

**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**TELECOMMUNICATION ENGINEERING TECHNICIAN**

**LEVEL 6**



TVET CDACC

P.O BOX 15745-00100

NAIROBI

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**Council Secretary/CEO**

**TVET Curriculum Development, Assessment and Certification Council**

**P.O. Box 15745–00100 Nairobi, Kenya**

**Email: cdacc.tvet@gmail.com**

# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blue print and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET 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 Telecommunication Engineering Technician Level 6. These Occupational Standards will also be the bases 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 Telecommunication 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 Telecommunication Engineering Technician. These standards will be the bases for development of a competency-based curriculum for Telecommunication Engineering 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, Telecommunication Engineering SSAC, expert workers and all those who participated in the development of these occupational standards.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng. Tech.**

**CHAIRMAN, 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 Telecommunication 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 TELECOMMUNICATION ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE**

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# ACRONYMS

KEBS Kenya Bureau of Standards

TLE Telecommunication

OS Occupational Standards

A Control version

BC Basic Competencies

CR Core Competencies

ENG Engineering

KP Kenya Power

CA Communication Authority

NCA National Construction Authority

OSHA Occupational Safety and Health Act

IEE Institute of Electrical Engineers

WIBA Work injury benefits Act

CCTV Closed Circuit Tele Vision

EHS Environment, Health and Safety

CAD Computer Aided Design

CDACC Curriculum Development, Assessment and Certification Council

HVAC Heating, Ventilation and Air Conditioning

IBMS Integrated Building Management System

PPE Personal Protective Equipment

TVET Technical and Vocational Education and Training

SSAC Sector Skill Advisory Committee

# KEY TO UNIT CODE

ENG/OS/TLE/BC/01/6/A

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

**OVERVIEW**

Telecommunicatiion Engineering Level 6 qualification consists of competencies that a person must achieve to enable him/her to be certified as a Telecommunication technician.

A Telecommunication Engineering Technician is a person who will carry out telecommunication duties using a given design and customer’s requirements. This work demands the technician to design, read and interpret telecommunication drawings so that he/she can install the system according to 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 telecommunication systems will largely be determined by the project owner and Telecommunication technician. Therefore, a Telecommunication technician is a well-trained person who can carry out these responsibilities.

Thus, the units of competency comprising Telecommunication Technician certificate level 6 qualifications include the following basic, common and core competencies:

**BASIC COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** |
| ENG/OS/TLE/BC/01/6/A | Demonstrate communication skills |
| ENG/OS/TLE/BC/02/6/A | Demonstrate digital literacy |
| ENG/OS/TLE/BC/03/6/A | Demonstrate entrepreneurial skills |
| ENG/OS/TLE/BC/04/6/A | Demonstrate employability skills |
| ENG/OS/TLE/BC/05/6/A | Demonstrate environmental literacy |
| ENG/OS/TLE/BC/06/6/A | Demonstrate occupational safety and health practices |

**COMMON COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** |
| ENG/OS/TLE/CC/01/6/A | Apply Engineering mathematics |
| ENG/OS/TLE/CC/02/6/A | Apply Electrical principles |
| ENG/OS/TLE/CC/03/6/A | Apply workshop processes |
| ENG/OS/TLE/CC/04/6/A | Prepare and interpret Technical Drawing |
| ENG/OS/TLE/CC/05/6/A | Demonstrate understanding of Electronics |

**CORE COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** |
| ENG/OS/TLE/CR/01/6/A | Perform Electrical Installation |
| ENG/OS/TLE/CR/02/6/A | Install base transceiver station |
| ENG/OS/TLE/CR/03/6/A | Install Satellite signal reflectors |
| ENG/OS/TLE/CR/04/6/A | Install Security systems |
| ENG/OS/TLE/CR/05/6/A | Install inside plant network |
| ENG/OS/TLE/CR/06/6/A | Install IP PABX |
| ENG/OS/TLE/CR/07/6/A | Install Fibre Optic cable |
| ENG/OS/TLE/CR/08/6/A | Install communication equipment |
| ENG/OS/TLE/CR/09/6/A | Install Radar System |
| ENG/OS/TLE/CR/10/6/A | Install broadcasting monitor |
| ENG/OS/TLE/CR/11/6/A | Install telephone network |
| ENG/OS/TLE/CR/12/6/A | Broadcast TV and Radio signals |
| ENG/OS/TLE/CR/13/6/A | Perform TCP-IP and Networking |
| ENG/OS/TLE/CR/14/6/A | Maintain Telecommunication equipment and systems |
| ENG/OS/TLE/CR/15/6/A | Manage Telecommunication Project |
| ENG/OS/TLE/CR/16/6/A | Install Telecommunication Transmission equipment |
| ENG/OS/TLE/CR/17/6/A | Install Wi-Fi network |

# BASIC UNITS OF COMPETENCY

# DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/TLE/BC/01/6/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 |
| 1. Develop communication strategies | * 1. Strategies for effective internal and external dissemination of information are developed to meet the organization’s requirements   2. Special communication needs are considered in developing strategies to avoid discrimination in the workplace   3. Communication ***strategies*** are analyzed, evaluated and revised where necessary to make sure they are effective |
| 1. Establish and maintain communication pathways | * 1. Pathways of communication are established to meet requirements of organization and workforce   2. Pathways are maintained and reviewed to ensure personnel are informed of relevant information |
| 1. Promote use of communication strategies | * 1. Information is provided to all areas of the organization to facilitate implementation of the strategy   2. Effective communication techniques are articulated and modelled to the workforce   3. Personnel are given guidance about adapting communication strategies to suit a range of contexts |
| 1. Conduct interview | 1. A range of appropriate communication strategies are employed in ***interview situations*** 2. Records of interviews are made and maintained in accordance with organizational procedures 3. Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated |
| 1. Facilitate group discussion | * 1. Mechanisms which enhance ***effective group interaction*** is defined and implemented   2. Strategies which encourage all group members to participate are used routinely   3. Objectives and agenda for meetings and discussions are routinely set and followed   4. Relevant information is provided to group to facilitate outcomes   5. Evaluation of group communication strategies is undertaken to promote participation of all parties   6. Specific communication needs of individuals are identified and addressed |
| 1. 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. Developed communication strategies to meet the organization requirements and applied in the workplace 2. Established and maintained communication pathways for effective communication in the workplace 3. Used communication strategies involving exchanges of complex oral information |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace or appropriately simulated environment where assessment can take place 2. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Direct Observation/Demonstration with Oral Questioning 2. Written Examination |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:** ENG/OS/TLE/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. Concepts of ICT are determined in accordance with computer equipment   2. Classifications of computers are determined in accordance with manufacturers specification   3. ***Appropriate computer software*** is identified according to manufacturer’s specification   4. ***Appropriate computer hardware*** is identified according to manufacturer’s specification   5. Functions and commands ofoperating system are determined in accordance withmanufacturer’s specification |
| 1. Apply security measures to data, hardware, software in automated environment | * 1. ***Data security and privacy are classified*** in accordance with the prevailing technology   2. ***Security threats*** areidentified **and *control measures*** are applied in accordance with laws governing protection of ICT   3. Computer threats and crimes are detected.   4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT |
| 1. Apply computer software in solving tasks | * 1. ***Word processing concepts***are applied in resolving workplace tasks, report writing and documentation   2. ***Word processing utilities*** are applied in accordance with workplace procedures   3. Worksheet layout is prepared in accordance with work procedures   4. Worksheet is build and data manipulated in the worksheet in accordance with workplace procedures   5. Continuous data manipulated on worksheet is undertaken in accordance with work requirements   6. Database design and manipulation is undertaken in accordance with office procedures   7. Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures |
| 1. Apply internet and email in communication at workplace | * 1. Electronic mail addresses are opened and applied in workplace communication in accordance with office policy   2. Office internet functions are defined and executed in accordance with office procedures   3. ***Network configuration*** is determined in accordance with office operations procedures   4. Official World Wide Web is installed and managed according to workplace procedures |
| 1. Apply Desktop publishing in official assignments | * 1. Desktop publishing functions and tools are identified in accordance with manufactures specifications   2. Desktop publishing tools are developed in accordance with work requirements   3. Desktop publishing tools are applied in accordance with workplace requirements   4. Typeset work is enhanced in accordance with workplace standards |
| 1. Prepare presentation packages | * 1. Types of presentation packages are identified in accordance with office requirements   2. Slides are created and formulated in accordance with workplace procedures   3. Slides are edited and run in accordance with work procedures   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 measures may include but not limited to: | * Counter measures against cyber terrorism * 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. Identified and controlled security threats   2. Detected and protected computer crimes   3. Applied word processing in office tasks   4. Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures   5. Opened electronic mail for office communication as per workplace procedure   6. Installed internet and World Wide Web for office tasks in accordance with office procedures   7. Integrated emerging issues in computer ICT applications   8. Applied laws governing protection of ICT |
| 1. Resource Implications | Resources such as the following should be provided. This include; Tablets, Laptops, Desktop PCs, Calculator, Internet, Smart phone, Operation Manuals etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written Test   2. Demonstration   3. Practical assignment   4. Interview/Oral Questioning   5. Demonstration |
| 1. Context of Assessment | Competency may be assessed in an off and on the job setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE UNDERSTANDING OF ENTREPRENEURSHIP**

**UNIT CODE:** ENG/OS/TLE/BC/03/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA** |
| --- | --- |
| 1. Demonstrate understanding of an Entrepreneur | * 1. Entrepreneurs and Business persons are distinguished as per ***principles of entrepreneurship***   2. ***Types of entrepreneurs*** are identified as per principles of entrepreneurship   3. Ways of becoming an Entrepreneur are identified as per principles of Entrepreneurship   4. ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship   5. Factors affecting Entrepreneurship development are explored as per principles of Entrepreneurship |
| 1. Demonstrate understanding of Entrepreneurship and self-employment | 1. Entrepreneurship and self-employment are distinguished as per principles of entrepreneurship 2. Importance of self-employment is analysed based on business procedures and strategies 3. ***Requirements for entry into self-employment*** are identified according to business procedures and strategies 4. Role of an Entrepreneur in business is determined according to business procedures and strategies 5. Contributions of Entrepreneurs to National development are identified as per business procedures and strategies 6. Entrepreneurship culture in Kenya is explored as per business procedures and strategies 7. Born or made Entrepreneurs are distinguished as per entrepreneurial traits |
| 1. Identify Entrepreneurship opportunities | 1. Sources of business ideas are identified as per business procedures and strategies 2. ***Business ideas*** and opportunities are generated as per business procedures and strategies 3. Business life cycle is analysed as per business procedures and strategies 4. Legal aspects of business are identified as per procedures and strategies 5. Product demand is assessed as per market strategies 6. Types of ***business environment*** are identified and evaluated as per business procedures 7. Factors to consider when evaluating business environment are explored based on business procedure and strategies 8. Technology in business is incorporated as per best practice |
| 1. Create entrepreneurial awareness | 1. ***Forms of businesses*** are explored as per business procedures and strategies 2. Sources of business finance are identified as per business procedures and strategies 3. Factors in selecting source of business finance are identified as per business procedures and strategies 4. ***Governing policies*** on Small Scale Enterprises (SSEs) are determined as per business procedures and strategies 5. Problems of starting and operating SSEs are explored as per business procedures and strategies |
| 1. Apply entrepreneurial motivation | 1. ***Internal and external motivation*** factors are determined in accordance with ***motivational theories*** 2. Self-assessment is carried out as per ***entrepreneurial orientation*** 3. Effective communications are carried out in accordance with ***communication principles*** 4. Entrepreneurial motivation is applied as per motivational theories |
| 1. Develop innovative business strategies | 1. Business innovation strategies are determined in accordance with the organization strategies 2. Creativity in business development is demonstrated in accordance with business strategies 3. ***Innovative business strategies*** are developed as per business principles 4. Linkages with other entrepreneurs are created as per best practice 5. ICT is incorporated in business growth and development as per best practice |
| 1. Develop Business Plan | 1. Identified Business is described as per business procedures and strategies 2. Marketing plan is developed as per business plan format 3. Organizational/Management plan is prepared in accordance with business plan format 4. Production/operation plan in accordance with business plan format 5. Financial plan is prepared in accordance with the business plan format 6. Executive summary is prepared in accordance with business plan format 7. Business plan is presented as per best practice |

**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**  include but not limited to: |
| --- | --- |
| 1. Types of entrepreneurs but not limited to: | 1. Innovators 2. Imitators 3. Craft 4. Opportunistic 5. Speculators |
| 1. Principles of Entrepreneurship but not limited to: | 1. Visionary 2. Solution provider 3. Accountability 4. Growth and marketing 5. Resilient 6. Tenacious |
| 1. Characteristics of Entrepreneurs include but not limited to: | 1. Creative 2. Innovative 3. Planner 4. Risk taker 5. Networker 6. Confident 7. Flexible 8. Persistent 9. Patient 10. Independent 11. Future oriented 12. Goal oriented |
| 1. Requirements for entry into self-employment | 1. Technical skills 2. Management skills 3. Entrepreneurial skills 4. Resources 5. Infrastructure |
| 1. Internal motivation include but not limited to: | 1. Interest 2. Passion 3. Freedom 4. Prestige |
| 1. Business environment | 1. External 2. Internal 3. Intermediate |
| 1. Forms of businesses | 1. Sole proprietorship 2. Partnership 3. Limited companies 4. Cooperatives |
| 1. Governing policies | 1. Increasing scope for finance 2. Promoting cooperation between entrepreneurs and private sector 3. Reducing regulatory burden on entrepreneurs 4. Developing IT tools for entrepreneurs |
| 1. External motivation include but not limited to: | 1. Rewards 2. Punishment 3. Enabling environment 4. Government policies |
| 1. Entrepreneurial orientation include but not limited to: | 1. Passion 2. Interest 3. Hobbies 4. Skills |
| 1. Innovative business strategies include but not limited to: | 1. New products 2. New methods of production 3. New markets 4. New sources of supplies 5. Change in industrialization |
| 1. Communication principles include but not limited to: | 1. Feed back 2. Attention 3. Clarity 4. Timeliness 5. Adequacy 6. Consistency 7. Informality |
| 1. Motivational theories include but not limited to: | 1. Marslows theory 2. McClelland theory 3. Fredrick Tylors theory |

**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:

* Assessing a range of alternative products and strategies
* Critically analyzing information, summarizing and making sense of previous and current market trends
* Identifying changing consumer preferences and demographics
* Thinking “outside the box”
* Ensuring quality consistency
* Reducing lead time to product/service delivery
* Management
* Using formal problem-solving procedures, e. g., root-cause analysis, six sigmas
* Communication
* Applying motivational principles, e. g., positive stroking, behavior modification
* Assessing range of alternatives rather than choosing the easiest option
* Achieving ownership and credibility for the enterprise vision
* Critically analyzing information, summarizing and making sense of previous and current market trends
* Developing solutions and practical strategies which are “outside the box”

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Entrepreneurial competencies
* Decision making
* Business communication
* Change management
* Coping with competition
* Risk taking
* Net working
* Time management
* Leadership
* Factors affecting entrepreneurship development
* Principles of Entrepreneurship
* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Customer care strategies
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Government and regulatory processes
* Local and international market trends
* Product promotion strategies
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Concepts of change management
* Relevant developments in other industries
* Regional/ County business expansion strategies
* Innovation in business

