicized terms*** ***are elaborated in the Range*** |
| 1. Identify computer software and hardware
 | * 1. ***Computer software*** are identified according to manufacturer’s specification
	2. ***Appropriate computer hardware*** is identified according to manufacturer’s specification
 |
| 1. Apply security measures to data, hardware, software
 | * 1. ***Data security and privacy are classified*** in accordance with the technological situation
	2. ***Security and control measures*** are applied in accordance with laws governing protection of ICT
	3. Computer threats and crimes are detected in accordance with information management guidelines.
	4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
 |
| 1. Apply computer software in solving tasks
 | * 1. Basic ***word processing concepts*** are applied in resolving workplace tasks as per job requirement.
	2. ***Word processing utilities*** are applied in accordance with workplace procedures
	3. Data is manipulated on worksheet in accordance with office procedures
 |
| 1. Apply internet and email in communication at workplace
 | * 1. Electronic mail is applied in workplace communication in accordance with office procedures
	2. Office internet functions are defined and executed in accordance with office procedures
	3. ***Network configuration*** and uses are determined in accordance with office operations procedures
 |

**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. Computer software may include but not limited to:
 | * Operating system
* MS office
* Web browser

Media players  |
| 1. Computer hardware may include but not limited to:
 | * Computer Case
* Monitor
* Keyboard
* Mouse
* Hard Disk Drive
* Motherboard
* Video Card
 |
| 1. Data security and privacy may include but not limited to:
 | * Confidentiality
* Cloud computing
* Confidentiality
* Cyber terrorism
* Integrity -but-curious data serving
 |
| 1. Security and control measures may include but not limited to:
 | * Countermeasures and risk reduction
* Cyber threat issues
* Risk management
 |
| 1. Word processing concepts may include but not limited to:
 | * Create
* Edit
* Print
* Documents
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing skills
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Input and output devices
* Central processing Unit (CPU)
* Peripherals
* Storage Media
* Software concept
* Types of concept
* Function of computer software
* Data security and privacy
* Security threats and control measures
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheet;
* Meaning, formulae, function and charts, uses, layout, data manipulation and application to cell
* Networking and Internet;
* Meaning, functions and uses of networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and apply emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified input, output, CPU and storage media devices of computers in accordance to computer specification
	2. Identified concepts, types and functions of computer software according to operation manual
	3. Identified and controlled security threats
	4. Detected and protected computer crimes
	5. Applied word processing in office tasks
	6. Prepared work sheet and applied data to the cells in accordance to workplace procedures
	7. Used Electronic Mail for office communication as per workplace procedure
	8. Applied internet and World Wide Web for office tasks in accordance with office procedures
	9. Applied laws governing protection of ICT
 |
| 1. Resource Implications for competence assessment
 | The following resources should be provided: 1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written Test
	2. Observation
	3. Practical assignment
	4. Interview
	5. Oral Questioning
 |
| 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. |

## DEMONSTRATE ENTREPRENEURIAL SKILLS

**UNIT CODE :** ENG/OS/EA/BC/03/3/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate Entrepreneurial skills. It involves developing entrepreneurial culture, identifying entrepreneurial opportunities, starting, operating and growing a small business.

**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 italicized terms are elaborated in the Range*** |
| 1. Develop entrepreneurial culture
 | 1. ***Entrepreneurship terminologies*** are defined following established procedures.
2. Contribution of entrepreneurship towards national development is identified in accordance to national development goals
3. Self-employment benefit are identified and emphasized to help create a positive attitude
4. Cultural factors that promote or inhibit entrepreneurial development areidentified and emphasis made on entrepreneurial promotion
5. Ways of managing factors that inhibit development of entrepreneurial culture are identified in accordance withcultural background and national social economic situation
 |
| 1. Identify entrepreneurial opportunities
 | 1. Myths associated with entrepreneurship, types of entrepreneurs and characteristics of entrepreneurship are determined in accordance with the set procedures
2. Identification of ***sources of business ideas,*** generation of business ideas is undertaken in accordance with the existing procedure
3. Evaluation of business opportunities is undertaken according to prevailing office procedures
4. Competencies are matched with business opportunities in accordance with business practices.
 |
| 1. Start a small business
 | Factors to consider when starting a small business are identified according to business sector. 1. ***Forms of business ownership*** are identified and procedure of starting a small business stipulated according to relevant legal requirements
2. Procedure of starting a small business is identified as per the legal requirements
3. Challenges faced when starting a small business are identified and mitigating factors provided for in accordance prevailing legal and regulatory requirement
4. Resource requirement for a small business are specified according to nature of business
5. Business life cycle is projected as per the nature of business and national social economic situation
 |
| 1. Operate a small business
 | 1. Relevant terms are defined in accordance with the set rules
2. Small business record is maintained in accordance with office procedures
3. Business support services are set up in accordance with the nature and size of business
4. Marketing activities are effected according to the nature and size of business
5. Small enterprise business plan is prepared depending on the size and nature of business and the client specification
6. Small business resources are run for efficiency and profitability
7. Small business records are kept for decision making purposes
8. Word processing concepts are applied in the management of small business according to office procedures
9. Basic computer application software and emerging trends and concerns are applied in small business management in accordance with office procedures
 |
| 1. Grow a small business
 | 1. Methods of growing/expanding a small business are identified and implemented in accordance with growth schedule
2. Resources for growing small business are identified and implementing
3. Small business growth plans are prepared according to growth schedule
4. ICT and small business growth schedule is prepared in accordance with office procedures
5. Use of computers and technology is incorporated in small scale business growth schedule in accordance with technological trends
6. Social media is used for business growth and profitability
7. Emerging issues and trends are considered in accordance with business growth schedule and activities
8. Community interest is built in product/service according to growth plan
9. Business communication is enhanced according to business communication planand profitability
10. Basic business growth strategies are identified and implemented for increased profitability
11. Word processing concepts are applied in growing of small business according to office procedures
12. Basic computer application software, programming and emerging trends and concerns are applied in small business growth in accordance with office procedures for growth and profitability
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Entrepreneurship terminologies include but not limited to:
 | * Intrapreneurship
* Enterprise
* Business vision. Mission, core values, objectives
 |
| 1. Sources of business ideas may include but not limited to:
 |

