REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

ELECTRICAL INSTALLATION TECHNICIAN

LEVEL 6

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 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 were developed for the purpose of developing a competency-based curriculum for Electrical Technician Level 6. 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 Electrical 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 Engineering Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for an Electrical Technician. These standards will be the bases for development of a competency-based curriculum for Electrical Technician Level 6. These Standards will also be the bases 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 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 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 ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE

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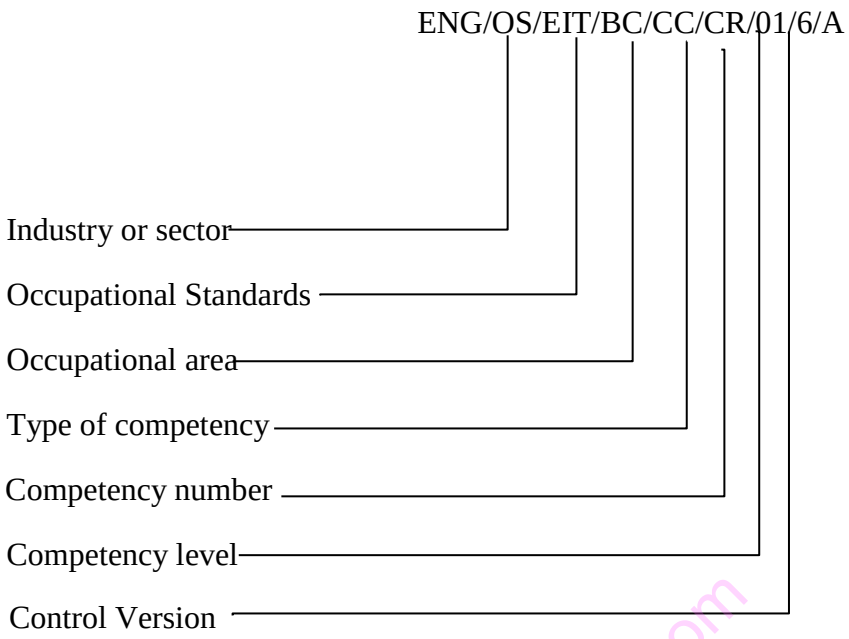
ACRONYMNS AND ABBREVIATIONS

ENG	Engineering
IEE	Institute of Electrical engineers
IEC	International Electrotechnical Commission
KEBS	Kenya Bureau of Standards
EPRA	Energy and petroleum regulatory Authority
NCA	National Construction Authority
OSHA	Occupational Safety and Health Act
WIBA	Work injury benefits Act
IBMS	Integrated Building Management System
EHS	Environment, Health and Safety
CDACC	Curriculum Development, Assessment and Certification Council
CAD	Computer Aided Design
HAVC	Heating, Ventilation and Air Conditioning
CCTV	Closed Circuit Television
IBMS	Integrated Building Management System
PPE	Personal Protective Equipment
TVET	Technical and Vocational Education and Training
OS	Occupational Standards
BC	Basic Competencies
CC	Common Competencies
A	Control Version

KEY TO UNIT CODE



OVERVIEW

Electrical Technician Level 6 qualification consists of competencies that a person must achieve to enable him/her to be certified as an Electrical technician.

Electrical Technician is a person who will carry out electrical installation work using a given design and customer's requirements. This work demands the technician to read and interpret electrical designs made by a designer so that the electrical technician interprets the design and installs the system according to the national and international standards. Moreover, the size and quantity of all materials, cables, control equipment and accessories and specifications for the items necessary to install the electrical systems will largely be determined by the project owner and electrical technician. Therefore, an electrical technician is a well-trained person who can carry out these responsibilities. Thus, the units of competency comprising Electrical Technician certificate level 6 qualification include the following basic and core competencies:

BASIC COMPETENCIES

Unit of Competency Code	Unit of Competency Title
ENG/OS/EIT/BC/01/6/A	Demonstrate communication skills
ENG/OS/EIT/CC/02/6/A	Demonstrate Digital Literacy
ENG/OS/EIT/BC/03/6/A	Demonstrate entrepreneurial skills
ENG/OS/EIT/BC/04/6/A	Demonstrate employability skills
ENG/OS/EIT/BC/05/6/A	Demonstrate environmental literacy
ENG/OS/EIT/BC/06/6/A	Demonstrate occupational safety and health practices

COMMON COMPETENCIES

Unit of Competency Code	Unit of Competency Title
ENG/OS/EIT/CC/01/6/A	Apply Engineering Mathematics
ENG/OS/EIT/CC/02/6/A	Apply Electrical Principles
ENG/OS/EIT/CC/03/6/A	Apply Workshop process
ENG/OS/EIT/CC/04/6/A	Prepare and interpret Technical drawings

CORE COMPETENCIES

Unit of Competency Code	Unit of Competency Title
ENG/OS/EIT/CR/01/6/A	Plan electrical installation works
ENG/OS/EIT/CR/02/6/A	Perform electrical installation
ENG/OS/EIT/CR/03/6/A	Manage electrical installation sites
ENG/OS/EIT/CR/04/6/A	Perform testing of electrical installation
ENG/OS/EIT/CR/05/6/A	Perform commissioning of electrical systems
ENG/OS/EIT/CR/06/6/A	Maintain electrical systems
ENG/OS/EIT/CR/07/6/A	Perform electrical system breakdown maintenance

BASIC UNITS OF COMPETENCY

DEMONSTRATE COMMUNICATION SKILLS

UNIT CODE: ENG/OS/EIT/BC/01/6/A

UNIT DESCRIPTION

This unit covers the competencies required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups and contribute to the development of communication strategies.

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. Meet communication needs of clients and colleagues	1 .1Specific communication needs of clients and colleagues are identified and met 1 .2 Different approaches are used to meet communication needs of clients and colleagues 1 .3 Conflict is addressed promptly and in a timely way and in a manner which does not compromise the standing of the organization
2. Contribute to the development of communication strategies	2.1 Strategies for internal and external dissemination of information are developed, promoted, implemented and reviewed as required 2.2 Channels of communication are established and reviewed regularly 2.3 Coaching ineffective communication is provided 2.4 Work related network and relationship are maintained as necessary 2.5 Negotiation and conflict resolution strategies are used where required 2.6 Communication with clients and colleagues is appropriate to individual needs and organizational objectives
3. Conduct interviews	3.1 A range of appropriate communication strategies are employed in ***interview situations*** 3.2 Records of interviews are made and maintained in accordance with organizational procedures 3.3 Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated
4. Facilitate	4.1 Mechanisms which enhance effective group interaction is

group discussions	defined and implemented 4.2 Strategies which encourage all group members to participate are used routinely 4.3 Objectives and agenda for meetings and discussions are routinely set and followed 4.4 Relevant information is provided to group to facilitate outcomes 4.5 Evaluation of group communication strategies is undertaken to promote participation of all parties 4.6 Specific communication needs of individuals are identified and addressed
5. Represent the organization	5.1 When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization 5.2 Presentation is clear and sequential and delivered within a predetermined time 5.3 Utilize appropriate media to enhance presentation 5.4 Differences in views are respected 5.5 Written communication is consistent with organizational standards 5.6 Inquiries are responded in a manner consistent with organizational standard

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**
Communication strategies includes but not limited:	• Language switch • Comprehension check • Repetition • Asking confirmation • Paraphrase • Clarification request • Translation • Restructuring • Approximation • Generalization
Effective group interaction includes but not limited to:	• Identifying and evaluating what is occurring within an interaction in a non-judgmental way • Using active listening • Making decision about appropriate words, behaviour • Putting together response which is culturally

	appropriate • Expressing an individual perspective • Expressing own philosophy, ideology and background and exploring impact with relevance to communication • Openness and flexibility in communication
Situations includes but not limited to:	• Establishing rapport • Eliciting facts and information • Facilitating resolution of issues • Developing action plans • Diffusing potentially difficult situations

REQUIRED KNOWLEDGE AND SKILLS

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

Required Knowledge

The individual needs to demonstrate knowledge of:

- Communication process
- Dynamics of groups and different styles of group leadership
- Communication skills relevant to client groups
- Flexibility in communication
- Communication skills relevant to client groups
- Key elements of communications strategy.

Required Skills

The individual needs to demonstrate the following skills:

- Effective communication process
- Active listening
- Giving/receiving feedback
- Interpretation of information
- Role boundaries setting
- Negotiation
- Establishing empathy
- Openness and flexibility in communication
- Communication skills required to fulfill job roles as specified by the organization

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 Developed communication strategies to meet the organization requirements and applied in the workplace

		1.2 Established and maintained communication pathways for effective communication in the workplace 1.3 Used communication strategies involving exchanges of complex oral information
2	Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Materials relevant to the proposed activity or tasks
3	Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Written Examination
4	Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
5	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/EIT/BC/02/6/A

UNIT DESCRIPTION

This unit covers the competencies required to effectively use digital devices such as smartphones, tablets, laptops and desktop PCs. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication, work performance and management at the work place.