**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. Distinguished entrepreneurs and business persons correctly 2. Identified ways of becoming an entrepreneur appropriately 3. Explored factors affecting entrepreneurship development appropriately 4. Analysed importance of self-employment accurately 5. Identified requirements for entry into self-employment correctly 6. Identified sources of business ideas correctly 7. GeneratedBusiness ideas and opportunities correctly 8. Analysed business life cycle accurately 9. Identified legal aspects of business correctly 10. Assessed product demand accurately 11. Determined Internal and external motivation factors appropriately 12. Carried out communications effectively 13. Identified sources of business finance correctly 14. Determined Governing policy on small scale enterprise appropriately 15. Explored problems of starting and operating SSEs effectively 16. Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly 17. Prepared executive summary correctly 18. Determined business innovative strategies appropriately 19. Presented business plan effectively |
| 1. Resource Implications | The following resources should be provided:   1. Check list 2. Research tools (Questionnaire, interview guide, observation schedule) 3. Materials, tools, equipment and machines relevant |
| 1. Methods of Assessment | 1. Written tests 2. Observation 3. Oral questions 4. Third party report 5. Interviews 6. Case problems 7. Portfolio |
| 1. Context of Assessment | 1. Competency may be assessed in workplace or in a simulated workplace setting 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 EMPLOYABILITY SKILLS**

**UNIT CODE:** ENG/OS/TLE/BC/04/6/A

**UNIT DESCRIPTION**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct self-management | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 2. Emotions are managed as per workplace requirements 3. Individual performance is evaluated and monitored according to the agreed targets. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for own actions are demonstrated. 6. Self-esteem and a positive self-image are developed and maintained. 7. Time management, attendance and punctuality are observed as per the organization policy. 8. Goals are managed as per the organization’s objective 9. Self-strengths and weaknesses are identified as per ***personal objectives*** 10. Critics are managed as per personal objectives |
| 1. Demonstrate interpersonal communication | 1. Listening and understanding is demonstrated as per communication policy 2. Writing to the needs of the audience is demonstrated as per communication policy 3. Speaking, reading and writing is demonstrated as per communication policy 4. Negotiation skills are demonstrated as per communication policy 5. Empathizing is demonstrated as per the communication policy 6. Numeracy is applied as per the communication policy 7. Internal and external customers’ needs are identified and interpreted as per the communication policy 8. Persuasion is demonstrated as per the communication policy 9. Communication networks are established as per the SOPs 10. Information is shared as per communication structure |
| 1. Demonstrate critical safe work habits | * 1. Stress is managed in accordance with workplace procedures.   2. Punctuality and time consciousness is demonstrated in line with workplace policy.   3. Personal objectives are integrated with organization goals based on organization’s strategic plan.   4. ***Resources*** are utilized in accordance with workplace policy.   5. Work priorities are set in accordance to workplace procedures.   6. Leisure time is recognized in line with organization policy.   7. Abstinence from ***drug and substance abuse*** is observed as per workplace policy.   8. Awareness of HIV and AIDS is demonstrated in line with workplace requirements.   9. Safety consciousness is demonstrated in the workplace based on organization safety policy.   10. ***Emerging issues*** are dealt with in accordance with organization policy. |
| 1. Lead a workplace team | 1. Performance expectations for the ***team*** are set 2. Duties and responsibilities are assigned in accordance with the organization policy. 3. Team parameters and ***relationships*** are identified according to set rules and regulations. 4. ***Forms of communication*** in a team are established according to office policy. 5. Communication is carried out as per workplace place policy and requirements of the job. 6. Team performance is supervised 7. ***Feedback*** on performance is collected and analyzed based on established team learning process 8. Conflicts are resolved between team members in line with organization rules and regulations. 9. ***Gender mainstreaming*** is undertaken in accordance with set regulations. 10. Human rights are adhered to in accordance with existing protocol. 11. Healthy relationships are developed and maintained for harmonious co-existence in line with workplace. |
| 1. Plan and organize work | 1. Task requirements are identified as per the workplace objectives 2. Task is interpreted in accordance with safety (OHS ), environmental requirements and quality requirements 3. Work activity is organized with other involved personnel as per the SOPs 4. Resources are mobilized, allocated and utilized to meet project goals and deliverables. 5. Work activities are monitored and evaluated in line with organization procedures. 6. Job planning is documented in accordance with workplace requirements. 7. Planning and organizing of work activities is reviewed as per the workplace requirements 8. Time is managed achieve workplace set goals and objectives. |
| 1. Maintain professional growth and development | * 1. Personal training needs are identified and assessed in line with the requirements of the job.   2. ***Training and career opportunities*** are identified and availed based on job requirements.   3. Resources for training are mobilized and allocated based organizations skills needs.   4. Licensees and certifications relevant to job and career are obtained and renewed.   5. ***Personal growth*** is pursued towards improving the qualifications set for the profession.   6. Work priorities and commitments are managed based on requirement of the job and workplace policy.   7. Recognitions are sought as proof of career advancement in line with professional requirements. |
| 1. Demonstrate workplace learning | * 1. Own learning is managed as per workplace policy.   2. Learning opportunities are sought and allocated based on job requirement and in line with organization policy.   3. Contribution to the learning community at the workplace is carried out.   4. ***Range of media for learning*** are established as per the training need   5. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job   6. Enthusiasm for ongoing learning is demonstrated   7. Time and effort is invested in learning new skills-based job requirements   8. Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace.   9. Awareness of Occupational Health and Safety procedures are demonstrated in use of technology in the workplace.   10. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.   11. New systems are developed and maintained in accordance with the requirements of the job.   12. Opportunities that are not obvious are identified and exploited in line with organization objectives.   13. Opportunities for performance improvement are identified proactively in area of work.   14. Awareness of personal role in workplace ***innovation*** is demonstrated. |
| 1. Demonstrate problem solving skills | * 1. Creative, innovative and practical solutions are developed based on the problem   2. Independence and initiative in identifying and solving problems is demonstrated.   3. Team problems are solved as per the workplace guidelines   4. Problem solving strategies are applied as per the workplace guidelines   5. Problems are analyzed and assumptions tested as per the context of data and circumstances |
| 1. Manage workplace ethics | * 1. Policies and guidelines are observed as per the workplace requirements   2. Self-worth and profession is exercised in line with personal goals and organizational policies   3. Code of conduct is observed as per the workplace requirements   4. Personal and professional integrity is demonstrated as per the personal goals   5. Commitment to jurisdictional laws is demonstrated as per the workplace requirements |

**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.

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| --- | --- |
| **Range** | **Variable** |
| ***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 |
| ***Relationships*** includes but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| ***Forms of communication*** include but not limited to: | * Written * Visual * Verbal * Non verbal * Formal and informal |
| ***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 |
| ***Range of media for learning*** include but not limited to: | * Mentoring * peer support and networking * IT and courses |

**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.

|  |  |
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| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Conducted self-management   2. Demonstrated interpersonal communication   3. Demonstrated critical safe work habits   4. Demonstrated the ability to lead a workplace team   5. Planned and organized work   6. Maintained professional growth and development   7. Demonstrated workplace learning   8. Demonstrated problem solving skills   9. Demonstrated the ability to manage ethical performance |
| 1. Resource Implications | |  | | --- | | The following resources should be provided: |  * 1. Case studies/scenarios |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * Oral Interview * Observation * Third Party Reports * Written |
| 1. Context of Assessment | * 1. Competency may be assessed in workplace or in a simulated workplace setting   2. Assessment shall be observed while tasks are being undertaken whether individually or in-group |
| 1. Guidance information for assessment | | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENVIRONMENTAL LITERACY**

**UNIT CODE:** ENG/OS/TLE/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, analyze resource use, develop resource conservation plans and implement selected plans.

**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 at all times according to environmental regulations and OSHS.  1.3 ***PPE*** is used according to OSHS. |
| 1. Control environmental Pollution control | * 1. Environmental pollution ***control measures*** are compiled following standard protocol.   2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999   3. Methods for minimizing ***noise pollution*** complied following environmental regulations. |
| 1. Demonstrate sustainable resource use | * 1. Methods for minimizing wastage are complied with.   2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)   3. Methods for economizing or reducing resource consumption are practiced. |
| 1. Evaluate current practices in relation to resource usage | * 1. Information on resource efficiency systems and procedures are collected and provided to the work group where appropriate.   2. Current resource usage is measured and recorded by members of the work group.   3. Current purchasing strategies are analyzed and recorded according to industry procedures.   4. Current work processes to access information and data is analyzed following enterprise protocol. |
| 1. 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 |
| 1. 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 |
| 1. 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 |
| 1. Analyze resource use | 8.1. All resource consuming processes are Identified  8.2. Quantity and nature of Resource consumed is determined  8.3. Resource flow is analyzed through different parts of the process.  8.4. Wastes are classified for possible source of resources. |
| 1. Develop resource Conservation plans | 9.1. Efficiency of use/conversion of resources is determined following industry protocol.  9.2. Causes of low efficiency of use of resources are  Determined based on industry protocol.  9.3. Plans for increasing the efficiency of resource use are developed based on findings. |

**RANGE**

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

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| **Variable** | **Range** |
| ***PPE*** May include but are not limited to | 1.1 Mask  1.2 Gloves  1.3 Goggles  1.4 Safety hat  1.5 Overall  1.6 Hearing protector |
| ***Environmental pollution control measures*** may include but are not limited to: | 2.1 Methods for minimizing or stopping spread and ingestion of airborne particles  2.2 Methods for minimizing or stopping spread and ingestion of gases and fumes  2.4 Methods for minimizing or stopping spread and ingestion of liquid wastes |
| ***Wastes*** may include but are not limited to: | 3.1 Unnecessary waste  3.2 Necessary waste |
| ***Waste management Procedures*** may include but are not limited to: | 4.1 Sorting  4.2 Storing of items  4.2 Recycling of items  4.3 Disposal of items |
| ***Resources*** may include but are not limited to: | 5.1 Electric  5.2 Water  5.3 Fuel  5.4 Telecommunications  5.5 Supplies  5.6 Materials |
| ***Workplace environmental hazards*** may include but are not limited to: | 6.1Biological hazards  6.2 Chemical and dust hazards  6.3 Physical hazards |
| ***Organizational systems and procedures*** may include but are not limited to: | 7.1 Supply chain, procurement and purchasing  7.2 Quality assurance  7.3 Making recommendations and seeking approvals |
| ***Legislations/Conventions*** may include but are not limited to: | 8.1 EMCA 1999  8.2 Montreal Protocol  8.3 Kyoto Protocol |
| ***Environmental aspects/impacts*** may include but are not limited to: | 9.1 Air pollution  9.2 Water pollution  9.3 Noise pollution  9.4 Solid waste  9.5 Flood control  9.6 Deforestation/Denudation  9.7 Radiation/Nuclear /Radio Frequency/ Microwaves  9.8 Situation  9.9 Soil erosion (e.g. Quarrying, Mining, etc.)  9.10 Coral reef/marine life protection |
| ***Industrial standards / Environmental practices*** may include but are not limited to: | 10.1 ISO standards  10.2 Company environmental management systems  (EMS) |
| ***Periodic*** may include but are not limited to: | 11.1 hourly  11.2 daily  11.3 weekly  11.4 monthly  11.5 quarterly  11.6 yearly |
| ***Programs/Activities*** may include but are not limited to: | 12.1 Waste disposal (on-site and off-site)  12.2 Repair and maintenance of equipment  12.3 Treatment and disposal operations  12.4 Clean-up activities  12.5 Laboratory and analytical test  12.6 Monitoring and evaluation  12.7 Environmental advocacy programs |

**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
* Making adjustments to 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
* Methods of minimizing wstage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs
* 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

**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. Controlled environmental hazard   2. Controlled environmental pollution   3. Demonstrated sustainable resource use   4. Evaluated current practices in relation to resource usage   5. Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.   6. Described industrial standard environmental practices according to the different environmental issues/concerns.   7. Resolved problems/ constraints encountered based on management standard procedures   8. Implemented and monitored environmental practices on a periodic basis as per company guidelines   9. Recommended solutions for the improvement of the program   10. Monitored and reported to proper authorities any environmental incidents |
| 1. Resource Implications | The following resources should be provided:   * 1. Workplace with storage facilities   2. Tools, materials and equipment relevant to the tasks (e.g. Cleaning tools, cleaning materials, trash bags)   3. PPE, manuals and references   4. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection   5. Case studies/scenarios relating to environmental Protection |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Demonstration   2. Oral questioning   3. Written examination   4. Interview/Third Party Reports   5. Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)   6. Simulations and role-play |
| 1. 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. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES**

**UNIT CODE:** ENG/OS/TLE/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**

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| --- | --- |
| **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 |
| 1. 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. |
| 1. 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. Identifies hazards/risks in the workplace and/or its indicators 2. Requests for evaluation and/or work environment measurements of OSH hazards/risk in the workplace 3. Gathers OSH issues and/or concerns raised by workers 4. Identifies and implements prevention and control measures, including use of PPE (personal protective equipment) for specific hazards 5. Recommends appropriate risk controls based on result of OSH hazard evaluation and OSH issues gathered 6. Establish contingency measures, including emergency procedures in accordance with organization procedures 7. Provides information to work team about company OSH program, procedures and policies/guidelines 8. Participates in the implementation of OSH procedures and policies/guidelines 9. Trains and advises team members on OSH standards and procedures 10. Implements procedures for maintaining OSH-related records |
| 1. 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 |
| 1. 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 |
| 1. 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. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

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# COMMON UNITS OF COMPETENCY

# APPLY ENGINEERING MATHEMATIC

**UNIT CODE:** ENG/OS/TLE/CC/01/6/A

This unit describes the competencies required by an Telecommunication 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