|  |
| --- |
| * Brainstorming
* Personal hobbies
* Newspapers, magazines,
* Friends and relatives
* Accounting/Administrative work
* Modern trends and concerns
 |

 |
| 1. Forms of business ownership may include but not limited to:
 | * Sole proprietorship
* Partnership
* Limited Company
* Unlimited Company
 |

**REQUIRED SKILLS AND KNOWLEDGE**

**Required Skills**

This section describes the skills and knowledge required for this unit of competency.

The individual needs to demonstrate the following skills:

* Marketing skills
* Advertising
* Basic book-keeping
* accounting skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Public relations concepts
* Basic product promotion strategies
* Basic market and feasibility studies
* Basic business ethics
* Building customer relations
* Business models and strategies
* Types and categories of businesses
* Business internal controls
* Relevant national and local legislation and regulations
* Basic quality control and assurance concepts
* Building relations with customer and employees
* Building competitive advantage of the enterprise

**EVIDENCE GUIDE**

This section describes the required skills which supports performance. These skills will need to be considered in the learning and assessment process.

|  |  |  |
| --- | --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:

|  |
| --- |
| 1. Demonstrated basic entrepreneurial skills
2. Demonstrated ability to conceptualize and plan a micro/small enterprise
3. Demonstrated ability to manage/operate a micro/small-scale business
4. Demonstrated basic marketing skills
 |

 |
| 1. Resource Implications for assessment
 | The following resources should be provided: 1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:

|  |  |
| --- | --- |
| 3.1 Written tests3.2 Oral Questioning 3.3 Observation3.4 Third Party Report |  |

 |
| 1. Context of Assessment
 |

|  |
| --- |
| Competency may be assessed:4.1 On the job4.2 Off the job4.3 During industrial attachment |
|  |

 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** ENG/OS/EA/BC/04/3/A

 **UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

**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 italicized terms are elaborated in the Range*** |
| 1. Conduct self-management
 | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives
2. Emotional intelligence is demonstrated as per workplace requirements.
3. Individual performance is evaluated ~~and monitored~~ according to the agreed targets.
4. Assertiveness is developed and maintained based on the requirements of the job.
5. Accountability and responsibility for own actions are demonstrated based on workplace instructions.
6. Self-esteem and a positive self-image are developed and maintained based on values.
7. Time management, attendance and punctuality are observed as per the organization policy.
8. Goals are managed as per the organization’s objectives
9. Self-strengths and weaknesses are identified based on personal objectives
 |
| 1. Demonstrate critical safe work habits
 | 1. Stress is managed in accordance with workplace policy.
2. Punctuality and time consciousness is demonstrated in line with workplace policy.
3. Personal objectives are integrated with organization goals based on organization’s strategic plan.
4. ***Resources*** are utilized in accordance with workplace policy.
5. Work priorities are set in accordance to workplace goals and objectives.
6. Leisure time is recognized and utilized in line with personal objectives.
7. ***Drugs and substances of abuse*** are identified and avoided based on workplace policy.
8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy.
9. Safety consciousness is demonstrated in the workplace based on organization safety policy.
10. ***Emerging issues*** are identified and dealt with in accordance with organization policy.
 |
| 1. Demonstrate workplace learning
 | * 1. Learning opportunities are sought and managed based on job requirement and organization policy.
	2. Improvement in performance is demonstrated based on courses attended.
	3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job
	4. Time and effort is invested in learning new skills based on job requirements
	5. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.
	6. New systems are developed and maintained in accordance with the requirements of the job.
	7. Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job.
 |
| 1. Demonstrate workplace ethics
 | 1. Policies and guidelines are observed as per the workplace requirements
2. Self-worth and professionalism is exercised in line with personal goals and organizational policies
3. Code of conduct is observed as per the workplace requirements
4. Integrity is demonstrated as per legal requirement
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| 1. Drug and substance abuse may include but not limited to:
 | Commonly abused* Alcohol
* Tobacco
* Miraa
* Over-the-counter drugs
* Cocaine
* Bhang
* Glue
 |
| 1. Feedback may include but not limited to:
 | * Verbal
* Written
* Informal
* Formal
 |
| 1. Team may include but not limited to:
 | * Small work group
* Staff in a section/department
* Inter-agency group
 |
| 1. Innovation may include but not limited to:
 | * New ideas
* Original ideas
* Different ideas
* Methods/procedures
* Processes
* New tools
 |
| 1. Emerging issues may include but not limited to:
 | * Terrorism
* Social media
* National cohesion
* Open offices
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Critical thinking
* Observation
* Organizing
* Record keeping
* Problem solving
* Decision Making
* Resource utilization