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 appropriate computer software and hardware	1.1 Concepts of ICT are determined in accordance with computer 1.2 Classifications of computers are determined in accordance with manufacturers specification 1.3 ***Appropriate computer software*** is identified according to manufacturer's specification 1.4 ***Appropriate computer hardware*** is identified according to manufacturer's specification 1.5 Functions and commands of operating system are determined in accordance with manufacturer's specification
2. Apply security measures to data, hardware, software in automated environment	2.1 ***Data security and privacy are classified*** in accordance with the prevailing technology 2.2 ***Security threats*** are identified **and** ***control measures*** are applied in accordance with laws governing protection of ICT 2.3 Computer threats and crimes are detected. 2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
3. Apply computer software in solving tasks	3.1 ***Word processing concepts*** are applied in resolving workplace tasks, report writing and documentation 3.2 ***Word processing utilities*** are applied in accordance with workplace procedures 3.3 Worksheet layout is prepared in accordance with work procedures 3.4 Worksheet is build and data manipulated in the worksheet in accordance with workplace procedures 3.5 Continuous data manipulated on worksheet is undertaken in accordance with work requirements 3.6 Database design and manipulation is undertaken in accordance with office procedures

	3.7 Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures
4. Apply internet and email in communication at workplace	4.1 Electronic mail addresses are opened and applied in workplace communication in accordance with office policy 4.2 Office internet functions are defined and executed in accordance with office procedures 4.3 ***Network configuration*** is determined in accordance with office operations procedures 4.4 Official World Wide Web is installed and managed according to workplace procedures
5. Apply Desktop publishing in official assignments	5.1 Desktop publishing functions and tools are identified in accordance with manufactures specifications 5.2 Desktop publishing tools are developed in accordance with work requirements 5.3 Desktop publishing tools are applied in accordance with workplace requirements 5.4 Typeset work is enhanced in accordance with workplace standards
6. Prepare presentation packages	6.1 Types of presentation packages are identified in accordance with office requirements 6.2 Slides are created and formulated in accordance with workplace procedures 6.3 Slides are edited and run in accordance with work procedures 6.4 Slides and handouts are printed according to work requirements

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**
Appropriate computer software may include but not limited to:	A collection of instructions or computer tools that enable the user to interact with a *computer*, its hardware, or perform tasks.
Appropriate computer hardware may include but not limited to:	Collection of physical parts of a computer system such as; • Computer case, monitor, keyboard, and mouse • All the parts inside the computer case, such as the hard disk drive, motherboard and video card
Data security and privacy may include but not limited to:	• Confidentiality of data • Cloud computing • Integrity -but-curious data surfing
Security and control	• Counter measures against cyber terrorism

measures may include but not limited to:	• Risk reduction • Cyber threat issues • Risk management • Pass-wording
Security threats may include but not limited to:	• Cyber terrorism • Hacking
Word processing concepts may include but not limited to:	Using a special program to create, edit and print documents
Network configuration may include but not limited to:	Organizing and maintaining information on the components of a computer network

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 (applying fundamental operations such as addition, subtraction, division and multiplication)
- Using calculator
- Basic ICT skills

Required Knowledge

The individual needs to demonstrate knowledge of:

- Software concept
- Functions of computer software and hardware
- Data security and privacy
- Computer security threats and control measures
- Technology underlying cyber-attacks and networks
- Cyber terrorism
- 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 sheets;

- ✓ Meaning, formulae, function and charts, uses and layout
- ✓ Data formulation, manipulation and application to cells
- ✓

- Database;
  - ✓ Database design, data manipulation, sorting, indexing, storage retrieval and security
- Desktop publishing;
  - ✓ Designing and developing desktop publishing tools
  - ✓ Manipulation of desktop publishing tools
  - ✓ Enhancement of typeset work and printing documents
- Presentation Packages;
  - ✓ Types of presentation Packages
  - ✓ Creating, formulating, running, editing, printing and presenting slides and handouts
- Networking and Internet;
  - ✓ Computer networking and internet.
  - ✓ Electronic mail and world wide web
- Emerging trends and issues in ICT;
  - ✓ Identify and integrate 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: 1.1 Identified and controlled security threats 1.2 Detected and protected computer crimes 1.3 Applied word processing in office tasks 1.4 Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures 1.5 Opened electronic mail for office communication as per workplace procedure 1.6 Installed internet and World Wide Web for office tasks in accordance with office procedures 1.7 Integrated emerging issues in computer ICT applications 1.8 Applied laws governing protection of ICT
2. Resource Implications	Resources such as the following should be provided. This include; Tablets, Laptops, Desktop PCs, Calculator, Internet, Smart phone, Operation Manuals etc.
3. Methods of Assessment	Competency may be assessed through: 3.1 Written Test 3.2 Demonstration 3.3 Practical assignment

	3.4 Interview/Oral Questioning 3.5 Demonstration
4. Context of Assessment	Competency may be assessed in an off and on the job setting
5. 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/EIT/BC/03/6/A

UNIT DESCRIPTION

This unit covers the competencies required in meeting communication needs of clients and colleagues; developing, establishing, maintaining communication pathways and strategies. It also covers competencies for conducting interview, facilitating group discussion and representing the organization in various forums.

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. Meet communication needs of clients and colleagues	1.1 Specific communication needs of clients and colleagues are identified and met 1.2 Different approaches are used to meet communication needs of clients and colleagues 1.3 Conflict is addressed promptly and in a timely way and in a manner, which does not compromise the standing of the organization
2. Develop communication strategies	2.1 Strategies for effective internal and external dissemination of information are developed to meet the organization's requirements 2.2 Special communication needs are considered in developing strategies to avoid discrimination in the workplace 2.3 Communication ***strategies*** are analyzed, evaluated and revised where necessary to make sure they are effective
3. Establish and maintain communication pathways	3.4 Pathways of communication are established to meet requirements of organization and workforce 3.5 Pathways are maintained and reviewed to ensure personnel are informed of relevant information
4. Promote use of communication strategies	4.1 Information is provided to all areas of the organization to facilitate implementation of the strategy 4.2 Effective communication techniques are articulated and modelled to the workforce 4.3 Personnel are given guidance about adapting communication strategies to suit a range of contexts
5. Conduct interview	5.1 A range of appropriate communication strategies are employed in ***interview situations*** 5.2 Records of interviews are made and maintained in accordance with organizational procedures 5.3 Effective questioning, listening and nonverbal

	communication techniques are used to ensure that required message is communicated
6. Facilitate group discussion	6.1 Mechanisms which enhance ***effective group interaction*** is defined and implemented 6.2 Strategies which encourage all group members to participate are used routinely 6.3 Objectives and agenda for meetings and discussions are routinely set and followed 6.4 Relevant information is provided to group to facilitate outcomes 6.5 Evaluation of group communication strategies is undertaken to promote participation of all parties 6.6 Specific communication needs of individuals are identified and addressed
7. Represent the organization	7.1 When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization 7.2 Presentation is clear and sequential and delivered within a predetermined time 7.3 Appropriate media is utilized to enhance presentation 7.4 Differences in views are respected 7.5 Written communication is consistent with organizational standards 7.6 Inquiries are responded in a manner consistent with organizational standard

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**
Communication ***strategies*** include but not limited to:	• Language switch • Comprehension check • Repetition • Asking confirmation • Paraphrase • Clarification request • Translation • Restructuring • Approximation • Generalization

Effective group interaction includes but not limited to:	• Identifying and evaluating what is occurring within an interaction in a nonjudgmental way • Using active listening • Making decision about appropriate words, behavior • Putting together response which is culturally appropriate • Expressing an individual perspective • Expressing own philosophy, ideology and background and exploring impact with relevance to communication
Situations include but not limited to:	• Establishing rapport • Eliciting facts and information • Facilitating resolution of issues • Developing action plans • Diffusing potentially difficult situations

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:

- Effective communication
- Active listening
- Giving/receiving feedback
- Interpretation of information
- Role boundaries setting
- Negotiation
- Establishing empathy
- Openness and flexibility in communication
- Communication skills required to fulfill job roles as specified by the organization
- Writing communications strategy
- Applying key elements of communications strategy

Required Knowledge

The individual needs to demonstrate knowledge of:

- Communication process
- Dynamics of groups and different styles of group leadership
- Communication skills relevant to client groups
- Flexibility in communication
- Communication skills relevant to client groups
- Key elements of communications strategy

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 Developed communication strategies to meet the organization requirements and applied in the workplace 1.2 Established and maintained communication pathways for effective communication in the workplace 1.3 Used communication strategies involving exchanges of complex oral information
2. Resource Implications	The following resources should be provided: 4. 1Access to relevant workplace or appropriately simulated environment where assessment can take place 4. 2Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation/Demonstration with Oral Questioning 3.2 Written Examination
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
5. 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/EIT/BC/04/6/A

UNIT DESCRIPTION

This unit covers competencies required to demonstrate employability skills. It involves competencies for exuding self-awareness and dealing with everyday life challenges; demonstrating critical safe work habits and leading a workplace team; planning and organizing work activities; applying learning, creativity and innovativeness in workplace functions; pursuing professional growth and managing time effectively in the 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. Develop self-awareness and understanding of every day demands and challenges in the workplace	1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 1.2 Emotions are managed as per workplace requirement 1.3 Thoughts, feelings and beliefs are expressed in direct, honest and appropriate ways. 1.4 Feelings are shared with others according to personal issues for healthy relations. 1.5 Individual performance is evaluated and monitored according to the agreed targets. 1.6 Assertiveness is developed and maintained based on the requirements of the job. 1.7 Own ideas and visions that generates excitement, enthusiasm and commitment are articulated. 1.8 Accountability and responsibility for own actions are demonstrated. 1.9 Self-esteem and a positive self-image are developed and maintained.
2. Demonstrate critical safe work habits for employees in the workplace	2.1 Stress is managed at the workplace in accordance with workplace procedures. 2.2 Punctuality and time consciousness is demonstrated in line workplace policy. 2.3 Personal objectives are integrated with organization goals in accordance with organization's strategic Plan. 2.4 Resources are effectively utilized in accordance with workplace policy. 2.5 Work priorities are set and met in according to

	workplace procedures. 2.6 Leisure time is recognized and used productively in line with organization policy. 2.7 Abstinence from drug and substance abuse is demonstrated as per workplace policy. 2.8 Awareness of HIV and AIDS is demonstrated in line with workplace requirements. 2.9 Safety consciousness is demonstrated in the workplace based on organization safety policy. 2.10 Emerging issues are dealt with in accordance with organization policy.
3. Lead a workplace team	3.1 Role and objectives of the team are determined in accordance workplace policy. 3.2 Team parameters and relationships are identified according to set rules and regulations. 3.3 Individual responsibilities are identified in accordance with work procedures. 3.4 Effective and appropriate forms of communication in a team are established according to office policy. 3.5 Business communication is carried out as per workplace place policy and requirements of the job. 3.6 Team activities are complemented in accordance with office procedures. 3.7 Team building activities are planned for in line with organization policy. 3.8 Conflicts are resolved between team members in line with organization rules and regulations. 3.9 ***Gender mainstreaming*** is undertaken in accordance with set regulations. 3.10 Human rights are adhered to in accordance with existing protocol. 3.11 Healthy relationships are developed and maintained for harmonious co-existence in line with workplace
4 Plan and organize work	4.1 Work schedules are developed for accomplishing given tasks within the set time lines and based on workplace policy. 4.2 Time is managed achieve workplace set goals and objectives. 4.3 Clear project goals and deliverables are established according to company set policies and regulations. 4.4 Resources are mobilized, allocated and utilized to meet project goals and deliverables. 4.5 Work activities are monitored and evaluated in line with organization procedures. 4.6 Situations that require decision making are identified within the work place and decision made in