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| **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. Calculations involving Indices are performed as per the concept 2. Calculations involving Logarithms are performed as per the concept 3. Scientific calculator is used in solving mathematical problems in line with manufacturer’s manual 4. Simultaneous equations are performed as per the rules 5. Quadratic equations are calculated as per the concept |
| * 1. Apply Trigonometry and hyperbolic functions | 1. Calculations are performed using trigonometric rules 2. Calculations are performed using ***hyperbolic functions*** |
| * 1. Apply complex numbers | * 1. Complex numbers are represented using Argand diagrams   2. Operations involving complex numbers are performed   3. Calculations involving complex numbers are performed using De Moivre’s theorem |
| 1. Apply Coordinate Geometry | * 1. Polar equations are calculated using coordinate geometry   2. Graphs of given polar equations are drawn using the Cartesian plane   3. Normal and tangents are determined using coordinate geometry |
| 1. Carry out Binomial Expansion | * 1. Roots of numbers are determined using binomial theorem   2. Errors of small changes are determined using binomial theorem |
| 1. Apply Calculus | * 1. Derivatives of functions are determined using Differentiation   2. Derivatives of hyperbolic functions are determined using Differentiation   3. Derivatives of inverse trigonometric functions are determined using Differentiation   4. Rate of change and small change are determined using Differentiation.   5. Calculation involving stationery points of functions of two variables are performed using differentiation.   6. Integrals of algebraic functions are determined using integration   7. Integrals of trigonometric functions are determined using integration   8. Integrals of logarithmic functions are determined using integration   9. Integrals of hyperbolic and inverse functions are determined using integration |
| 1. Solve Ordinary differential equations | * 1. First order and second order differential equations are solved using the method of undetermined coefficients   2. First order and second order differential equations are solved from given boundary conditions |
| 1. Apply Laplace transforms | * 1. Laplace transforms are solved using initial and final value theorems   2. Inverse Laplace transforms are solved using partial fractions   3. Differential equations are solved using Laplace transforms |
| 1. Apply Power Series | * 1. Power series are obtained using Taylor’s Theorem   2. Power series are obtained using Maclaurin’s theorem |
| 1. Apply Statistics | 1. Identification, Collection and Organization of data is performed 2. Interpretation, analysis and presentation of data in appropriate format is performed 3. Mean, median ,mode and Standard deviation are obtained from given data 4. Calculations are performed based on Laws of probability 5. Calculation involving probability distributions , mathematical expectation sampling distributions are performed |
| 1. Apply Fourier Series | * 1. Fourier series coefficients are obtained using Fourier series techniques   2. Fourier series for 2π to T is are obtained using Fourier series techniques   3. Fourier series for odd and even functions are obtained using Fourier series techniques   4. Harmonic analysis is performed using numerical methods |
| 12.Apply Vector theory | * 1. Calculations involving vector algebra, dot and cross products using vector theory   2. Gradient, Divergence and Curl are obtained   3. Vector calculations are performed using Green’s theorem   4. Vector calculations are performed using Stoke’s theorem   5. Conservative vector fields and line and surface integrals are obtained using Gauss’s theorem |
| 1. Apply Matrix | * 1. Determinant and inverse of 3x3 matrix are obtained   2. Solutions of simultaneous equations are obtained   3. Calculation involving Eigen values and Eigen vectors are performed |
| 1. Apply Numerical methods | * 1. Roots of polynomials are obtained using iterative numerical methods   2. Interpolation and extrapolation are performed using numerical methods |
| 1. Apply concepts of probability for work | * 1. Probability events are determined from dependent, independent and mutually exclusive   2. Counting is done using permutation, combination, tree diagrams and Venn diagrams techniques |
| 1. Perform commercial calculations | * 1. Exchange rate calculations are done using devaluation and revaluation   2. Sales, stock turnover and profit and loss are determined   3. Incomes, salaries and wages are calculated |
| 1. Perform estimations, measurements and calculations of quantities | * 1. Measurement information in workplace is extracted and interpreted   2. Appropriate workplace measuring tools and equipment are identified and selected   3. Conversions are performed between units of measurement   4. Measurements are estimated and taken   5. Length, width, height, perimeter, area and angles of ***figures*** are calculated   6. Volume and surface area of figures are calculated   7. Information 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.

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| **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 KNOWLEDGE**

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

**Required Skills**

The individual needs to demonstrate the following skills:

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

**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.

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| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied Trigonometry and hyperbolic functions   2. Applied complex numbers   3. Determined angles and length in triangles   4. Applied Calculus   5. Solved Ordinary differential equations   6. Applied Laplace transforms   7. Applied Power Series   8. Applied Fourier Series   9. Applied Vector theory   10. Applied Matrix   11. Identified and selected measuring equipments   12. Collected, Analyzed and presented data   13. Applied Numerical methods |
| 1. Resource Implications | The following resources should be provided:   * 1. Access to relevant workplace or appropriately simulated environment where assessment can take place   2. Measuring equipment   3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Direct Observation   2. Demonstration with Oral Questioning   3. Written tests |
| 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/TLE/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. Basic ***SI unit***s in Electrical are identified   2. ***Quantitie***s of Charge, force, work and power are identified   3. Perform calculations involving Ohm’s law i.e Current, Resistance and voltage   4. Calculations involving various electrical quantities are performed |
| * + 1. Use the concepts of D.C and A.C circuits in electrical installation | * 1. Calculations involving parallel and series circuits are performed   2. Calculations involving DC and AC Network theorems are performed. E.g. Kirchoff’s laws, Superposition, Thevinin’s, Norton’s |
| 1. Use basic electrical machine | * 1. Types of various electrical machines are identified   2. Single phase and three phase motor starting methods are performed   3. DC motor starting methods are performed   4. Calculations involving single phase and three phase AC and DC Motors are performed   5. Calculations involving single and three phase AC and DC transformers are performed   6. Calculations involving single and three phase generators are performed   7. Special machines are identified   8. Calculations involving special machines are performed   9. Calculations involving Electric Drives are performed |
| 1. Demonstrate understanding of three phase power supply | * 1. Connections of three phase power supply are performed as per the standard operating procedure   2. Calculations involving three phase power supply connections are performed   3. Measurements of three phase power supply is performed   4. Interconnections of three phase power supply are performed as per the nature of the load. |
| * 1. Use power factor in electrical installation | * 1. Power triangle is identified i.e. Active, Apparent and reactive power   2. The use of power factor is performed   3. Calculations involving power factor correction is performed   4. Methods of power factor correction are applied |
| * 1. Use earthing in Electrical installations | * 1. Earthing types are identified   2. Earthing points on Electrical installation are identified   3. Calculation involved in determining the earthing type is performed   4. Test on an earthing system is performed in line with the IEE regulations |
| 1. Apply lightning protection measures | * 1. Types of lightening strokes are identified   2. Components of lightening protection system are identified   3. Test to be carried out in lightening protection system are established   4. Application of lightening protection system is determined |
| 1. Apply Electromagnetic field Theory | * 1. Electromagnetic radiation sources are identified   2. Detectors of Electromagnetic radiations are determined   3. Electromagnetic waves are applied   4. Electromagnetics Laws are Identified   5. Behaviours and effects of Electromagnetic waves are established |
| 1. Apply Electrodynamics | * 1. Electrostatics terms are identified   2. Magnetostatics terms are identified   3. Electrodynamics laws are identified |
| 1. Apply Energy and Momentum in Electromagnetic field | * 1. Energy conservation theorem is identified   2. Electromagnetic Energy flow is determined |
| 1. Apply transients in Electrical Circuit Analysis | * 1. Growth and decay in R-L-C circuits are determined   2. Calculations involving Growth and decay in R-L-C are performed |
| 1. Use Two Port networks | * 1. Basic passive networks are performed   2. Characteristic impedance is determined   3. Types of transmission lines and their applications are performed |
| 1. Demonstrate understanding of Refrigeration and Air conditioning | * 1. Use of Refrigeration and Air conditioning is demonstrated   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.

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| **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.

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| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied the correct SI units of Electrical quantities   2. Stated, Calculate and relates the quantities in Ohm’s law   3. Identified the components of an earthing system   4. Stated and apply various laws in Electrical system   5. Differentiated between AC and DC network   6. Applied correct formulas in the calculation of AC and DC machines   7. Used power triangle in calculating power factor   8. Applied various methods in power factor correction   9. Identified types of lightening arrestors and their applications |
| 1. Resource Implications | The following resources should be provided:   * 1. Access to relevant workplace or appropriately simulated environment where assessment can take place   2. Measuring equipment   3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Direct Observation   2. Demonstration with Oral Questioning   3. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or  through accredited institution |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM WORKSHOP PROCESSES

**UNIT CODE:** ENG/OS/TLE/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 equipments, preparation of workshop materials, preparation of workshop for Electrical installation practicals, Storage of Electrical tools and materials after practicals, troubleshoot and repair workshop tools and equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

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

**RANGE**

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

| **Variable** | **Range** |
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| Workshop tools include but not limited to: | * + Pliers   + Hacksaws   + Hammer   + Spirit levels   + 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:

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| * Health and safety * Environment * PPE * Use of service manual * Fault identification and diagnosis * Use of workshop tools and equipment * 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:

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| * Electrical wiring * Analytical * Problem solving * Faults troubleshooting * Maintenance * Operation of First Aid equipment * 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.

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| 1. Critical Aspects of Competency | **Assessment requires evidence that the candidate:**   * 1. Adhered to the proper use of PPE   2. Observed the workshop rules   3. Performed the First Aid procedures in the workshop   4. Observed workshop procedures in the storage of tools   5. Safely used testing equipment and tools   6. Observed EHS in the waste disposal   7. Properly demonstrated care and maintenance of workshop tools   8. Obtained, recorded and interpreted test results   9. Identified faulty tools and instruments   10. Repaired/Replaced faulty tools |
| 1. Resource Implications | The following resources must be provided:  Resources the same as that of workplace are advised to be applied e.g. Installation tool kit, testing equipment, measuring equipment, First Aid kits |
| 1. Methods of Assessment | **Competency may be assessed through:**   * 1. Oral test   2. Observation   3. Practical demonstration |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through a simulated work place setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PREPARE AND INTERPRET TECHNICAL DRAWINGS

**UNIT CODE:** ENG/OS/TLE/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 equipment 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)*** |
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| 1. Use and maintain drawing equipment and materials | 1.1 ***Drawing equipment*** are identified and gathered according to task requirements  1.2 ***Drawing materials*** are identified and gathered according to task requirements  1.3 Drawing equipment 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 Equipment*** is used according to occupational safety and health regulations |
| * 1. Produce plane geometry drawings | * 1. Different types of lines used in drawing and their meanings are identified according to standard drawing conventions   2. Different types of ***geometric forms*** are constructed according to standard conventions   3. Different types of angles are constructed according to principles of trigonometry   4. Different types of angles are measured using appropriate measuring tools   5. Angles are bisected according to standard conventions   6. Freehand sketching of different types of geometric forms, tools, equipment, diagrams is conducted |
| * 1. Produce solid geometry drawings | * 1. Drawings of patterns are interpreted according to standard conventions   2. Patterns are developed in accordance with standard conventions |
| * 1. Produce orthographic and pictorial drawings | * 1. Symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions   2. First and third angle orthographic drawings are interpreted and produced in accordance with the standard conventions   3. Orthographic elevations are dimensioned in accordance with standard conventions   4. Isometric drawings are interpreted and produced in accordance with standard conventions   5. Assembly drawing is produced and interpreted in line with the operating standards |
| 5. Produce electrical drawings | * 1. Electrical symbols and abbreviations are identified and their meaning interpreted according to BS 3939   2. ***Electrical drawings*** are produced in accordance with BS 3939 |
| 6. Apply CAD packages | * 1. CAD packages are selected according to task requirements   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** |
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| 1. Drawing equipment include but not limited to: | Drawing boards, T and set squares, drawing sets, computers with CAD packages |
| 1. Drawing materials include but not limited to: | Drawing papers, pencils, erasers, masking tapes, paper clips |
| 1. Environmental legislations include but not limited to: | EMCA 1999 |
| 1. Personal Protective Equipment include but not limited to: | Dust coats, closed leather shoes |
| 1. Geometric forms include but not limited to: | Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci |
| 1. 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 |
| 1. 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 equipment handling
* Analysis and synthesis
* Communication
* Inter personal

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Drawing equipment and materials
* Freehand sketching
* Lettering
* Geometrical constructions
* Types of drawings
* Types of lines
* 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.

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| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied and adhered to safety procedures   2. Cared and maintained drawing equipment   3. Interpreted circuit, assembly and lay out diagrams   4. Applied appropriate technical standards, used proper tools and equipment for a given task   5. Produced sketches and drawings   6. Applied CAD packages in production of drawings |
| 1. Resource Implications | Resources the same as that of workplace are advised to be applied. Which include; drawing room, drawing equipment and materials, computers, CAD packages   * 1. Drawing room   2. Drawing equipment and materials   3. Computers   4. CAD packages |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical tests   2. Observation |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or a simulated work place setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# **DEMONSTRATE UNDERSTANDING OF ELECTRONICS**

**UNIT CODE:** ENG/OS/TLE/CR/05/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate understanding of Electronics. Competencies includes; Apply semiconductor theory, Applying semiconductor diodes, demonstrating understanding of transistors, Applying special semiconductor devices, Performing rectification, applying amplifiers, demonstrating understanding of oscillators, applying wave shaping and pulse generation circuit and application of Opto-electronics..

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicised terms are elaborated in the Range)*** |
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| * + 1. Demonstrate understanding of semiconductor theory | * 1. Types of ***materials*** are established in line with semiconductor theory   2. Semiconductor materials are identified as per their electrical conductivity properties |
| * + 1. Demonstrate understanding of semiconductor diodes | * 1. Types of diodes are identified as per their functionality   2. ***Diodes*** characteristics are determined as per their properties   3. Forward and reverse bias characteristics are established as per the properties of the semiconductor material |
| 1. Demonstrate understanding of transistors | * 1. ***Transistors*** are identified as per their characteristics   2. NPN and PNP are determined as per their operation   3. P and N channels are identified as per their operation   4. ***Biasing*** and determination of gain of transistors is performed as per their standard operating procedure   5. Transistor configuration is performed as per their application |
| 1. Apply special semiconductor devices | * 1. Special semiconductor devices are identified as per their operation   2. Special semiconductors are applied as per their standard operating procedure   3. Types of special semiconductor devices are identified |
| 1. Perform rectification | * 1. Types of rectifiers are identified as per their functions   2. Classes of rectifiers are identified as per their input voltage   3. Applications of rectifiers are established   4. Converters are identified as per their functions   5. Applications of converters are established as per their functions |
| 1. Apply amplifiers | * 1. Types of ***amplifiers*** are identified as per their functions   2. Operational amplifier is identified as per its applications   3. Characteristics of operational amplifiers are determined |
| 1. Demonstrate understanding of oscillators | * 1. ***Oscillators*** are classified as per their operation   2. Types of oscillators is determined as per their applications   3. Damped and Undamped oscillation is performed as per oscillator operation |
| 1. Apply wave shaping and pulse generation circuit | * 1. Wave shaping and pulse generation circuits are performed as per their standard operating procedure |
| 1. Apply opto-electronics | * 1. Types of Opt-electronics semiconductors are identified as per the operation characteristics   2. Diodes are classified as per their operation |

**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** |
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| 1.Materials | * 1. Insulators   2. Conductors   3. Semiconductors |
| 1. Diodes | 1. Photo diodes 2. Laser 3. Zener diodes 4. Light emitting diode 5. Schottky diodes |
| 1. Transistors | * 1. BJTs   2. FETs |
| 1. Biasing | * 1. Forward bias   2. Reverse bias |
| 1. Amplifiers | * 1. RC coupled amplifiers   2. Small signal amplifiers   3. Power amplifiers   4. Tuned amplifier   5. Wide band amplifiers   6. Op-Amp amplifiers |
| 1. Oscillators | * 1. Tuned collector   2. RC phase shift   3. Colpits   4. Hartley   5. Crystal   6. Blocking |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

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

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

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Amplifier construction
* Communications (verbal and written);
* Proficient in ICT;
* Time management;
* Analytical
* Problem solving
* Planning;
* Decision making;
* First aid;
* Electronics biasing