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Organizing work
* Record keeping
* Workplace problems and how to deal with them
* Assertiveness
* Team work
* HIV and AIDS
* Drug and substance abuse
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Innovation
* Emerging issues
	+ Social media
	+ Terrorism
	+ National cohesion

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Conducted self-management
	2. Demonstrated critical safe work habits
	3. Demonstrated workplace learning
	4. Demonstrated workplace ethics
 |
| 1. Resource Implications
 | The following resources should be provided: 1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Oral questioning
2. Portfolio of evidence
3. Third Party Reports
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. |

##  DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE :** ENG/OS/EA/BC/05/3/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate environmental literacy. It involves controlling environmental hazard, controlling environmental pollution and demonstrating sustainable resource use.

**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 italicized terms*** ***are elaborated in the Range*** |
| 1. Control environmental hazard
 | 1. Storage and handling methods for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS.
2. Disposal methods of hazardous wastes are followed at all times according to environmental regulations and OSHS.
3. ***PPE*** is used according to OSHS.
 |
| 1. Control environmental Pollution
 | * 1. ***Environmental pollution******control measures*** are complied with following standard protocol.
	2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999
	3. Methods for minimizing noise pollution complied following environmental regulations.
 |
| 1. Demonstrate sustainable use of resource
 | * 1. Methods for minimizing wastage are complied with.
	2. ***Waste management procedures*** are employed following principles of 3Rs (Reduce, Reuse, Recycle)
	3. Methods for economizing or reducing ***resource*** consumption are practiced.
 |

**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. PPE may include but not limited to:
 | * + Mask
	+ Gloves
	+ Goggles
	+ Safety hat
	+ Overall
	+ Hearing protector
 |
| 1. Environmental pollution control measures may include but not limited to:
 | * + Methods for minimizing or stopping spread and ingestion of airborne particles
	+ Methods for minimizing or stopping spread and ingestion of gases and fumes
	+ Methods for minimizing or stopping spread and ingestion of liquid wastes
 |
| 1. Waste management procedures may include but not limited to:
 | * + Sorting
	+ Storing of items
	+ Recycling of items
	+ Disposal of items
 |
| 1. Resources may include but not limited to:
 | * + Electric
	+ Water
	+ Fuel
	+ Telecommunications
	+ Supplies
	+ Materials
 |
| 1. Workplace environmental hazards may include but not limited to:
 | * + Biological hazards
	+ Chemical and dust hazards
	+ Physical hazards
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Observation
* Writing
* Analytical

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous wastes
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid wastes
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1.1 Controlled environmental hazard 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use |
| 1. Resource Implications for assessment
 | The following resources should be provided:* 1. Workplace with storage facilities
	2. Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)
	3. PPE
	4. Manuals and references
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:3.1 Observation3.2 Oral questioning3.3 Written examination |
| 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. |

## DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/OS/EA/BC/06/3/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to practice and promote safety and health at work. This entails preparing to practice safety and health at work and complying and promoting compliance of workers to organization’s occupational safety and health instructions and requirements

**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 italicized terms*** ***are elaborated in the Range*** |
| 1. Prepare to practice safety and health at work
 | 1.1 Awareness of legislation that outlines the minimum standards for occupational safety and health requirements/ regulations are emphasized1.2 Benefits of implementing an occupational safety and health program are identified1.3 ***Safety requirements/ regulations*** of own work and of other workers are familiarized1.4 Workplace standards and procedures ***for incidents and Emergencies*** are determined1.5 ***Prevention and control measures***, including use of ***safety gears/PPE*** (Personal Protective Equipment) to avoid accident, injuries and sickness are identified |
| 1. Comply and promote compliance of workers to organization’s occupational safety and health instructions and requirements
 | 2.1 Safety instructions and safety signs are followed and disseminated to co-workers2.2 Safe handling of tools, equipment and materials is learned and shared with co-workers2.3 Execution of own work and of co-workers is monitored in according to safe work procedures 2.4 Use of safe guards and safety devices is monitored2.5 Hazards, incidents, injuries and sickness in the workplace are reported properly following standards and procedures |