	accordance with workplace policy. 4.7 Steps required in making effective decisions are applied within the workplace. 4.8 Problems arising in the course of working are identified and solved or reported according the workplace policies and procedures. 4.9 Values required in problem solving process are demonstrated at the work place. 4.10 Situations within the workplace that require negotiation identified and negotiations done to create win-win situations. 4.11 Negotiation techniques are developed and applied at workplace to meet clientele's satisfaction and organizations' objectives.
5. Maintain professional growth and development in the workplace	5.1 Personal training needs are assessed and identified in line with the requirements of the job. 5.2 ***Training and career opportunities*** are identified and availed based on job requirements. 5.3 Resources for training are mobilized and allocated based organizations skills needs. 5.4 Licensees and certifications relevant to job and career are obtained and renewed. 5.5 Personal growth is pursued towards improving the qualifications set for the profession. 5.6 Work priorities and commitments are managed based on requirement of the job and workplace policy. 5.7 ***Recognitions*** are sought as proof of career advancement in line with professional requirements.
6. Demonstrate learning, creativity and innovativeness in the workplace	6.1 Time and effort is invested in learning new skills-based job requirements. 6.2 Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace. 6.3 Learning opportunities are sought and allocated based on job requirement and in line with organization policy. 6.4 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job. 6.5 Application of a range of basic IT skills is demonstrated based on requirements of the job. 6.6 Awareness of Occupational Health and Safety procedures are demonstrated in use of technology in the workplace. 6.7 Initiative is taken to create more effective and efficient processes and procedures in line with

	workplace policy. 6.7 New systems are developed and maintained in accordance with the requirements of the job. 6.8 Opportunities that are not obvious are identified and exploited in line with organization objectives. 6.9 Opportunities for performance improvement are identified proactively in area of work. 6.10 Awareness of personal role in workplace innovation is demonstrated.

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**
Drug and substance abuse include but not limited to:	Commonly abused • Alcohol • Tobacco • Miraa • Over-the-counter drugs • Cocaine • Bhang • Glue
Feedback includes but not limited to:	• Verbal • Written • Informal • Formal
Clients includes but not limited to:	• New clients • Existing clients • Internal clients • External clients
Relationships includes but not limited to:	• Man/Woman • Trainer/trainee • Employee/employer • Client/service provider • Husband/wife • Boy/girl • Parent/child • Sibling relationships
Communication methods include but not limited to:	• Written • Talk/presentation • Video

	• Audio • Graphical • Modeling
Team includes but not limited to:	• Small work group • Staff in a section/department • Inter-agency group
Personal growth includes but not limited to:	• Growth in the job • Career mobility • Gains and exposure the job gives • Net workings • Benefits that accrue to the individual as a result of noteworthy performance
Personal objectives include but not limited to:	• Long term • Short term • Broad • Specific
Trainings and career opportunities includes but not limited to	• Participation in training programs ✓ Technical ✓ Supervisory ✓ Managerial ✓ Continuing Education • Serving as Resource Persons in conferences and workshops
Resource include but not limited to:	• Human • Financial • Technology ✓ Hardware ✓ Software
Innovation include but not limited to:	• New ideas • Original ideas • Different ideas • Methods/procedures • Processes • New tools
Emerging issues 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:

- Personal hygiene practices
- Intra and Interpersonal skills
- Communication skills
- Knowledge management
- Interpersonal skills
- Critical thinking skills
- Observation skills
- Organizing skills
- Negotiation skills
- Monitoring skills
- Evaluation skills
- Record keeping skills
- Problem solving skills
- Decision Making skills
- Resource utilization skills
- Resource mobilization skills

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
- Resources and allocating resources
- Organizing work
- Monitoring and evaluation
- Record keeping
- Workplace problems and how to deal with them
- Negotiation
- Assertiveness
- Team work
- Gender mainstreaming
- HIV and AIDS
- Drug and substance abuse
- Leadership
- Safe work habits

- Professional growth and development
- Technology in the workplace
- Learning
- Creativity
- 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: 1.1 Attained job targets within key result areas. 1.2 Maintained intra- and inter-personal relationship in the course of managing oneself. 1.3 Completed trainings and career progression opportunities in time. 1.4 Was punctual and time conscious. 1.5 Acquired and maintained licenses and/or certifications required for the job. 1.6 Planned and organized resources to achieve organization goals and objectives. 1.7 Monitored and evaluated work activities. 1.8 Identified, analyzed and solved problem arising in the course of working. 1.9 Was conscious of health and safety while carrying out work functions. 1.10 Maintained a mentorship and coaching program for employees. 1.11 Innovatively made work processes and procedures more efficient. 1.12 Mainstreamed gender issues in the workplace. 1.13 Build a strong team of workers in the workplace. 1.14 Sought and allocated learning opportunities and resources in the workplace. 1.15 Demonstrated awareness of HIV and AIDS. 1.16 Abstained from drug and substance abuse. 1.17 Demonstrated ability to cope with emerging issues.
2. Resource Implications	The following resources should be provided: 2.1 Workplace or assessment location 2.2 Case studies/scenarios
3. Methods of	Competency in this unit may be assessed through:

Assessment	3.1 Oral Interview 3.2 Observation 3.3 Third Party Reports 3.4 Written tests
4. Context of Assessment	4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group
5. 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/EIT/BC/05/6/A

UNIT DESCRIPTION

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, comply with workplace sustainable resource use, evaluate current practices in relation to resource usage, develop and adhere to environmental protection principles/strategies/guidelines.

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	1.1 ***Storage methods*** for environmentally ***hazardous*** materials are strictly followed according to environmental regulations and OSHS. 1.2 ***Disposal methods*** of hazardous wastes are followed always according to environmental regulations and OSHS. 1.3 ***PPE*** is used according to OSHS.
2. Control environmental Pollution control	2.1 Environmental pollution ***control measures*** are compiled following standard protocol. 2.2 Procedures for solid waste management are observed according to Environmental Management and Coordination Act 1999 2.3 Methods for minimizing ***noise pollution*** complied following environmental regulations.
3. Demonstrate sustainable resource use	3.1 Methods for minimizing wastage are complied with. 3.2 Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing or reducing resource consumption are practiced.
4. Evaluate current practices in relation to resource usage	4.1 Information on resource efficiency **systems and procedures** are collected and provided to the work group where appropriate. 4.2 Current resource usage is measured and recorded by members of the work group. 4.3 Current purchasing strategies are analyzed and recorded according to industry procedures. 4.4 Current work processes to access information and

	data is analyzed following enterprise protocol.
5. Identify Environmental legislations/conventions for environmental concerns	5.1 Environmental ***legislations/conventions*** and local ordinances are identified according to the different ***environmental aspects/impact*** 5.2 ***Industrial standard/environmental practices*** are described according to the different environmental concerns
6. Implement specific environmental programs	6.1 Programs/Activities are identified according to organizations policies and guidelines. 6.2 Individual roles/responsibilities are determined and performed based on the activities identified. 6.3 Problems/constraints encountered are resolved in accordance with organizations' policies and guidelines 6.4 Stakeholders are consulted based on company guidelines
7. Monitor activities on Environmental protection/Programs	7.1 Activities are periodically monitored and evaluated according to the objectives of the environmental Program 7.2 Feedback from stakeholders are gathered and considered in proposing enhancements to the program based on consultations 7.3 Data gathered are analyzed based on evaluation requirements 7.4 Recommendations are submitted based on the findings 7.5 Management support systems are set/established to sustain and enhance the program 7.6 Environmental incidents are monitored and reported to concerned/proper authorities

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**
PPE include but are not limited to:	• Mask • Gloves • Goggles • Safety hat • Overall • Hearing protector • Safety boots

Environmental pollution control measures include but are 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
Waste management procedure include but are not limited to:	• Sorting • Storing of items • Recycling of items • Disposal of items
Resources may include but are not limited to:	• Electric • Water • Fuel • Telecommunications • Supplies • Materials
Workplace environmental hazards include but are not limited to:	• Biological hazards • Chemical and dust hazards • Physical hazards
Organizational systems and procedures include but are not limited to:	• Supply chain, procurement and purchasing • Quality assurance • Making recommendations and seeking approvals

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 1.4 Evaluated current practices in relation to resource usage 1.5 Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns. 1.6 Described industrial standard environmental practices according to the different environmental issues/concerns. 2.1 Resolved problems/ constraints encountered based on management standard procedures 2.2 Implemented and monitored environmental practices on a periodic basis as per company guidelines 2.3 Recommended solutions for the improvement of the Program 2.4 Monitored and reported to proper authorities any

	environmental incidents
2. Resource Implications	The following resources should be provided: 2.1 Workplace with storage facilities 2.2 Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.) 2.3 PPE 2.4 Manuals and references 2.5 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection 2.6 Case studies/scenarios relating to environmental Protection
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration 3.2 Oral questioning 3.3 Written examination 3.4 Interview/Third Party Reports 3.5 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad) 3.6 Simulations and role-plays
4 Context of Assessment	Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment.
5 Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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:

- Following storage methods of environmentally hazardous materials
- Following disposal methods of hazardous wastes
- Using PPE
- Practicing OSHS
- Complying environmental pollution control
- Observing solid waste management
- Complying methods of minimizing noise Pollution
- Complying methods of minimizing wastage
- Employing waste management procedures
- Economizing resource consumption
- Listing of resources used
- Measuring current usage of resources
- Identifying and reporting workplace environmental hazards
- Conveying all environmental issues
- Following environmental regulations

- Identifying environmental regulations
- Assessing procedures for assessing compliance
- Collecting information on environmental and resource efficiency systems and procedures, and Providing information to the work group
- Measuring and recording current resource usage
- Analysing and recording current purchasing strategies.
- Analysing current work processes to access information and data and Assisting identifying areas for improvement
- Analysing resource flow
- Determining efficiency of use/conversion of resources
- Determining causes of low efficiency of use
- Developing plans for increasing the efficiency of resource use
- Checking resource use plans
- Complying to regulations/licensing requirements
- Determining benefit/cost of plans
- Ranking proposals based on benefit/cost compared to limited resources
- Checking proposals meet regulatory requirements
- Monitoring implementation
- Adjusting plan and implementation
- checking new resource usage

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
- 3Rs principle
- Types of resources
- Techniques in measuring current usage of resources
- Calculating current usage of resources
- Types of workplace environmental hazards
- Environmental regulations
- Environmental regulations applying to the enterprise.