**EVIDENCE GUIDE**

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

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| 1. Critical Aspects of Competency | **Assessment requires evidence that the candidate:**   * 1. Identified different semiconductor material   2. Demonstrated understanding in biasing of semiconductor materials   3. Identified special semiconductor devices   4. Performed forward and reverse biasing of semiconductor materials   5. Identified different types of transistors   6. Classified various types of oscillators   7. Identified various types of opto-electronics semiconductors |
| 1. Resource Implications | The following resources must be provided:   * 1. Stationeries   2. Reference materials   3. Practical materials   4. Measuring instruments   5. Tools   Resources the same as that of workplace are advised to be applied |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral test   2. Written test   3. Observation   4. Practical demonstration |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through a simulated work place setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

# PERFORM ELECTRICAL INSTALLATION

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

**UNIT DESCRIPTION**

This unit specifies the competencies required for performing electrical installation. Competencies required includes; applying EHS Standards, conducting site survey, designing installation, performing system sizing, preparation of working drawings, planning for logistics, preparation of list of tools equipment and materials, preparation of installation work plan, establishment of installation team, preparation of work site, marking, piping and fixing accessories, performing installation, terminating installation, testing and inspecting installation and finally preparation of tenders and service contracts

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  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. ***Safety regulations*** are applied as per the EHS   2. Occupational health and safety standards are applied   3. ***Good housekeeping*** practices are applied   4. Accident and incidents are recorded and reported as per the working organization structure.   5. First aid is applied as per the as per OSHA |
| 1. Conduct site survey | * 1. The site is surveyed for suitability for thetype of ***installation*** to be done as per the contract   2. Conditions of the site are evaluated according tothe ***established procedures***   3. Installation route is identified as per the standard operating procedure   4. Measurements are taken as per the expected installation.   5. Survey report is generated and shared with relevant parties according to the established procedures |
| 1. Design Electrical installation. | * 1. Electrical installation is designed as per the size of the load.   2. Wiring type is established as per the clients need.   3. Electrical design is performed as per the type of the structure.   4. Electrical design is performed as per the size of the structure.   5. Electrical installation design is performed in line with the IEE regulation.   6. Electrical installation design is performed in line with the national and international standards |
| 1. Prepare working drawings | * 1. Installation design drawing is interpreted   2. Symbols and nomenclatures are applied in accordance with British Standards [BS 3939]   3. Drawing tools are applied as per the expected task   4. Components and their ratings are identified   5. Cable sizes and lengths are shown as per the design   6. Power supply and distribution circuits are drawn as per the design   7. Phase balancing of the loads is done as per the usage   8. Cable routes are clearly indicated in line with design   9. Working drawing is prepared per the design and any deviations shared with relevant parties |
| 1. Perform system sizing | * 1. Load estimation is conducted according to the set ***standard***   2. Type and size of protective devices is determined according to ***IEE regulations***   3. Cable sizes are calculated for the estimated loads according to ***IEE regulations***   4. System sizes are recorded and shared as per ***established procedures*** |
| 1. Plan for logistics | * 1. ***logistics*** for the particular work and site is determined   2. Logistics are reported and planned for with the relevant parties according to work schedule |
| 1. Prepare list of tools, equipment & materials. | * 1. Tools, equipment and materials needed for the work are determined and list prepared as per established procedure   2. Tools, equipment and materials are checked for ***specifications*** and functionality as per the standard operating procedure   3. Tools, equipment and materials are assembled and stored as per the established procedure |
| 1. Prepare installation work plan | * 1. Installation drawing is acquired as per ***established procedure***   2. The scope of installation work is identified   3. Work is undertaken as per the workplace procedures.   4. Team members are identified according to the tasks   5. ***Work schedule*** is prepared based on the scope and the working drawing   6. Type of permit to work is identified as per the working station   7. Permits issued bodies are identified   8. Permit to work form is filled and submitted to the responsible body |
| 1. Establish installation team | * 1. Communication protocol is designed and distributed among the team members   2. Responsibilities are established and distributed among the team members   3. Team familiarization is done according to the established procedure |
| 1. Prepare work site | * 1. Special work, hazard and safety requirements are identified.   2. Identified hazards and safety issues are mitigated according to ***OSHA*** (Occupational Safety and Health Act   3. Work plan is confirmed in accordance with legislative and regulatory requirements and standard operating procedures.   4. Work site is prepared for accessibility of ***utilities*** |
| 1. Perform marking, piping and fixing of accessories | * 1. Marking, piping and fixing tools are identified as per the nature of the job   2. Marking is performed as per the working drawing   3. Marking is performed in line with establishes procedures and standards   4. Marking positions are performed as per the IEE regulations   5. Conduits are laid in line with standard operating procedures   6. Accessories are fixed as per the established procedure |
| 1. Perform Electrical installation | * 1. Installation procedures and technical standards are applied   2. Working drawing is implemented   3. Safety procedures are adhered to for each activity   4. Cables, conductors, conduits, enclosures and support systems are installed as per the working drawing   5. Cables are drawn-in in line with standard operating procedures.   6. Number and size of cables are laid in a conduit is performed as per the IEE regulations   7. Insulation resistance test is performed as per the IEE regulations |
| 1. Terminate Electrical installation | * 1. Cable lugging is performed as per the standards operating procedure.   2. Cables are terminated as per the IEE regulations   3. Labelling of the cables is performed as per the complexity of the job.   4. Insulation is performed as per the IEE regulation |
| 1. Test Electrical installation | * 1. Type of tests are identified   2. Test is performed as per the IEE regulations   3. Firmness of the installation is established   4. Continuity test is performed   5. Ring circuit test is performed as per the standard operating procedure   6. Earth continuity test is performed as per the IEE regulations   7. Short circuit test is performed as per the IEE regulation   8. Earth resistance test is performed   9. Open circuit test is performed |
| 1. Prepare tenders and service contracts | * 1. Laws of contracts and tendering are adhered to   2. Types and forms of contracts are identified   3. Type of tenders are identified   4. Tender estimating is performed in line with the tendering laws   5. Statutory documents in contract and tendering are identified |

**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 include but not limited to: | * + Domestic installation   + Commercial installation   + Industrial Installation   + Street lighting   + Security   + IBMS (integrated building Management system) |
| Established Procedures include but not limited to: | * + Company rules   + Procedures mentioned in contract |
| Design include but not limited to: | * + Electrical design for lighting and power   + Electrical design for switchgear   + Electrical design for alarm systems |
| Standard include but not limited to: | * + IEE standard   + British Standard   + KEBS standard |
| IEE regulations include but not limited to: | * 17th Edition |
| Logistics includes but not limited to: | * + Personnel, Finance and input materials   + Transport and storage   + Communications   + Security |
| Specifications include but not limited to: | * + Tolerance/ range   + Make / model   + Size   + Class |
| Regulations and legislative requirements include but not limited to: | * + KPLC procedures   + County bylaws   + Energy Act, 2006   + National Construction Authority Act   + OSHA |
| Work schedule include but not limited to: | * + Gantt chart   + Block |
| Permit to work include but not limited to: | * + KPLC permit   + Gate Pass   + Daily work permit   + Work Tag |
| Utilities include but not limited to: | * Water, electrical power, toilets and communication |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Health and safety in Electrical wiring
* Various types of wiring system
* OSHA
* EPRA regulations on Electrical wiring
* Testing and measuring tools in Electrical installation
* Workshop procedures and guidelines
* Wiring statutory documents
* PPE
* Material management
* Workplace communication
* Legal requirement relating to Electrical
* Documentation and records keeping
* Importance of manufacturers
* Manuals in electrical installation and maintenance

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Wiring
* Troubleshooting
* Electrical maintenance
* Problem solving
* Analytical
* First aid
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing
* Decision making
* Maintenance

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied work health and safety procedures   2. Interpreted design and prepared a working drawing   3. Applied appropriate standard   4. Determined types and sizes of materials and equipment and protective devices   5. Demonstrated knowledge of logistics to the given task   6. Survey report was generated and shared with the relevant parties   7. Measurement were we taken at the site   8. Installation planning was performed as per the scope of the work   9. Electrical design was performed as per the installation scope   10. Load was calculated as per the scope of the installation   11. Phases were balanced as per the expected load   12. Cables and accessories were installed as per the IEE regulation   13. Cables were terminated as per the IEE regulation   14. Installation was tested and results documented |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied  including Measuring tape, pegs, calculator, stationery, accessories and cables |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Observation  3.2 Oral questioning  3.3 Practical demonstration |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace and simulated setting of the actual work place |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL BASE TRANSCEIVER STATION

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

**UNIT DESCRIPTION**

This unit covers the competencies required to install Base transceiver station: Competencies include; conducting site survey, requesting for BTS installation (RFI), assembling tools, equipment and materials, preparing site installation layout, Installing (BTS), aligning installed Antenna, testing and commissioning installed Site and documenting installed Base Transceiver Station

**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. Site survey is conducted as per the type of installation to be carried out   2. Site conditions are evaluated according to the established procedures   3. Installation route is identified as per the standard operating procedure   4. Measurements are taken as per the expected installation.   5. Site survey photos are documented in line with the industry best practices   6. Site survey report is analysed according to the collected data and installation requirements   7. Survey report is generated and shared with relevant parties according to the expected guidelines   8. Site orientation is noted according to the installation region   9. Safety procedures are adhered to for each activity |
| * + 1. Request for BTS installation (RFI) | * 1. Request for BTS installation is performed as per the site survey   2. Materials are provided as per the RFI documents   3. Location of installation site is determined in accordance with the GPS coordinates in the RFI document   4. BTS installation time is determined as per the RFI document   5. BTS installation acceptance period is determined as per the RFI document   6. Work permits and licenses are acquired in accordance with the RFI document   7. Safety procedures are adhered to for each activity |
| * + 1. Assemble tool, equipment and materials | * 1. Assembling and fixing tools and equipment are identified according to the type of components to be installed   2. Tools, equipment and materials needed for the work are determined and list prepared as per established procedure   3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure   4. Tools, equipment and materials are assembled and stored as per developed guidelines   5. Distance measuring instruments are identified and adjusted as per the required scale and the parameters |
| * + 1. Prepare site installation layout | * 1. Transmitters - receiver distance is determined according to the expected signal coverage   2. ***Installation*** layout is prepared in line with the design   3. Installation layout is designed as per the expected load   4. layout is prepared according to the type and nature of the components to be installed   5. Installation layout is prepared in adherence to EHS regulations.   6. Installation layout approval is acquired in accordance with the standard operation procedures. |
| * + 1. Install (BTS) | * 1. Safety procedures are adhered to for each activity   2. BTS equipment is installed according to the installation design   3. Component and equipment are installed in line with the manufacturer’s manuals.   4. BTS coverage antenna is installed according to the installation design.   5. Feeder cables are laid and terminated according to the standard installation procedure.   6. Transmission link is installed in accordance with the installation design.   7. Transmission Antenna is installed in accordance with the installation design.   8. Weather proofing is performed as per the IEC standards   9. Safety procedures are adhered to for each activity   10. Waste materials are disposed in accordance with EHS regulations |
| * + 1. Align installed Antenna | * 1. Antenna height is adjusted as per the design   2. Safety procedures are adhered to for each activity   3. Installation of antenna protection system is carried out according to the design and security threats available   4. Antenna transmission frequency is adjusted based on the expected output and the design   5. Adjustment is carried out based on the installation design.   6. Signal optimization is carried out in accordance to the expected coverage design. |
| * + 1. Test and commission installed Site | * 1. Types of tests are identified according to the system functionality.   2. Signal testing tools and instruments are assembled as per the series of tests expected to be carried out.   3. Commissioning schedule is prepared according to the complexity of the installation.   4. Testing is carried out in line with the manufacturers manual   5. Installed site is commissioned as per the commissioning guidelines.   6. Safety procedures are adhered to for each activity |
| * + 1. Document installed Base Transceiver Station | * 1. Reports are prepared in line with the organization approved format   2. Report are shared according to the organization policy and the structure   3. Reports are filed in line with organization filing system   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Installation include but not limited to: | * + Antenna installation   + Components mounting |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Types of signals
* Signal transmission medium
* Health and safety in antenna installation
* CAK regulations in installation of antenna
* OSHA
* Testing and measuring tools in antenna installation
* Local Authority regulations
* Workshop procedures and guidelines
* Antenna installation statutory documents
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Importance of manufacturers manuals antenna installation and maintenance
* Types of antenna

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Antenna installation
* Troubleshooting
* Signals measuring instruments
* Survey and data capture
* Decision making
* Planning
* Negotiation
* Problem solving
* Analytical
* First aid
* Communications
* Proficient in ICT
* Time management
* Report writing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Conducted site survey as per the type of installation to be carried out   2. Surveyed site conditions according to the terrain of the installation location   3. Analysed site survey report according to the collected data and installation requirements   4. Identified assembling and fixing tools and equipment according to the type of components to be installed   5. Determined transmitters - receiver distance according to the expected signal coverage   6. Prepared layout according to the type and nature of the components to be installed   7. Installed component and equipment in line with the manufacturers manuals   8. Adjusted antenna height as per the design   9. Identified types of tests according to the system functionality |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied  including installation tools, signal measuring tools and instruments, antenna, crane machines, |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Observation   * 1. Oral questioning   2. Practical demonstration   3. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace and simulated setting of the actual work place |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**INSTALL SATELLITE SIGNAL REFLECTORS**

**UNIT CODE:** ENG/OS/TLE/CR/03/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to install satellite signal reflectors. Competencies include; conducting site survey, assembling installation tools and equipment, identifying mounting location, aligning signal reflector, connecting RCA component and coaxial cables to the receiver, testing and commissioning satellite signal installation and documenting satellite 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. Conduct pre-installation live survey | * 1. Site survey is conducted as per the type of installation to be carried out   2. Safety procedures are adhered to for each activity   3. Site conditions are evaluated according to the installation requirements   4. Live pre-installation survey is conducted as per the expected feasibility.   5. Installation route is identified as per the strength of signal required   6. Survey is conducted in line with the site near and far shadings   7. Site survey report is analysed according to the collected data and installation requirements   8. Survey report is generated and shared with relevant parties according to the expected guidelines |
| 1. Assemble installation tools and equipment | * 1. Assembling and fixing tools and equipment are identified according to the type of signal reflector to be installed   2. Tools, equipment and materials needed for the work are determined and list prepared as per established procedure   3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure   4. Tools, equipment and materials are assembled and stored as per developed guidelines |
| 1. Identify mounting location | * 1. Mounting location is determined according to the ***type of signals***   2. Mounting position is identified based on the direction of the satellite signals transmission   3. Location is identified as per the signal strength requirement   4. Mounting location is identified based on site near and far shading   5. Mounting location is determined according to the size and type of the reflector |
| 1. Align satellite signal reflector | * 1. Signal reflector is aligned according the strength of the expected signal   2. Safety procedures are adhered to for each activity   3. Alignment is performed based on the receiver frequency requirement   4. Alignment is performed as per the receiver designed noise band levels   5. Alignment is performed according to the type of signal required   6. Signal reflector is aligned in consideration of the satellite signal transmission links |
| 1. Connect satellite receiver dish and box | * 1. Dish and box components are connected in line to the installation manuals   2. Safety procedures are adhered to for each activity   3. Cable connection is performed based on the expected output   4. Connection is performed in consideration of the cable impedances   5. Connections are performed as per the expected signal strength and purpose.   6. Connectors are tightened as per the industry best practices   7. Weather proofing materials are applied as per the standard operating procedure   8. Waste materials are disposed in accordance with EHS regulations |
| 1. Test and commission satellite signal installation | * 1. Types of tests are identified as per the purpose of the installation.   2. Signal testing tools and instruments are assembled as per the series of tests expected to be carried out.   3. Signal frequency test is conducted according to the receiver requirements   4. Signal quality and strength is tested in line with the expected signal levels   5. Commissioning schedule is prepared according to the complexity of the installation.   6. Installed satellite system is commissioned as per the commissioning guidelines |
| 1. Document satellite installation | * 1. Reports are prepared in line with the organization approved format   2. Report are shared according to the organization policy and the structure   3. Reports are filed in line with organization filing system   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Types of signals include but not limited to: | * Discrete * Continuous |
| Components include but not limited to: | * Switches * Reflectors * Brackets * Mounting arms |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Types of signal transmission medium
* Types of signals
* Health and safety in antenna installation
* Satellite signals
* CAK regulations in space signal transmission
* Material management
* Workplace communication
* Satellite signal testing and measuring instruments
* Workshop procedures and guidelines
* Satellite signal installation statutory documents
* PPE
* Documentation and records keeping
* OSHA
* Manufacturers of satellite components

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of satellite components
* Signal maintenance
* Troubleshooting
* Signals measuring instruments
* Survey and data capture
* Problem solving
* Analytical
* First aid
* Decision making
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Evaluated site conditions according to the installation requirements   2. Analysed site survey report according to the collected data and installation requirements   3. Generated and shared survey report with relevant parties according to the expected guidelines   4. Assembled and stored tools, equipment and materials as per developed guidelines   5. Location is identified as per the signal strength requirement   6. Aligned signal reflector according to the strength of the expected signal   7. Performed reflector alignment according to the type of signal required   8. Connected RCA components in line with the installation manuals   9. Performed cable connection based on the expected output   10. Tested signal frequency according to the receiver requirements |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied  including installation tools, signal measuring tools and instruments, satellite reflectors, communication cable, ladder etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in   * 1. The actual workplace or   2. Simulated work place environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# **INSTALL SECURITY SYSTEMS**

**UNIT CODE:** ENG/OS/TLE/CR/04/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing of security systems. Competencies includes; Security system design, marking out of security systems zones, laying system cables, mounting accessories, terminate system cables and testing of the system.