**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 requirements / regulations*** may include but are not limited to:
 | * Building code
* Permit to Operate
* Occupational Safety and Health Standards
 |
| 1. ***Incidents and emergencies*** may include but are not limited to:
 | * Chemical spills
* Equipment/vehicle accidents
* Explosion
* Fire
* Gas leak
* Injury to personnel
* Structural collapse
* Toxic and/or flammable vapors emission.
 |
| 1. ***Prevention and control measures*** may include but are not limited to:
 | * Eliminate the hazard
* Isolate the hazard
* Substitute the hazard with a safer alternative
* Use administrative controls to reduce the risk
* Use engineering controls to reduce the risk
* Use personal protective equipment
* Safety, Health and Work Environment Evaluation
* Periodic and/or special medical examinations of workers
 |
| 1. ***Safety devices/ PPEs*** (personal protective equipment) May include but are not limited to:
 | * Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Observation
* Reporting
* Organizing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Elements of an effective occupational safety and health program
* Benefits of implementing an occupational safety and health program
* Safety requirements of own work and of other workers
* Standard emergency plan and procedures in the workplace
* Different OSH control measures
* General OSH principles
* Work standards and procedures
* Safe handling procedures of tools, equipment’s and materials
* Standard emergency plan and procedures in the workplace
* Different OSH control measures
* Standard accident and illness reporting procedures in the workplace
* Monitoring system on compliance to work safety and health

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Arranged work area and items in accordance with workplace procedures requirements
2. Followed work standards and procedures based on instructions
3. Applied ***Prevention and control measures*** based on instructions
4. Undertook orientations on ***OSH requirements and regulations*** in line with policy.
5. Provided feedback on occupational health and safety as per workplace instructions.
6. Adhered to workplace procedures for reporting hazards, incidents, injuries and sickness to as per workplace policy.
7. Identified and proposed ***OSH-related training needs*** as per workplace policy.
 |
| 1. Resource Implications for assessment
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Oral questioning
2. Portfolio of evidence
3. Third Party Reports
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. |

**COMMON UNITS OF COMPETENCY**

## DEMONSTRATE UNDERSTANDING OF ELECTRONICS

 **UNIT CODE:** ENG/OS/EA/CC/01/3/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate understanding of Electronics. Competencies include; Apply semiconductor theory, applying semiconductor diodes and demonstrating understanding of transistors.

**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 semiconductor theory
 | * 1. Types of ***materials*** are established in line with semiconductor theory
	2. Semiconductor materials are identified as per their electrical conductivity properties
 |
| * 1. Apply semiconductor diodes
 | * 1. Types of diodes are identified as per their functionality
	2. ***Diodes*** characteristics are determined as per their properties
	3. Forward and reverse bias characteristics are established as per the properties of the semiconductor material
 |
| 1. Demonstrate understanding of transistors
 | * 1. ***Transistors*** are identified as per their characteristics
	2. NPN and PNP are determined as per their operation
	3. P and N channels are identified as per their operation
	4. ***Biasing*** and determination of gain of transistors is performed as per their standard operating procedure
	5. Transistor configuration is performed as per their application
 |

**RANGE**

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

| **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. Transistors may include but is not limited to:
 | * BJTs
* FETs
 |
| 1. Biasing may include but is not limited to:
 | * Forward bias
* Reverse bias
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

***The individual needs to demonstrate knowledge and understanding of:***

* The manufacturer's warranty requirements relating to electronic materials
* The legal and statutory requirements relating to Electronics
* workplace procedures relevant to:
* Health and safety;
* The environment (including waste disposal);
* Appropriate personal and protective equipment;
* Workplace procedures for:
	+ Appropriate use of tools and equipment
	+ Electronics operations
	+ Reporting of technical challenges
* The importance of documenting Electronics operations manuals
* The importance of working within agreed timelines and sharing progress reports.
* The relationship between time and costs.
* The importance of reporting anticipated delays to relevant parties promptly.
* How to find, interpret and use sources of technical information for project activities
* The importance of using the correct sources of technical information.

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Amplifier construction
* Communications (verbal and written);
* Proficient in ICT;
* Time management;
* Analytical
* Problem solving;
* Decision making;
* First aid;
* Electronics biasing
* 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. Identified different semiconductor material
	2. Demonstrated understanding in biasing of semiconductor materials
	3. Identified special semiconductor devices
	4. Performed forward and reverse biasing of semiconductor materials
	5. Identified different types of transistors
	6. Demonstrated understanding of rectification.
 |
| 1. Resource Implications
 | The following resources must be provided:* 1. Stationeries
	2. Reference materials
	3. Practical materials
	4. Measuring instruments
	5. Tools

Resources the same as that of workplace are advised to be applied |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral test
	2. Written test
	3. Observation
	4. Practical demonstration
 |
| 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 MATHEMATICS

**UNIT CODE:** ENG/OS/EA/CC/02/3/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a worker in order to apply a wide range of mathematical calculations for work; Use and apply ratios, rates and proportions for work; Estimate, measure and calculate measurement for work; Use detailed maps to plan travel routes for work; Use geometry to draw 2D shapes and construct 3D shapes for work; Collect, organize, and interpret statistical data for work; Use routine formula and algebraic expressions for work, and Use common functions of a scientific calculator for work.