- Procedures for assessing compliance with environmental regulations.
- Collection of information on environmental and resource efficiency systems and procedures,
- Measurement and recording of current resource usage
- Analysis and recording of current purchasing strategies.
- Analysis current work processes to access information and data Analysis of data and information
- Identification of areas for improvement
- Resource consuming processes
- Determination of quantity and nature of resource consumed
- Analysis of resource flow of different parts of the resource flow process
- Use/conversion of resources
- Causes of low efficiency of use
- Increasing the efficiency of resource use
- Inspection of resource use plans
- Regulations/licensing requirements
- Determine benefit/cost for alternative resource sources
- Benefit/costs for different alternatives
- Components of proposals
- Criteria on ranking proposals
- Regulatory requirements
- Proposals for improving resource efficiency
- Implementation of resource efficiency plans
- Procedures in monitor implementation
- Adjustments of implementation plan
- Inspection of new resource usage

DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE: ENG/OS/EIT/BC/06/6/A

UNIT DESCRIPTION

This unit specifies the competencies required to lead the implementation of workplace's safety and health program, procedures and policies/guidelines.

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 workplace hazards and risk	1.1 ***Hazards*** in the workplace and/or its ***indicators*** of its presence, are identified 1.2 ***Evaluation and/or work environment*** measurements of OSH hazards/risk existing in the workplace is conducted by Authorized personnel or agency 1.3 ***OSH issues and/or concerns*** raised by workers are Gathered
2. Identify and implement appropriate control measures	2.1 Prevention ***and control measures***, including use of s***afety gears / PPE (personal protective equipment)*** for specific hazards identified and implemented 2.2 Appropriate ***risk controls*** based on result of OSH hazard evaluation is recommended. 2.3 ***Contingency measures***, including ***emergency procedures*** during workplace ***incidents and emergencies*** are recognized and established in accordance with organization procedures.
3. Implement OSH programs, procedures and policies/ guidelines	3.1 Information to work team about company OSH program, procedures and policies/guidelines are provided 3.2 Implementation of OSH procedures and policies/ guidelines are participated 3.3 Team members are trained and advised on OSH standards and procedures 3.4 Procedures for maintaining ***OSH-related records*** are implemented

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
Hazards include but are not limited to:	• Physical hazards – impact, illumination, pressure, noise, vibration, extreme temperature, radiation • Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects • Chemical hazards – dusts, fibers, mists, fumes, smoke, • gasses, vapors • Ergonomics Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, • varying metabolic cycles • Physiological factors – monotony, personal • relationship, work out cycle • Safety hazards (unsafe workplace condition) – • confined space, excavations, falling objects, gas • leaks, electrical, poor storage of materials and waste, spillage, waste and debris • Unsafe workers' act (Smoking in off-limited areas, Substance and alcohol abuse at work)
Indicators include but are not limited to:	• Increased of incidents of accidents, injuries • Increased occurrence of sickness or health complaints/ symptoms • Common complaints of workers related to OSH • High absenteeism for work-related reasons
Evaluation and/or work environment measurements include but are not limited to:	• Health Audit • Safety Audit • Work Safety and Health Evaluation • Work Environment Measurements of Physical and Chemical Hazards
OSH issues and/or concerns include but are not limited to:	• Workers' experience/observance on presence of work hazards • Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks) • Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines

Prevention and control measures include but are not limited to:	• Eliminate the hazard (i.e., get rid of the dangerous machine • Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off) • Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) • Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signages, rotation/shifting work schedule) • Use engineering controls to reduce the risk (i.e. use safety guards to machine) • Use personal protective equipment • Safety, Health and Work Environment Evaluation • Periodic and/or special medical examinations of workers
Safety gears /PPE (Personal Protective Equipment's) 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
Appropriate risk controls include but not limited to:	Appropriate risk controls in order of impact are as follows: ○ Eliminate the hazard altogether (i.e., get rid of the dangerous machine) ○ Isolate the hazard from anyone who could be harmed (i.e., keep the machine in a closed room and operate it remotely; barricade an unsafe area off) ○ Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) ○ Use administrative controls to reduce the risk (i.e., train workers how to use equipment safely; train workers about the risks of harassment; issue signage) ○ Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users) ○ Use personal protective equipment (i.e., wear gloves and goggles when using the machine)

Contingency measures include but are not limited to:	• Evacuation • Isolation • Decontamination • (Calling designed) emergency personnel
Emergency procedures include but are not limited to:	• Fire drill • Earthquake drill • Basic life support/CPR • First aid • Spillage control • Decontamination of chemical and toxic • Disaster preparedness/management • Se of fire-extinguisher
Incidents and emergencies include but are not limited to:	• Chemical spills • Equipment/vehicle accidents • Explosion • Fire • Gas leak • Injury to personnel • Structural collapse • Toxic and/or flammable vapour emission.
OSH-related Records include but are not limited to:	• Medical/Health records • Incident/accident reports • Sickness notifications/sick leave application • OSH-related trainings obtained

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:

- Skills on preliminary identification of workplace hazards/risks
- Knowledge management
- Critical thinking skills
- Observation skills
- Coordinating skills
- Communication skills
- Interpersonal skills
- Troubleshooting skills
- Presentation skills
- Training skills

Required Knowledge

The individual needs to demonstrate knowledge of:

- General OSH Principles
- Occupational hazards/risks recognition

- OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
- National OSH regulations; company OSH policies and protocols
- Systematic gathering of OSH issues and concerns
- General OSH principles
- National OSH regulations
- Company OSH and recording protocols, procedures and policies/guidelines
- Training and/or counselling methodologies and strategies

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 Identifies hazards/risks in the workplace and/or its indicators 1.2 Requests for evaluation and/or work environment measurements of OSH hazards/risk in the workplace 1.3 Gathers OSH issues and/or concerns raised by workers 1.4 Identifies and implements prevention and control measures, including use of PPE (personal protective equipment) for specific hazards 1.5 Recommends appropriate risk controls based on result of OSH hazard evaluation and OSH issues gathered 1.6 Establish contingency measures, including emergency procedures in accordance with organization procedures 1.7 Provides information to work team about company OSH program, procedures and policies/guidelines 1.8 Participates in the implementation of OSH procedures and policies/guidelines 1.9 Trains and advises team members on OSH standards and procedures 1.10 Implements procedures for maintaining OSH-related records
2. Resource Implications	The following resources should be provided: 2.1 Workplace or assessment location 2.2 OSH personal records 2.3 PPE 2.4 Health records
3. Methods of Assessment	Competency may be assessed through: 3.1 Portfolio Assessment 3.2 Interview 3.3 Case Study/Situation 3.4 Observation/Demonstration and oral questioning

COMMON UNITS OF COMPETENCY

APPLY ENGINEERING MATHEMATIC

UNIT CODE: ENG/OS/EIT/CC/01/6/A

UNIT DESCRIPTION

This unit describes the competencies required by an Instrumentation Technician to apply a wide range of engineering mathematics in their work. This includes applying algebraic functions, Complex numbers, coordinate geometry, carrying out binomial expansion, calculus, ordinary differential equations, Laplace transforms, power series, Statistics, Fourier series, Vector theory, Matrix and Numerical methods in solving problems

ELEMENTS 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 Algebra	1.1 Calculations involving Indices are performed as per the concept 1.2 Calculations involving Logarithms are performed as per the concept 1.3 Scientific calculator is used in solving mathematical problems in line with manufacturer's manual 1.4 Simultaneous equations are performed as per the rules 1.5 Quadratic equations are calculated as per the concept
2. Apply Trigonometry and hyperbolic functions	2.1 Calculations are performed using trigonometric rules 2.2 Calculations are performed using ***hyperbolic functions***
3. Apply complex numbers	3.1 Complex numbers are represented using Argand diagrams 3.2 Operations involving complex numbers are performed 3.3 Calculations involving complex numbers are performed using De Moivre's theorem
4. Apply Coordinate Geometry	1.1 Polar equations are calculated using coordinate geometry 1.2 Graphs of given polar equations are drawn using the Cartesian plane 1.3 Normal and tangents are determined using coordinate geometry
5. Carry out Binomial Expansion	5.0 Roots of numbers are determined using binomial theorem

	5.1 Errors of small changes are determined using binomial theorem
6. Apply Calculus	6.0 Derivatives of functions are determined using Differentiation 6.1 Derivatives of hyperbolic functions are determined using Differentiation 6.2 Derivatives of inverse trigonometric functions are determined using Differentiation 6.3 Rate of change and small change are determined using Differentiation. 6.4 Calculation involving stationery points of functions of two variables are performed using differentiation. 6.5 Integrals of algebraic functions are determined using integration 6.6 Integrals of trigonometric functions are determined using integration 6.7 Integrals of logarithmic functions are determined using integration 6.8 Integrals of hyperbolic and inverse functions are determined using integration
7. Solve Ordinary differential equations	7.0 First order and second order differential equations are solved using the method of undetermined coefficients 7.1 First order and second order differential equations are solved from given boundary conditions
8. Apply Laplace transforms	8.1 Laplace transforms are solved using initial and final value theorems 8.2 Inverse Laplace transforms are solved using partial fractions 8.3 Differential equations are solved using Laplace transforms
9 Apply Power Series	9.1 Power series are obtained using Taylor's Theorem 9.2 Power series are obtained using Maclaurin's theorem
10 Apply Statistics	10.1 Identification, Collection and Organization of data is performed 10.2 Interpretation, analysis and presentation of data in appropriate format is performed 10.3 Mean, median ,mode and Standard deviation are obtained from given data 10.4 Calculations are performed based on Laws of probability 10.5 Calculation involving probability

	distributions , mathematical expectation sampling distributions are performed
11. Apply Fourier Series	11.1 Fourier series coefficients are obtained using Fourier series techniques 11.2 Fourier series for 2π to T is are obtained using Fourier series techniques 11.3 Fourier series for odd and even functions are obtained using Fourier series techniques 11.4 Harmonic analysis is performed using numerical methods
12.Apply Vector theory	12.1 Calculations involving vector algebra, dot and cross products using vector theory 12.2 Gradient, Divergence and Curl are obtained 12.3 Vector calculations are performed using Green's theorem 12.4 Vector calculations are performed using Stoke's theorem 12.5 Conservative vector fields and line and surface integrals are obtained using Gauss's theorem
13. Apply Matrix	13.1 Determinant and inverse of 3x3 matrix are obtained 13.2 Solutions of simultaneous equations are obtained 13.3 Calculation involving Eigen values and Eigen vectors are performed
14. Apply Numerical methods	14.1 Roots of polynomials are obtained using iterative numerical methods 14.2 Interpolation and extrapolation are performed using numerical methods
15. Apply concepts of probability for work	15.1 Probability events are determined from dependent, independent and mutually exclusive 15.2 Counting is done using permutation, combination, tree diagrams and Venn diagrams techniques
16. Perform commercial calculations	16.1 Exchange rate calculations are done using devaluation and revaluation 16.2 Sales, stock turnover and profit and loss are determined 16.3 Incomes, salaries and wages are calculated
17. Perform estimations, measurements and calculations of quantities	17.1 Measurement information in workplace is extracted and interpreted 17.2 Appropriate workplace measuring tools and are identified and selected