**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. Design security system | * 1. Design is performed as per the scope of the system   2. Design is performed as per the system’s functionality   3. Design components are identified as per the system functionality   4. Complexity is established as per the scope of the system   5. Wiring design is performed in line with the IEE regulation.   6. Wiring System is performed in line with the national and international standards   7. System is designed in line with the expected self-defensive mechanism   8. Design is performed in adherence to ***the regulatory*** ***bodies*** requirement |
| 1. Mark out security system zones | * 1. Marking, piping and fixing tools are identified as per the nature of the job   2. Marking is performed as per the design drawing   3. Marking is performed in line with establishes procedures and standards   4. ***Marking points and zones*** are performed as per the design |
| 1. Lay system cables | * 1. Cable types are identified as per their use   2. Cables are laid as per the IEE regulations   3. Cables laying system is as per the environmental condition   4. Firmness of the cables are installed as per the standard operating procedure   5. Cables are segregated as per the standard operating procedure |
| 1. Mount accessories | * 1. Accessories are labelled as per their functions.   2. Accessories are wired as per the design   3. Control panel is mounted as per the standard operating procedure   4. Accessories are mounted as per the system design   5. Control panel is ***enclosed*** as per the OSHA |
| 1. Terminate system cables | * 1. Cable lugging is performed as per the standards operating procedure.   2. Cables are terminated as per the IEE regulations   3. Cables are terminated in the connector as per the design |
| 1. Test security system | * 1. Type of ***tests*** are identified   2. Test is performed as per the IEE regulations   3. Firmness of the installation is established   4. Continuity test is performed   5. Insulation resistance test is performed as per the IEE regulations |

**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** |
| --- | --- |
| Points and zones include but not limited to: | * + Switch points   + Socket points   + Lighting points   + Installation points   + System control point |
| Enclosing materials include but not limited to: | * + Metal case   + Wooden case   + Plastic case |
| Tests include but not limited to: | * + Continuity   + Insulation resistance   + Short circuit   + Firmness   + Sound   + Speed   + Efficiency   + Expected output |
| Regulatory bodies include but not limited to: | * + County Governments   + EPRA (Energy and Petroleum Regulatory Authority)   + MSK (Music Copyright of Kenya)   + NCA (National Construction Authority)   + National Environment Management Authority (NEMA)   + Communications Authority of Kenya (CAK)   + Kenya Civil Aviation Authority (KCAA) |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Testing of security systems
* Workshop procedures and guidelines
* Statutory documents in installation of security systems
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Manufacturers of different types of security systems
* CAK regulations
* Environmental health and safety
* Legal requirements in the installation of security systems
* Types of security systems and their operations
* Installation of different types of security systems
* Types of signal transmission medium
* Types of signals
* Health and safety in antenna installation
* OSHA

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of security systems
* Security systems maintenance
* Troubleshooting
* Survey and data capture
* Problem solving
* Analytical
* First aid
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing
* Decision making

**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. Security system designed in line with clients requirements   2. Wired security systems as per the IEE regulations   3. Marking of the components position was performed before fixing   4. Cables were segregated in line with standard operating procedure   5. Accessories were labelled after the installation of the system   6. Cables were terminated in the connectors as per the design   7. Insulation, continuity, short circuit and firmness tests were performed.   8. Applied appropriate safety standards   9. Applied appropriate technical standards   10. Identified and used appropriate tools and equipment   11. Demonstrated good communication and interpersonal skills   12. Prepared and kept appropriate records |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, security systems components, communication cable, ladder etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL INSIDE PLANT NETWORK

**UNIT CODE:** ENG/OS/TLE/CR/05/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing communication network. Competencies includes; surveying network installation site, designing network installation, assembling installation tools, equipment and materials, installing network equipment and devices, configuring network devices.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Survey network installation site | * 1. Survey is conducted according to the type of network to be installed   2. Site conditions are evaluated according to the network installation requirements   3. Installation route is identified as per expected network coverage and architectural design   4. Site survey report is analysed according to the collected data and installation requirements   5. Survey report is generated and shared with relevant parties according to the expected guidelines   6. Safety procedures are adhered to for each activity |
| 1. Design inside plant network | * 1. Design is performed as per the expected network use   2. Design is performed as per the network numbers of users   3. Design components are identified as per the network application   4. Network is designed according to the expected transmission platform   5. Network installation is designed in line with the national and international standards   6. Network installation is designed in line with the expected network security requirements   7. Design is performed in adherence to the regulatory bodies requirement |
| 1. Assemble installation tools, equipment and materials | * 1. Assembling and fixing tools and equipment are identified according to the type of network to be installed   2. Tools, equipment and materials needed for the installation are determined and list prepared as per the nature of the work   3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure   4. Tools, equipment and materials are assembled and stored as per developed guidelines |
| 1. Install network equipment and devices. | * 1. Network installation is performed in line with the design   2. Components are installed according to the manufacturers manuals   3. Network is installed in adherence to the expected output signals   4. Network is installed as per the standard operating procedure   5. Cable ***enclosures*** are installed according to the size of communication cables   6. Communication cables are laid and enclosed in adherence to the IEE regulations   7. Network components are installed in adherence to the laws and policies of the relevant ***regulatory bodies***   8. Network components are labelled.   9. Safety procedures are adhered to for each activity   10. Waste materials are disposed in accordance with EHS regulations |
| 1. Configure network devices | * 1. Tools, materials and devices for network configuration are identified according to the network type   2. Network connection is performed according to National and international communication standards and protocols   3. Stability and connectivity tests of cables and equipment is performed as per the network type   4. Network is installed and configured according to network installation manual.   5. IP addressing scheme, subnet masking and routing protocol configuration is performed   6. Network segmentation is determined as per the Network design.   7. Network security is implemented in accordance with the expected security threats.   8. Network privileges are allocated according to the network configuration.   9. Safety procedures are adhered to for each activity   10. Network types are configured as per the type of connection   11. Remote network access for specified users is configured in accordance with the organization policy.   12. Network is configured in line with the number of users |
| 1. Test and commission installed network | * 1. Types of testes are identified according to the purpose of the network.   2. Test tools and equipment are identified in accordance with the required tests.   3. Tests are performed according to the components installation manual   4. Network capacity is tested in line with the number of users expected.   5. Commissioning schedule is prepared according to the complexity of the installation.   6. Network is commissioned as per the commissioning guidelines |
| 1. Document installed network | * 1. Network installation report is prepared according to the organization policy   2. Installation report is shared based on the organization structure   3. Network installation report is filed according to the organization filing system.   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Enclosing materials include but not limited to: | * + Metal case   + Wooden case   + Plastic case |
| Tests include but not limited to: | * + Continuity   + Efficiency |
| Regulatory bodies include but not limited to: | * + County Governments   + EPRA (Energy and Petroleum Regulatory Authority)   + MSK (Music Copyright of Kenya)   + NCA (National Construction Authority)   + National Environment Management Authority (NEMA)   + Communications Authority of Kenya (CAK)   + Kenya Civil Aviation Authority (KCAA) |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

|  |  |
| --- | --- |
| The individual needs to demonstrate knowledge and understanding of: | |
| * Environmental health and safety * Legal requirements in the installation of security systems * Types of communication network * Installation of different types of networks * Types of signal transmission medium * Types of networks * Health and safety measures in installation of network * OSHA * Testing of network * Statutory documents in installation of different types of network * PPE * Material management * Workplace communication * Documentation and records keeping * Manufacturers of different types of security systems * CAK regulations |  |

**FOUNDATION SKILLS**

|  |  |
| --- | --- |
| The individual needs to demonstrate the following foundation skills: | |
| * Installation of networks * Network maintenance * Troubleshooting * Problem solving * Analytical * Planning * Communications * Proficient in ICT * Time management * Negotiation * Report writing * First aid * Decision making |  |

**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. Designed network installation in line with the national and international standards   2. Identified design components as per the network application   3. Analysed site survey report according to the collected data and installation requirements   4. Evaluated site conditions according to the network installation requirements   5. Performed design as per the network users   6. Installed components according to the manufacturers manuals   7. Installed network in line with the design   8. Performed network connection according to National and International communication standards and protocols   9. Allocated network privileges according to the network configuration   10. Conducted testing according to the network installation manual |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, network testing tools, communication cable, routers, switches, RJ connectors, patch panels etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL IP PABX

**UNIT CODE:** ENG/OS/TLE/CR/06/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing IP PABX. Competencies includes; setting mini SIP Server, connecting local users to mini SIP Server, connecting mini SIP Server to VOIP providers' network, deploying network services, testing and run installed IP PABX system and documenting installed PABX system.

**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. IP PABX installation survey | * 1. A pre-installation site visit is conducted in accordance with industry policy   2. A survey report is generated in regards to the industry standards   3. Site survey report is analysed according to the collected data and installation requirements   4. Survey report is generated and shared with relevant parties according to the expected guidelines   5. Required materials are identified according to the pre-installation site survey report   6. Safety procedures are adhered to for each activity |
| 1. Setup mini SIP Server | * 1. Network connection between service provider and the client is established based on the configuration provided by the service provider   2. Mini SIP server is set up according to the capacity of the PABX to be installed   3. Mini SIP server is tested on in and out bound calls based on its inbuilt call back functionality   4. Safety procedures are adhered to for each activity |
| 1. Connect local users to mini SIP Server | * 1. Connections are performed in line with the clients requirements   2. Connections are performed as per the expected users   3. Connections are performed as per the manufacturers manuals |
| 1. Connect mini SIP Server to VOIP providers' network | * 1. Mini SIP server is connected to the VOIP network based on the capacity and capability of ***access device***   2. Connections are performed according to the SIP and service provider configuration   3. Cable are connected according in line with industry best practices |
| 1. Deploy network services | * 1. Network services are deployed in line with the design   2. Network service are deployed according to the expected functionality   3. Network services are deployed according to the expected performance. |
| 1. Test, commission and run installed IP PABX system | * 1. Types of tests are identified according to the system functionality   2. Test tools and equipment are identified in accordance with the required tests.   3. Testing is carried out according to the expected efficiency.   4. Testing is performed in line with expected connections.   5. Commissioning schedule is prepared according to the complexity of the installation.   6. IP PABX is commissioned as per the commissioning guidelines |
| 1. Document installed IP PABX system. | * 1. IP PABX installation report is prepared according to the organization approved format   2. Reports is shared based on the organization structure   3. Reports are filed according to the organization filing system   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Access device include but not limited to: | * + Access router   + ONT ( Optical Network Terminal)   + Cisco Routers and boxes |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

| The individual needs to demonstrate knowledge and understanding of: | |
| --- | --- |
| * Environmental health and safety * Installation of different types of networks * Types of signal transmission medium * Health and safety measures in installation of IP PABX * Cisco Routers and boxes * CAK regulations * OSHA * Testing of network * PPE * Material management * Documentation and records keeping |  |

**FOUNDATION SKILLS**

| The individual needs to demonstrate the following foundation skills: | |
| --- | --- |
| * Installation of networks * Network maintenance * Troubleshooting * Proficient in ICT * Time management * Negotiation * Problem solving * Analytical * First aid * Decision making * Planning * 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. Tested mini SIP server on in and out bound calls based on its inbuilt call back functionality   2. Performed connection in line with the clients requirements   3. Connected mini SIP server to the VOIP network based on the available access device   4. Deployed network services in line with the design   5. Carried out testing according to the expected efficiency   6. Filed reports according to the organization filing system |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, communication cable, routers, switches etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL FIBRE OPTIC CABLE

**UNIT CODE:** ENG/OS/TLE/CR/07/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing fibre optic cables. Competencies include: conducting site survey, acquiring authorisation documents, assembling tools, equipment and materials, building cable laying paths, laying fibre optic cable, splicing fibre optic cables, testing and commission fibre optic installation and documenting fibre optic installation 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. Conduct site survey | * 1. Survey is conducted according to the type of network to be installed   2. Safety procedures are adhered to for each activity   3. Site conditions are evaluated according to the network installation requirements   4. Installation route is identified as per expected network coverage   5. Site survey report is analysed according to the collected data and installation requirements   6. Survey report is generated and shared with relevant parties according to the expected guidelines |
| 1. Acquire authorisation documents | * 1. Relevant regulatory bodies in installation of fibre optic network are identified based on the location and nature of installation   2. County by- laws adhered to and installation licences are acquired according to the cable installation location   3. Way-leaves are acquired in accordance with the concerned parties. |
| 1. Assemble tools, equipment and materials | * 1. Assembling and fixing tools and equipment are identified according to the type of network to be installed   2. Tools, equipment and materials needed for the installation are determined and list prepared as per the nature of the work   3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure   4. Tools, equipment and materials are assembled and stored as per developed guidelines |
| 1. Build cable laying route | * 1. Cable laying route are build based on the network requirements   2. Safety procedures are adhered to for each activity   3. Fibre optic cable routes are build according to the installation location   4. Fibre optic cable are build based on the network design   5. Fibre optic cable are build according to the expected termination point |
| 1. Lay fibre optic cable | * 1. Ducts are laid in line with the expected installation requirement   2. Safety procedures are adhered to for each activity   3. Fibre optic cables are laid according to the standard operating procedures   4. Fibre optic cables are laid based on the user requirements   5. Fibre optic cable is laid according to the design requirements   6. Fibre optic cable blowing is performed according to the standard operating procedures |
| 1. Splice fibre optic cables | * 1. Splicing is performed according to the standard operating procedure   2. Safety procedures are adhered to for each activity   3. Splicing is performed in consideration of the necessary expected losses   4. Waste materials are disposed in accordance with EHS regulations |
| 1. Test and commission fibre optic installation | * 1. ***Types of tests*** are identified according to the network expected output   2. Test tools and equipment are identified in accordance with the required tests.   3. Testing is carried out according to the network functionality   4. Commissioning schedule is prepared according to the complexity of the installation.   5. Installation is commissioned as per the commissioning guidelines |
| 1. Document fibre Optic câblé installation report | * 1. Fibre optic installation report is prepared according to the organization policy   2. Installation report is shared in line with the organization structure   3. Fibre optic installation report is filed according to the organization filing system.   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Types of tests include but not limited to: | * + OTDR test   + Dispersion tests   + Continuity   + Laser tests   + Power level tests. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Legal requirements in the installation of security systems
* Types of communication network
* Installation of different types of networks
* Types of signal transmission medium
* Types of networks
* Documentation and records keeping
* Manufacturers of different types of security systems
* Health and safety measures in installation of network
* CAK regulations
* OSHA
* Testing of network
* Statutory documents in installation of different types of network
* PPE
* Material management
* Workplace communication