 **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 italicized terms*** ***are elaborated in the Range.*** |
| 1. Apply a wide range of mathematical calculations for work | 1. Mathematical information embedded in a range of workplace tasks and texts is extracted
2. Mathematical information is interpreted and comprehended
3. A range of mathematical and problem-solving processes are select and used
4. Different forms of fractions, decimals and percentages are flexibly used
5. Calculation performed with positive and negative numbers
6. Numbers are expressed as powers and roots and are used in calculations
7. Calculations done using routine formulas
8. Estimation and assessment processes are used to check outcome
9. Mathematical language is used to discuss and explain the processes, results and implications of the task
 |
| 2. Use and apply ratios, rates and proportions for work | * 1. Information regarding ratios, rates and proportions extracted from a range of workplace tasks and texts
	2. Mathematical information related to ratios, rate and proportions is analyzed
	3. Problem solving processes are used to undertake the task
	4. Equivalent ratios and rates are simplified
	5. Quantities are calculated using ratios, rates and proportions
	6. Graphs, charts or tables are constructed to represent ratios, rates and proportions
	7. The outcomes reviewed and checked
	8. Information is record using mathematical language and symbols
 |
| 3. Estimate, measure and calculate measurement for work | 1. Measurement information embedded in workplace texts and tasks are extracted and interpreted
2. Appropriate workplace measuring equipment are identified and selected
3. Accurate measurements are estimate and made
4. The area of 2D shapes including compound shapes are calculated
5. The volume of 3D shapes is calculated using relevant formulas
6. Sides of right-angle triangles are calculated using Pythagoras’ theorem
7. conversions are performed between units of measurement
8. Problem solving processes are used to undertake the task
9. The measurement outcomes are reviewed and checked
10. Information is recorded using mathematical language and symbols appropriate for the task
 |
| 4. Use detailed maps to plan travel routes for work | * 1. Different types of maps are identified and interpreted
	2. Key features of maps are identified
	3. Scales are identified and interpreted
	4. Scales are applied to calculate actual distances
	5. Positions or locations are determined using directional information
	6. Routes are planned by determining directions and calculating distances, speeds and times
	7. Information is gathered and identified, and relevant factors related to planning a route checked
	8. Relevant equipment is select and checked for accuracy and operational effectiveness
	9. Task is planned and recorded using specialized mathematical language and symbols appropriate for the task
 |
| 5. Use geometry to draw 2D shapes and construct 3D shapes for work | 1. A range of 2D shapes and 3D shapes and their uses in work contexts is identified
2. Features of 2D and 3D shapes are named and described
3. Types of angles in 2D and 3D shapes are identified
4. Angles are drawn, estimated and measured using geometric instruments
5. Angle properties of 2D shapes are named and identified
6. Angle properties are used to evaluate unknown angles in shapes
7. Properties of perpendicular and parallel lines are applied to shapes
8. Understanding and use of symmetry is demonstrated
9. Understanding and use of similarity is demonstrated
10. The workplace tasks and mathematical processes required are identified
11. 2D shapes is drawn for work
12. 3D shapes is constructed for work
13. The outcomes are reviewed and checked
14. Specialized mathematical language and symbols appropriate for the task are used
 |
| 6. Collect, organize, and interpret statistical data for work | 1. Workplace issue requiring investigation are identified
2. Audience / population / sample unit is determined
3. Data to be collected is identified
4. Data collection method is selected
5. Appropriate statistical data is collected and organized
6. Data is illustrated in appropriate formats
7. The effectiveness of different types of graphs are compared
8. The summary statistics for collected data is calculated
9. The results / findings are interpreted
10. Data is checked to ensure that it meets the expected results and content
11. Information from the results including tables, graphs and summary statistics is extracted and interpreted
12. Mathematical language and symbols are used to report results of investigation
 |
| 7. Use routine formula and algebraic expressions for work | 1. Understanding of informal and symbolic notation, representation and conventions of algebraic expressions is demonstrated
2. Simple algebraic expressions and equations are developed
3. Operate on algebraic expressions
4. Algebraic expressions are simplified
5. Substitution into simple routine equations is done
6. Routine formulas used for work tasks are identified and comprehended
7. Routine formulas are evaluated by substitution
8. Routine formulas transposed
9. Appropriate formulas are identified and used for work related tasks
10. Outcomes are checked and result of calculation used
 |
| 8. Use common functions of a scientific calculator for work | 1. Required numerical information to perform tasks is located
2. The order of operations and function keys necessary to solve mathematical calculation are determined
3. Function keys on a scientific calculator are identified and used
4. Estimations are referred to check reasonableness of problem-solving process
5. Appropriate mathematical language, symbols and conventions are used to report results
 |