	17.3 Conversions are performed between units of measurement 17.4 Measurements are estimated and taken 17.5 Length, width, height, perimeter, area and angles of ***figures*** are calculated 17.6 Volume and surface area of figures are calculated 17.7Information is recorded using mathematical language and symbols appropriate for the task

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**
Hyperbolic functions include but not limited to:	• Sinh x • Cosh x • Cosec x • Coth x • Tanh x • Sech x
Figures include but not limited to:	• Triangles • Squares • Rectangles • Circles • Spheres • Cylinders • Cubes • Polygons • Cuboids • Pyramids
Quantities include but not limited to:	• Weight, • Mass • Area • Volume • Length • Width • Depth • Perimeter

REQUIRED SKILLS AND UNDERSTANDING

Required Skills

The individual needs to demonstrate the following skills:

• Applying fundamental operations (addition, subtraction, division, multiplication) • Using and applying mathematical formulas	• Problem solving • Applying statistics • Drawing graphs • Using different measuring tools • Logical thinking

Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations

EVIDENCE GUIDE

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

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied Trigonometry and hyperbolic functions 1.2 Applied complex numbers 1.3 Determined angles and length in triangles 1.4 Applied Calculus 1.5 Solved Ordinary differential equations 1.6 Applied Laplace transforms 1.7 Applied Power Series 1.8 Applied Fourier Series 1.9 Applied Vector theory 1.10 Applied Matrix 1.11 Identified and selected measuring s 1.12 Collected, Analyzed and presented data 1.13 Applied Numerical methods
2.0 Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring 2.3 Materials relevant to the proposed activity or tasks
3.0 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning

	3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
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/EIT/CC/02/6/A

UNIT DESCRIPTION

This unit describes the competencies required by a technician in order to apply a wide range of Electrical principles in their work; use the concept of basic Electrical quantities, use the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, use of power factor in electrical installation, use of earthing in Electrical installations, use of earthing in Electrical installations and apply 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	1.1 Basic ***SI unit***s in Electrical are identified 1.2 ***Quantitie***s of Charge, force, work and power are identified 1.3 Perform calculations involving Ohm's law i.e Current, Resistance and voltage 1.4 Calculations involving various electrical quantities are performed
2. Use the concepts of D.C and A.C circuits in electrical installation	2.1 Calculations involving parallel and series circuits are performed 2.2 Calculations involving DC and AC Network theorems are performed. E.g. Kirchoff's laws, Superposition, Thevinin's, Norton's
3. Use basic electrical machine	3.1 Types of various electrical machines are identified 3.2 Single phase and three phase motor starting methods are performed 3.3 DC motor starting methods are performed 3.4 Calculations involving single phase and three phase AC and DC Motors are performed 3.5 Calculations involving single and three phase AC and DC transformers are performed 3.6 Calculations involving single and three phase generators are performed 3.7 Special machines are identified 3.8 Calculations involving special machines are performed 3.9 Calculations involving Electric Drives are performed
4. Demonstrate understanding of	4.1 Connections of three phase power supply are performed as per the standard operating procedure

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
three phase power supply	4.2 Calculations involving three phase power supply connections are performed 4.3 Measurements of three phase power supply is performed 4.4 Interconnections of three phase power supply are performed as per the nature of the load.
4. Use power factor in electrical installation	4.1 Power triangle is identified i.e. Active, Apparent and reactive power 4.2 The use of power factor is performed 4.3 Calculations involving power factor correction is performed 4.4 Methods of power factor correction are applied
5. Use earthing in Electrical installations	2.1 Earthing types are identified 2.2 Earthing points on Electrical installation are identified 2.3 Calculation involved in determining the earthing type is performed 2.4 Test on an earthing system is performed in line with the IEE regulations
6. Apply lightning protection measures	6.1 Types of lightening strokes are identified 6.2 Components of lightening protection system are identified 6.3 Test to be carried out in lightening protection system are established 6.4 Application of lightening protection system is determined
7. Apply Electromagnetic field Theory	7.1 Electromagnetic radiation sources are identified 7.2 Detectors of Electromagnetic radiations are determined 7.3 Electromagnetic waves are applied 7.4 Electromagnetics Laws are Identified 7.5 Behaviours and effects of Electromagnetic waves are established
8. Apply Electrodynamics	8.1 Electrostatics terms are identified 8.2 Magnetostatics terms are identified 8.3 Electrodynamics laws are identified
9. Apply Energy and Momentum in Electromagnetic field	9.1 Energy conservation theorem is identified 9.2 Electromagnetic Energy flow is determined
10. Apply transients in Electrical Circuit Analysis	10.1 Growth and decay in R-L-C circuits are determined 10.2 Calculations involving Growth and decay in R-L-C are performed

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.***
11. Use Two Port networks	11.1 Basic passive networks are performed 11.2 Characteristic impedance is determined 11.3 Types of transmission lines and their applications are performed
12. Demonstrate understanding of Refrigeration and Air conditioning	12.1 Use of Refrigeration and Air conditioning is demonstrated 12.2 Installation of the Refrigeration and Air conditioning system is simulated

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
SI units include but not limited to:	• Power – Watts (W) • Current – Amperes (A) • Resistance – Ohms(Ω) • Voltage – Volts (V)
Quantities includes 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
- Power factor correction
- 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
- Power triangle
- 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: 1.1 Applied the correct SI units of Electrical quantities 1.2 Stated, Calculate and relates the quantities in Ohm's law 1.3 Identified the components of an earthing system 1.4 Stated and apply various laws in Electrical system 1.5 Differentiated between AC and DC network 1.6 Applied correct formulas in the calculation of AC and DC machines 1.7 Used power triangle in calculating power factor 1.8 Applied various methods in power factor correction 1.9 Identified types of lightening arrestors and their applications
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
Guidance	Holistic assessment with other units relevant to the industry

information for assessment	sector, workplace and job role is recommended.

PERFORM WORKSHOP PROCESSES

UNIT CODE: ENG/OS/EIT/CC/03/6/A

UNIT DESCRIPTION

This unit covers the competencies required to perform workshop processes. Competencies include applying workshop Safety, use of workshop tools, instruments and , 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 .

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 workshop safety	1.1 Proper use of PPE is adhered to as per standard operating procedure 1.2 Workshop rules are followed as per standard operating procedure 1.3 Proper use of safety s are followed as per the manufacturers recommendations 1.4 First Aid procedures are adhered to
2. Use workshop tools, Instruments and	2.1 ***Workshop tools***, Instruments and s are Identified 2.2 Tools, Instruments and are used as per the manufactures manuals 2.3 Calibration of workshop instruments are performed as per the standard operating procedure 2.4 Proper handling of workshop tools, Instruments and should be followed 2.5 Care and Maintenance of workshop tools, Instruments and s should be adhered too
3 Prepare workshop tools and instruments for an Electrical installation practical e.g.	3.1 List of required tools and instruments are prepared 3.2 Issuing of required tools and instruments is performed 3.3 Confirmation of the issued tools and instruments is performed 3.4 Functioning of the issued tools and instruments is checked in line with the standard operating procedure

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. ***(Bold and italicised terms are elaborated in the Range)***
	3.5 Sharpening of the cutting tools is performed
4 Prepare workshop for an Electrical practical	4.1 Practical working section is arranged as per the number of practicals to be carried out. 4.2 Power supply availability in every practical section is confirmed as per the practical to be carried out 4.3 Tools and materials required are supplied as per the practical to be carried out.
5 Store Electrical tools and materials after practicals	5.1 Tools are checked against the issuing list after practicals 5.2 Tools are stored out as per their standard operating procedure 5.3 Tools are cleaned as per the workshop standard operating procedure 5.4 Waste materials are disposed as per the EHS 5.5 Tools are stored in their respective sections as per the workshop procedures
6 Troubleshoot and repair/replace workshop tools and	6.1 Faulty tools are identified as per their expected functioning 6.2 Faulty component are diagnosed as per the fault diagnosis procedures 6.3 Repair/Replace faulty components as per the expected functioning 6.4 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
Workshop tools include but not limited to:	• Pliers • Hacksaws • Hammer • Spirit levels

Variable	Range
	• Phase Tester • Side cutters
Manual include but not limited to:	• Operational • Installation • Commissioning • Technical specification /data sheet
Parameters include but not limited to:	• Light intensity • Sound • Speed • Efficiency • Temperature • Electrical quantities e.g. Voltage, current and resistance levels

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• Health and safety • Environment • PPE • Use of service manual • Fault identification and diagnosis • Use of workshop tools and • Workshop tools and materials • Material handling	• Repair, modification and replacement of defective parts or components • Report writing • Legal and statutory requirement in telecommunication industry • Workshop procedures • Workshop rules and guidelines • Communication system

FOUNDATION SKILLS

The individual needs to demonstrate the following foundation skills:

• Electrical wiring • Analytical • Problem solving • Faults troubleshooting • Maintenance • Operation of First Aid • Planning	• Decision making • First Aid • Report writing • Communications • Proficient in ICT • Time management • Assembling of communication system

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	**Assessment requires evidence that the candidate:**

	of Competency	1.1 Adhered to the proper use of PPE 1.2 Observed the workshop rules 1.3 Performed the First Aid procedures in the workshop 1.4 Observed workshop procedures in the storage of tools 1.5 Safely used testing and tools 1.6 Observed EHS in the waste disposal 1.7 Properly demonstrated care and maintenance of workshop tools 1.8 Obtained, recorded and interpreted test results 1.9 Identified faulty tools and instruments 1.10 Repaired/Replaced faulty tools
2	Resource Implications	The following resources must be provided: Resources the same as that of workplace are advised to be applied e.g. Installation tool kit, testing , measuring , First Aid kits
3	Methods of Assessment	**Competency may be assessed through:** 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4	Context of Assessment	Competency may be assessed individually in the actual workplace or through a simulated work place setting
5	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/EIT/CC/04/6/A

UNIT DESCRIPTION

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, use and maintain drawing and materials. It also involves producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings and application of Computer Aided Design (CAD) packages.