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of networks
* Network maintenance
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Proficient in ICT
* Negotiation
* Report writing
* Decision making
* Planning
* Communications
* Time management

**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. Evaluated site conditions according to the network installation requirements   2. Identified installation route as per expected network coverage   3. Identified relevant regulatory bodies of fibre optic network based on the location of installation   4. Build cable laying route based on the network requirements   5. Build route based on the network design   6. Performed fibre optic cable blowing according to the standard operating procedures   7. Layed ducts in line with the expected installation requirement   8. Performed splicing ccording to the standard operating procedure   9. Carried out testing according to the network functionality   10. Prepared fibre optic installation report according to the organization policy |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, network testing tools, communication cable, routers, switches etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | * 1. Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL COMMUNICATION EQUIPMENT

**UNIT CODE:** ENG/OS/TLE/CR/08/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing communication equipment. Competencies include; interpreting equipment design specifications, assembling telecommunication devices, connecting telecommunication devices, operating signal generator, operating signal electronic measuring instrument, inspecting communication cables, testing and commissioning installed equipment and documenting equipment installation 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. Conduct site survey | * 1. Site survey is conducted as per the type of installation to be carried out   2. Site conditions are evaluated according to the established procedures   3. Measurements are taken as per the expected installation.   4. Site survey photos are documented in line with the industry best practices   5. Site survey report is analysed according to the collected data and installation requirements   6. Survey report is generated and shared with relevant parties according to the expected guidelines   7. Safety procedures are adhered to in line with the OSHA |
| 1. Interpret equipment design specifications | * 1. Equipment to be installed is identified based on the provided manufacturers manuals   2. Manufacturers manuals are interpreted in line with the equipment designs and drawings   3. Equipment power ratings is identified according to its specification   4. Equipment installation location is identified based on the specified condition |
| 1. Assemble telecommunication devices | * 1. Installation tools are identified according to the type and size of the components to be assembled.   2. Devices assembling location is identified according to the standard operating conditions   3. Telecommunication devices are unpacked and assembled as per the provided manufacturers manuals   4. Safety procedures are adhered to for each activity |
| 1. Install telecommunication equipment | * 1. Connections are performed according to the manufacturers guidelines   2. Installation is performed according to the clients requirements   3. Power and network cables are connected as per the equipment requirements   4. Equipment is secured as per the manufacturers design   5. Safety procedures are adhered to for each activity   6. Waste materials are disposed in accordance with EHS regulations   7. Adherence to CAK regulations in installation of the communication system. |
| 1. Test and commission installed equipment | * 1. Types of tests are identified according to the equipment functionality   2. Power on self-test is performed according to the equipment functionality   3. Equipment connectivity is tested according to the stipulated requirements   4. Commissioning schedule is prepared according to the complexity of the installation.   5. Communication system is commissioned as per the commissioning guidelines |
| 1. Document equipment installation report | * 1. Equipment installation report is prepared according to the organization policy   2. Installation report is shared in line with the organization structure   3. Equipment installation report is filed according to the organization filing system.   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Types of tests include but not limited to: | * + OTDR test   + Power on Self-test   + Dispersion tests   + Continuity |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Types of communication network
* Installation of different types of networks
* Types of networks
* CAK regulations
* OSHA
* Types of tests in various communication equipment
* Statutory documents in installation of different types of communication equipment
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Customer management

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of communication
* Communication equipment maintenance
* Troubleshooting
* Report writing
* Proficient in ICT
* Time management
* Problem solving
* Analytical
* First aid
* Decision making
* Planning
* Negotiation
* Communications

**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. Interpreted manufacturers manuals in line with the equipment designs and drawings   2. Identified installation location based on the specified condition   3. Identified devices assembling location according to the standard operating conditions   4. Performed installation according to the clients requirements   5. Connected power and network cables as per the equipment requirements   6. Types of tests are identified according to the equipment functionality   7. Filed equipment installation according to the organization filing system |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, network testing tools, communication cable, routers, switches, hubs, access points, fasteners etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL RADAR SYSTEM

**UNIT CODE:** ENG/OS/TLE/CR/09/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing radar systems. Competencies include; conducting site survey, assembling tools, equipment and materials, preparing radar installation location, mounting radar system, testing and commissioning installed radar system and documenting radar installation 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. Conduct site survey | * 1. Survey is conducted according to the type of radar system to be installed   2. Site conditions are evaluated according to the radar installation requirements   3. Radar system installation location is identified as per expected coverage   4. Site survey report is analysed according to the collected data and installation requirements   5. Survey report is generated and shared with relevant parties according to the expected guidelines   6. Safety procedures are adhered to for each activity |
| 1. Assemble tools, equipment and materials | * 1. Installation tools are identified and assembled in line with the type of installation to be carried out   2. Tools, equipment and materials assembled as per their use in installation of a radar system   3. Tools, equipment and materials are checked for specification and functionality as per the standard operating procedure.   4. Tools, equipment and materials are assembled and stored as per developed guidelines   5. Safety procedures are adhered to for each activity |
| 1. Prepare radar installation location | * 1. Installation location is prepared according to the type of installation to be carried out.   2. Installation location is prepared as per the functionality of the radar system   3. Relevant regulatory bodies are identified based on location and nature of installation.   4. Way-leaves are acquired in accordance with the concerned parties.   5. County by-laws are adhered to and installation licenses are acquired in accordance to the installation location.   6. Safety procedures are adhered to for each activity |
| 1. Mount radar system | * 1. Rader system is installed in line with the manufacturers manuals   2. Safety procedures are adhered to for each activity.   3. Radar system is installed based on the expected functionality   4. Radar system is configured according to manufacturer’s manuals   5. Radar system installation is performed according to the standard operating procedure   6. Safety procedures are adhered to for each activity   7. Waste materials are disposed in accordance with EHS regulations |
| 1. Test and commission installed radar | * 1. Types of tests are identified according to the system functionality.   2. Test tools and equipment are identified in accordance with the required tests.   3. Safety procedures are adhered to for each activity.   4. System connectivity is tested according to the stipulated requirements   5. Commissioning schedule is prepared according to the complexity of the installation.   6. Installation is commissioned as per commissioning guidelines. |
| 1. Document radar installation report | * 1. System installation report is prepared according to the organization policy   2. Installation report is shared based on the organization structure   3. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   4. Defects liability period is established in accordance with the standard operating procedures.   5. System installation report is filed according to the organization filing system. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Types of radar system
* Installation of different types of radar systems
* Types of networks
* CAK regulations
* OSHA
* Customer management
* Types of tests on various radar system
* Statutory documents in installation of different types of radar system
* PPE
* Material management
* Workplace communication
* Documentation and records keeping

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of radar system
* Radar system maintenance
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Proficient in ICT
* Time management
* Negotiation
* Decision making
* Planning
* Communications
* 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. Evaluate site conditions according to the radar installation requirements   2. Identified radar installation route as per the expected coverage   3. Assembled tools, equipment and materials as per their use in installation of a radar system   4. Identified installation team according to the scope and the nature of the work to be done   5. Prepared installation location as per the functionality of the radar system   6. Installed radar system is installed in line with the manufacturers manuals   7. Identified types of tests according to the system functionality   8. Filed system installation report according to the organization filing system. |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, Radar ,network testing tools, communication cable, routers, switches, hubs, access points, fasteners etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL BROADCASTING MONITOR

**UNIT CODE:** ENG/OS/TLE/CR/10/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing broadcasting monitor. Competencies include; sourcing and connecting communication device and equipment, feeding signal in transmitter, aligning wave guides, operating frequency synthesizers, testing and commission installed broadcasting monitor and documenting monitor installation 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. Source and connect communication device and equipment | * 1. Communication devices are sourced and connected as per the clients requirements   2. Devices are connected as per the system functionality   3. Safety procedures are adhered to for each activity |
| 1. Feed signal in transmitter | * 1. Signal transmitters are fed according to the standard operating procedures   2. Signals are fed in accordance with the expected output |
| 1. Align wave guides | * 1. Wave guides are aligned according to the size of the broadcasting monitor   2. Wave guides are aligned according to the functionality of the monitor   3. Safety procedures are adhered to for each activity   4. Waste materials are disposed in accordance with EHS regulations |
| 1. Operate frequency synthesizers | * 1. Frequency synthesizers are operated according to the standard operating procedure |
| 1. Test and commission installed broadcasting monitor | * 1. Types of tests are identified according to the system functionality   2. System connectivity is tested according to the stipulated requirements |
| 1. Document monitor installation report | * 1. System installation report is prepared according to the organization policy   2. Installation report is shared based on the organization structure   3. System installation report is filed according to the organization filing system.   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Types of broadcasting monitors
* Types of networks
* CAK regulations
* OSHA
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Customer management
* Types of tests on various radar system
* Statutory documents in installation of broadcasting monitors

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of broadcasting monitors
* Broadcasting monitors maintenance
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Decision making
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* 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. Connected devices as per the system functionality   2. Aligned wave guides according to the size of the broadcasting monitor   3. Operated frequency synthesizers according to the standard operating procedure   4. Identified types of tests according to the system functionality   5. System installation report is filed according to the organization filing system |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, measuring tools and instruments, Radar ,network testing tools, communication cable, routers, switches, hubs, access points, fasteners etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# INSTALL TELEPHONE NETWORK

**UNIT CODE:** ENG/OS/TLE/CR/11/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing telephone network. Competencies include: surveying installation premises, identifying network installation area, mounting KSU, plugging of the circuit cards into the KSU, interconnecting telephone line with the KSU.

**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. Survey installation premises | * 1. A pre-installation site visit is conducted in accordance with industry policy   2. A survey report is generated in regards to the industry standards   3. Site survey report is analysed according to the collected data and installation requirements   4. Survey report is generated and shared with relevant parties according to the expected guidelines   5. Required materials are identified according to the pre-installation site survey report   6. Safety procedures are adhered to for each activity |
| 1. Identify network installation area | * 1. KSU mounting location is identified in accordance with the client’s preferences   2. Handsets/phones location is determined as per the client’s preferences   3. Trunkings and trays for laying cable are identified in line with current client’s premises setup   4. Safety procedures are adhered to for each activity |
| 1. Mount KSU( Norstar Key Service Unit) | * 1. Norstar Key Service Unit is mounted and powered in line with manufacturer’s guidelines   2. The mounted KSU unit’s physical strength and tolerance to a force is tested in line with standard operating procedures |
| 1. Plug circuit cards into KSU | * 1. Circuit card’s compatibility with the KSU is checked in line with operational procedures   2. Circuit cards are plugged into KSU one by one in accordance with the manufacturer’s manuals |
| 1. Interconnect telephone lines with the KSU | * 1. Cable laying and termination is performed in line with the ISO/IEC-11801 standards   2. Cable laying routes are build based on the phone network requirements   3. Cable laying routes are build according to the installation location   4. Cable laying routes are build based on the phone network design   5. Cable laying routes are build according to the expected termination point |
| 1. Interconnect KSU with phone units. | * 1. Handsets are connected to KSU in line with the manufacturer’s manuals   2. Handsets are powered in line with manufacturers guidelines   3. Firmware versions on the handsets are upgraded in line with manufacturer’s requirements   4. Safety procedures are adhered to for each activity |
| 1. Code KSU unit. | * 1. KSU unit is programmed in line with the standard operating procedures   2. KSU unit programme is checked and debugging procedures run in line with standard operating procedures   3. KSU unit’s firmware is upgraded to the latest standards/ version according to manufacturers guidelines   4. Safety procedures are adhered to for each activity   5. Waste materials are disposed in accordance with EHS regulations |
| 1. Test telephone network | * 1. Phones are tested in line with the manufacturer’s standards.   2. Both inbound and outbound calls are tested within the area of installation for all extensions in line with standard operating procedures |
| 1. Document installed telephone network | * 1. Extensions aligned to the telecommunication company are documented according to organizational structure   2. Handsets’ and KSU’s serial numbers are recorded for support purposes in line with organizational   3. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   4. Defects liability period is established in accordance with the standard operating procedures operating procedures.   5. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   6. Defects liability period is established in accordance with the standard operating procedures. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Installation of telephone networks
* Network maintenance
* Mounting of KSU units
* Types of telephone networks
* Network alignment
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Decision making
* CAK regulations
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing
* Material management
* Workplace communication
* Documentation and records keeping
* OSHA
* Customer management

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of telephone network
* Telephone network maintenance
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Decision making
* Time management
* Negotiation
* Report writing
* Planning
* Communications
* Proficient in ICT

**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. Conducted a pre-installation site visit   2. Generated a survey report   3. Determined handsets/phones   4. Mounted Norstar Key Service Unit in line with the manufacturers guidelines   5. Performed cable laying and termination in line with the ISO/IEC-11801 standards   6. Build route according to the expected termination point   7. Programmed KSU unit in line with the standard operating procedures   8. Tested phones as per the guidelines of the manufacturer |
| 1. Resource Implications | The following resources must be provided: These include  Resources same as that of workplace are advised to be applied, installation tools, testing tools and instruments, communication cables, KSUs, handsets. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# BROADCAST TV AND RADIO SIGNALS

**UNIT CODE:** ENG/OS/TLE/CR/12/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in broadcasting TV and Radio signals. Competencies include; maintaining programming logs, controlling audio equipment, operating monitor and converse, regulating sound fidelity, recording audio or video signals, monitoring signal strength, aligning transmitting and receiving antennas and maintaining broadcasting equipment.