**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. Geometry may include but not limited to:
 | * Scale drawing
* Triangles
* Simple solid
* Round
* Square
* Rectangular
* Triangle
* Sphere
* Cylinder
* Cube
* Polygons
* Cuboids
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying Fundamental operations (addition, subtraction, division, multiplication)
* Using calculator
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:* 1. Performed calculation using positive and negative numbers
	2. Numbers expressed as powers and roots were used in calculations
	3. Calculated quantities using ratios, rates and proportions
	4. Constructed graphs, charts and tables were represented in forms of ratios, rates and proportions
	5. Calculated the volumes of 3D shapes using relevant formulas
	6. Calculated sides of right-angle triangles using Pythagoras’ theorem
	7. Performed conversions between units of measurement
	8. Used problem solving processes to undertake the task
	9. Determined positions or locations using directional information
	10. Simplified algebraic expressions
	11. Used appropriate mathematical language, symbols and conventions in reporting results
 |
| 2. Resource Implications | The following resources should be provided:1. Materials relevant to the proposed task
 |
| 3. Methods of Assessment | Competency may be assessed through* 1. Oral test
	2. Written test
	3. Observation
	4. Practical demonstration
 |
| 4. Context of Assessment | Competency may be assessed * 1. On the job
	2. Off the job
	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. |

## PERFORM WORKSHOP PROCESSES

**UNIT CODE**: ENG/OS/EA/CC/03/3/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform workshop processes. Competencies include applying workshop Safety, use of workshop tools, instruments and equipment, preparation of workshop materials, preparation of workshop for Electrical installation practical, Storage of Electrical tools and materials after practical, troubleshoot and repair workshop tools and equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Apply workshop safety | 1. Proper use of PPE is adhered to as per standard operating procedure
2. Workshop rules are followed as per standard operating procedure
3. Proper use of safety equipment are followed as per the manufacturers recommendations
4. First Aid procedures are adhered to
 |
| 1. Use workshop tools, Instruments and equipment
 | * 1. *Workshop tools*, Instruments and equipments are Identified
	2. Tools, Instruments and equipments are used as per the manufactures manuals
	3. Calibration of workshop instruments are performed as per the standard operating procedure
	4. Proper handling of workshop tools, Instruments and equipments should be followed
	5. Care and Maintenance of workshop tools, Instruments and equipments should be adhered too
 |
| 1. Prepare workshop tools and instruments for an Electrical installation practical e.g.
 | * 1. List of required tools and instruments are prepared
	2. Issuing of required tools and instruments is performed
	3. Confirmation of the issued tools and instruments is performed
	4. Functioning of the issued tools and instruments is checked in line with the standard operating procedure
	5. Sharpening of the cutting tools is performed
 |
| 1. Prepare workshop for an Electrical practical
 | * 1. Practical working section is arranged as per the number of practical to be carried out.
	2. Power supply availability in every practical section is confirmed as per the practical to be carried out
	3. Tools and materials required are supplied as per the practical to be carried out.
 |
| 1. Store Electrical tools and materials after practical
 | * 1. Tools are checked against the issuing list after practical
	2. Tools are stored out as per their standard operating procedure
	3. Tools are cleaned as per the workshop standard operating procedure
	4. Waste materials are disposed as per the EHS
	5. Tools are stored in their respective sections as per the workshop procedures
 |
| 1. Troubleshoot and repair/replace workshop tools and equipment
 | * 1. Faulty tools are identified as per their expected functioning
	2. Faulty component is diagnosed as per the fault diagnosis procedures
	3. Repair/Replace faulty components as per the expected functioning
	4. Repaired/Replaced tool are tested as per the expected functioning.
 |

**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. Workshop tools include but not limited to:
 | * + Pliers
	+ Hacksaws
	+ Hammer
	+ Spirit levels
	+ Phase Tester
	+ Side cutters
 |
| 1. Manual include but not limited to:
 | * Operational
* Installation
* Commissioning
* Technical specification /data sheet
 |
| 1. Parameters include but not limited to:
 | * + Light intensity
	+ Sound
	+ Speed
	+ Efficiency
	+ Temperature
	+ Electrical quantities e.g. Voltage, current and resistance levels
	+ Expected output
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

*The individual needs to demonstrate knowledge and understanding of:*

* The manufacturer's manual about the operation of various workshop tools and instruments
* The legal and statutory requirements relating to electrical Workshop operation activities.
* workplace procedures relevant to:
* health and safety;
* the environment (including waste disposal);
* appropriate personal and protective equipment;
* appropriate use of service manuals
* Workplace procedures for:
	+ Fault identification and diagnosis
	+ Appropriate use of tools and equipment;
	+ Repairing, modifying or replacing defective parts or components.
	+ Reporting of technical challenges
* The importance of documenting workshop practical activities and information.
* The importance of working within agreed timelines and sharing progress reports.
* The importance of reporting anticipated delays to relevant parties promptly.
* The use of technical information including:
* How to find, interpret and use sources of technical information for workshop practical activities
* The importance of using the correct sources of technical information.
* The purpose of and how to use identification codes.