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)***
1.0 Use and maintain drawing and materials	1.1 ***Drawing*** are identified and gathered according to task requirements 1.2 ***Drawing materials*** are identified and gathered according to task requirements 1.3 Drawing are used and maintained as per manufacturer's instructions 1.4 Drawing materials are used as per workplace procedures 1.5 Waste materials are disposed in accordance with workplace procedures and ***environmental legislations*** 1.6 ***Personal Protective*** is used according to occupational safety and health regulations
2.0 Produce plane geometry drawings	2.1 Different types of lines used in drawing and their meanings are identified according to standard drawing conventions 2.2 Different types of ***geometric forms*** are constructed according to standard conventions 2.3 Different types of angles are constructed according to principles of trigonometry 2.4 Different types of angles are measured using appropriate measuring tools 2.5 Angles are bisected according to standard conventions 2.6 Freehand sketching of different types of geometric forms, tools, , diagrams is conducted
3.0 Produce solid geometry drawings	3.1 Drawings of patterns are interpreted according to standard conventions 3.2 Patterns are developed in accordance with standard conventions

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)***
4.0 Produce orthographic and pictorial drawings	4.1 Symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions 4.2 First and third angle orthographic drawings are interpreted and produced in accordance with the standard conventions 4.3 Orthographic elevations are dimensioned in accordance with standard conventions 4.4 Isometric drawings are interpreted and produced in accordance with standard conventions 4.5 Assembly drawing is produced and interpreted in line with the operating standards
5. Produce electrical drawings	5.1 Electrical symbols and abbreviations are identified and their meaning interpreted according to BS 3939 5.2 ***Electrical drawings*** are produced in accordance with BS 3939
6. Apply CAD packages	1.1 CAD packages are selected according to task requirements 1.2 CAD packages are applied in production of electrical drawings

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 include but not limited to:	Drawing boards, T and set squares, drawing sets, computers with CAD packages
2. Drawing materials include but not limited to:	Drawing papers, pencils, erasers, masking tapes, paper clips
3. Environmental legislations include but not limited to:	EMCA 1999
4. Personal Protective include but not limited to:	Dust coats, closed leather shoes
5. Geometric forms include but not limited to:	Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci
6. Standard conventions include but 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
7. Electrical drawings include but not limited to:	Block, schematic, circuit, line and 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 handling
- Analysis and synthesis
- Communication
- Inter personal

Required knowledge
The individual needs to demonstrate knowledge of:

- Drawing and materials
- Freehand sketching
- Lettering
- Geometrical constructions
- Types of drawings
- Types of lines
- Isometric drawing conventions, features, characteristics, components
- Orthographic drawing conventions, features, characteristics, components
- 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: 1.1 Applied and adhered to safety procedures 1.2 Cared and maintained drawing 1.3 Interpreted circuit, assembly and lay out diagrams 1.4 Applied appropriate technical standards, used proper tools and for a given task 1.5 Produced sketches and drawings 1.6 Applied CAD packages in production of drawings

2. Resource Implications	Resources the same as that of workplace are advised to be applied. Which include; drawing room, drawing and materials, computers, CAD packages 2.1 Drawing room 2.2 Drawing and materials 2.3 Computers 2.4 CAD packages
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or a simulated work place setting
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

CORE UNITS OF COMPETENCY

PLAN ELECTRICAL INSTALLATION WORK

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

UNIT DESCRIPTION

This unit covers the competencies required to plan electrical installation works. It is for Electrical Technicians involved in the different types of electrical installation and systems, ranging from simple to complex installations.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***(Bold and italicised terms are elaborated in the Range)***
1. Conduct site survey	1.1 The site is surveyed for suitability for the type of installation to be done as per the contract 1.2 Conditions of the site are evaluated according to the established procedures 1.3 The best location and route for the installation is identified as per design 1.4 Actual measurements are taken 1.5 Survey report is generated and shared with relevant parties according to the established procedures
2. Perform system sizing	2.1 Load estimation is conducted according to the set standard 2.2 Type and size of protective devices is determined according to IEE regulations 2.3 Cable sizes are calculated for the estimated loads according to IEE regulations 2.4 System sizes are recorded and shared as per established procedures
3. Prepare list of tools, equipment & materials	3.1 The necessary tools and equipment needed for the work are determined and list prepared as per established procedure 3.2 Tools and equipment are checked for correct specifications and functionality and list prepared as per established procedure 3.3 Materials needed for the work are determined and list prepared as per established procedure
4. Arrange logistics	4.1 Necessary logistics for the particular work and site is determined 4.2 Determined logistics are reported and arranged

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)***
	with the responsible party according to work schedule
5. Prepare installation work plan	5.1 Official request is made for installation drawings 5.2 Installation drawing is acquired and deposited in a safe place as per established procedure 5.3 The scope of installation work is identified 5.4 All work is undertaken safely and to workplace procedures, 5.5 National/County regulations and legislative requirements 5.6 Working drawing is prepared in accordance with the design drawing 5.7 Work schedule is prepared based on the scope and the working drawing
6. Establish installation team	6.1 Team members are identified according to the task 6.2 Communication protocol is designed and distributed among the team members 6.3 Responsibilities are established and distributed among the team members 6.4 Team familiarization is done according to the established procedure
7. Acquire working permit	7.1 Type of permit to work is identified where applicable 7.2 Permit to work issuing body is identified 7.3 Permit to work form is filled and submitted to the responsible body
8. Prepare work site	8.1 Special work, hazard and safety requirements are identified 8.2 Identified hazards and Safety issues are mitigated according to OSHA 8.3 (Occupational Safety and Health Act 8.4 Work plan is confirmed in accordance with legislative and regulatory requirements and standard operating procedures. 8.5 Work site is prepared for accessibility of utilities
9. Prepare tenders and service contracts	9.1 Laws of contracts and tendering are adhered to types and forms of contracts are identified 9.2 Type of tenders are identified

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)***
	9.3 Tender estimating is performed in line with the tendering laws 9.4 Statutory documents in contract and tendering are identified

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**
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)
Established Procedures may include but is not limited to:	• Company rules • Procedures mentioned in contract
Design may include but is not limited to:	• Electrical design for lighting • and power • Electrical design for switchgear • Electrical design for alarm systems
Standard may include but is not limited to:	• IEE standard • British Standard • KEBS standard • 17th Edition
Logistics includes but not limited to	• Personnel, Finance and input materials • Transport and storage • Communications

Variable	Range
	• Security
Specifications may include but is not limited to:	• Make / model • Size • Class • Tolerance/ range
Regulations and legislative requirements may include but is not limited to	• KPLC procedures • County bylaws • Energy Act, 2006 • National Construction • Authority Act • 8.5 OSHA
Work schedule may include but is not limited to:	• Gant chart • Block
Permit to work may include but is not limited to:	• KPLC permit • Gate Pass • Daily work permit • Work Tag
Utilities may include but is not limited to:	• Water, electrical power, toilets and • communication

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• The manufacturer's warranty requirements relating to electrical installation systems and related components. • The legal requirements relating to electrical installation • 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	• Communications (verbal and written) • Proficient in ICT • Time management • Problem solving • Negotiation • Decision making • First aid • Report writing • Planning • Contractual agreements • Necessary insurance and policies including security bonds, performance bonds, contractors • Preparing work plans in accordance with legislative and regulatory requirements and standard operating procedures and health and safety requirements

• Materials management • The importance of documentation and keeping records • The relationship between time and costs • The use of technical information including: • Importance of contractual agreements •	• all risks • Insurance of contractors work • Keeping records of income • Financial statements • Interpreting circuits, drawings, specifications and instructions • The importance of using the correct sources of technical information.

FOUNDATION SKILLS

The individual needs to demonstrate the following foundation skills:	
• Communications (verbal and written) • Time management • Proficient in ICT	• Negotiation • Problem solving • Decision making • First aid • Report writing • Planning

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied work health and safety procedures 1.2 Interpreted drawings correctly 1.3 Applied appropriate standard 1.4 Determined types and sizes of materials and equipment and protective devices 1.5 Demonstrated knowledge of logistics to the given task
2. Resource Implications	Resources the same as that of workplace are advised to be applied including. Measuring tape, pegs, calculator, stationery
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report

4. Context of Assessment	Competency may be assessed individually 4.1 In the actual workplace 4.2 Simulated environment of the work place
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

PERFORM ELECTRICAL INSTALLATION

UNIT CODE: ENG/OS/EIT/CR/02/6/A

UNIT DESCRIPTION

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

Installation work includes application of EHS standards, interpretation of drawings and development of working drawing, preparation of tools and equipment, installation of electrical systems, facilitating work team and other service providers throughout the 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	1.1 Appropriate safety regulations are applied 1.2 Occupational health and safety standards are applied 1.3 Good housekeeping practices are applied 1.4 Accidents, incidents and near misses are reported to management immediately 1.5 First aid is applied and specialised treatment is sought where necessary
2. Prepare working drawings	2.1 Installation drawing is interpreted 2.2 Symbols and nomenclatures are applied in accordance with British Standards [BS 3939] 2.3 Appropriate drawing tools are applied 2.4 Components and their ratings are identified 2.5 Cable sizes and lengths are clearly shown 2.6 Power supply and distribution circuits are shown using single line diagrams 2.7 Phase balancing of the loads is done as per the usage 2.8 Cable routes are clearly indicated 2.9 Working drawing is prepared and any deviations shared with relevant bodies
3. Assemble tools, equipment & materials	3.1 Tools, equipment and materials are checked for the proper specifications and functionality 3.2 Tools, equipment and materials are assembled and stored as per the established procedure
4. Observe technical	4.1 The appropriate technical standards for the work is acquired and procedures are checked against