**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. Maintain programming logs | * 1. Programming logs are documented in line with the organizational procedures   2. Programming logs are backed up as per the organization ICT policy   3. Logs are availed according to the industry best practices |
| 1. Control audio equipment | * 1. Control equipment are selected based on the type of broadcast   2. Audio equipment are controlled according to the standard operating procedure |
| 1. Operate monitors and converse | * 1. Quality of video and audio signals are operated in line with standard operating procedures   2. Monitors and converse are operated according to the CAK policies, rules and regulations |
| 1. Regulate sound fidelity | * 1. The quality of the sound is regulated depending on the operating frequencies   2. Sound fidelity depends on the quality of the equipment in use |
| 1. Record audio or video signals | * 1. Audio and video recording equipment are adjusted as per the current operating standards   2. Clarity of the video signals in carried out in adherence to OSHA standards |
| 1. Monitor signal strength | * 1. Received signal strength is monitored often in line with organizational standards   2. Signal monitoring is performed according to CAK standards |
| 1. Align transmitting and receiving antennas | * 1. Antennas are aligned as per the desired output   2. The type of antenna determines the transmitted and received signal strength.   3. Safety procedures are adhered to for each activity |
| 1. Maintain broadcasting equipment | * 1. Broadcasting equipment is routinely checked for malfunctions in line with standard operating procedures   2. Audio and Visual equipment are kept clean in line with standard operating procedures   3. Broken down equipment are repaired in line with standard operating procedures   4. Redundant system is periodically checked for functionality in accordance with the standard operating procedures.   5. Inventory of spares is updated in accordance with the standard operating procedures. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Types of networks
* CAK regulations
* OSHA
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Customer management
* Types of tests on various radar system
* Statutory documents in installation of different types of radar system

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Broadcasting of TV and Radio signals
* TV and Radio maintenance
* Troubleshooting
* Problem solving
* Analytical
* First aid
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing
* Decision making

**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. Backed up programming logs as per the organization ICT policy   2. Selected control equipment based on the type of broadcast   3. Operated monitors and converse according to the CAK policies, rules and regulations   4. Regulated sound quality in line with the operating frequencies   5. Adjusted audio and video recording equipment as per the current operating standards   6. Aligned antennas as per the desired output   7. Repaired broken down equipment in line with standard operating procedures |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied. These include: Broadcasting tools, network testing tools, communication equipment, routers, switches, hubs, access points etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM TCP-IP AND NETWORKING

**UNIT CODE:** ENG/OS/TLE/CR/13/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing SME and Home IP networks. Competencies includes; setting IP network, connecting local users to network, connecting users to network resources, deploying network services, testing and run installed IP network system and documenting installed IP network.

**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. Survey is conducted according to the equipment and the services to be deployed.   2. Survey is conducted according to the expected number of users.   3. Survey is conducted according to mode of network access.   4. Network is surveyed in line with the expected network security mechanism.   5. Network survey report is analysed according to the collected data and set up requirements   6. Survey report is generated and shared with relevant parties according to the expected guidelines.   7. Safety procedures are adhered to for each activity |
| 1. Design TCP-IP network | * 1. Design is performed as per the network users.   2. Design is performed as per the network functionality and size.   3. Design is performed as per the available ISP.   4. Design is performed as per the equipment to be deployed.   5. Network installation is designed in line with the national and international standards.   6. Network installation is designed in line with the expected network security requirements.   7. Design is performed in adherence to the regulatory authorities’ requirement. |
| 1. Perform TCP-IP network Planning. | * 1. Tools, equipment and materials needed for setup are determined and checklist prepared as per the nature of work.   2. Resources required for the network installation are determined and assembled.   3. Network setup work plan is prepared.   4. Network set up logistics are determined and checklist prepared   5. Relevant licence and way-leaves are acquired in accordance with the standard operating procedures.   6. Network installation team is assembled and duties delegated. |
| 1. Setup private and public IP network | * 1. Tools, materials and devices for network configuration are identified according to the network type.   2. Network is installed and configured according to the network design.   3. IP addressing scheme, subnet masking and routing protocol configuration is performed.   4. Network segmentation is determined as per the network design.   5. Network security is implemented in accordance with expected security threat.   6. Network shared resources and remote access as per the organisation policy is implemented.   7. Network services are deployed in line with the design   8. Network service are deployed according to the expected functionality   9. Network services are deployed according to the expected performance.   10. Network implementation is done in adherence to IEEE regulations.   11. Safety procedures are adhered to for each activity.   12. Waste materials are disposed in accordance with EHS regulations |
| 1. Test, commission and run installed IP network | * 1. Types of tests are identified according to the system functionality   2. Test tools and equipment are identified in accordance with the required tests.   3. Testing is carried out according to the expected efficiency.   4. Testing is performed in line with expected connections.   5. Network security is tested in accordance with organisation policy.   6. Commissioning schedule is prepared according to the complexity of the installation.   7. IP network is commissioned as per the commissioning guidelines |
| 1. Document installed IP network | * 1. IP Network installation report is prepared according to the organization approved format   2. Reports is shared based on the organization structure   3. Reports are filed according to the organization filing system   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties.   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| Access device include but not limited to: | * + Access router   + ONT ( Optical Network Terminal)   + Cisco Routers and boxes |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Installation of different types of networks
* Types of signal transmission medium
* Health and safety measures in installation of IP PABX
* Cisco Routers and boxes
* CAK regulations
* OSHA
* Testing of network
* PPE
* Material management
* Documentation and records keeping

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of networks
* Network maintenance
* Troubleshooting
* Proficient in ICT
* Time management
* Negotiation
* Problem solving
* Analytical
* First aid
* Decision making
* Planning
* 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. Tested mini SIP server on in and out bound calls based on its inbuilt call back functionality   2. Performed connection in line with the clients requirements   3. Connected mini SIP server to the VOIP network based on the available access device   4. Deployed network services in line with the design   5. Carried out testing according to the expected efficiency   6. Filed reports according to the organization filing system |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied,  including installation tools, communication cable, routers, switches etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# MAINTAIN TELECOMMUNICATION EQUIPMENT AND SYSTEMS

**UNIT CODE:** ENG/OS/TEL/CR/14/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to carry out maintenance in telecommunication equipment and systems. This includes preparing maintenance schedule, inspecting and testing telecommunication equipment and systems, preparing list of maintenance tools and equipments, performing maintenance activities, system testing and documenting maintenance records.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Prepare maintenance schedule | * 1. Type of equipment and ***systems*** to be maintained are identified   2. The ***maintenance type*** and scope are defined   3. Maintenance checklists is prepared   4. Manufacturers manuals are referred to   5. Maintenance team identified as per the area of specialization   6. Maintenance work plan is developed |
| 1. Prepare a list of Maintenance tools | * 1. Maintenance tools are identified as per the type of maintenance to be carried out   2. List of maintenance tools is prepared as per established procedure   3. Maintenance tools are checked for specifications and functionality as per their standard operating procedure   4. Maintenance tools are arranged as per their functions |
| 1. Inspect, test and troubleshoot telecommunication equipment and system | * 1. Equipment and System are inspected according to the established procedure   2. Main isolation points are identified   3. Components in the system are identified   4. Maintenance activities schedules are identified and recorded.   5. Components and the entire telecommunication system are tested   6. Troubleshoot and diagnose the system.   7. Inspection and tests are performed as per the standard operating procedure |
| 1. Perform maintenance activities | * 1. Components and defective parts to be replaced/repaired are identified in regards to existing conditions   2. Cleaning, oiling and tightening of components is performed   3. Defective components/parts are replaced/repaired as per established procedures   4. Replaced and repaired components are configured as per the system operation   5. Maintenance is done in accordance to health safety and other relevant regulations and standards   6. ***Waste materials*** are disposed in accordance with EHS regulations |
| 1. Conduct system tests | * 1. Type of tests to be carried out are identified   2. Components to be tested are identified   3. Replaced/repaired components are tested as per the manufacture’s manual.   4. System tests is performed as per the expected output and results recorded |
| 1. Document Maintenance records | * 1. Document the maintenance checklist as per the standard operating procedure   2. Cost, current status of the system and recommendations are documented in a report   3. Maintenance report is filed and submitted to 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**  ***May include but is not limited to:*** |
| --- | --- |
| 1. System | * 1. Security   2. Power generator   3. Domestic installations   4. Industrial installations   5. Commercial installation   6. Telecommunication system   7. Automated systems   8. Solar system   9. Water heating   10. CCTV   11. Power transmission and distribution   12. Horticulture   13. IBMS |
| 1. Maintenance type | 2.1 Periodic   * 1. Preventive   2. Breakdown   3. Ad-hoc |
| 1. Relevant parties | * 1. Service providers   2. Client/representatives   3. Other service providers   4. Security |
| 1. Waste material | * 1. Old batteries   2. Oil   3. Cable lugs   4. Tapes   5. Cable sheaths   6. Offcuts   7. Recovered faulty parts   8. Cable armouries |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

| * **Organisational and legislative requirements including:** | |
| --- | --- |
|  | * The manufacturer's warranty requirements relating to maintenance activities for the telecommunication systems and related components. |
|  | * The legal requirements relating to system maintenance |
|  | * Legislation and workplace procedures relevant to:   + - Health and safety;     - The environment (including waste disposal);     - Appropriate PPE * Appropriate bylaws |
|  | * Workplace procedures for:   + - recording system maintenance work and any variations from the original specification;     - Accidents and incidents reporting * Reporting of challenges |
|  | * The importance of documenting maintenance information. |
|  | * The importance of working within agreed timelines and sharing progress reports |
|  | * The relationship between time and costs. |
|  | * The importance of reporting anticipated delays to relevant parties promptly. |
| * **The use of technical information including:** | |
|  | * How to find, interpret and use sources of technical information for scheduled maintenance activities, including on-board diagnostic displays. |
|  | * The importance of using the correct sources of technical information. |
| * **The operation of installed systems including:** | |
|  | * How the system operates. |
|  | * The operating specifications and tolerances for the different type(s) of systems |
|  | * The hazards associated with maintaining telecommunication Systems |
| * **Routine maintenance requirements including:** | |
|  | * How to conduct scheduled, routine system maintenance activities using prescribed checklist |
|  | How to record failures and faults |
| * **Conducting system tests** | |

**FOUNDATION SKILLS**

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

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

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied safety standards   2. Prepared maintenance schedule and checklist   3. Repaired faulty components on the system   4. Documented maintenance records   5. Components were cleaned before reinstallation   6. Identified the type of maintenance to be carried out   7. Prepared a list of maintenance tools to be used   8. Used appropriate maintenance tools and equipment safely   9. Safely conducted system tests   10. Demonstrated techniques of maintenance work |
| 1. Resource Implications | ***The following resources must be provided:***   * 1. Stationery   2. Test equipment and tools   3. Communication equipment   4. Service manuals |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through a simulated work place environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# **MANAGE A TELECOMMUNICATION PROJECT**

**UNIT CODE:** ENG/OS/TLE/CR/15/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to manage a Telecommunication project. Competencies includes; preparation of work plans and policies, managing project team, managing material, tools and equipment, managing project budget, supervising and assessing project implementation, preparing project reports and commissioning.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Prepare work plans and policies | * 1. Identify the scope of the work plan as per the nature of the project   2. Goals and objectives are established as per the nature of the project   3. ***Resources*** required are identified as per the nature of the project   4. Project ***logistics*** are established as per its nature.   5. Organization structure is developed as per the nature of the project   6. ***Policies*** are developed as per the project standard operating procedure   7. Time span is established as per the complexity of the project |
| 1. Manage Project team | * 1. Project team is identified as per the scope and area of specialization.   2. Job descriptions of the team are developed as per the nature of the project   3. Objectives of the project are communicated to the team as per the project policies.   4. Project activities are delegated in line with the standard operating procedure   5. OSHA is adhered to as per the nature of the project   6. Project team is trained on project activities as per the nature of the project   7. EHS is adhered to in line with the complexity of the project   8. ***SWOT*** analysis is performed as per the nature of the project |
| 1. Manage materials, tools and equipment | * 1. Tools , materials and equipment are identified as per the project activities   2. Auditing of tools, materials and equipment is performed as per the scope of the project   3. Tools, material and equipment inventory system is developed as per the nature of the project   4. Tools, materials and equipments are classified as per the project activities   5. Tools, materials and equipment are maintained in line with project policies.   6. EHS standards are adhered to in line with work place procedures   7. Tools, material and equipment are stored in accordance with manufacturer guidelines and laid down procedures. |
| 1. Manage project budget | * 1. Project budget is prepared in accordance with the scope and standard operating procedures.   2. Project budget is shared with relevant parties.   3. Project budget is monitored and Cost control mechanism is developed as per the scope of the project   4. Miscellaneous activities are recorded as per the budget developed   5. Resource distribution is performed as per the project plan   6. Routine activities on budget implementation is communicated to the relevant parties as per the project policies |
| 1. Supervise and assess project implementation | * 1. Monitoring of project activities as per the project work plan   2. ***Activities*** are delegated to team with their order of priority as per the project plan.   3. Quality of work is assessed as per the project standard operating procedures   4. Direct the team on the expected output as per the work plan   5. Short range action steps are planned for as per project activities   6. Ensure EHS standards are adhered to in line with work place procedures |
| 1. Prepare project reports | * 1. Progress reports are prepared as per the project activities and standard operating procedures.   2. Progress reports are shared with the relevant parties   3. Project operation manuals are documented and shared with the relevant parties |
| 1. Test and commission the Project | * 1. Telecommunication project is tested according to stipulated requirements.   2. Commissioning schedule is prepared according to complexity of the project   3. Training of the project user is conducted as in line with the project operation manual   4. Hand over documents are prepared, signed and submitted to the relevant parties as per contract   5. Telecommunication project commissioned as per the guidelines. |

**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**  ***May include but is not limited to:*** |
| --- | --- |
| 1. Resources | * 1. Finance   2. Personnel   3. Consultancy   4. Materials   5. Tools   6. Storage facilities   7. Buildings |
| 1. Logistics | 1. Transport 2. Security 3. Communication |
| 1. Policies | * 1. Work injury benefit act   2. Disability policy   3. Gender policy |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

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

| * **Organisational and legislative requirements including:** | |
| --- | --- |
|  | * The manufacturer's warranty requirements relating to project management activities |
|  | * The legal and statutory requirements relating to project management. |
|  | * workplace procedures relevant to: * health and safety; * the environment (including waste disposal); * appropriate personal and protective equipment; |
|  | * Workplace procedures for: * Appropriate use of tools and equipment; * Recording project activities * Project quality control evaluation process * Reporting of technical challenges |
|  | * The importance of documenting project implementation report |
|  | * The importance of working within agreed timelines and sharing progress reports. |
|  | * The relationship between time and costs. |
|  | * The importance of reporting anticipated delays to relevant parties promptly. |
| * **The use of technical information including:** | |
|  | * How to find, interpret and use sources of technical information for project activities |
|  | * The importance of using the correct sources of technical information. |

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Communications (verbal and written);
* Proficient in ICT;
* Time management;
* Analytical
* Faults troubleshooting;
* Problem solving;
* Planning;
* Decision making;
* First aid;
* Report writing;
* Project 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. Identified the resources required in a project   2. Prepared a project plan   3. Managed the project budget as per the project scope   4. Wrote and shared project report   5. Delegated project activities to the team   6. Assessed project quality and documented the results   7. Planned for project logistics |
| 1. Resource Implications | ***The following resources must be provided:***   * 1. Finance   2. Personnel   3. Consultancy   4. Materials   5. Tools   Resources the same as that of workplace are advised to be applied |
| 1. Methods of Assessment | **Competency may be assessed through:**   * 1. Oral test   2. Observation   3. Practical demonstration |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through a simulated work place setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# **INSTALL TELECOMMUNICATION TRANSMISSION EQUIPMENT**