**FOUNDATION SKILLS**

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

* Communications (verbal and written);
* Proficient in ICT;
* Time management;
* Analytical
* Faults troubleshooting;
* Problem solving;
* Planning;
* Decision making;
* First aid;
* Report writing

**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. Adhered to the proper use of PPE
	2. Observed the workshop rules
	3. Performed the First Aid procedures in the workshop
	4. Observed workshop procedures in the storage of tools
	5. Safely used testing equipment and tools
	6. Observed EHS in the waste disposal
	7. Properly demonstrated care and maintenance of workshop tools
	8. Obtained, recorded and interpreted test results
	9. Identified faulty tools and instruments
	10. Repaired/Replaced faulty tools
 |
| 1. Resource Implications
 | *The following resources must be provided:** 1. Electrical installation tool kit
	2. Testing equipment
	3. Measuring equipment
	4. First Aid kit

Resources the same as that of workplace are advised to be applied |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral test
	2. Observation
	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. |

## APPLY ELECTRICAL PRINCIPLES

**UNIT CODE**: ENG/OS/EA/CC/04/3/A

**UNIT DESCRIPTION**

This unit describes the competencies required by an to apply electrical principles. Competencies include; using the concept of basic electrical quantities, using the concepts of D.C and A.C circuits in electrical installation, using of basic electrical machine, using of earthing in Electrical installations and applying lightning protection measures.

**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 italicized terms are elaborated in the Range.* |
| --- | --- |
| * + - 1. Use the concept of basic electrical quantities
 | * 1. Basic *SI unit*s in Electrical are identified
	2. *Quantitie*s of Charge, force, work and power are identified
	3. Perform calculations involving Ohm’s law i.e Current, Resistance and voltage
	4. Calculations involving various electrical quantities are performed
 |
| * + 1. Use the concepts of D.C and A.C circuits in electrical installation
 | * 1. Calculations involving parallel and series circuits are performed
 |
| 1. Use of basic electrical machine
 | * 1. Types of various electrical machines are identified as per standard operating procedure
	2. Single phase motor starting methods are performed in line standard operating procedure
	3. DC and AC motor starting methods are performed as per standard operating procedure
 |
| 1. Use of earthing in Electrical installations
 | * 1. Earthing types are determined as per installation in accordance to system requirements
	2. Earthing points on electrical installation are identified based site conditions
	3. Calculation involved in determining the earthing type is performed as per standard operating procedure
	4. Test on earthing system is performed in line with the IEE regulations
 |
| 1. Apply lightning protection measures
 | * 1. Types of lightning strikes are identified as per standard operating procedure
	2. Components of lightening protection system are identified based on system requirements
	3. Test to be carried out in lightening protection system are established as per system configuration
	4. Application of lightening protection system is determined in line with standard operating procedure
 |

**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. SI unit include but not limited to:
 | * + Power – Watts (W)
	+ Current – Amperes (A)
	+ Resistance – Ohms(Ω)
	+ Voltage – Volts (V)
 |
| 1. Quantities include but not limited to:
 | * + Charge
	+ Force
	+ Work
	+ Power
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Apply basic electrical formulas
* Use of basic electrical instruments
* Perform various unit conversions of electrical quantities
* Electrical earthing
* Lightening arrestors
* Logical thinking
* Problem solving
* Applying statistics
* Drawing graphs
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Electrical power calculations
* Various laws in electrical engineering
* Electrical formulas
* SI units of various electrical parameters
* Earthing testing
* Lightening arrestor testing
* Selecting the correct type of electrical machines for various uses
* Types and purpose of measuring instruments
* Units of measurement and abbreviations

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: * 1. Applied the correct SI units of Electrical quantities
	2. Stated, Calculate and relates the quantities in Ohm’s law
	3. Identified the components of an earthing system
	4. Differentiated between AC and DC power
	5. Applied correct formulas in the calculation of AC and DC machines
	6. Identified types of lightening arrestors and their applications
 |
| 1. Resource Implications
 | The following resources should be provided: * 1. Access to relevant workplace or appropriately simulated environment where assessment can take place
	2. Measuring equipment
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * 1. Direct Observation
	2. Practical Tests
	3. Oral Questioning
	4. Written tests
 |
| 1. Context of Assessment
 | Competency may be assessed * 1. On the job
	2. Off the jo
	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. |

## PREPARE AND INTERPRET TECHNICAL DRAWINGS

**UNIT CODE**: ENG/OS/EA/CC/05/3/A

**UNIT DESCRIPTION**

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, using and maintaining drawing equipment and materials, producing basic plain geometry drawings

**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. Use and maintain drawing equipment and materials
 | 1.1 *Drawing equipment* are identified and gathered according to task requirements1.2 *Drawing materials* are identified and gathered according to task requirements 1.3 Drawing equipment are used and maintained as per manufacturer’s instructions1.4 Drawing materials are used as per workplace procedures1.5 Waste materials are disposed in accordance with workplace procedures and *environmental legislations*1.6 *Personal Protective Equipment* is used according to occupational safety and health regulations |
| * + - 1. Plane geometry drawings
 | 1. Different types of lines used in drawing and their meanings are identified according to standard drawing conventions
2. Different types of *geometric forms* are constructed according to standard conventions
3. Different types of angles are constructed according to principles of trigonometry
4. Different types of angles are measured using appropriate measuring tools
5. Angles are bisected according to standard conventions
6. Freehand sketching of different types of geometric forms, tools, equipment, diagrams is conducted
 |

**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. Drawing equipmentmay include but is not limited to:
 | * Drawing boards
* T and set squares
* drawing sets
 |
| 1. Drawing materialsmay include but is not limited to:
 | * Drawing papers
* Pencils
* Erasers
* masking tapes
* paper clips
 |
| 1. Environmental legislationsmay include but is not limited to*:*
 | * EMCA 1999
 |
| 1. Personal Protective Equipmentmay include but is not limited to:
 | * Dust coats
* closed leather shoes
 |
| 1. Geometric formsmay include but is not limited to:
 | * Circles
* Triangles
* Rectangles
* Parallelogram
* Polygons
* Pyramids
* conic sections
* prisms
 |
| 1. Standard conventions may include but is not limited to:
 | * Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends)
* Drawing scale (paper size and drawing symbols)
* International drawing standards
 |
| 1. Electrical drawingsmay include but is not limited to:
 | * Block
* Schematic
* Circuit
* line
* wiring diagrams
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required skills**

The individual needs to demonstrate the following skills:

* Critical thinking
* Drawing
* Interpretation
* Drawing equipment handling
* Analysis and synthesis
* Communication
* Inter personal

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Drawing equipment and materials
* Freehand sketching
* Lettering
* Geometrical constructions
* Types of drawings
* Types of lines
* Sketches and drawings of simple patterns

**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. Cared and maintained drawing equipment
	3. Interpreted circuit, assembly and lay out diagrams
	4. Applied appropriate technical standards, used proper tools and equipment for a given task
	5. Produced sketches and drawings
 |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be applied.* 1. Drawing room
	2. Drawing equipment and materials
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Practical tests
	2. Observation
	3. Written tests
	4. Oral questioning
 |
| 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. |

**CORE UNITS OF COMPETENCY**

## PERFORM ELECTRICAL INSTALLATION

**UNIT CODE**: ENG/OS/EA/CR/01/3/A

**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, performing termination of electrical installation, inspecting and testing 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. Tools, equipment and materials are identified and list prepared as per established procedure
	2. Tools, equipment and materials are checked for ***specifications*** as per their functionality
	3. 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. Piping is performed as per working drawing
	3. Piping is performed in line with standard operating procedure
	4. Number and size of cables are laid in a conduit as per the IEE regulations
	5. Cables, conduits, enclosures and support systems are installed as per the working drawing
	6. Cables are drawn-in in line with standard operating procedures
	7. 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 to IEE regulations
	3. Components are mounted in line with standard operating procedure
 |
| 1. Terminate Electrical Installation
 | * 1. Cable lugging and jointing is performed as per the standards operating procedure.
	2. Cables are terminated as per the IEE regulations
	3. 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. 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
 |
| 1. Permit to work may include but is not limited to:
 | * KPLC permit
* Gate Pass
* Daily work permit
* Work Tag
 |
| 1. Utilities may include but is 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 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. Determined and prepared a list of tools, equipment and materials as per established procedure
	2. Checked tools, equipment and materials for specifications and functionality as per the standard operating procedure
	3. Laid number and size of cables in a conduit as per the IEE regulations
	4. Drawn-in cables line with standard operating procedures
	5. Mounted components in accordance to the working drawings
	6. Terminated cables as per the IEE regulations
	7. Performed labelling of the cables as per the complexity of the job.
	8. Checked firmness of the installation as per established procedures
	9. 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 appliedincluding 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**: ENG/OS/EA/CR/02/3/A

**UNIT DESCRIPTION**

This unit covers competencies required to perform electrical and electronic equipment and appliances repair. Competencies includes: 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. 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 in 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.

|  |  |
| --- | --- |
| **VARIABLE** | **RANGE** |
| 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 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 appliedIncluded: 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**: ENG/OS/EA/CR/03/3/A

**UNIT DESCRIPTION**

This unit covers the competencies required to apply electrical instrumentation. Competencies include; demonstrating understanding of measurements, applying electrical instruments, measuring electrical quantities, 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. Meters are classified based on their functionality
	2. Analogue meters are applied in line with standard operating procedures
	3. Digital multimeters are applied in accordance with standard operating procedure
	4. Clamp ammeters are applied as per standard operating procedure
	5. 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 are 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
 |

**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. IEC Standards includes but not limited to:
 | * IEC 62257
* IEC 60364
* IS 732/IEC 60364
 |
| 1. Output parameters includes but not limited to:
 | * Current
* Voltage
* Resistance
 |
| 1. Digital and analogue instruments includes but not limited to:
 | * Voltmeter
* Ammeter
* Ohmmeter
* Wattmeter
 |

**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. Applied analogue ammeters in line with standard operating procedures
	4. Applied clamp ammeters as per standard operating procedure
	5. Classified meters are based on their functionality
	6. Performed measurement of resistance as per standard operating procedures
	7. Performed high resistance measurement in line with operating procedures
	8. Performed measurement of current as per standard operating procedure
	9. Performed cleaning, soldering and tightening of components based on standard operating procedure
	10. Configured instruments in accordance to the instrument functionality
	11. Tested repaired components are in accordance to manufacturer’s manuals
 |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluded: 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. |