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)***
standards	the standards
5. Coordinate working team	5.1 Tasks and responsibilities are assigned to each team member according to established procedure 5.2 Communication procedures are applied 5.3 Team members are trained as per established procedure
6. Install electrical system	6.1 Appropriate installation procedures and technical standards are applied 6.2 The working drawing is implemented Safety procedures are adhered to for each activity 6.3 Cables, conductors, conduits, enclosures and support Systems are installed to specifications using appropriate techniques, tools and equipment as per the working drawing 6.4 Labelling of the installation for identification is done
7. Facilitate other service providers	7.1 Other service providers on the site are identified 7.2 Communication protocols and procedures are applied 7.3 Service providers are communicated before, during, and after the installation, as necessary 7.4 The requirements of other service providers are obtained and agreed upon 7.5 Provision for other services are made according to the design
8. Maintain house keeping	8.1 Safety check list is prepared for electrical equipment and machines 8.2 Regular follow up is done according to the prepared checklist 8.3 Workplace procedures are followed to deal with any accidents and damage of equipment occurring during the cleaning process 8.4 Activities are recorded and reported as per established procedures

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
Installation materials include but not limited to:	• Accessories • Cables • Meter boxes • CCUs
International standards includes but not limited to:	• ISO 14001 • 90001 •

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• Electrical wiring • Measurement conversions • Load calculations • Power ratings	• Electrical design software • Design tools • Electrical standards

FOUNDATION SKILLS

The individual needs to demonstrate the following additional skills:	
• Electrical codes • Engineering principles • Depth of knowledge of electrical wiring methods • Teamwork • Draw plans • Environmental regulations	• Decision making; • Report writing; • Knowledge of "normal" electricity usage • Read and understand plans and symbols • CAD and basic mechanical drafting/illustration

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: 1.1 Applied and adhered to safety procedures 1.2 Interpreted layouts/ circuit diagrams correctly 1.3 Applied appropriate technical standards Used proper tools and equipment for a given task 1.4 Demonstrated safe selection, placing and wiring of cables/ wires, fixtures and fittings 1.5 Installed functional electrical systems
2. Resource	Resources the same as that of workplace are advised to be applied

Implications	Included: Electrical installation tool kit, calculator, stationery Electrical installation materials Testing equipment Storage facility
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through simulated work environment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

MANAGE ELECTRICAL INSTALLATION SITES

UNIT CODE: ENG/OS/EIT/CR/03/6/A

UNIT DESCRIPTION

This unit covers the competencies required to manage a site where an electrical installation work is done. Managing electrical installation site work includes assigning and monitoring of site works, time management, establishing work relationship, recoding work progress, proper implementation of EHS and working drawings, organizing site meetings and generation of site work report.

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. Assign specific duties	1.1. The type of installation and corresponding duties and procedures are identified based on the contract 1.2. Team members are identified based on their skills as per established procedure 1.3. Duties and responsibilities are assigned to appropriate team members
2. Monitor site activities	2.1. All site activities are identified 2.2. Timelines and procedures are identified based on the work plan 2.3. Monitoring procedures are established as per the contract 2.4. Each activity is monitored according to the time line, safety standard and work place procedure 2.5. Findings are documented and shared as per work place procedure and shared with relevant parties
3. Manage timelines	3.1. Work is carried out in accordance with work plan 3.2. Work progress is recorded and feedback is given to the team members based on the developed timeline 3.3. Work reports are documented and shared with management
4. Keep installation records	4.1. Installation parameters are identified, in accordance with the standard 4.2. Changes of parameters are recorded as per

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)***
	contract
5. Implement EHS standards	5.1 Appropriate EHS standards are identified 5.2 Each activity is monitored against the identified EHS standard 5.3 Any activity against EHS is recorded and reported
6. Implement working drawings	6.1.The working drawing is acquired 6.2.The working drawing is checked for correctness, version and its compliance with the design 6.3.Working drawing is updated and reported to team members 6.4.Electrical installation work is compared with working drawing
7. Prepare installation reports	7.1.Report is generated as per the agreed format and timelines 7.2.Report is shared with the appropriate parties 7.3.Report is filed according to the record management system
8. Establish work relationship	8.1.Established rules of team work are applied 8.2.Relationship rules are established for the workplace 8.3.Work relationships are followed up and reported as per the established procedure
9. Organize site meetings	9.1.Meeting rules and procedures are set up 9.2.Meetings are conducted according to set rules and procedures 9.3.Minutes are recorded according to agreed format 9.4.Reports of meetings are shared among the appropriate parties using the agreed means of communication.

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**
Installation 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)
Site activity include but is not limited to:	• Cable routing • Fitting • Testing • Commissioning • Handing over • Surveying
Team members include but is not limited to:	• Supervisor • Technician • Store keeper • Assistants • Safety officer
Duties include but is not limited to:	• Supervision Testing • Installing • Keeping records • Reporting • Briefing • Security
Timelines may include but is not limited to:	• Daily • Weekly • Fortnightly • Monthly • Quarterly • Yearly
EHS regulation (Environment, Health and Safety)regulation may include but is not limited to:	• EMCA 1999 Act • OSHA
Installation parameters include but is not	• The type of material/installation • Quantity of materials (pieces, length)

Variable	Range
limited to:	• Tools and equipment • Time • Workforce • Weather

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 • Legal requirement related to electrical installations • Specification (manuals for the system) ➢ Legislation and workplace procedures relevant to: ➢ Electrical wiring ➢ Electrical design software ➢ Health and safety; ➢ The environment (including waste disposal); • Appropriate PPEs (personal and protection equipment). • Workplace procedures for: • Recording system installation and maintenance work o Timely reporting of work	• Color coding • Use of electrical & mechanical tools • Troubleshooting • Electrical power distribution • Power protection • Measurement • Electrical standards • The importance of documentation and record keeping • The importance of time management • The relationship between time and costs. • The importance of efficiency

FOUNDATION SKILLS

The individual needs to demonstrate the following foundation skills:	
• Communications (verbal and written) • Proficient in logistic management • Time management • Meeting organization • Analytical • Faults troubleshooting	• Planning • Decision making • First aid • Report writing • Problem solving • Management

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied and adhered to safety procedures 1.2 Applied appropriate standards 1.3 Demonstrated good communication and interpersonal skills 1.4 Assigned tasks and supervised team members 1.5 Prepared reports and maintained records
2. Resource Implications	The following resources must be provided: Resources same as that of workplace are advised to be applied Including: Site office, Office equipment, Stationery
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace and simulated setting of the actual work place
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

PERFORM TESTING OF ELECTRICAL INSTALLATION

UNIT CODE: ENG/OS/EIT/CR/04/6/A

UNIT DESCRIPTION

This unit covers the competencies required to carry out inspection and testing of an electrical installation. The inspection and testing work covers identification of types of test, preparation of test equipment, verifying installed fittings, conducting performance tests, recording testing results, generation of reports and issuance of certificates

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. Identify the test to be carried out	1.1 The installation to be tested is identified 1.2 Test points are identified 1.3 Relevant standards for testing are applied
2. Prepare test equipment	2.1 Appropriate Test equipment are identified 2.2 Test equipment are checked for appropriate specifications and functionality 2.3 Test equipment are prepared and stored for safe and easy access in accordance with established procedure
3. Verify installed fittings	3.1 Visual inspection is carried out 3.2 Fitting points and equipment are identified 3.3 Physical condition of all fittings are verified for safety appropriateness
4. Perform the test	4.1 **Test parameters** are identified 4.2 Test equipment are assembled 4.3 Test sequence procedure is decided based on the test standards 4.4 Safety precautions are adhered to 4.5 Additional precaution is observed on the installation in hazardous environment as per EHS standard 4.6 Tests are carried out 4.7 Functionality of all devices including protective devices is checked as per the set standards 4.8 Test results are recorded as per agreed format 4.9 Test results are compared with permissible data parameters in data sheets and standards

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)***
	4.10 Test report is compiled and shared with relevant parties
5. Issue certificates	5.1 Test certificate is issued to the relevant parties 5.2 Wiring certificate is issued to the relevant parties

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**
Installation may include but is not limited to:	• Domestic • Industrial • Commercial • Agriculture/ horticulture • CCTV • Water heater • Security system • Fire alarm and detection system
Test equipment may include but is not limited to:	• Multimeter/AVO meter • Wattmeter • Insulation resistance tester • Loop impedance tester • Earth resistance tester • Clamp meter • Power quality analyser • Infrared camera • Phase sequence meter • Frequency meter • Synchroscope • Tachometer • Tacho generator • Laser meter • Lux meter

Variable	Range
Visual inspection may include but is not limited to:	• Check for: • Firmness of accessories/equipment • Loose connections • Damaged equipment/component • Colour coding
Fitting points may include but is not limited to:	• 4.1 Switches • 4.2 Cables • 4.3 • Socket outlets • Switches • Cables • Light fittings • Conduits and cable trays • Trunking • Motors • Power generators • Pumps
Test parameters may include but is not limited to:	• Potential difference between circuits • Power • Resistance • Voltage • Current • Inductance/capacitance • Frequency • Q- factor • Power factor • Harmonics • Speed of rotary equipment
Tests may include but is not limited to:	• Continuity • Insulation resistance • Polarity • Earth electrode resistance • Earth fault loop impedance • Phase sequence

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components.	• Workplace procedures for ➢ Using test tools and instruments ➢ Work place communication;

• The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • Legislation and workplace procedures relevant to ➢ Health and safety; ➢ The environment (including waste disposal); ➢ Appropriate personal protection equipment (PPE).	➢ Time management ➢ Tools and equipment management • The importance of documentation and keeping records • The relationship between time and costs. • Performing tests including ➢ Connection of testing equipment ➢ Operation of testing equipment ➢ Recording and interpretation of test results ➢ Making recommendations based on test results ➢ Compiling test report

FOUNDATION SKILLS

The individual needs to demonstrate the following additional skills:	
• Proficient in using test equipment • 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 skills and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied and adhered to safety procedures 1.2 Applied the procedures of testing according to the standard 1.3 Obtained and recorded test values accurately 1.4 Interpreted the recorded test results
2. Resource Implications	Resources the same as that of workplace are advised to be applied. Include: Electrical installation tool kit, Multimeter/AVO meter, Wattmeter, Insulation resistance tester, Clamp meter, Phase sequence meter, Frequency meter, Tacho meter etc.
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning

	3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through simulated work environment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

PERFORM COMMISSIONING OF ELECTRICAL SYSTEMS

UNIT CODE: ENG/OS/EIT/CR/05/6/A

UNIT DESCRIPTION

This unit covers the competencies required for commissioning of electrical installation Systems. Commissioning includes preparation of schedule, formulation of procedures, notification of system readiness, organizing commissioning team, conducting tests, training of users, and issuing of completion certificate(s).

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 commissioning schedule and handover procedure	1.1 ***Relevant parties*** are communicated to in accordance with the contract 1.2 Commissioning schedule is prepared in consultation with the responsible parties 1.3 Handover documents and tools checklists are prepared

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)***
2. Formulate commissioning procedures	2.1 Test and commissioning procedures are formulated according to the design and contract 2.2 Commissioning procedure is shared with responsible parties according to the communication procedure
3. Notify system readiness	3.1 ***System readiness*** notification standard is developed 3.2 Responsible parties are notified as per the established procedure
4. Demonstrate system readiness	4.1 System parameters are identified for demonstration 4.2 System functioning is demonstrated to the 4.3 responsible parties 4.4 Parameters of the functioning system are recorded
5. Conduct user training	5.1 System operation manuals, brochures and as-built drawings are availed 5.2 Safe operation procedure and functioning of the system is identified 5.3 Users are trained on the operation of the system, and routine checks according to the operation manuals 5.4 Training report is recorded according to the established procedure
6. Prepare completion documents	6.1 Other responsible regulatory parties are notified 6.2 Completion certificate(s) are issued 6.3 Other responsible regulatory parties are identified 6.4 Handover documents are prepared by the concerned parties

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

Variable	Range
Relevant parties may include but is not limited to:	• Consulting Engineers • Clients • Authorized company representatives • Quantity surveyors •
System readiness may include but is not limited to:	• Complete function of the system • Expected System output
Parameters may include but is not limited to:	• Light intensity • Sound • Speed • Efficiency • Temperature • Electrical quantities (like • Voltage, current and resistance • levels) • Expected output
Regulatory parties may include but is not limited to:	• County Governments • ERC (Energy Regulatory Commission) • MSK (Music Copyright of Kenya) • NCA (National Construction Authority) • National Environment Management Authority (NEMA) • Communications Authority of Kenya (CAK)

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • Legislation and workplace procedures relevant to ➢ Health and safety; ➢ The environment (including waste disposal); ➢ Appropriate personal protection equipment (PPE).	• Workplace procedures for ➢ Using test tools and instruments ➢ Work place communication; ➢ Time management ➢ Tools and equipment management • The importance of documentation and keeping records • The relationship between time and costs. • Performing tests including ➢ Connection of testing equipment ➢ Operation of testing equipment ➢ Recording and interpretation of

• How the system operates • The operating specifications and tolerances for different types of installed systems • The hazards associated with operating the system. • Identification of users to be trained	test results ➢ Making recommendations based on test results ➢ Compiling test report

FOUNDATION SKILLS

The individual needs to demonstrate the following additional skills:	
• Proficient in using test equipment • 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 skills and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied appropriate safety standards 1.2 Applied appropriate technical standards 1.3 Identified and used appropriate tools and equipment 1.4 Demonstrated good communication and interpersonal skills 1.5 Prepared and kept appropriate records
2. Resource Implications	Resources the same as that of workplace are advised to be applied. Include: Testing equipment and tools, Electrical power and stationery Stationery
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through simulated work environment

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

MAINTAIN ELECTRICAL INSTALLATION SYSTEMS

UNIT CODE: ENG/OS/EIT/CR/06/6/A

UNIT DESCRIPTION

This unit covers the competencies required to carry out maintenance in electrical installation systems. The maintenance includes scheduling maintenance, visual inspection, testing, system servicing and documentation of test results

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 maintenance schedule	1.1 Type of the system to be maintained is identified 1.2 The maintenance type and scope are defined 1.3 Relevant manual/service instruction is referred to 1.4 Maintenance schedule is developed in accordance with the service checklist 1.5 Relevant maintenance procedures are referred to where applicable
2. Inspect electrical system	2.1 System is inspected according to the established procedure 2.2 Instances where the maintenance activities cannot be fully met or where there are defects outside the planned schedule are identified and recorded
3. Prepare list of materials, tools and equipment	3.1 Tools, equipment and materials relevant for maintenance are identified and documented 3.2 Specifications of identified tools, materials and equipment are checked against safety standards where applicable
4. Perform system maintenance	4.1 Maintenance check list is prepared based on service manual where applicable 4.2 Service points and parameters are defined 4.3 Maintenance activities are carried out in consultation with relevant parties 4.4 Maintenance activities are carried out in the specified sequence and within agreed timelines Maintenance is done in accordance with health and safety and other relevant regulations and standards 4.5 Maintenance activities are recorded according to

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)***
	the checklist 4.6 Waste materials are disposed in accordance with safe working practices and approved procedures
5. Conduct system tests	5.1 Test points are identified as per system manual 5.2 System tests are conducted and results recorded according to established procedure 5.3 Test result is recorded as per the established company rule 5.4 Test results are documented and shared with the relevant parties

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
System may include but is not limited to:	• Security • Wind • Power generator • Domestic installations • Industrial installations • Water heating • CCTV • Power transmission and distribution • Horticulture • IBMS •
Maintenance type may include but is not limited to:	• Periodic • Preventive • Breakdown • Ad-hoc •
Relevant parties may include but is not limited	• Service providers • Client/representatives • Other service providers

Variable	Range
to:	• Security
Waste material may include but is not limited to:	• Old batteries • Oil • Cable lugs • • Tapes • Cable sheaths • Offcuts • Recovered faulty parts • Cable armouries

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

• The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • Legislation and workplace procedures relevant to ➢ Health and safety; ➢ The environment (including waste disposal); ➢ Appropriate personal protection equipment (PPE). • How the system operates • The operating specifications and tolerances for different types of installed systems • The hazards associated with operating the system. • Identification of users to be trained	• Workplace procedures for ➢ Using test tools and instruments ➢ Work place communication; ➢ Time management ➢ Tools and equipment management • The importance of documentation and keeping records • The relationship between time and costs. • Performing tests including ➢ Connection of testing equipment ➢ Operation of testing equipment ➢ Recording and interpretation of test results ➢ Making recommendations based on test results ➢ Compiling test report

FOUNDATION SKILLS

The individual needs to demonstrate the following additional skills:	
• Proficient in using test equipment • Time management	• Planning • Decision making

• Analytical • Faults troubleshooting • Problem solving	• First aid • Report writing

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: 1.1 Applied safety standards 1.2 Used appropriate maintenance tools and equipment safely 1.3 Safely conducted system tests 1.4 Demonstrated techniques of maintenance work
2. Resource Implications	Resources the same as that of workplace are advised to be applied. Include: Stationery, Test equipment and tool, Communication equipment, Service manuals
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through simulated work environment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

PERFORM ELECTRICAL SYSTEM BREAKDOWN MAINTENANCE

UNIT CODE: ENG/OS/EIT/CR/07/6/A

UNIT DESCRIPTION

This unit covers the competencies required to perform breakdown maintenance in an electrical installation system. Competencies include fault identification, repairing, testing and generating maintenance report.

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. Identify system failure	1.1 The necessary information about the failure is obtained from the user, as per set procedures. 1.2 Manuals for the system are referred to identify test points and measured parameters where applicable.
2. Troubleshoot cause of failure	2.1 Safety procedures are applied in accordance with the safety standards 2.2 System trouble shooting is conducted in accordance with the set procedure 2.3 System is diagnosed for failure using the appropriate procedure 2.4 System failure results are recorded as per established procedure. 2.5 Parameters are compared against the standards values 2.6 Decision is made and recommendations are recorded
3. Prepare list of tools, equipment & materials	3.1 Maintenance tools, equipment and materials are identified 3.2 Specifications and functionality of tools, equipment and materials are checked in accordance with the applicable technical and safety standards
4. Repair the system	4.1 Safety precautions are observed 4.2 System is repaired in accordance with maintenance manual where applicable 4.3 Repair activities are recorded according to the established procedure

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. ***(Bold and italicised terms are elaborated in the Range)***
5. Test the system	5.1 Appropriate tests and test points are identified Safety procedures are adhered to 5.2 System is tested as per test procedure 5.3 Test results are recorded according to the established procedures 5.4 Parameters are compared against the standard values 5.5 Maintenance report is prepared according to approved format

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
Failure may include but is not limited to:	• Partial • Total
Manual may include but is not limited to:	• Maintenance • Operational • Installation • Commissioning • Technical specification /data sheet
Parameters may include but is 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 warranty requirements relating to inspection and testing activities for the electrical installations and related components. • The manufacturer's warranty requirements relating to inspection and testing activities for the electrical installations and related components. • Legislation and workplace procedures relevant to ➢ Health and safety; ➢ The environment (including waste disposal); ➢ Appropriate personal protection equipment (PPE). • How the system operates • The operating specifications and tolerances for different types of installed systems • The hazards associated with operating the system. • Identification of users to be trained	• Workplace procedures for ➢ Using test tools and instruments ➢ Work place communication; ➢ Time management ➢ Tools and equipment management • The importance of documentation and keeping records • The relationship between time and costs. • Performing tests including ➢ Connection of testing equipment ➢ Operation of testing equipment ➢ Recording and interpretation of test results ➢ Making recommendations based on test results ➢ Compiling test report

FOUNDATION SKILLS

The individual needs to demonstrate the following additional skills:	
• Proficient in using test equipment • 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 skills and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Safely used testing equipment and tools 1.2 Obtained, recorded and interpreted test results 1.3 Repaired and maintained a system
2. Resource Implications	Resources the same as that of workplace are advised to be applied. Include: Electrical installation tool kit Testing equipment, Measuring equipment
3. Methods of	Competency may be assessed through:

Assessment	3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through simulated work environment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.