**UNIT CODE:** ENG/OS/TLE/CR/16/6/A

**UNIT DESCRIPTION**

This unit covers the competency required to install telecommunication transmission equipment. Competencies include: conducting site survey, planning installation of telecommunications transmission equipment, assembling installation tools and equipment, installing telecommunications transmission hardware and cabling, installing telecommunications transmission accessories, configuring and testing of installed system, cleaning-up installation site and commissioning and documentation of installed telecommunication transmission equipment

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct site survey | * 1. Site survey is conducted as per the type of installation to be carried out   2. Site conditions are evaluated according to the established procedures   3. Measurements are taken as per the expected installation.   4. Site survey photos are documented in line with the industry best practices   5. Site survey report is analysed according to the collected data and installation requirements   6. Survey report is generated and shared with relevant parties according to the expected guidelines   7. Safety procedures are adhered to in line with the OSHA |
| 2. Plan installation of telecommunications transmission equipment | 1. Work preparation is conducted in accordance with the with ***OSHA*** and environmental requirements 2. Site accessibility is provided for as per the nature work 3. Existing and potential site ***hazards*** are assessed in accordance with the location and nature of the installation 4. Proposed ***network equipment*** installation location is verified in accordance with plans obtained from authorised personnel 5. Installation plans are developed in accordance with the relevant legislation codes, regulations and standards 6. Tools and test equipment are obtain as per the workshop rules and regulation 7. Network outage on the affected parties is communicated as per the organization policies |
| * + 1. Assemble installation tools and equipment | 1. Assembling and fixing tools and equipment are identified according to the type of components to be installed 2. Tools, equipment and materials needed for the work are determined and listed as per established procedure 3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure 4. Tools, equipment and materials are assembled and stored as per developed guidelines 5. Distance measuring instruments are identified and adjusted as per the required scale and the parameters |
| 4. Install telecommunications transmission hardware and cabling | 1. Transmission equipment is installed in accordance with the plan and manufacturer's instructions 2. Transmission equipment cards, RF modules, Interface modules are installed as per the manufacturer’s manuals 3. All interconnecting cables (RF, IF or OFC) are laid as per the specifications and design 4. Safety procedures are adhered to for each activity |
| 5. Install telecommunications transmission accessories | 1. Alarms are installed according to instruction manuals, specification and manufacturer’s manual. 2. Operations and maintenance system are installed according to specification and manufacturer’s manual 3. Operator communication facilities are installed in accordance with the design and specification. |
| 6. Configure and test installed system | 1. Software installation is performed as per the manufacturer’s instruction manuals. 2. Configuration instructions are performed according to design and manufacturer’s system specifications 3. S*yste*m performance is tested as per the customer requirements 4. Test results are recorded and documented in accordance as per the organization policies |
| 1. Clean-up installation site | 1. Debris and waste are disposed from installation site in accordance with the ***EHS*** 2. Changes made to the work area during installation are restored as per the industry best practices |
| 8. Commission and document installed telecommunication transmission equipment | 1. Commissioning and integration of transmission equipment is declared as per the organization policies 2. Reports are prepared in line with the organization approved format. 3. Reports are shared according to the organization policy and the structure. 4. Reports are filed in line with organization filing system. |

**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** |
| Testing include but not limited to: | * 1. Insulation test   2. Ring circuit test   3. Short circuit test   4. Firmness   5. Earth continuity |
| Relevant OSHA and environmental Requirements may include but not limited to: | 1. Identifying other services including power 2. Need for decommissioning, worksite and line isolation prior to commencement 3. PPE: 4. Safety barriers 5. Trench guards 6. Warning signs and tapes 7. Safe working practices, such as the safe use and handling of tools and equipment |
| Hazards may include but not limited tio: | 1. Building debris 2. Earth potential rise (EPR) 3. Glass fibre 4. Live power lines 5. Manual handling 6. Optical cable 7. Radio frequency (RF) equipment emitting radiation 8. Remote power feeding services 9. Vermin. |
| Network equipment may include but not limited to: | 1. Multiplexing and radio: 2. Optical equipment 3. RF equipment 4. Transmission |
| Authorised personnel may include but not limited to: | 1. Consultant 2. Contractor 3. Network administrator 4. Project manager. |
| Relevant legislation, codes, regulations and standards may include but not limited to: | 1. Communications Authority of Kenya (CA) 2. International Telecommunications Union (ITU) recommendations 3. National Environment Management Authority (NEMA 4. OHS Acts 5. IEE |
| Tools may include but not limited to: | 1. Anti-static testers 2. Cable strippers 3. Cable testers 4. Cable tie tensioners 5. Crimpers 6. Hammers 7. Mechanical lifts/hoists 8. Pliers 9. Power tools 10. Screwdrivers 11. Soldering irons 12. Spanners 13. Tape measures 14. Tension wrenches 15. Termination tools 16. Trolleys 17. Wire strippers. |
| Test equipment may include but not limited to: | 1. Adaptors 2. Analogue transmission measuring sets 3. Digital analysers 4. Error meter 5. Frequency measurer 6. Lap top computer 7. Microwave link analyser 8. Modulator tester 9. Multimeters 10. Optical attenuators 11. Oscillator 12. Oscilloscopes 13. Pattern generators 14. RF band noise measurer 15. RF microwave test sets 16. RF sweep tester 17. Spectrum analysers 18. Sweep test coaxial and wave guide antenna systems 19. Standing wave ratio (SWR) meters 20. Transmitter/Receiver filter combiner equipment |
| Interconnecting cables may include but not limited to: | 1. Communications cables: 2. Category 5 or 6 3. Coaxial cable 4. Data cables 5. Jumper cables 6. Optical patch cords 7. Control cables 8. Power cables 9. Signal cables. |
| Tests may include but not limited to: | 1. Bit error rate (BER) 2. Continuity 3. End to end 4. Frequency response 5. Functionality test 6. Gain and attenuation 7. Loop back 8. Signal to noise ratio |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

Analytical skills to:

* + interpret test equipment settings and readings
  + interpret design specifications including:
  + circuit diagrams
  + plans
  + specifications
  + communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
  + literacy skills to interpret technical specifications and related documentation
  + numeracy skills to make calculations and necessary calibration changes
  + planning and organisation skills to make site access and equipment delivery arrangements
  + problem solving to account for unexpected faults or equipment incompatibilities

Technical skills to:

* apply antistatic techniques for material and equipment handling
* correctly handle, connect and calibrate test equipment
* install cables including:
* appropriate cable separation
* minimum bending radii
* provision of spare length

Terminate cables including:

* + stripping
  + conductor identification and fanning
  + cleaning of optical fibres connectors
  + provision of spare length
  + use hand tools for mounting and securing equipment

Required knowledge

* Cabling types, connectors and cabling structures
* Connections to carrier infrastructure or equipment
* Electrical and or optical properties to be measured
* Overview knowledge of network and transmission equipment
* Power requirements and electrical safety
* Typical performance parameters and faults that may be encountered in customer equipment and related connection and transmission media
* Various test equipment types suitable for tests to be made
* Waste handling and environmental compliances in its disposal

**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. Analysed site survey report according to the collected data and installation requirements   2. Developed installation plans in accordance with the relevant legislation codes, regulations and standards   3. Checked tools, equipment and materials for specifications and functionality as per the standard operating procedure   4. Installed transmission equipment in accordance with the plan and manufacturer's instructions   5. Installed transmission equipment cards, RF modules, Interface modules as per the manufacturer’s manuals   6. Laid all interconnecting cables (RF, IF or OFC) as per the specifications and design   7. Installed operations and maintenance system according to specification and manufacturer’s manual   8. Install operator communication facilities in accordance with the design and specification.   9. Performed configuration instructions according to the design and manufacturer’s system specifications   10. Disposed debris and waste from installation site in accordance with the EHS   11. Filed reports in line with organization filing system |
| * + - 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied. This include: Installation site, telecommunication transmission equipment, installation tools, communication cables |
| 3. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| * + 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through a simulated work place setting |
| * + 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# INSTALL WIFI NETWORK

**UNIT CODE:** ENG/OS/TLE/CR/17/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required in installing WI-FI network. Competencies include: surveying WI-FI network installation site, designing WI-FI network, assembling installation tools, equipment and materials, installing WI-FI network equipment and devices, configuring WI-FI network devices, testing and commissioning installed WI-FI network and documenting installed WIFI network

**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. Survey WIFI network installation site | * 1. Survey is conducted according to the type of network to be installed   2. Site conditions are evaluated according to the network installation requirements   3. A clean frequency channel is identified according as per the standard operating procedure   4. Installation location is identified as per expected network coverage and architectural design   5. Site survey report is analysed according to the collected data and installation requirements   6. Survey report is generated and shared with relevant parties according to the expected guidelines   7. Safety procedures are adhered to for each activity |
| 1. Design WIFI network | * 1. Design is performed as per the expected network use   2. Design is performed as per the network numbers of users   3. Design components are identified as per the network application   4. Network is designed according to the expected transmission platform   5. Network installation is designed in line with the national and international standards   6. Network installation is designed in line with the expected network security requirements   7. Design is performed in adherence to the regulatory bodies requirement |
| 1. Assemble installation tools, equipment and materials | * 1. Assembling and fixing tools and equipment are identified according to the type of network to be installed   2. Tools, equipment and materials needed for the installation are determined and list prepared as per the nature of the work   3. Tools, equipment and materials are checked for specifications and functionality as per the standard operating procedure   4. Tools, equipment and materials are assembled and stored as per developed guidelines |
| 1. Install WIFI network equipment and devices. | * 1. Network installation is performed in line with the design   2. Components are installed according to the manufacturers manuals   3. Network is installed in adherence to the expected output signals   4. Network is installed as per the standard operating procedure   5. Cable ***enclosures*** are installed according to the size of communication cables   6. Communication cables are laid and enclosed in adherence to the IEE regulations   7. Network components are installed in adherence to the laws and policies of the relevant ***regulatory bodies***   8. Safety procedures are adhered to for each activity   9. Waste materials are disposed in accordance with EHS regulations |
| 1. Configure WIFI network devices | * 1. Tools, materials and devices for network configuration are identified according to the network type   2. Network connection is performed according to National and international communication standards and protocols   3. Stability and connectivity tests of cables and equipment is performed as per the network type   4. Network is installed and configured according to network installation manual.   5. IP addressing scheme, subnet masking and routing protocol configuration is performed as per the IEE regulations   6. Network segmentation is determined as per the Network design.   7. Network security is implemented in accordance with the expected security threats.   8. Network privileges are allocated according to the network configuration.   9. Safety procedures are adhered to for each activity   10. Network types are configured as per the type of connection   11. Remote network access for specified users is configured in accordance with the organization policy.   12. Network is configured in line with the number of users |
| 1. Test and commission installed WIFI network | * 1. Types of tests are identified according to the purpose of the network.   2. Test tools and equipment are identified in accordance with the required tests.   3. Tests are performed according to the components installation manual   4. Network capacity is tested in line with the number of users expected.   5. Commissioning schedule is prepared according to the complexity of the installation.   6. Network is commissioned as per the commissioning guidelines |
| 1. Document installed WIFI network | * 1. Network installation report is prepared according to the organization policy   2. Installation report is shared based on the organization structure   3. Network installation report is filed according to the organization filing system.   4. Necessary warranty documents for the installed equipment are issued and shared with relevant parties as per the organization policies   5. Defects liability period is established in accordance with the standard operating procedures. |

**RANGE**

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

|  |  |
| --- | --- |
| Variable | **Range** |
| Relevant OSHA and environmental requirements may include but not limited to: | PPE:   * + gloves   + protective suits   + safety boots   + safety glasses   Safety equipment:   * + flashing lights   + safety barriers   + warning signs and tapes   Safe working practices, such as the safe use and handling of:   * + materials   + tools and equipment   + work platforms   + special access requirements   + suitable light and ventilation   + environmental considerations:   + clean-up protection   + waste management. |
| Hazards may include but not limited to: | * Building debris * Earth potential rise (EPR) * Glass fibre * Manual handling * Radio frequency (RF) equipment emitting radiation * Remote power feeding services |
| Network equipment may include but not limited to: | Customer premises equipment (CPE) equipment:   * + Closed circuit TV (CCTV)   + Intercom   + Office equipment   + Security equipment   Computer network:   * + Gateways   + Network managers   + Router   + Servers   + Switches   + Wireless LAN   + Optical equipment |
| Authorised personnel may include but not limited to: | * Consultant * Contractor * Network administrator * Project manager. |
| Relevant legislation, codes, regulations and standards may include but not limited to: | * Communications Authority of Kenya (CAK) * IEE 802 standards * Frequency Band (2.4ghz & 5ghz) |
| Tools may include but not limited to: | * Anti-static testers * Cable strippers * Cable testers * Cable tie tensioners * Crimpers * Hammers * Insulation displacement tools * Pliers * Screwdrivers * Soldering irons * Spanners * Tape measures * Tension wrenches * Termination tools * Wire strippers. |
| Test equipment may include but not limited to: | * Adaptors * Communication system analysers * Digital analysers * Error meter * Frequency measurer * Lap top computer * Multi-meters * Optical attenuators * RF band noise measurer * Spectrum analysers * Transmitter/receiver filter combiner equipment |
| Interconnecting cables may include but not limited to: | * Communications cables: * Category 5 or 6 * Data cables * Optical patch cords * Power cables * Signal cables. |
| Tests may include many include but not limited to: | * Bit error rate (BER) * Continuity * End to end * Frequency response * Functionality test * Gain and attenuation * Signal to noise ratio * Link speed. |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

* Environmental health and safety
* Legal requirements in the installation of security systems
* Types of communication network
* Installation of different types of networks
* Types of signal transmission medium
* Types of networks
* Health and safety measures in installation of network
* OSHA
* Testing of network
* Statutory documents in installation of different types of network
* PPE
* Material management
* Workplace communication
* Documentation and records keeping
* Manufacturers of different types of security systems
* CAK regulations

**FOUNDATION SKILLS**

The individual needs to demonstrate the following foundation skills:

* Installation of networks
* Network maintenance
* Troubleshooting
* Problem solving
* Analytical
* Planning
* Communications
* Proficient in ICT
* Time management
* Negotiation
* Report writing
* First aid
* Decision making

**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. Analysed site survey report according to the collected data and installation requirements   2. Designed network installation in line with the national and international standards   3. Identified design components as per the network application   4. Evaluated site conditions according to the network installation requirements   5. Performed design as per the network users   6. Installed components according to the manufacturers manuals   7. Installed network in line with the design   8. Performed network connection according to National and International communication standards and protocols   9. Allocated network privileges according to the network configuration   10. Conducted testing according to the network installation manual |
| 1. Resource Implications | The following resources must be provided:  Resources same as that of workplace are advised to be applied. This include: installation tools, measuring tools and instruments, network testing tools, communication cable, routers, switches etc. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical demonstration   3. Observation   4. Written tests |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |